DOE/EIS-0350-SA-2
January 2015

Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico

Supplement Analysis

National Nuclear Security Administration

U.S. Department of Energy
Washington, DC

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ACRONYMS AND ABBREVIATIONS

AC	analytical chemistry
AEI	areas of environmental interest
ALARA	as low as reasonably achievable
ARF	airborne release fraction
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
CH	contact-handled
CMR	Chemistry and Metallurgy Research
CMRR	Chemistry and Metallurgy Research Building Replacement
CMRR-NF	Chemistry and Metallurgy Research Building Replacement Nuclear Facility
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
EIS	environmental impact statement
ETWC	Eastern Tennessee Waste Treatment Complex
FR	*Federal Register*
FTE	full-time equivalent
g	gravitational acceleration
HEPA	high-efficiency particulate air filter
LANL	Los Alamos National Laboratory
LCF	latent cancer fatality
LEED	Leadership in Energy and Environmental Design
LLW	low-level radioactive waste
LPF	leak path factor
LTP-OCD	LANL Transuranic Program-Oversized Container Disposition
Mw	moment magnitude
MAR	material at risk
MC	materials characterization
MEI	maximally exposed individual
MLLW	mixed low-level radioactive waste
NEPA	National Environmental Policy Act of 1969
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
PuE	plutonium-239-equivalent
PF-4	Plutonium Facility, Building 4
PIDADS	perimeter intrusion, detection, assessment and delay system
RAMROD	Radioactive Materials Research, Operations, and Demonstration
RANT	Radioassay and Nondestructive Testing Facility
RCRA	Resource Conservation and Recovery Act
RF	respirable fraction
RLUOB	Radiological Laboratory/Utility/Office Building
RLWTF	Radioactive Liquid Waste Treatment Facility
ROD	Record of Decision

ROI	Region of Influence
SA	Supplement Analysis
SEIS	supplemental environmental impact statement
SWBs	standard waste boxes
SWEIS	site-wide environmental impact statement
SWS	sanitary wastewater system
TA	technical area
TLD	thermoluminescent dosimeter
TQ	threshold quantity
TRU	transuranic waste
USFWS	U.S. Fish and Wildlife Service
WCS	Waste Control Specialists
WIPP	Waste Isolation Pilot Plant

1.0 INTRODUCTION AND PURPOSE AND NEED FOR AGENCY ACTION

To meet mission requirements, the U.S. Department of Energy/National Nuclear Security Administration (DOE/NNSA) proposes to relocate analytical chemistry (AC) and materials characterization (MC) capabilities at Los Alamos National Laboratory (LANL) from the Chemistry and Metallurgy Research (CMR) Building to other existing LANL facilities. Relocation of AC and MC capabilities from the CMR Building was evaluated in the *Final Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EIS-0350) (*CMRR EIS*). The Radiological Laboratory/Utility/Office Building (RLUOB) was constructed and began radiological operations in August 2014 pursuant to the *CMRR EIS* Record of Decision (ROD) (69 *Federal Register* 6967). DOE/NNSA now proposes changes that have become viable for relocating AC and MC capabilities at LANL since publication of the *CMRR EIS* and its ROD – namely, to use a combination of space already available in RLUOB and space made available at the Plutonium Facility. In accordance with DOE and Council on Environmental Quality regulations, this Supplement Analysis evaluates whether the proposed changes would represent a substantial change relevant to environmental concerns or whether new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts are significant.

1.1 Background

The U.S. Department of Energy/National Nuclear Security Administration (DOE/NNSA) is charged with national security and research and development missions involving nuclear or radioactive materials. To fulfill its missions, NNSA requires analytical chemistry (AC) and materials characterization (MC) capabilities for NNSA's actinide-based missions in support of stockpile stewardship. Since the 1950s, AC and MC have been performed at the Chemistry and Metallurgy Research (CMR) Building located in Technical Area 3 (TA-3) at Los Alamos National Laboratory (LANL) in New Mexico; however, the capabilities of and operations at the CMR Building are restricted due to safety constraints. In 2003, DOE prepared the *Final Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EIS-0350) (*CMRR EIS*) (DOE 2003b), which evaluated alternatives for replacement of the CMR Building. The purpose and need for the CMR Building Replacement (CMRR) project was to provide the physical means for accommodating the continuation of the functional, mission-critical CMR capabilities, to consolidate like activities for operational efficiency, and to provide extra space for future modifications (for example, space for handling large vessels used to contain dynamic experiments). DOE issued a Record of Decision (ROD) (69 *Federal Register* [FR] 6967), dated February 12, 2004, for constructing and operating a two-building replacement for the CMR Building to be located in TA-55. This CMRR Facility was to consist of: (1) a building housing administrative offices and support functions (now called the Radiological Laboratory/Utility/Office Building [RLUOB]); and (2) a Nuclear Facility (CMRR-NF) housing Hazard Category 2 nuclear operations. RLUOB has been constructed and is in operation; however, CMRR-NF was not constructed.

In 2011, NNSA issued the *Supplemental Environmental Impact Statement for the Nuclear Facility Portion of the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EIS-0350-S1) (*CMRR-NF SEIS*) (DOE 2011a), which evaluated the potential environmental impacts from proposed alternatives for constructing and operating the CMRR-NF as evaluated in the *CMRR EIS*, as well as impacts from ancillary projects that had been proposed since its publication. In an October 18, 2011, amended ROD (76 FR 64344), NNSA selected the Modified CMRR-NF Alternative for constructing and operating the CMRR-NF portion of the CMRR project.

In addition to the Modified CMRR-NF and other alternatives evaluated in detail, the *CMRR-NF SEIS* evaluated alternatives that were determined not to be reasonable and thus were not evaluated in detail, including an alternative whereby AC and MC capabilities would be distributed among multiple LANL facilities. A Hazard Category 2 facility such as Plutonium Facility, Building 4 (PF-4) in TA-55 would be required for some AC and MC activities; however, it was determined that using space and capabilities at PF-4 would interfere with its work and reduce the availability of facility space for future expected DOE and NNSA mission support work. Other LANL Hazard Category 2 facilities outside of TA-55 were not considered reasonable for a variety of reasons, particularly a lack of available space or required engineered safety controls, so their use would introduce new hazards for which the facilities were not designed.[1] In addition, use of facilities in other LANL locations would not conform to the objective of collocating plutonium operations near PF-4 and would require periodic closure of roadways and heightened security to enable transfer of materials between the facilities. NNSA also evaluated whether a combination of space at PF-4 and RLUOB could be used, but dismissed this combination alternative from detailed evaluation because of limits on the quantities of materials allowed in RLUOB and the expected lack of space at PF-4 as discussed above (DOE 2011a).

Since publication of the *CMRR EIS* ROD, changes have been made to mission needs and expected PF-4 programs (see Chapter 3, Section 3.3.1). Furthermore, in accordance with recent NNSA guidance (NNSA 2014), NNSA has increased the quantity of nuclear material allowed in a Radiological Facility (see Chapter 3, Section 3.3.2). Due to these mission need, programmatic, and technical changes, it is now possible to provide the necessary AC and MC capabilities using a combination of space already available in RLUOB and space to be made available at PF-4. Two subprojects would be implemented to effect the proposed changes. One subproject, to be completed in 2019, would address the changes in RLUOB; the second subproject, to be partially completed in 2019 and fully completed in 2024, would address the changes in PF-4. The proposed subprojects support NNSA's goal of ceasing programmatic operations in the CMR Building by the end of 2019.

1.2 Purpose and Need for the Supplement Analysis

NNSA proposes to transfer AC and MC capabilities from the CMR Building to two existing LANL facilities at TA-55: RLUOB and PF-4. RLUOB operates as a Radiological Facility with 19,500 square feet of space available for radiological laboratory operations. PF-4 is a Hazard Category 2 Nuclear Facility providing research and applications in chemical and metallurgical processes for recovering, purifying, and converting plutonium and other actinides into many compounds and forms; research into material properties; and fabrication of parts for research and stockpile applications. PF-4 is surrounded by a perimeter intrusion, detection, assessment, and delay system (PIDADS).

In RLUOB, NNSA proposes to further outfit available laboratory space for AC and MC activities by installing equipment in currently unequipped laboratory space and re-equipping three laboratory rooms. The project would outfit some existing RLUOB laboratory floor space for AC and MC activities while leaving contingency space for other activities. In PF-4, NNSA proposes to adjust existing laboratory space for AC and MC activities that require quantities of radiological materials greater than those allowed in RLUOB. Equipment in some laboratory rooms would be removed, and new equipment would be installed or existing equipment reconfigured.

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[1] Other reasons included: (1) they had been decommissioned for safety and security reasons and were no longer considered Hazard Category 2 facilities; (2) they were closure sites (specifically, environmental cleanup potential release sites); or (3) they were support facilities lacking the necessary space to perform AC and MC operations (for example, waste management facilities).

NNSA's proposal requires evaluation of potential environmental impacts. Council on Environmental Quality (CEQ) regulations under Title 40, Section 1502.9(c), of the *Code of Federal Regulations* (40 CFR 1502.9(c)) require Federal agencies to prepare a supplement to an environmental impact statement (EIS) or a new EIS when an agency makes substantial changes to a proposed action that are relevant to environmental concerns, or when there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. DOE regulations under 10 CFR 1021.314(c) direct that, when it is unclear whether a supplement to an EIS is required, a Supplement Analysis (SA) should be prepared to assist in that determination.

In accordance with CEQ and DOE requirements, NNSA has prepared this SA to evaluate the potential environmental impacts of the proposed changes. The focus of this analysis is on determining whether NNSA's proposal to provide AC and MC laboratory capabilities in existing space in RLUOB and PF-4 represents a substantial change that is relevant to environmental concerns or whether new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts are significant. The end result of this analysis is a determination whether the existing *CMRR EIS* should be supplemented, a new EIS should be prepared, or no further National Environmental Policy Act (NEPA) analysis is necessary.

1.3 Relevant National Environmental Policy Act Documents

The analysis relies in part on previous NEPA analyses that evaluate potential environmental impacts at LANL. As discussed in Section 1.1, in November 2003, DOE issued the *CMRR EIS* (DOE 2003b), which evaluated the No Action and four alternatives for the replacement of the CMR Building: the Preferred Alternative (construction and operation of RLUOB and CMRR-NF at TA-55), a Greenfield Alternative (construction and operation of RLUOB and CMRR-NF at TA-6), and two Hybrid Alternatives (construction and operation of new laboratory facilities at TA-55 or TA-6 combined with use of CMR Building for administrative and support functions). In the February 12, 2004, ROD for the *CMRR EIS* (69 FR 6967), DOE selected the Preferred Alternative and decided to construct and operate RLUOB and CMRR-NF. These buildings were intended to support ongoing research and development operations for AC and MC at LANL, and to replace the CMR Building so that long-term AC and MC operations would be available to successfully accomplish LANL mission support activities and programs, including stockpile stewardship.

In January 2005, NNSA issued the *Supplement Analysis, Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement (CMRR) Project at Los Alamos National Laboratory, Los Alamos, New Mexico, Changes to the Location of the CMRR Facility Components* (DOE/EIS-0350-SA-01) (*2005 CMRR SA*) (DOE 2005). This SA evaluated the environmental effects of changes in the locations of certain components of the Preferred Alternative evaluated in the *CMRR EIS*. NNSA proposed to execute the first phase of the CMRR project by constructing the building now called RLUOB at one of two possible locations that differed slightly from the locations analyzed in the *CMRR EIS*. The SA evaluated the environmental impacts of building RLUOB south of the intersection of Pajarito Road and Pecos Drive, a location that is now used as employee parking and is being considered in the present SA for construction-support offices, and at a location north of Pajarito Road (DOE 2005). RLUOB was constructed at the location north of Pajarito Road.

In May 2008, NNSA issued the *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EIS-0380) (*LANL SWEIS*) (DOE 2008a). The *LANL SWEIS* evaluated the potential environmental impacts from ongoing LANL operations and new activities including a TA-55 Refurbishment (now called Reinvestment) Project, and included an analysis of support activities related to construction of the CMRR project in addition to those evaluated in the 2003 *CMRR EIS* (DOE 2003b). The *LANL SWEIS* stated that although planning for RLUOB was complete and construction was underway and planning for CMRR-NF had been initiated, CMRR-NF construction would not begin until NNSA had completed a programmatic NEPA document and made a decision on the organization of the NNSA nuclear enterprise. Following completion of the *Final Complex Transformation Supplemental Programmatic Environmental Impact Statement* (DOE/EIS-0236-S4) (DOE 2008b), NNSA issued two RODs (73 FR 77644, 73 FR 77656) that included decisions to retain plutonium operations at LANL and to proceed with construction and operation of CMRR-NF. In RODs for the *LANL SWEIS* (73 FR 55840, 74 FR 33232), NNSA selected the No Action Alternative, including construction and operation of the CMRR project and the additional support activities evaluated under that alternative. NNSA also decided to implement a long-term program to refurbish PF-4 that would involve replacement or upgrade of obsolete or worn-out facility components and safety systems (74 FR 33232).[2] LANL issues Yearbooks that assess annual LANL operations compared to the projection of impacts in the *LANL SWEIS*.

As discussed in Section 1.1, in August 2011, NNSA issued the *CMRR-NF SEIS* (DOE 2011a), which analyzed a No Action, a Modified CMRR-NF, and a Continued Use of CMR Building Alternative. On October 18, 2011, DOE issued an amended ROD (76 FR 64344) selecting the Modified CMRR-NF Alternative for constructing and operating the CMRR-NF portion of the CMRR project.

2.0 PROPOSED CHANGES

The Proposed Action, as stated in the *CMRR EIS* (DOE 2003b), is to relocate AC, MC, and associated research and development capabilities from the CMR Building to a newly constructed facility and to continue to perform these operations and activities. This SA evaluates proposed changes to implementation of the Proposed Action that have become viable since publication of the *CMRR EIS*.

2.1 Analytical Chemistry and Materials Characterization Operations

AC involves the study, evaluation, and analysis of radioactive materials. In general terms, AC is a branch of chemistry that addresses the separation, identification, and determination of the components in a sample. Examples of sample characterization activities include assay and determination of isotopic ratios of plutonium, uranium, and other radioactive materials, as well as identification of major and trace elements in materials, the content of gases, constituents at the surfaces of various materials, and methods to characterize waste constituents in hazardous and radioactive materials. MC relates to the measurement of basic material properties and the changes in those properties as a function of temperature, pressure, or other factors. These AC and MC activities support actinide research and development capabilities and NNSA strategic objectives for stockpile stewardship and management at LANL and other sites across the DOE Complex such as Lawrence Livermore National Laboratory, the Savannah River Site, and Sandia National Laboratories.

AC and MC activities are being conducted at reduced levels at the CMR Building and PF-4. A full suite of MC capabilities was previously performed in the CMR Building, but now only a subset of those activities is being performed. In addition, because of the limited analytical capabilities at each facility, inefficiency is introduced because of the time required to transport analytical samples and nuclear material between the CMR Building in TA-3 and facilities in TA-55. RLUOB began radiological operations in August 2014.

[2] The PF-4 Refurbishment (Reinvestment) Project consists of a number of subprojects including removal (replacement) of outdated gloveboxes, development of warehouse capacity, and installation of equipment. Although most of the subprojects would occur indoors, implementation of several subprojects was expected to involve varying degrees of land-disturbing activities including construction of accessory structures or additions to existing structures (DOE 2008a).

The changes proposed in this SA would enhance or establish AC and MC capabilities in PF-4 and RLUOB consistent with current program requirements (see Chapter 3, Section 3.3.1), and eliminate the need for inefficient transfer of analytical samples and nuclear material between TA-3 and TA-55.

2.2 Modifications to LANL Facilities

RLUOB and PF-4 would be modified as discussed in the following sections. **Figure 1** shows the location of RLUOB, PF-4, and proposed construction support areas in TA-55; the figure also shows the location of proposed additional office capacity in TA-50. Modifications at both facilities would require 8 to 10 years to complete, and would occur primarily within the confines of RLUOB and PF-4. About 17,500 square feet (1,630 square meters) of space within the two buildings would be modified to provide the needed laboratory capabilities. Between the two buildings, 55 ventilated enclosures (gloveboxes, open-front gloveboxes, and fume hoods) would be removed, while 30 existing enclosures would be modified and 124 new enclosures would be installed.

Figure 1. CMRR Project Vicinity

To support modifications, construction support trailers and storage structures would be temporarily located within previously disturbed areas in convenient proximities to RLUOB and PF-4. Four construction support trailers, one covered storage structure, and one restroom trailer would be located near RLUOB. Four construction support trailers, one covered storage structure, and one restroom trailer would be located near PF-4 within its protected area. Several freight containers may be temporarily installed in TA-55 to store equipment or to support subcontractors. Existing space within PF-3 (an existing TA-55 building inside of the protected area) may be modified to provide temporary office space.

In addition, there would be new construction to support facility modifications and LANL operations. Additional office space would be developed by installing modular (trailer-like) structures similar to those located in TA-50 to support RLUOB construction (some structures were removed when RLUOB construction was complete), or by constructing a more substantial structure in TA-50 or another TA. For purposes of analysis, it is assumed that an office building of about 48,000 square feet (4,460 square meters) would be located in TA-50 and would occupy some of the space now used for employee parking, and/or a graded area next to the parking lot where modular office structures were previously sited. Furthermore, minor modifications would be made to an existing warehouse and equipment storage area within TA-55, and a permanent warehouse would be constructed in TA-48 or other nearby TA. Several potential locations in TA-48 are under consideration; each location is 20 to 50 percent vegetated with the remaining area in each location consisting of land that was previously disturbed for vehicle parking or other activities. It is expected that the new warehouse would be an uncomplicated structure (e.g., steel building on a concrete slab) and after construction would have a maximum size of about 50,000 square feet (4,650 square meters) with a parking area of approximately equal size.

2.2.1 Modifications to RLUOB

The proposed modifications to RLUOB would install additional laboratory capabilities using existing building space consistent with the revised limit for a Radiological Facility of 38.6 grams of plutonium-239-equivalent (PuE)[3] (see Chapter 3, Section 3.3.2). Activities to be conducted at RLUOB under this limit would include AC and some MC capabilities including radiochemistry, trace-element analysis, mass spectrometry, sample preparation and distribution, assay, AC/MC research and development, and support operations. These capabilities would be provided by installing new ventilated enclosures with accompanying instrumentation and ancillary equipment. Modification and refitting of RLUOB would be complete by 2019.

Facility modifications in RLUOB would require temporary reconfiguration of security and radiological control boundaries, creation of an indoor construction staging area, and the opening of an entrance to an existing tunnel that extends a short distance from the RLUOB laboratory floor. Opening this tunnel entrance would require minor site excavation and outdoor construction. This entrance would enable efficient entry and egress of facility modification crews.

Except for small quantities of solid low-level radioactive waste (LLW) (e.g., personal protective gear) that could result from connecting new equipment to existing liquid radioactive waste drain lines and ventilation systems, waste generated from RLUOB modifications would consist of nonhazardous construction debris such as empty crates and boxes or metal pipe pieces. Very small quantities of hazardous waste could be generated. All radioactive and nonradioactive wastes would be appropriately managed as discussed in Chapter 3, Section 3.3.5, and Chapter 4, Section 4.4. Liquid sanitary waste would be addressed using existing or modified building capabilities or portable services.

2.2.2 Modifications to PF-4

AC and MC activities requiring greater than Radiological Facility limiting quantities of nuclear material (38.6 grams PuE) would be conducted in reconfigured space within PF-4. Reconfiguration would require removal of some ventilated enclosures, equipment, and materials; reconfiguration of some enclosures; and installation of new enclosures, instrumentation, and ancillary equipment. Modifications would include an indoor construction support area, additional shower and locker room space, and a reconfigured PF-4 entry and egress control area in an adjacent and connected building. Modification and refitting of PF-4 would be complete by 2024.

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[3] *The term plutonium-239-equivalent (abbreviated PuE) is used in this SA to refer to quantities of different radionuclides on a common health-risk basis. The mass or radioactivity of other radionuclides can be expressed in terms of the amount of plutonium-239 that would result in the same committed effective dose upon inhalation.*

Radioactively contaminated enclosures, equipment, and materials removed from PF-4 would be packaged and transferred to TA-54 for processing. Such processing would include decontamination of the removed enclosures and large pieces of equipment so that they could be characterized, packaged, and disposed of as LLW or mixed low-level radioactive waste (MLLW). Other LLW or MLLW from facility modifications or equipment installation would also be appropriately managed.

The decontamination process would generate transuranic (TRU)[4] waste that would be packaged, characterized, and stored pending certification and shipment for disposal at the Waste Isolation Pilot Plant (WIPP) (see Chapter 3, Section 3.3.5). TRU waste storage would be consistent with safety-basis limits for material at risk. The first transfer of gloveboxes from TA-55 to TA-54 would occur in the summer of 2015.

PF-4 modifications could generate a small quantity of hazardous waste as well as nonhazardous waste including construction and demolition debris. Liquid sanitary waste would be addressed using existing or modified building capabilities or portable services. All radioactive and nonradioactive wastes would be appropriately managed as discussed in Chapter 3, Section 3.3.5, and Chapter 4, Section 4.4.

3.0 KEY ASSUMPTIONS AND CHANGES

This section summarizes the key assumptions from the *CMRR EIS* (DOE 2003b) analysis, the relationship of the analysis in this SA to previous NEPA analyses, and the key programmatic and environmental changes that have occurred since publication of the *CMRR EIS*.

3.1 Key Assumptions from the *CMRR EIS* Analysis

The following key assumptions form the basis for the analysis presented in the *CMRR EIS* of the impacts from constructing a single, consolidated, special nuclear material (SNM)-capable, Hazard Category 2 laboratory, and a separate building housing administrative offices and support functions (Preferred Alternative, Construction Option 3) (DOE 2003b):

- All Hazard Category 2 and 3 operations would be housed in a single Hazard Category 2 laboratory. The Hazard Category 2 building would contain a total of approximately 200,000 square feet (18,580 square meters) of floor space, and be constructed with one floor below grade containing the Hazard Category 2 operations and one floor above grade containing Hazard Category 3 operations.
- The Administrative Offices and Support Functions Building (now called RLUOB) would have a total square footage of about 200,000 square feet (18,580 square meters) dispersed over several stories, with a total disturbed construction-site area of about 4.0 acres (1.6 hectares). One or more floors could be constructed below ground with a maximum depth of excavation of about 50 feet (15.2 meters). The building would contain laboratories capable of handling materials up to a Hazard Category designation of Radiological Facility, and include a utility structure housing equipment and services for the CMRR Facility, including power, hot water, heat, sanitary sewer, and chilled water. The utility structure (approximately 25,000 square feet [2,320 square meters]) is included in the total estimated square footage for the administrative offices and support functions building. This building would have a maximum height of three stories, or about 35 feet (10.7 meters) above ground-level.

[4] Because TRU and mixed TRU waste are managed essentially the same, TRU waste as used in this SA includes mixed TRU waste.

- Connecting tunnels between the CMRR Facility and the Plutonium Facility would be excavated to a maximum depth of 50 feet (15.2 meters), with an estimated total length of tunnels of about 1,200 feet (366 meters).

3.2 Relationship of the Present Analysis to Previous NEPA Analyses

The evaluations in this SA rely in part on NEPA analyses that evaluated environmental impacts at LANL and were prepared subsequent to the *CMRR EIS* (DOE 2003b). The relevant analyses are summarized below. Where these prior analyses are referenced in the present SA, citations to the original documents are provided:

- *2005 CMRR EIS SA* (DOE 2005): This SA evaluated the impacts from construction of RLUOB and related structures in two alternative areas, and concluded that construction in either area would result in no changes to the impacts analyzed in the *CMRR EIS.* One of the alternative areas, located south of Pajarito Road in TA-50, was eventually used for RLUOB construction project support offices and employee parking. Some project support offices have been removed, although others remain, and the area includes an employee parking lot. The present SA evaluates use of a portion of this parking lot, or adjacent land disturbed from previous RLUOB construction support activities, as a location for support offices for the currently proposed construction and facility modification activities.

- *2008 LANL SWEIS* (DOE 2008a): The *LANL SWEIS* evaluated the impacts from continued operation of LANL, including (as Appendix G.7) the impacts from implementing a TA-55 Refurbishment (now called Reinvestment) Project that would include upgrades of facilities, replacement of equipment or gloveboxes, and provision of additional warehouse capacity. This TA-55 Refurbishment Project is cited in the present SA where its inclusion would meaningfully augment the evaluations for some resource areas – e.g., human health, waste management, and transportation. Additional LANL activities evaluated in the *LANL SWEIS* and incorporated by reference in the present SA include modifications and upgrades to LANL waste management capabilities, waste generation rates, on- and offsite waste disposition, and transportation of radioactive and nonradioactive wastes to offsite facilities. The present SA also references the accident analyses and geologic and seismic conditions as evaluated in the *LANL SWEIS* for PF-4 and LANL support facilities.

- *CMRR-NF SEIS* (DOE 2011a): This supplement to the *CMRR EIS* included an updated description of geologic and seismic conditions at LANL, updated analyses of potential accidents involving nuclear material, and updated estimates of impacts from continued operation of the CMR Building. The updated analyses used revised population data for the LANL area projected to the year 2030, including distributions of low-income and minority individuals. These updates are incorporated as part of the evaluations in the present SA.

- *Draft Surplus Plutonium Disposition Supplemental Environmental Impact Statement (Draft SPD Supplemental EIS)* (DOE 2012a): This supplemental EIS included updated analyses of potential accidents involving nuclear material in PF-4, and updated population distributions in the LANL area to the year 2020, including distributions of low-income and minority individuals. These updates are incorporated by reference as part of the evaluations in the present SA.

3.3 Programmatic and Environmental Changes since Publication of the *CMRR EIS*

This section summarizes the principal programmatic and environmental changes that have occurred since publication of the *CMRR EIS* (DOE 2003b).

3.3.1 Programmatic Changes

Although the need to maintain AC and MC capabilities has been the same since publication of the *CMRR EIS* and its ROD, the Mission Need Statement for CMRR Facility was updated in August 2014. Whereas the original Mission Need Statement referred to "mission critical CMR capabilities at LANL," the statement now refers to "ensuring continuity in enduring analytical chemistry and materials characterization for NNSA actinide-based missions…." In addition, changes in programs to be performed at PF-4 have enabled repurposing of existing laboratory space at this facility to support additional AC and MC activities. Program changes include a different approach in the experimental strategy for the weapons certification program and elimination of the need for a nuclear ceramic fuels capability using plutonium ceramics. In addition, consolidating operations for chemical recovery and purification of plutonium from residues into a more efficient configuration and removing legacy unused equipment will make additional space available.

3.3.2 Revisions to Technical Quantities for NNSA Nuclear Facilities

In November 2011, NNSA issued guidance on the use of updated radionuclide dosimetry information and accident release fractions when establishing the hazard category of a nuclear facility, as required in 10 CFR Part 830.202(b)(3), Nuclear Safety Management, Safety Basis Requirements; an administrative change was issued on May 13, 2014 (NNSA 2014). Threshold quantities (TQs)[5] at NNSA nuclear facilities are being re-evaluated in accordance with the NNSA guidance.

Although the TQs for numerous radionuclides were reduced pursuant to the guidance, the TQs were raised for many radionuclides, including plutonium-239. Because the TQ for plutonium-239 in a Hazard Category 3 Facility was changed from 8.4 grams to 38.6 grams, the limiting quantity of plutonium-239 in a Radiological Facility was correspondingly changed from 8.4 grams to 38.6 grams. This change is completely a function of an enhanced understanding of dosimetry[6] and revised accident release fractions. That is, the health risk associated with 8.4 grams of plutonium-239 as calculated using the previous dosimetry and accident release fractions yields the same health risk as 38.6 grams of plutonium-239 as calculated using the updated dosimetry and accident release fractions. NNSA has approved the use of updated TQs at LANL; consequently, the limiting quantity for RLUOB was revised to 38.6 grams PuE.

3.3.3 Revised Seismic Characterization

The geology and seismicity of the LANL area was described in the *CMRR EIS*. The description was updated in the *LANL SWEIS* (DOE 2008a) and again in the *CMRR-NF SEIS* (DOE 2011a). A summary description based on these updates is provided below.

LANL is located on the Pajarito Plateau, which lies between the Sierra de los Valles, located in the Jemez Mountains, to the west, and the Rio Grande to the east. The major tectonic feature in the LANL region is

[5] *Nuclear and radiological facilities at LANL are identified by a hazard category in accordance with the potential consequences in the event of an accident (10 CFR Part 830). Radionuclide TQs define the lower boundaries for classification of nuclear facilities. In this example, 38.6 grams of plutonium-239 is the TQ for classifying a facility as a Hazard Category 3 nuclear facility; facilities authorized to contain plutonium-239 in quantities not exceeding 38.6 grams, such as RLUOB, may be considered Radiological Facilities.*

[6] *On June 8, 2007, DOE promulgated amendments to 10 CFR Part 835,* Occupational Radiation Protection, *to incorporate (among other revised requirements) updated dosimetric models and radiation dose terms (72 FR 31905).*

the Rio Grande rift which consists of a complex system of north-south-trending basins. The Jemez Mountains and associated Pajarito fault system locally form the active western margin of the rift. The Pajarito fault system is a complex zone of deformation, consisting of many laterally discontinuous faults and associated folds and fractures extending for about 31 miles (50 kilometers) from Cochiti to Santa Clara Canyon. Although large historical earthquakes have not occurred on the Pajarito fault system, geologic evidence indicates that it is seismically active and capable of producing large surface-faulting earthquakes up to 6.9 to 7.3 moment magnitude (Mw). Numerous studies have been conducted on several different traces of the fault system, revealing evidence of at least two, possibly three, large surface-faulting earthquakes during the last 11,000 years and as many as nine large earthquakes during the last 110,000 years (LANL 2007a; Lewis et al. 2009).

A comprehensive update to the LANL seismic hazard analysis was completed in June 2007 (LANL 2007a). The updated study used more-recent field data, including data for the CMRR project site, and the application of the most current analysis methods, to update the seismic source model, ground motion attenuation relationships, and dynamic properties of the subsurface (primarily the Bandelier Tuff) beneath LANL, as well as the probabilistic seismic hazard and design/evaluation-basis earthquake ground motions for LANL. The approach used in the 2007 analysis follows the Senior Seismic Hazard Analysis Committee's guidelines for a Level 2 analysis, as described in the Nuclear Regulatory Commission's *Recommendations for Probabilistic Seismic Hazard Analysis – Guidance on Uncertainty and Use of Experts* (NRC 1997). Based on this analysis, the dominant contributor to seismic hazard at LANL is the Pajarito fault system due to its proximity and rate of activity (LANL 2007a).

In 2009, the probabilistic seismic hazard analysis was revised to incorporate a new set of ground motion attenuation relationships and to examine potential conservatisms in the 2007 study (LANL 2009a). These revised ground motions were based on the latest geologic data, including that published in Lewis et al. (2009). Expected mean maximum magnitudes for the various rupture scenarios of the Pajarito fault system range from magnitude Mw 6.5 to Mw 7.3. The 2009 updated study refined the estimate for the dominant earthquake, determining that a range in magnitude of about Mw 6.0 to Mw 7.0 was appropriate at close distances (LANL 2009a).

Current data indicate a lack of active surface-displacing faults at TA-55. Investigations at and near TA-55 used a variety of intensive geologic field techniques to recognize and map vertical fault displacements that may have been unmapped using standard geologic mapping techniques (Reneau et al. 1995; Gardner et al. 1998, 1999, 2008; Lavine et al. 2005). Near TA-55 the stratigraphic markers in the Bandelier Tuff are continuous and show no compelling evidence for laterally continuous surface-rupturing faults. This is consistent with findings of subsurface excavation at the CMRR project site in TA-55 that also used high-precision mapping techniques (Gardner et al. 2008). Although Gardner et al. (2008) did observe some fractures and small faults confined within units of the tuff, they concluded that the exposed fractures and faults formed very shortly after emplacement of the tuff at 1.256 million years, as a result of cooling and compaction, and the identified geologic structures pose no surface rupture hazard.

The estimated peak horizontal and vertical ground accelerations at the time the *CMRR EIS* was prepared were about 0.31 *g* and 0.27 *g*,[7] respectively, with a return interval of about 2,000 years. Based on the more recent studies (e.g., LANL 2009a), the TA-55 horizontal and vertical peak ground acceleration values for a 2,500-year return period are estimated to be 0.47 *g* and 0.51 *g*, respectively.

[7] *The abbreviation "g" refers to acceleration due to Earth's gravity.*

Since publication of the *CMRR EIS*, an additional preliminary evaluation was performed regarding the potential for volcanism in the vicinity of LANL, which is unlikely over the next 50 to 100 years but cannot be ruled out (Keating et al. 2010). Based on available information on the volcanic history of the region surrounding LANL, the preliminary calculation of the estimated average recurrence rate for both Valles Caldera silicic eruptions and rift-related basaltic volcanism is about 1×10^{-5} per year, similar to recurrence rates calculated for Idaho National Laboratory and the Hanford Site. This simple calculation assumes a homogenous (Poisson) distribution of events, and its associated uncertainty is not well understood. The recurrence rate for a volcanic eruption occurring somewhere in the study region is an order of magnitude less than the performance goal of 1×10^{-4} per year (DOE-STD-1023-95) for facilities such as PF-4 at LANL (DOE 2012a; LANL 2010). Nevertheless, the unlikely occurrence of silicic volcanism in the Valles Caldera or basaltic volcanism along the Rio Grande rift could have substantial consequences to LANL operations. Because of the potential for this high-consequence low-probability event, the laboratory continues to collect and interpret geologic data to reduce uncertainty regarding the dates and magnitudes of eruptions. Additionally, the seismic network has been expanded to include the caldera area to monitor for potential caldera-related seismicity or tremor activity.

3.3.4 PF-4 Safety Upgrades

In consideration of concerns raised by the independent Defense Nuclear Facilities Safety Board (DNFSB) regarding PF-4 performance in the event of a strong earthquake, DOE has undertaken several actions over the past several years to enhance the safety configuration at PF-4. Actions taken to date to reduce risk at PF-4 include improving the building’s fire-suppression systems and upgrading the building’s structure and confinement system to withstand design-basis earthquakes. Additional measures taken to reduce risk include: (1) reducing the first floor radioactive material-at-risk limit; (2) reducing the vault radioactive material-at-risk limit; (3) implementing the use of new safety-class containers for heat-source plutonium; and (4) removing one kilogram of heat-source plutonium from the PF-4 first floor (DOE 2013a). Further structural modifications are under way to reduce the probability of collapse and further enhancements to the facility’s fire-suppression systems are being implemented (DNFSB 2014).

In response to DNFSB’s concerns, DOE indicated that because PF-4 can perform its confinement safety function based on DOE’s current seismic analysis and near-term risk-reduction measures would further reduce potential consequences, PF-4 can continue to operate safely while longer-term structural modifications are being completed (DOE 2013a). DNFSB disagreed with the seismic analysis methodology on which DOE’s March 2013 assessment was based and suggested that DOE perform an “alternate” analysis to improve the safety posture of PF-4 (DNFSB 2013). DOE agrees that the analysis would be helpful in understanding the seismic integrity of the PF-4 facility and ensuring identification of all structural elements that require updating (DOE 2013b). Phase I (code-like analysis) of the alternate analysis is complete. Phase II (probabilistic assessment) of the alternate analysis will be executed after input from a seismic expert panel. This panel was convened to assist in understanding the differences between the original LANL analyses and the Phase I results of the alternate analysis and to recommend a path forward.

The PF-4 seismic analyses and facility upgrades that are under way are independent of the activities evaluated in this SA. Activities to remove and replace gloveboxes, other enclosures, and equipment at PF-4 would not prevent or degrade any of the facility upgrades. Construction scheduling would minimize any conflict between the two projects. As addressed in Chapter 4, Section 4.3.1, the additional AC and MC activities to be performed at PF-4 would not increase material at risk in PF-4 or the source terms associated with seismically induced PF-4 accidents.

3.3.5 LANL Waste Management Facilities

At the time of publication of the *CMRR EIS*, LANL's solid and liquid radioactive and chemical waste management capabilities were located primarily in TA-50 and TA-54. Although LANL waste management capabilities are still located primarily in those TAs, these capabilities continue to be upgraded. Principal changes include the following:

- Because of the requirements in a March 1, 2005, Compliance Order on Consent between DOE, the LANL management and operating contractor, and the State of New Mexico, certain waste management capabilities in Area G have been discontinued or are being transitioned to other locations along the Pajarito Road corridor -- i.e., other locations on the same mesa as TA-54 (DOE 2008a). LLW disposal operations have been discontinued within a 63-acre area in TA-54; disposal operations in Area G are currently restricted to shaft disposal of LLW. Volume reduction of LLW at TA-54 has been discontinued.

- The Radioactive Materials Research, Operations, and Demonstration (RAMROD) facility in TA-50 is no longer used to support waste management activities.

- Capabilities in TA-54 for TRU waste management have been augmented to facilitate treatment and characterization of legacy and newly generated TRU waste, including enhanced sorting, segregation, and size reduction and waste characterization capabilities such as real-time radiography units and high efficiency neutron counters. Capabilities may be transitioned to other locations as the backlog of legacy TRU waste is eliminated and capabilities in other TAs are developed (see below).

- TRU waste is currently characterized at Area G before transfer to the Radioassay and Nondestructive Testing Facility (RANT), also located in TA-54, and loading into TRUPACT-II packages for shipment to WIPP (DOE 2012a). After it becomes operational in 2017, management of newly generated TRU waste could occur at a new TRU Waste Facility under construction in TA-63; this facility would provide storage, characterization, and certification capabilities. DOE decided to construct the new TRU Waste Facility in TA-63 based, in part, on analysis in the 2008 *LANL SWEIS* (DOE 2008a) (73 FR 55833).

- At the time of publication of the *CMRR EIS*, about 6,750,000 cubic feet (191,100 cubic meters) of TRU waste was projected or in above- and below-grade storage at LANL, primarily in Area G of TA-54 (DOE 2003b). The majority of this stored waste has been volume-reduced, sorted, repackaged, and shipped to WIPP for disposal. In recent years, DOE undertook a major operation to remove 130,900 cubic feet (3,706 cubic meters) of combustible and dispersible TRU waste stored above-grade at Area G, as defined in the 2012 Framework Agreement with the State of New Mexico (DOE/NNSA/NMED 2012). About 32,950 cubic feet (933 cubic meters) of TRU waste remain in above-grade storage and 84,650 cubic feet (2,397 cubic meters) remain in below-grade storage (LANL 2014d). As a matter of perspective, the total volume of this stored TRU waste (118,000 cubic feet [3,330 cubic meters]) represents about 2 percent of the TRU waste volume stored at LANL at the time of publication of the *CMRR EIS*.

- The Radiological Liquid Waste Treatment Facility (RLWTF) in TA-50 is being upgraded and construction is expected to begin on a replacement for the RLWTF liquid LLW treatment system in the second quarter of 2015. A construction start date for the Transuranic Liquid Waste Treatment Facility Subproject at RLWTF is planned for April 2017. DOE decided to perform these upgrades and replacement activities based, in part, on analysis in the *LANL SWEIS* (DOE 2008a) (74 FR 33232).

- The Los Alamos County Landfill has closed disposal operations and operates as a transfer facility.

3.3.6 Suspension of WIPP Operations

DOE suspended waste disposal operations at WIPP following two events that occurred in February 2014[8] and is implementing a recovery plan (DOE 2014a). Pending the resumption of WIPP operations, TRU waste generated by LANL activities is being safely stored.

3.3.7 Population Growth

Potential impacts to the population surrounding LANL were evaluated in the *CMRR EIS* (DOE 2003b) using census data for the year 2000; the population within 50 miles (80 kilometers) of TA-55 was assumed to be 309,143. The population surrounding LANL has since grown. It is estimated that the population within 50 miles (80 kilometers) of TA-55 would be about 448,000 by the year 2020 (DOE 2012a) and about 511,000 by the year 2030 (DOE 2011a).

3.3.8 Changes to the Status of Federally Listed Threatened and Endangered Species in the LANL Region

The *CMRR EIS* identified five federally listed threatened and endangered species that had been documented in the LANL region: the black-footed ferret (*Mustela nigripes*), southwestern willow flycatcher (*Empidonax traillii extimus*), bald eagle (*Haliaeetus leucocephalus*), Mexican spotted owl (*Strix occidentalis lucida*), and mountain plover (*Charadrius montanus*). Although no Federal critical habitat had been designated at LANL, areas of environmental interest (AEIs) were identified within LANL for the Mexican spotted owl, bald eagle, and southwestern willow flycatcher. Since publication of the *CMRR EIS*, the status of the bald eagle was changed and additional federally listed species were identified in the LANL region: the Jemez Mountains salamander (*Plethodon neomexicanus*), the New Mexico meadow jumping mouse (*Zapus hudsonius luteus*), and the yellow-billed cuckoo (*Coccyzus americanus*).

On July 9, 2007, the U.S. Fish and Wildlife Service (USFWS) determined that the bald eagle population had recovered sufficiently to warrant its removal from the Federal List of Endangered and Threatened Wildlife in the lower 48 states of the United States (72 FR 3736). On September 10, 2013, the USFWS determined that the Jemez Mountains salamander warranted endangered species status under the Endangered Species Act (ESA) (78 FR 55600). On November 20, 2013, the USFWS designated approximately 90,716 acres (36,711 hectares) in Los Alamos, Rio Arriba, and Sandoval Counties in New Mexico as critical habitat for the Jemez Mountains salamander (78 FR 69569). None of this critical habitat is located within the LANL boundary; however, AEIs in Los Alamos canyons were established and are being managed as core salamander habitat under the *LANL Threatened and Endangered Species Habitat Management Plan* (LANL 2014a). Effective July 10, 2014, the USFWS determined endangered species status under the ESA for the New Mexico meadow jumping mouse (79 FR 33119). The USFWS proposed to designate critical habitat for the New Mexico meadow jumping mouse, consisting of

[8] *Detailed information may be obtained from http://www.wipp.energy.gov/wipprecovery/recovery.html.*

approximately 14,560 acres (5,892 hectares) within New Mexico, Colorado, and Arizona (78 FR 37328, 79 FR 19307). Some of this habitat is within 20 miles of LANL, but none is within the site boundary. Effective November 3, 2014, the USFWS determined threatened species status for the western distinct population segment of the yellow-billed cuckoo (79 FR 59991). The USFWS proposed to designate approximately 546,335 acres (221,094 hectares) of critical habitat for the yellow-billed cuckoo (79 FR 48547, 79 FR 67154). Approximately 82,408 acres (33,350 hectares) within New Mexico, including habitat near LANL, is proposed as critical habitat for the yellow-billed cuckoo; however, no critical habitat is located within the LANL boundary.

4.0 ANALYSIS

4.1 Screening Analyses

This section presents the results of a screening analysis performed for each resource area for the proposed changes evaluated in this SA. The potential impacts that could result were assessed and compared to impacts evaluated in previous NEPA analyses. Impacts were principally compared to those of the Preferred Alternative evaluated in the *CMRR EIS* (DOE 2003b),[9] augmented by those of the Modified CMRR-NF Alternative in the *CMRR-NF SEIS* (DOE 2011a), and the No Action Alternative and selected projects in the *LANL SWEIS* (DOE 2008a). The principal considerations for this analysis are summarized in the text box.

Principal Considerations for the Screening Analysis	
CMRR EIS	**This SA**
- Construct and operate RLUOB and a separate nuclear facility to support and replace AC and MC functions performed in the CMR Building.	- RLUOB has been constructed and is operating. - Modify and equip existing rooms in RLUOB and the existing PF-4 to support AC and MC functions. - Construct office and warehouse capabilities.
- Perform AC, MC, and cleanout and material recovery from large containment vessels from Dynamic Experiments Programs.	- Perform AC and MC in RLUOB and PF-4 appropriate with each facility's radioactive or nuclear material limit.

Table 1 presents the results of the screening analysis. The screening analysis for the following resource areas clearly indicates that impacts from the proposed changes would be less than those previously analyzed for the CMRR project or would result in no significant new circumstances or information relevant to environmental concerns: land use, visual resources, infrastructure, air quality, noise, geology and soils, water resources, ecological resources, cultural resources, socioeconomics, and environmental justice. Other resources areas were evaluated in more detail. Detailed analyses are presented in Chapter 4, Sections 4.2 through 4.5, for the human health impacts from normal operations, facility accidents, waste management, and transportation resource areas.

[9] *The No Action Alternative evaluated in the CMRR-NF SEIS (DOE 2011a) reflects the Preferred Alternative evaluated in the CMRR EIS (DOE 2003b).*

Table 1. Summary of Screening Analysis

Resource Area	***Potential Impact***	***Warrants Detailed Analysis?***
Land Use	There would be no change in land use in any TA. The overall scope of construction would be less than that evaluated in the *CMRR EIS*. Under this SA, up to 2 acres (0.8 hectares) of previously undisturbed land could be affected.	No
Visual Resources	There would be only minor changes to the visual landscape. TA-55 and other affected areas would continue to appear industrial in nature.	No
Infrastructure	There would be a small increase in current utility demands to support construction and operational activities, but these increases would not exceed LANL site capacities. Operational utility increases at PF-4 and RLUOB would be offset by operational utility decreases at the CMR Building.	No
Air Quality	Overall, construction requirements would be less than those evaluated in the *CMRR EIS*, with less use of construction equipment that could emit nonradiological pollutants into the air. Nonradiological emissions during facility operations would be dominated at both RLUOB and PF-4 by testing of emergency diesel generators. Meaningful radioactive emissions are not expected from activities associated with TA-55 modifications and radioactive emissions from AC and MC activities in TA-55 would be less than those evaluated in the *CMRR EIS*. Impacts to members of the public from radioactive emissions are evaluated in Section 4.2.2.	No
Noise	Construction noise would be comparable to or less than that evaluated in the *CMRR EIS* because of the reduced construction scope. Operational noise associated with PF-4 and RLUOB would be the same as current levels.	No
Geology and Soils	The physical footprint of the RLUOB and PF-4 facilities would not change, and the proposed construction of support facilities would have no meaningful impacts on geology and soils. Updated seismic data in TA-55 is discussed in Chapter 3, Section 3.3.3, and Section 4.3.	No
Water Resources	Reductions in new facility construction would result in less potential to impact surface water and less consumption of groundwater resources. Operational consumption of water would be comparable to or less than that analyzed in the *CMRR EIS*.	No
Ecological Resources	The physical footprint of the RLUOB and PF-4 facilities would not change, although there could be up to 2 acres (0.8 hectares) of habitat loss in an existing industrial area. Construction and operations in affected TAs would not add material stress to indigenous species, including threatened and endangered species.	No
Cultural Resources	There are no known cultural resources within TA-48, TA-50, or TA-55 that would be impacted by the proposed changes evaluated in this SA. Except for a warehouse to be located in TA-48, all construction would occur in previously disturbed areas. However, because PF-4 is potentially eligible for listing in the National Register of Historic Places, consultations with the State Historic Preservation Officer would be implemented as necessary. No impacts would occur during operations.	No
Socioeconomics	There would be increased temporary employment for facility modification and construction; nonetheless, facility construction and modification would have no meaningful socioeconomic impacts on the LANL ROI, and the effects would be less than those for the CMRR-NF. Additional employment to support AC and MC activities would be smaller than that evaluated in the *CMRR EIS* and have no meaningful socioeconomic impacts on the LANL ROI.	No
Environmental Justice	Impacts on low-income and minority populations would remain negligible-to-low for all resource areas, despite projected population growth in the LANL area. In some cases impacts would be less under the proposed changes evaluated in this SA than those evaluated in the *CMRR EIS*. Therefore, no disproportionately high and adverse impacts on low-income or minority populations are expected.	No
Human Health Impacts from Normal Operations	During TA-55 modifications, involved workers would receive radiation exposures, but no latent cancer fatalities are expected among the involved worker population. Annual collective worker doses during AC and MC operations would be smaller than those evaluated in the *CMRR EIS*, although average annual individual doses among PF-4 workers performing AC or MC may be larger than those for all involved workers evaluated in the *CMRR EIS* under the CMRR project. No meaningful radiological impacts to members of the public are expected from TA-55 modifications, while impacts to members of the public during AC and MC operations would be smaller than those evaluated in the *CMRR EIS*. Radiological impacts to workers and the public are evaluated in Section 4.2	Yes

Resource Area	***Potential Impact***	***Warrants Detailed Analysis?***
Facility Accidents	Moving AC and MC activities from the CMR Building to PF-4 and RLUOB would change the accident risks associated with nuclear operations in the TA-55 area, but those changes would be small. In addition, the accident risks associated with ongoing AC and MC activities in the CMR Building and transfer of nuclear material between the CMR Building in TA-3 and TA-55 facilities would be eliminated. Risks from postulated accidents at PF-4 and RLUOB are evaluated in Section 4.3.	Yes
Waste Management	TRU waste, LLW, MLLW, and possibly hazardous waste would be generated from the proposed modifications to PF-4 and RLUOB in quantities greater than those estimated for construction of the CMRR project in the *CMRR EIS*. Waste generation during AC and MC operations would be smaller than that estimated in the *CMRR EIS*. TRU waste would require safe storage pending shipment to WIPP for disposal, while LLW, MLLW, and hazardous waste would be shipped off site for treatment and/or disposal. Waste generation quantities and their significance to LANL operations are evaluated in Section 4.4.	Yes
Transportation	Offsite transport of TRU waste, LLW, and MLLW for treatment and/or disposal would be enveloped by the analysis in the *LANL SWEIS*. Risks associated with radioactive waste transportation are evaluated in Section 4.5.	Yes

AC = analytical chemistry; CMR = Chemistry and Metallurgy Research; CMRR = CMR Building Replacement; EIS = environmental impact statement; LLW = low-level radioactive waste; MC = materials characterization; MLLW = mixed low-level radioactive waste; PF-4 = Plutonium Facility, Building 4; RLUOB = Radiological Laboratory/Utility/Office Building; ROI = region of influence; SA = Supplement Analysis; SWEIS = site-wide environmental impact statement; TA = Technical Area; TRU = transuranic; WIPP = Waste Isolation Pilot Plant.

4.1.1 Land Use

Construction and Operations—There would be no change in land use designation at the affected LANL TAs. Operations at TA-48, TA-50, and TA-55 would be consistent with those described in the *LANL SWEIS* (DOE 2008a).

Construction or construction support activities in TA-50 and TA-55 would occur in previously disturbed areas. In TA-50, the proposed additional office building would cover up to 48,000 square feet (4,460 square meters) within an area that is currently used as a parking lot or was previously used for temporary modular office structures. In TA-55, a 135-foot (41-meter) driveway and retaining walls would be constructed in previously disturbed land as part of creating a worker and equipment entrance to the RLUOB tunnel, and some previously disturbed land would be affected as part of expanding the existing TA-55 warehouse. Construction support trailers and storage structures would be temporarily located on previously disturbed land. The projected minor impacts on land resources at TA-55 is consistent with those evaluated for implementation of subprojects under the TA-55 Refurbishment Project evaluated in the *LANL SWEIS* (DOE 2008a).

In TA-48, up to 4 acres (1.6 hectares) of land would be disturbed to build a new warehouse. Much of this acreage has already been disturbed by grading or other site activities; however, up to 2 acres (0.8 hectares) of previously undisturbed land could be used for construction. The previously undisturbed land within TA-48 would represent up to 7 percent of the total affected area (26.75 acres [10.8 hectares]) analyzed in the *CMRR EIS* for construction of the CMRR project (DOE 2003b).

Conclusion —There would be no change in land use at the affected TAs. Construction activities could affect up to 2 acres (0.8 hectares) of previously undisturbed land in TA-48. Because there would be no meaningful impacts on land use, no further NEPA evaluation is required.

4.1.2 Visual Resources

Construction and Operations—Affected areas within TA-48, TA-50, and/or TA-55 would have the appearance of construction zones within or in proximity to industrialized areas. Therefore, there would be no change in visual resources during construction compared to that evaluated in the *CMRR EIS* (DOE 2003b) and its 2005 SA (DOE 2005). Because RLUOB, PF-4, a new warehouse, and office capacity are or would be all located in areas that are already industrial in nature, operation of these facilities would present no meaningful change from current visual conditions.

Conclusion—Because no meaningful impacts on visual resources are expected from the proposed changes evaluated in this SA, no further NEPA evaluation is required.

4.1.3 Site Infrastructure

Construction—RLUOB has been constructed, and there would be a small short-term increase in utility demands for modifications to RLUOB and PF-4, and for construction of additional warehouse and office capacity. This increase in utilities for construction would be less than that for the entire CMRR project as evaluated in the *CMRR EIS*, and would not exceed current LANL site capacities.

Operations—The operations evaluated in this SA are less encompassing in scope than the activities proposed under the *CMRR EIS* for the entire CMRR project, and projected operational demands on utility resources would not exceed LANL site capacities. There would be no meaningful additional demands on utility resources at PF-4 and RLUOB to support the proposed AC and MC activities in these buildings. The modest utility demands associated with the operation of a new warehouse and office space would be small compared to demands of a new CMRR-NF. Although current utility demands would slightly increase at TA-48, TA-50, and TA-55 to support the activities evaluated in this SA, the utility resource demands in the CMR Building to support AC and MC activities would decrease as these operations are transferred to PF-4 and RLUOB.

Conclusion—There would be a small increase in current utility demands to support construction and operational activities, and these increases would not exceed current LANL site capacities. Operational utility increases at PF-4 and RLUOB would be countered by operational utility decreases at the CMR Building. Therefore, because there would be no meaningful impacts on infrastructure and utility resource demands, no further NEPA evaluation is required.

4.1.4 Air Quality

Construction—Criteria air pollutants would be generated primarily from fugitive dust (particulate matter), heavy equipment, trucks, and employee vehicles. Contributions from fugitive dust and heavy equipment would be less than those evaluated in the *CMRR EIS*, because of the reduced construction scope evaluated in this SA compared to that evaluated for the CMRR project. By extension, the reduced construction scope and less use of heavy equipment would result in less use of fossil fuels and lower emissions of greenhouse gases. As stated in the *CMRR EIS*, overall air quality would remain within applicable standards and because LANL is in an attainment area, the "General Conformity" rule does not apply and no conformity analysis is required (DOE 2003b). Modification of PF-4 would not result in meaningful radiological emissions because the removal of radioactive components (e.g., gloveboxes) would be accomplished within the building and under controlled conditions. In addition, any potential air emissions would be offset by decreases in radiological air emissions from operations in the affected PF-4 areas while the modifications were being performed. Processing the removed radioactive components under controlled conditions at TA-54 would involve the same activities as those required for processing legacy and newly generated wastes, resulting in small nonradiological and radiological air emissions within the anticipated levels for the processing facilities. Radiological impacts to the public from these emissions are discussed in Section 4.2.2.

Operations—Criteria air pollutants would be limited to those generated from periodic preventative maintenance testing of emergency generators at RLUOB and PF-4, and from employee vehicles. The proposed changes evaluated in this SA would not alter the test protocols for the emergency generators, and there would be no changes in air emissions.

There would be a minor decrease in personnel requirements at RLUOB and PF-4 compared to that evaluated for the CMRR project (DOE 2003b), with a corresponding minor decrease in emissions from employee vehicles. Reduced emissions from diesel-burning generators and a slightly smaller work force (and therefore, fewer expected commuter vehicles) would result in lower generation of greenhouse gases compared to operation of the entire CMRR project. Any additional air emissions from operations would not have a significant effect on the location and severity of impacts on downwind receptors such as the Royal Crest Trailer Park or the northern boundary of the LANL site.

Emissions of radionuclides to the air from the activities evaluated in this SA are expected to be smaller than the emissions projected under the *CMRR EIS* for the CMRR project. Radiological impacts to members of the public from these emissions are discussed in Section 4.2.2.

Conclusion—Fewer criteria pollutants would be generated from construction activities than previously analyzed. Furthermore, because the proposed facility operations would involve reduced radioactive functions compared to those analyzed in the *CMRR EIS*, the potential for impacts from radioactive emissions would be less (see Section 4.2.2). Therefore, impacts on air quality would be comparable to or less than those analyzed in the *CMRR EIS* and do not require further NEPA evaluation.

4.1.5 Noise

Construction and Operations—Construction noise would be comparable to or less than that evaluated for the CMRR project in the *CMRR EIS* or the *CMRR-NF SEIS*. The construction scope would be less than that evaluated in the *CMRR EIS* or the *CMRR-NF SEIS* for the entire CMRR project, and most construction activities would occur within existing buildings, resulting in less construction noise. There could be a larger peak number of construction employees than evaluated in the *CMRR EIS*, however, resulting in a larger daily number of employee vehicles. But, the peak number of employees, and therefore transportation traffic noise, would be smaller than evaluated in the *CMRR-NF SEIS*. Operational noise associated with PF-4 and RLUOB would be essentially the same as current levels, with the only meaningful potential for increased noise arising from a slightly increased daily number of employee vehicles compared to that from current operations. The projected number of operational employees would be less, however, than those evaluated in the *CMRR EIS*.

Conclusion—Because no meaningful noise impacts are expected under the proposed change evaluated in this SA, no further NEPA evaluation is required.

4.1.6 Geology and Soils

Construction—Construction of RLUOB under the CMRR project is complete. Some land disturbance and use of geologic resources would be required under the proposed changes evaluated in this SA, but the overall construction scope for the CMRR project as evaluated in this SA would be less than that evaluated in the *CMRR EIS*. In TA-55, about 3,200 cubic yards (2,400 cubic meters) of soil would be excavated, and 4,200 cubic yards (3,200 cubic meters) of backfill and aggregate material would be needed to create a construction crew and equipment access to RLUOB (LANL 2015).

Similar materials would be needed for the other construction activities proposed in this SA, of which the most extensive activity is expected to be the construction of a warehouse in TA-48. This construction is expected to require up to 500 cubic yards (380 cubic meters) of asphalt and 1,000 cubic yards (760 cubic meters) of concrete. Aggregate and other geologic resources needed for construction are abundant in Los Alamos County. Some construction materials could be acquired from the Clean Fill Yard in TA-60, a facility used to stage and store clean fill from site-wide construction and demolition projects as part of LANL's sustainability program. Construction would not require deep sub-surface excavation at any TA.

Operations—The operations evaluated in this SA would not impact geologic or soil resources at LANL. Updated seismicity data for the TA-55 area indicate that seismic hazards were understated in the *CMRR EIS.* The increased seismic hazard is described in Chapter 3, Section 3.3.3, and is evaluated in Section 4.3.

Conclusion—The physical footprint of the RLUOB and PF-4 facilities would not change, and the additional proposed construction in the affected TAs would have no meaningful impacts on geology and soils. No further NEPA evaluation is required.

4.1.7 Water Resources

Construction—No surface water would be used to support the activities evaluated in this SA. Portable toilets or existing facility sanitary systems would be used for construction personnel, resulting in no direct discharge of sanitary wastewater and no impact on surface waters. Except for a warehouse in TA-48, construction would occur within disturbed, industrial areas having existing stormwater runoff control capabilities. But because stormwater runoff could impact downstream surface water quality, appropriate soil erosion and sediment control measures (such as sediment fences and mulching disturbed areas) and spill prevention practices would be employed in construction areas to minimize suspended sediment and potential water quality impacts. Proposed construction in TAs (TA-48, TA-50, and TA-55) would not occur in areas prone to flooding and the nearest 100-year floodplains are all at much lower elevations within Twomile, Mortandad, and Pajarito Canyons.

Groundwater would be required to support construction and modification activities. The volume of required groundwater would be small compared to site availability and historic usage, and there would be no discharge of wastewater to the subsurface. The overall scope of construction would be reduced compared with that evaluated in the *CMRR EIS* (DOE 2003b), with less overall need for construction groundwater. All applicable requirements of the National Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities would be in place.

Operations—There would be no use of surface water during operations. Annual consumption of groundwater to support operations would be less than that evaluated for the CMRR project in the *CMRR EIS* because of the reduced scope of operations. Annual consumption of groundwater to support the proposed operations would be slightly increased at PF-4 and RLUOB compared to current demands. At the same time, however, demands for conducting similar operations at the CMR Building would decrease.

Conclusion—Because there would be no meaningful impacts on water resources, there is no need for further NEPA evaluation.

4.1.8 Ecological Resources

Construction—The proposed activities evaluated in this SA would largely occur within previously disturbed areas with no additional removal of vegetation or habitat. Much of this previously disturbed area was disturbed during implementation of the CMRR project analyzed in the *CMRR EIS* (DOE 2003b) and 2005 SA (DOE 2005). Construction of a new warehouse in TA-48, however, would occur in an industrial area where about 50 to 80 percent of the land under consideration for the warehouse was previously disturbed from grading or other site activities. Assuming a total land disturbance of up to 4 acres (1.6 hectares) in TA-48, the activity would affect up to 2 acres (0.8 hectares) of previously undisturbed land. There could be some loss of less mobile species and displacement of mobile species from this construction area. The work area would be marked, however, to prevent construction equipment and workers from disturbing adjacent natural habitat. Construction or installation of an office building in TA-50 would occur in a previously disturbed area on or adjacent to an existing parking area.

Proposed construction activities would have minimal to no effect on wetlands or aquatic resources that inhabit these wetlands. Although three wetlands are located within TA-55, only minor construction activities would occur in TA-55. There are no wetlands in the areas considered for development of office capability in TA-50 or a warehouse in TA-48. Sediment and erosion control plans would be implemented to control stormwater runoff.

No impacts are expected on threatened and endangered species. AEIs have been established at LANL for the Mexican spotted owl, bald eagle,[10] southwestern willow flycatcher, and the Jemez Mountains salamander. Portions of TA-48, TA-50, and TA-55 include both core and buffer zones for the Mexican spotted owl. Since issuance of the *CMRR EIS* ROD (69 FR 6967), several biological assessments were prepared and submitted to the USFWS. These biological assessments evaluated the potential effects on the Mexican spotted owl from construction of additional buildings, associated parking lots, and laydown yards in LANL TAs including TA-55, the area proposed for the office building in TA-50, and a portion of TA-48 (LANL 2004, 2006, 2007b, 2009b, 2011c). The USFWS determined that the proposed construction as defined in the biological assessments may affect, but was not likely to adversely affect, the Mexican spotted owl (USFWS 2005, 2006, 2007, 2009, 2011). The AEIs for the bald eagle, southwestern willow flycatcher, and Jemez Mountains salamander do not include any part of TA-48, TA-50, or TA-55.

Operations—There would be no meaningful impacts on ecological resources during operations. Adverse conditions such as traffic, lighting, and noise would be no different from existing conditions at the affected TAs.

Conclusion—The physical footprint of the RLUOB and PF-4 facilities would not change, although there could be up to 2 acres (0.8 hectares) of habitat loss in an area adjacent to an existing industrial area. Construction and operations in affected TAs would not add material stress to indigenous species, including threatened and endangered species. Therefore, impacts on ecological resources do not require further NEPA evaluation.

4.1.9 Cultural Resources

Construction and Operations—No adverse impacts on historic resources are expected from the activities evaluated in this SA. No known paleontological resources are present in the affected TAs. There is one prehistoric site within TA-48 near the boundary of TA-55 that is eligible for listing in the National Register of Historic Places. This site would be avoided during construction and operation of the proposed warehouse. If an inadvertent discovery of cultural resource remains were made during construction, work would stop while appropriate action took place. No known prehistoric sites are located within TA-55 and any construction within TA-50 to provide office capability would occur in a previously disturbed area. Construction in areas within TA-55 external to PF-4 would also occur within previously disturbed areas.

[10] The bald eagle has been removed in the lower 48 States of the United States from the Federal List of Endangered and Threatened Wildlife. See Chapter 3, Section 3.3.8.

It is unlikely that an inadvertent discovery of cultural resource remains would be made within these disturbed areas.

PF-4 within TA-55 is considered potentially eligible for listing in the National Register of Historic Places, because it was built during the Cold War period of significance and has yet to be reviewed for eligibility. It is also a Key Facility as identified in both the 1999 *LANL SWEIS* (DOE 1999) and the 2008 *LANL SWEIS* (DOE 2008a). Under the National Historic Preservation Act, properties considered potentially eligible for listing in the National Register of Historic Places must be managed as if they are eligible for listing until formal determinations are made. Modifications to PF-4 are routinely tracked by cultural resources staff. As appropriate, NNSA would consult with the State Historic Preservation Officer and, if necessary, collect data and recover artifacts.

Conclusion—No meaningful impacts to cultural resources are expected. Potential impacts on cultural resources do not require further NEPA evaluation.

4.1.10 Socioeconomics

Construction—Modifications to RLUOB and PF-4 and construction of additional office and warehouse capacity would occur simultaneously with most of the work being done in the first 7 years. Estimated personnel requirements for this period are shown in **Table 2**; most personnel requirements would occur over the first 5 years. Over the subsequent 2 years, personnel requirements would be reduced with efforts focused on completing modifications and equipment installation in PF-4. After the 7 years of construction and facility modifications, a few years would be required to complete readiness reviews and bring all AC and MC activities up to full operations. There would be limited personnel requirements during these few years.

Table 2. Construction and Facility Modification Personnel Requirements (FTE)

FY2015	*FY2016*	*FY2017*	*FY2018*	*FY2019*	*FY2020*	*FY2021*
477	451	469	394	354	122	107

FTE = full-time equivalent; FY = fiscal year.
Source: LANL 2015.

Construction and facility modification personnel would include a combination of resident TA-55 technicians, outside project subcontract workers, and technical experts for equipment installation. While some of the workforce would come from existing LANL staff, it is assumed that current LANL personnel would be largely committed to other projects and that the listed personnel would represent new hires. The peak personnel requirement, which is 477 in fiscal year 2015 (LANL 2015), would represent about 4 percent of the LANL workforce (about 13,366 in 2012) (LANL 2013b) and about 0.3 percent of the workforce in the LANL region of influence (ROI)[11] (163,000 in 2011) (DOE 2012a). These peak personnel requirements are higher than those analyzed in the *CMRR EIS* (about 300 full-time equivalents [FTEs]) (DOE 2003b), because the construction time frames are shorter and modifications to RLUOB and PF-4 would occur simultaneously; however, the overall worker-hour requirements are comparable. Peak personnel requirements would be less than those analyzed in the *CMRR-NF SEIS* (about 790 FTEs) (DOE 2011a). The additional 477 personnel at LANL would generate an approximately equal number of indirect jobs in the LANL ROI, assuming an employment multiplier for the LANL area of 2 (DOE 2012a). There would be little stress on housing and community services in the ROI.

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[11] *The socioeconomic region of influence for LANL is defined as the four-county area of Los Alamos, Rio Arriba, Sandoval, and Santa Fe Counties in New Mexico (DOE 2012a).*

Operations—The *CMRR EIS* evaluated an increase in operational work force over existing CMR Building operations of 346 annual FTEs to a total of 550 employees for the CMRR project. RLUOB provides office or laboratory space for about 400 persons of which 50 are associated with laboratory operations. To support AC and MC activities at PF-4 and RLUOB, several personnel would be transferred from the CMR Building, and approximately 30 FTEs would be new hires. Therefore, the operational workforce under the proposed changes evaluated in this SA would be smaller than that evaluated in the *CMRR EIS.* Using the same estimates of the LANL and regional workforces as those for the above construction analysis, these 30 new hires would represent about 0.2 percent of the LANL workforce and 0.02 percent of the employment in the ROI. The additional 30 personnel at LANL would generate an approximately equal number of indirect jobs in the LANL ROI, again assuming an employment multiplier for the LANL area of 2 (DOE 2012a). There would be little stress on housing and community services in the ROI.

Conclusion— Facility construction and modification would have no meaningful socioeconomic impacts on the LANL ROI. There would be increased temporary employment at LANL for facility modification and construction, but at levels lower than previously analyzed. Additional employment to support AC and MC activities would be smaller than that evaluated in the *CMRR EIS* and have no meaningful socioeconomic impacts on the LANL ROI. Therefore, no further NEPA evaluation is required.

4.1.11 Environmental Justice

Construction and Operations—The *CMRR EIS* determined that potential impacts from construction and operation of a CMRR Facility in TA-55 would be negligible to low for all resource areas; therefore, no disproportionately high and adverse impacts on low-income or minority populations within the ROI were projected. Construction impacts would be temporary and were expected to remain within the boundary of LANL (DOE 2003b).

Construction-related impacts would be smaller than those for the CMRR project as evaluated in the *CMRR EIS*. Operational health risk impacts, including those to Tribal lands and populations, would be low for normal operations. Under the proposed changes evaluated in this SA, operational radiological functions would be less than those analyzed in the *CMRR EIS*, with smaller radiological risks.

The *CMRR EIS* based its environmental justice analyses on 2000 Census Data. Using these data, DOE estimated that 309,143 individuals resided within 50 miles (80 kilometers) of TA-55, of which approximately 162,000 (52 percent of the total population) were minority individuals and approximately 35,500 (11 percent of the total population) were low-income individuals (DOE 2003b). Comparable projections are presented in **Table 3** for populations in 2020 and 2030 as projected from 1990, 2000, and 2010 census data.

Table 3. Projected Populations in 2020 and 2030 Surrounding Technical Area 55

	5 Miles		*10 Miles*		*20 Miles*		*50 Miles*	
Population	***2020***	***2030***	***2020***	***2030***	***2020***	***2030***	***2020***	***2030***
Total Population	12,419	12.431	20,092	20,219	61,654	66,156	447,541	511,475
Total Minorities	3,800 (31%)	4,401 (35%)	6,599 (33%)	7,538 (37%)	39,681 (64%)	44,157 (67%)	250,317 (56%)	291,353 (57%)
Total Low-Income	352 (3%)	398 (3%)	777 (4%)	881 (4%)	8,712 (14%)	7,914 (12%)	54,194 (12%)	65,777 (13%)

Note: To convert miles to kilometers, multiply by 1.6093.
Source: DOE 2011a, 2012a.

While it is projected that the population surrounding TA-55 would grow significantly from 309,143 individuals in 2000 to 511,475 individuals in 2030 (a total increase of 65 percent, or an average annual increase of 1.7 percent during this time frame), the relative proportion of minorities and low-income individuals would remain comparable with only a slight increase. As shown in Table 3, a higher percentage of minority and low-income populations are found between 10 miles and 50 miles of TA-55 than within 10 miles of TA-55; offsite impacts would be larger for nearby populations than for more distant populations. As discussed in Sections 4.2, 4.3, and 4.5, potential impacts to human health from normal operations and accidents at LANL would be negligible to low, as would impacts from offsite transportation of radioactive waste.

Conclusion—Potential impacts for all resource areas would be negligible to low. Significant population growth is projected within the LANL ROI (within 80 kilometers [50 miles] of TA-55) from 2000 to 2030; however, the relative proportion of minority and low-income individuals is expected to remain relatively stable. Therefore, because impacts would remain negligible to low for all resource areas, and in some cases would be less under the proposed changes evaluated in this SA than those evaluated in the *CMRR EIS*, no disproportionately high and adverse impacts are expected on low-income or minority populations. No further NEPA evaluation is required.

4.2 Human Health Impacts from Normal Operations

This section presents potential radiological impacts on workers and the public from normal (non-accident) operations involving the activities at LANL that are addressed in this SA. Radiological doses and risks are assessed for involved workers, the offsite population, and a maximally exposed individual (MEI). An involved worker is directly or indirectly involved with operations at a facility who receives an occupational radiation exposure from direct radiation (i.e., neutron, x-ray, beta, or gamma) or from radionuclides released to the environment from normal operations. The offsite population comprises members of the general public living within 50 miles (80 kilometers) of a facility. The MEI is a hypothetical member of the public at a location of public access that would result in the highest exposure, which is assumed to be at the LANL site boundary during normal operations. For individuals or population groups, estimates of potential latent cancer fatalities (LCFs) are made using a risk estimator of 0.0006 LCFs per rem or person-rem (DOE 2003a).

4.2.1 Worker Doses for Facility Modifications and Operations

Table 4 compares the estimated radiological doses received by involved workers pursuant to the analysis in the *CMRR EIS* with the analysis for the proposed changes evaluated in this SA.

In the *CMRR EIS*, construction under the CMRR project was projected to occur outside of radiation control areas, with no radiological impacts projected among workers other than those that could be received from their presence on the LANL site (DOE 2003b). In the *LANL SWEIS*, DOE determined that implementation of the TA-55 Refurbishment Project would result in radiation exposures among involved workers, with accompanying small levels of risk, but that workers would be protected through appropriate training, monitoring, and management controls. Individual worker doses would be maintained to levels as low as reasonably achievable (ALARA) and annually less than 500 millirem for any subproject (DOE 2008a).

Table 4. Comparison of Radiological Impacts to Involved Workers under the *CMRR EIS* and this SA

CMRR EIS	***This SA***
Construction	
No radiation doses for the CMRR project.	*The only meaningful worker radiation doses would be from enclosure and equipment removal, reconfiguration, and replacement activities at PF-4:* - Annual average worker population dose: 36 person-rem - Life-of-project worker population dose: 253 person-rem - Average annual individual dose: 300 millirem
Operations	
Radiation doses for the CMRR project: - Annual worker population dose: 61 person-rem - Average annual individual dose: 110 millirem [b]	*Radiation doses from AC and MC at RLUOB:* - Annual worker population dose: < 1 person-rem [a] - Average annual individual dose: < 10 millirem [c] *Radiation doses from AC and MC at PF-4:* [d] - Annual worker population dose: < 10 person-rem - Average annual individual dose: < 170 millirem [e]

AC = analytical chemistry; CMRR = Chemistry and Metallurgy Research Building Replacement; MC = materials characterization; PF-4 = Plutonium Facility Building 4; RLUOB = Radiological Laboratory/Utility/Office Building; SA = Supplement Analysis.

[a] Radiation doses for all involved workers at RLUOB.

[b] Based on a 3-year average for all LANL workers receiving a measurable dose.

[c] Determined assuming 100 involved workers including those performing AC and MC activities plus facility and support personnel.

[d] Applies only to involved workers performing AC and MC activities at PF-4.

[e] Determined assuming 60 involved workers performing AC and MC activities at PF-4 and an annual worker population dose of less than 10 person-rem.

Source: DOE 2003b; LANL 2015.

For this SA, involved workers could receive radiation doses primarily from facility modifications involving removal and replacement of gloveboxes and other enclosures and equipment at PF-4. There would be no meaningful worker radiation doses for outfitting available laboratory space in RLUOB. Worker doses from modification of PF-4 would occur over the 7 years required to complete enclosure and equipment removal, reconfiguration, and replacement.

Involved workers modifying PF-4 would receive an average annual population dose of about 36 person-rem, and a total involved worker population dose over all PF-4 modification activities of about 253 person-rem. No LCFs are expected among the involved worker population from these doses on either an annual or a total project basis (calculated values of 0.02 LCF and 0.2 LCF, respectively). As facility modifications progress, the specific activities to be performed and the number of involved workers performing these activities would change, leading to yearly variations in radiation doses received by the involved worker population; however, the average annual dose to a worker involved in facility modifications is estimated to be about 300 millirem. The risk of an LCF from this annual dose would be about 0.0002. Administrative and engineering controls would be instituted for work in radiation and radioactive contamination areas in accordance with the LANL ALARA Program with the goal of minimizing radiation doses to workers.

During operations, the *CMRR EIS* projected a collective annual dose of 61 person-rem among involved workers from the activities performed under the CMRR project, and an average annual individual dose of about 110 millirem. No LCFs were expected among the worker population (calculated value of 0.04 LCFs) and the annual average individual risk of an LCF was estimated to be 6.6×10^{-5}. For this SA, radiation doses would be received by a smaller population of involved workers than those estimated for the *CMRR EIS*. Combining the estimated doses from PF-4 and RLUOB, the collective annual worker dose would be less than 11 person-rem, which is smaller than that projected in the *CMRR EIS*. (Note that the estimated dose for RLUOB operations is for all potentially involved workers while that for PF-4 is only for workers performing AC and MC activities.) No LCFs would be expected (calculated value of 7×10^{-3} LCF). The average individual worker dose across all involved workers at RLUOB is expected to be less than 10 millirem, which would represent an annual risk of an LCF of less than 6×10^{-6}. The average annual individual dose only among PF-4 workers performing AC and MC activities is estimated to be less than 170 millirem, which would represent an annual risk of an LCF of less than 1×10^{-4}.

The average annual dose projected for PF-4 workers (170 millirem) is larger than the estimate in the *CMRR EIS*, which was an average across all low-dose and higher-dose AC and MC activities at a two-building CMRR Facility (110 millirem), and larger than the current average annual dose among all LANL workers with a measurable dose. As indicated in **Table 5**, the average annual radiation doses received by LANL workers with a measurable dose ranged from 83 to 94 millirem for the years 2008 through 2012, with an average of 90 millirem (DOE 2009b, 2010, 2011c, 2013d). During 2012, the average annual dose among all TA-55 workers issued thermoluminescent dosimeters (TLDs), including those receiving no dose, was 72 millirem (LANL 2015).

Table 5. LANL Worker Radiation Doses for the Years 2008 through 2012

Personnel	*From Onsite Releases and Direct Exposure by Year*					*Average*
	2008	*2009*	*2010*	*2011*	*2012*	
Average radiation worker (millirem) [a]	88	83	94	87	97	90
Collective worker dose (person-rem)	107	116	125	127	140	123
Number of workers receiving a measurable dose	1,219	1,392	1,335	1,459	1,438	1,369

[a] No standard is specified for an "average radiation worker"; however, the maximum radiological dose to a worker is limited to 5,000 millirem per year (10 CFR Part 835). Furthermore, DOE has a goal of maintaining radiological exposure as low as reasonably achievable, and has established an Administrative Control Level of 2,000 millirem per year. The site contractor sets facility administrative control levels below the DOE level (DOE 2009a).

Source: DOE 2009b, 2010, 2011c, 2013d.

Until all AC and MC activities projected under this SA are established in TA-55, workers performing AC and MC activities at the CMR Building would continue to receive radiation doses. In the *CMRR EIS*, the annual dose was estimated to be 22 person-rem among involved CMR Building workers, with no LCFs expected (calculated value of 0.013 LCF) (DOE 2003b); in the *CMRR-NF SEIS*, the annual dose was estimated to be 21 person-rem (DOE 2011a). In the *CMRR EIS*, the average annual individual radiation dose at the CMR Building was estimated to be 110 millirem, representing an annual risk of an LCF of 6.6×10^{-5} (DOE 2003b); in the *CMRR-NF SEIS*, the average annual individual dose was estimated to be 100 millirem (DOE 2011a). Worker doses at the CMR Building would decline as AC and MC activities are transferred from the CMR Building to TA-55.

Wastes generated from the activities evaluated in this SA and processed at TA-54 would have characteristics similar to other wastes that have been processed at TA-54. Involved workers at TA-54 would perform the same functions as they do for other wastes managed in TA-54. Therefore, waste management activities at TA-54 resulting from the activities evaluated in this SA would result in no meaningful change in radiation dose rates currently experienced by involved workers at TA-54. In 2012, workers in the LANL Transuranic Program-Oversized Container Disposition Group (LTP-OCD) participating in TA-54 glovebox line operations and receiving a measurable dose had an average annual dose of 70 millirem; the average annual dose among all LTP-OCD workers that were issued TLDs was 28 millirem (LANL 2015).

The analyses in the *CMRR EIS* and this SA indicate that individual radiation doses received by workers would be less than the DOE worker dose limit of 5,000 millirem in a year and less than the LANL Administrative Level of 2,000 millirem in a year. These and other radiation protection requirements and guidelines would be implemented during facility modifications, waste management, and AC and MC activities at LANL, and actual radiation doses would be maintained to levels ALARA.

4.2.2 Public doses

Table 6 compares the estimated radiological doses received by members of the public pursuant to the analysis in the *CMRR EIS* with the analysis for the proposed changes evaluated in this SA.

Table 6. Comparison of Radiological Impacts to Members of the Public under the *CMRR EIS* and this SA

CMRR EIS	***This SA***
Construction	
No public radiation doses were expected.	No public radiation doses are expected.
Operations	
Annual air release of radioactive material (curies): - Plutonium-239-equivalent: 0.00076 - Krypton-85: 100 - Xenon-131: 45 - Xenon-133: 1,500 - Tritium: 1,000 [a]	*Annual air release of radioactive material (curies):* - Reduced compared to the *CMRR EIS* due to reduced levels of activities.
Annual radiation doses for CMRR project: - Population within 50 miles: 1.9 person-rem - Average individual within 50 miles: 0.0063 millirem - MEI: 0.33 millirem	*Radiation doses:* - Reduced compared to the CMRR EIS due to reduced levels of activities.

CMRR = Chemistry and Metallurgy Research Building Replacement; EIS = environmental impact statement; MEI = maximally exposed individual; SA = Supplement Analysis.

[a] Assumed to consist of 750 curies as tritium oxide and 250 curies as elemental tritium.

Source: DOE 2003b; LANL 2015.

Public doses and risks from the activities evaluated in this SA are expected to be minimal. For the CMRR project as evaluated in the *CMRR EIS*, DOE estimated that the population within 50 miles (80 kilometers) would receive an annual dose of 1.9 person-rem, the average individual within this population would receive an annual dose of 0.0063 millirem, and the MEI would receive an annual dose of 0.33 millirem (DOE 2003b). No LCFs were expected from the annual population dose (calculated value of 0.0011 LCF), while the annual risks of an LCF to the average individual in the exposed population and the MEI were estimated to be 3.8×10^{-9} and 2.0×10^{-7}, respectively (DOE 2003b). Population doses were determined assuming a population within 50 miles (80 kilometers) of TA-55 of 309,143 based on the 2000 census (DOE 2003b). Assuming a 50-mile (80-kilometer) population growth to about 448,000 for the year 2020 (DOE 2012a), the annual population dose estimated in the *CMRR EIS* would be about 2.8 person-rem when extrapolated to 2020. Still, no LCFs are expected (calculated value of 0.002 LCF).

Due to considerations including the reduced scope of material handling operations, it is expected that operational air emissions would be reduced compared to those evaluated in the *CMRR EIS*. No changes are expected to the air emissions monitoring programs at RLUOB or PF-4. No meaningful public doses from PF-4 and RLUOB operations are expected from liquid (groundwater or surface water) pathways. Therefore population doses and risks as extrapolated to the year 2020 would be likely smaller than those estimated in the preceding paragraph, as would doses and risks to an MEI.

This assessment is supported by the analysis in the *LANL SWEIS*, which evaluated impacts from continued operation of LANL, including operation of Key Facilities such as the CMR Building and the Plutonium Facility Complex. Under the No Action Alternative, the impacts from the CMR Building included those associated with transitioning operations to a newly constructed CMRR Facility in TA-55, while those for the Plutonium Facility Complex included those from annual production of up to 20 plutonium pits. Operations at LANL under the No Action Alternative were estimated to result in an annual dose of 30 person-rem to the population within a 50-mile (80-kilometer) radius, with contributions of 0.43 person-rem and 0.19 person-rem, respectively, from the CMR Building and Plutonium Facility Complex. The annual dose to the MEI was estimated to be 7.8 millirem, with contributions of 0.011 millirem and 0.012 millirem, respectively, from the CMR Building and Plutonium Facility Complex (DOE 2008a). The projected population and MEI doses for the CMR Building and Plutonium Facility Complex are smaller than those evaluated for the CMRR Facility in the *CMRR EIS*.

In the *LANL SWEIS*, implementation of the TA-55 Refurbishment Project was projected to result in no radiological risks among members of the public, either during construction or during operations, because the upgrades projected for TA-55 would not materially change TA-55 operations (LANL 2008a).

At TA-54, processing TRU waste from PF-4 enclosure and equipment removal, reconfiguration, and replacement activities could result in emissions of very small quantities of radionuclides into the air that could cause public doses. The projected activities at TA-54, however, involve a relatively small amount of waste and are consistent with those that have occurred in the past. Hence, no meaningful changes are expected to the already small levels of emissions from waste processing activities and the already small public doses that result from these emissions (see below). In addition, due to the relatively small amount of waste expected to result from the proposed activities and because all waste is expected to be contact-handled waste, little or no change is expected in offsite direct radiation exposure levels resulting from onsite storage of TRU waste or staging of TRU and other radioactive wastes for offsite shipment. Therefore, there would be little or no change in potential public doses from waste storage operations at TA-54.

Until RLUOB begins AC and MC activities, which are scheduled to occur by the end of 2019, public impacts from operation of the CMR Building would continue. In the *CMRR EIS*, DOE estimated that the population within 50 miles (80 kilometers) of the CMR Building would receive an annual dose of 0.040 person-rem, the average individual within this population would receive an annual dose of 1.3×10^{-4} millirem, and the MEI would receive an annual dose of 0.0059 millirem (DOE 2003b). No LCFs were expected from the annual population dose (calculated value of 2.4×10^{-5} LCF), while the annual risks of an LCF to the average individual in the exposed population and the MEI were estimated to be 7.9×10^{-11} and 3.5×10^{-9}, respectively (DOE 2003b). These doses were determined assuming a population within 50 miles (80 kilometers) of TA-3 of 302,120 based on the 2000 census (DOE 2003b). Assuming a 50-mile population growth to about 448,000 for the year 2020 (DOE 2012a), the population dose estimated in the *CMRR EIS* would be about 0.059 person-rem when extrapolated to 2020. Still, no LCFs are expected (calculated value of 4×10^{-5} LCF).[12]

There are population centers such as Albuquerque that are located a few miles beyond a 50-mile (80-kilometer) radius from LANL. In the *LANL SWEIS*, DOE demonstrated that the public dose beyond a 50-mile radius from LANL would be very small under both normal operations and accident conditions. Regarding normal operations, DOE showed that the dose to an individual from the proposed LANL activity resulting in the largest public impact would be reduced by a factor of over 200 between a radial distance of 0.5 and 50 miles (0.8 to 80 kilometers). Regarding accident conditions, DOE showed that, under the conditions of the worst-case postulated accident, extending the population dose analysis to a

[12] *Reflecting reduced operations at the CMR Building due to safety and seismic concerns, the more recent CMRR-NF SEIS projects lower public doses from continued use of the CMR Building. The CMRR-NF projected an annual dose of 0.016 person-rem to the population within 50 miles (80 kilometers) of the CMR Building (as projected to 2030), 0.000032 millirem to an average individual in this population, and 0.0023 millirem to the MEI. No LCFs were expected from the annual population dose (calculated value of 1×10^{-5} LCF), while the annual risks to the average individual in the exposed population and the MEI were 2×10^{-11} and 1×10^{-9} LCF, respectively (DOE 2011a).*

100-mile (160-kilometer) radius from the accident would increase the population dose by only 3 percent even though the population increased by 194 percent (DOE 2008a). Therefore, it is expected that the activities evaluated in this SA would result in no meaningful radiological impacts to members of the public in Albuquerque or other locations beyond a 50-mile (80-kilometer) radius from LANL.

LANL's annual air reports for the years 2010 through 2013 support the expectation of low public doses and risks from the activities evaluated in this SA. Selected information from these reports is presented in **Table 7**, which shows the total MEI doses for each year as well as the doses and percentage of total doses contributed by the CMR Building in TA-3, the Plutonium Facility in TA-55, and the waste processing domes in TA-54. (RLUOB is not listed because it did not start operations using radioactive material until August 2014.) Each year, the CMR Building and the Plutonium Facility each contributed less than one percent of the total dose received by an MEI, while no meaningful contributions resulted from TRU waste processing activities in TA-54. From 2010 to 2013, for example, the MEI received an annual dose from operations at the Plutonium Facility ranging from 0.000477 millirem to 0.00173 millirem, primarily due to estimated emissions of actinides and tritium (LANL 2011a, 2012b, 2013c, 2014b). It is expected that the low levels of public doses contributed by the Plutonium Facility and waste processing operations in TA-54 would continue during AC and MC operations. In addition, note that each year, the annual doses to the MEI from operation of the CMR Building were smaller than the annual estimate of MEI dose (0.0059 millirem) in the *CMRR EIS* (DOE 2003b).

Table 7. Contributions to Annual LANL MEI Dose from Selected LANL Facilities

Facility (TA) [a]	2010		2011		2012		2013	
	Dose (millirem)	Percent	Dose (millirem)	Percent	Dose (millirem)	Percent	Dose (millirem)	Percent
CMR Building (TA-3)	3.46×10^{-4}	0.11	3.73×10^{-4}	0.011	2.49×10^{-4}	0.043	1.58×10^{-4}	0.076
Plutonium Facility (TA-55)	1.73×10^{-3}	0.53	1.26×10^{-3}	0.036	8.75×10^{-4}	0.150	4.77×10^{-4}	0.23
Waste Processing (TA-54)	– [b]	– [b]	– [b]	– [b]	4.78×10^{-10}	8.2×10^{-8}	1.82×10^{-9}	8.7×10^{-7}
Entire LANL Site	0.328	100	3.53 [c]	100	0.582	100	0.21	100

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

[a] For the CMR Building the doses reflect the total contribution from releases from 14 CMR Building stacks in TA-3; for the Plutonium Facility, the total contribution from releases from 2 facility stacks in TA-55; and for Waste Processing, the total contribution from releases from 3 building stacks in TA-54.

[b] Doses were reported as zero for these years.

[c] The increase in MEI dose during 2011 was due to TA-21 remediation activities. The hypothetical MEI was proximal to and the dose was dominated by these remediation activities. Typically, the MEI is in another location (for example, East Gate) and further from any specific LANL activities.

Source: LANL 2011a, 2012b, 2013c, 2014b.

4.3 Facility Accidents

Potential accidents associated with operations at PF-4, RLUOB, and support facilities have been extensively evaluated in existing NEPA and safety documents supporting the operation of those facilities. These NEPA documents include the *CMRR EIS* (DOE 2003b), *LANL SWEIS* (DOE 2008a), *CMRR-NF SEIS* (DOE 2011a), and *Draft SPD Supplemental EIS* (DOE 2012a). In addition, these facilities maintain safety basis documents that evaluate the hazards associated with operations and identify controls to provide reasonable assurance of adequate protection of workers, the public, and the environment, taking into account the work to be performed and the associated hazards (10 CFR 830.4(c)).

For this SA, the proposed operations at affected facilities were reviewed to determine whether the new operations would result in substantial changes to the accident risks identified in current NEPA and, to a lesser extent, safety basis documents. The NEPA documents cited above evaluate a range of accidents including operational accidents such as spills, fires, and explosions; accidents initiated by external events such as wildfires and aircraft crashes; and natural phenomena-initiated events such as earthquakes. The operations associated with the proposed activities at PF-4 and RLUOB are similar to those identified in the current NEPA documents supporting those facilities, including the *LANL SWEIS* and the *Draft SPD Supplemental EIS* for PF-4; the *CMRR EIS* and *CMRR-NF SEIS* for RLUOB; and the *LANL SWEIS* for support facilities including waste management capabilities in TA-50 and TA-54. The proposed changes evaluated in this SA do not introduce new types of hazards or larger quantities of radionuclides compared to those identified in these existing EISs and the accident risks are expected to be well within the accident risks reported in them. In some cases, the amounts of radionuclides in gloveboxes and rooms would decrease substantially from the quantities assumed in the existing EISs.

The following subsections identify how the proposed changes in operations at PF-4, RLUOB, and support facilities would affect accident risks in those facilities. The subsections also evaluate the extent to which the accident risks reported in the existing EISs bound the incremental risks associated with the proposed changes in operations. Radioactive doses and risks are evaluated for noninvolved workers, the offsite population, and an MEI. A noninvolved worker is a site worker outside of a facility who would not be subject to direct radiation exposure, but could be exposed to emissions from that facility, particularly during postulated accidents. The offsite population comprises members of the general public living within 50 miles (80 kilometers) of a facility. The MEI is a hypothetical member of the public at a location of public access that would result in the highest exposure, which is assumed to be at the LANL site boundary during postulated accidents. For individuals or population groups, estimates of potential LCFs are made using a risk estimator of 0.0006 LCFs per rem or person-rem (DOE 2003a). For acute doses to an individual equal to or greater than 20 rem, the factor is doubled (NCRP 1993).

4.3.1 Potential Accidents in PF-4

Potential severe accidents in PF-4 were evaluated in the *LANL SWEIS* (DOE 2008a) and, more recently, in the *Draft SPD Supplemental EIS* (DOE 2012a). These analyses demonstrate that the PF-4 structure and support equipment provide substantial confinement of radionuclides. The *Draft SPD Supplemental EIS* reflects current operating modes and includes results from TA-55 safety basis documents, including the then current Documented Safety Analysis (DSA).

Current/Existing NEPA Accident Analysis for PF-4

The *Draft SPD Supplemental EIS* provides a detailed evaluation of accidents at PF-4, based on accidents evaluated in the 2011 PF-4 DSA. Although many types and isotopic mixtures of plutonium and other nuclides may be present at PF-4, the predominant types are weapons-grade plutonium and heat-source plutonium, which is mostly plutonium-238. For safety analysis purposes, the plutonium inventories for all types and isotopic mixtures are expressed in terms of weapons-grade plutonium equivalent which is about 93 percent plutonium-239. Thus, for purposes of this SA, plutonium quantities at PF-4 are expressed in terms of weapons-grade plutonium equivalents or just plutonium. For dose estimation purposes, the releases are presented as PuE.

Operational accidents included a criticality, a spill involving 4,500 grams of molten weapons-grade plutonium equivalent (plutonium), a glovebox fire involving 9,000 grams of plutonium, a vault fire involving 1,500 kilograms of plutonium, and a hydrogen deflagration involving 1,040 grams of plutonium in salts and 1,040 grams of plutonium in oxides. In addition, a design-basis earthquake with spills and fires (with degraded confinement) was evaluated assuming the entire processing (first) floor safety limit of plutonium (2,600 kilograms) was at risk and subject to spillage and fires. In the evaluation of a beyond-design-basis earthquake plus fire, a functional confinement system was not credited.

For each of the PF-4 accident scenarios evaluated in the *Draft SPD Supplemental EIS*, conservative, bounding source-term estimates were developed as part of the LANL safety-basis process (for the 2011 PF-4 DSA) to identify the controls necessary to protect the public. These source-term estimates take little, if any, credit for the integrity of containers or building confinement under severe accident conditions and assume that all containers and material at risk would be subject to near-worst-case conditions. The safety-basis evaluations generally assume a leak path factor (LPF) of 1 for the unmitigated case, meaning that all of the material that is made airborne as respirable particles within the building or process enclosure is released to the environment. For the mitigated case, the LANL safety-basis analyses only take credit for the PF-4 building operating in a passive mode, with the doors open and the building confinement system and HEPA filters not functioning, and assume a lower LPF, generally 0.05.

For the *Draft SPD Supplemental EIS*, accident source-terms were developed that present more realistic, yet conservative, estimates of potential releases from PF-4. For these scenarios, the building confinement, including HEPA filters, was expected to continue functioning, although perhaps at a degraded level, during and after the accident. The scenarios use conservative airborne release fractions (ARFs) and respirable fractions (RFs) from DOE Handbook 3010, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities* (DOE 1994).

Ongoing Safety Analyses and Seismic Upgrades for PF-4

Since release of the *Draft SPD Supplemental EIS* in July 2012, DOE has continued safety analyses for the PF-4 facility. The *Draft SPD Supplemental EIS* accident analyses were based on Revision 1.0 of the 2011 DSA. Currently, Revision 1.5 of the 2011 DSA is operational at PF-4, but a 2014 update has been approved and will be implemented in the near future. The accident analyses in the 2014 DSA did not change substantially relative to the 2011 DSA, Revision 1.0; however, the glovebox pyrochemical fire included in the 2011 DSA, Revision 1.0 (and the *Draft SPD Supplemental EIS*) was deleted and is now represented by a generic glovebox fire. Two of the factors affecting release (the airborne release fraction and the respirable fraction) differed between the two scenarios and the material at risk increased. The net result was a slight reduction (about 20 percent) in the source term and impacts. This would reduce the MEI dose for a glovebox fire as presented in the *Draft SPD Supplemental EIS* from 0.0012 rem to 0.00096 rem; this dose would remain smaller than that of the operational accident of a hydrogen deflagration from dissolution of plutonium metal (MEI dose of 0.11 rem). Another change was the use of a larger LPF for the seismically initiated facility fire; this increased the source term for this accident scenario marginally. In addition, the 2014 DSA takes credit for some safety improvements implemented since the 2011 DSA, Revision 1.0 and the *Draft SPD Supplemental EIS*, including reduction in the inventories of some materials.

For the design-basis earthquake scenarios, the 2011 DSA assumed the facility remained standing and provided its credited safety containment. In order to better understand the potential impacts of a large, rare earthquake, LANL prepared an addendum to the DSA in 2013. The analyses in the addendum assumed a hypothetical earthquake that causes major structural damage to PF-4, including collapse of the roof onto the first floor and collapse of the first floor into the basement. It evaluated the potential releases associated with widespread spills and fires postulated to follow the earthquake. The DSA addendum was prepared specifically to address circumstances that could occur after a seismic collapse of PF-4 and a post-seismic fire. Consequences of structural collapse calculated in the DSA addendum range from less than a fourth of the bounding DSA design-basis spill plus fire impacts for the more realistic case to a factor of 40 higher for the hypothetical extreme bounding case (LANL 2015). In response to these analyses, DOE has adopted several near-term measures to increase the margin of PF-4 safety as summarized in Section 3.3.4 of this SA.

DOE has committed to seismic upgrades to PF 4 that would result in an updated safety-basis estimate for a seismically induced fire. Proposed future improvements that will be incorporated into PF 4 include fire rated containers, seismically qualified fire suppression systems, and seismically qualified portions of the confinement ventilation system.

Proposed Operations in PF-4

The proposed enhancement of AC and MC activities at PF-4 would replace past operations that have been evaluated in PF-4 safety basis documents. The proposed AC and MC activities would be similar to those identified in the *CMRR EIS* (DOE 2003b) and the *CMRR-NF SEIS* (DOE 2011a) as being planned for CMRR-NF. In those EISs, a range of operational accidents was considered, but controls were expected to be in place, including a hardened structure and robust confinement system, that would ensure that all operational accidents would only release radioactive material to the environment through controlled release via HEPA filters. The bounding accidents identified in both the *CMRR EIS* and *CMRR-NF SEIS* were events that might threaten the building confinement systems; these events included a facility-wide fire and seismic events of such magnitude that they could cause wide-scale spills, fires, and failure of building confinement.

Operational Accidents—The proposed AC and MC activities could involve operations on samples of nuclear material in quantities up to several kilograms (hence the need to conduct operations in a Hazard Category 2 nuclear facility instead of RLUOB). The overall inventory of AC and MC materials in PF-4 would likely be less than 10 percent of the PF-4 processing floor inventory and most of the AC and MC material would be in the form of non-dispersible metal. For AC activities, about 70 percent of the inventory would be in the form of metal; for MC activities, more than 95 percent would be metal. Potential accidents associated with the proposed AC and MC activities would not have sufficient inherent energy to aerosolize and disperse more material within a glovebox than the bounding operational accidents for PF-4 that were evaluated in the *Draft SPD Supplemental EIS*. Those bounding operational accidents could result in airborne plutonium within a PF-4 glovebox from a spill of 4,500 grams of molten plutonium in a glovebox used for the Advanced Recovery and Integrated Extraction System project (0.028 grams PuE stack release), or a glovebox fire involving 9,000 grams of plutonium (0.024 grams PuE stack release). The *Draft SPD Supplemental EIS* hydrogen deflagration accident from dissolution of plutonium metal was estimated to result in a stack release of 2.2 grams PuE. The radiological impacts from bounding operational accidents were estimated in the *Draft SPD Supplemental EIS* to result in doses of up to 0.11 rem to an individual at the site boundary and up to 26 person-rem to the population within 50 miles (with no LCFs expected). Changes in the PF-4 DSA between 2011 and 2014 would not change this result. Any operational accident involving the proposed AC and MC activities would not be expected to result in larger potential releases to the environment than these bounding *Draft SPD Supplemental EIS* operational accidents.

Seismically Initiated Accidents—The proposed AC and MC activities would not be expected to increase source terms or material releases from PF-4 compared to any of the seismically initiated accidents evaluated for this facility in the *Draft SPD Supplemental EIS*. The new AC and MC activities would replace existing plutonium activities evaluated in current safety basis documents and the *Draft SPD Supplemental EIS* PF-4 accident analysis. The total building plutonium inventory associated with the additional AC and MC activities would represent a small fraction of current building inventories. For the design-basis earthquake with spill and fire evaluated in the *Draft SPD Supplemental EIS*, the entire processing (first) floor safety limit of plutonium (2,600 kilograms) was at risk and subject to spillage and fires. With the replacement of some activities evaluated in the *Draft SPD Supplemental EIS* with the AC and MC activities proposed in this SA, these material limits would not change. In fact, the material at risk associated with the proposed AC and MC activities would be lower than that in gloveboxes and PF-4 rooms as currently evaluated. The forms of the materials associated with the AC and MC activities are not expected to be more vulnerable to large-scale aerosolization in seismic spills and fire accidents than those evaluated in the *Draft SPD Supplemental EIS*. Thus, the impacts from seismically initiated accidents involving the proposed AC and MC operations in PF-4 would be bounded by the impacts evaluated in the *Draft SPD Supplemental EIS*, and the contribution of AC and MC operations to these impacts would be small. For the design-basis earthquake with spill plus fire, the release to the environment was estimated to be 29 to 76 grams PuE, depending on the alternative addressed in the *Draft SPD Supplemental EIS* for surplus plutonium disposition. The radiological impacts from the design-basis earthquake with spill plus fire accident was estimated in the *Draft SPD Supplemental EIS* to result in doses of up to 1.5 to 3.9 rem to an individual at the site boundary and up to 900 person-rem to the population within 50 miles (with the possibility of 1 LCF). Changes in the PF-4 DSA between 2011 and 2014 would result in a slight reduction in these doses.

For the beyond-design-basis earthquake with spill plus fire, the most recent analysis of potential releases to the environment is the DSA addendum. That analysis evaluates the potential radiological impacts of an earthquake so severe that it would cause major structural damage to the heavily reinforced PF-4. The earthquake was assumed to damage the internal structures causing the collapse of the roof onto the first floor and collapse of the first floor into the basement. The analysis assumes that radioactive materials within PF-4 would spill and be impacted by falling structural components, and that a major, facility-wide fire would ensue. The assumed extent of damage is highly unlikely even in an earthquake with ground motion much higher than that of the design-basis earthquake. Although there could be a substantial release of radioactive material following such an earthquake accompanied by a facility-wide fire, loss of life within the facility and within the region due to seismic damage would be the predominant impact of such an earthquake. For the beyond-design-basis earthquake with spill plus fire, the release to the environment was estimated to be 173 grams PuE for the more-realistic case (the median, mitigated total collapse case). The radiological impacts from the beyond design-basis earthquake with spill plus fire accident was estimated in the *Draft SPD Supplemental EIS* to result in doses of 6.2 to 15 rem to an individual at the site boundary and up to 3,500 person-rem the population within 50 miles (with the possibility of up to 2 LCF). The DSA addendum release to the environment of 173 grams PuE falls within the range of releases for this accident as evaluated in the *Draft SPD Supplemental EIS*, of 123 to 297 grams PuE. Consequently, the corresponding dose in the DSA addendum analysis would be less than that reported in the *Draft SPD Supplemental EIS*.

Because the material inventories associated with AC and MC operations are primarily in non-dispersible metal forms, represent less than 10 percent of the overall building inventories, and would not increase the facility MAR, they would not appreciably add to the source term of earthquake-initiated accidents. Consequently, the impacts from the bounding accidents in the *Draft SPD Supplemental EIS* or current PF-4 safety documents would not be affected by the new AC and MC activities.

4.3.2 Potential Accidents in RLUOB

The proposed AC and MC activities for RLUOB would be similar to those identified in the *CMRR EIS* (DOE 2003b), but would involve much smaller quantities of radioactive materials than those for the AC and MC activities planned for CMRR-NF in the *CMRR EIS*. Because RLUOB is designated a Radiological Facility, the facility is limited to the maximum quantities of radionuclides (38.6 grams PuE) specified in DOE Technical Standard 1027 (DOE 1997) and NNSA Supplemental Guidance NA-1 SD G 1027 (NNSA 2014). Although RLUOB is being operated as a Radiological Facility, it was built to higher safety design standards than those required for a Radiological Facility. RLUOB has a building HEPA filtration system that would provide a significant degree of confinement for minor accidents.

The accidents evaluated in the *CMRR EIS* were for a new nuclear facility at TA-55, now called CMRR-NF. The accidents evaluated for CMRR-NF included a process spill, a process fire, a fire in the main vault, a process explosion, a facility-wide spill, a facility-wide fire, a seismic-induced laboratory spill, and a seismically induced fire. The *CMRR EIS* did not explicitly evaluate the impacts for a RLUOB-like facility but assumed the impacts for other supporting facilities, such as a radiological laboratory at TA-55, would be bounded by the impacts evaluated for the proposed CMRR-NF. Each of these types of accidents (except for a fire in the main vault) that were evaluated for CMRR-NF is in principle applicable to RLUOB, although the quantities of radioactive material at risk in any one operation or the building are substantially less. For the proposed Hazard Category 2 facility, individual glovebox or process limits in the *CMRR EIS* were assumed to be 7.2 kilograms PuE while the building inventory was assumed to be 6,000 kilograms PuE. Within RLUOB, the DOE Radiological Facility designation would limit any single process or the entire building to 38.6-gram PuE.

Table 8 presents the material at risk, building leak path factors, and releases for each major accident evaluated for the new CMRR Facility in the *CMRR EIS* (DOE 2003b, Section C.4.1). Table 8 also includes an equivalent release for these accident scenarios if the material at risk in each accident scenario was equal to the revised NNSA limit for a Radiological Facility, such as RLUOB, of 38.6 grams PuE, and no credit is assumed for in-place controls at RLUOB such as the building confinement system and HEPA filters. The comparisons were made to the proposed facility in the *CMRR EIS* rather than the *CMRR-NF SEIS* (DOE 2011a) because the *CMRR EIS* considered specific process accidents that would be directly applicable to RLUOB while the *CMRR-NF SEIS* addressed bounding, building-wide accidents applicable only to a large facility.

Table 8. *CMRR EIS* Accident Scenarios and Equivalent Releases with RLUOB Inventory

CMRR EIS Accident Scenario	*Material at Risk [a] (kg PuE)*	*Building LPF [a]*	*CMRR EIS Release [a] (g PuE)*	*Equivalent CMRR EIS Release with LPF=1 [a] (g PuE)*	*Equivalent RLUOB Release with MAR=38.6 g and LPF=1 [b] (g PuE)*
Process Spill	7.2	0.016	0.23	14.4	0.077
Process Fire	30	0.016	0.96	60	0.077
Fire in Main Vault	5,700	1	1,430	1,430	NA [c]
Process Explosion	7.2	0.016	0.17	10.6	0.057
Facility-Wide Spill	6,000	1	12,000	12,000	0.077
Facility-Wide Fire	6,000	1	2,030	2,030	0.013
Seismic-Induced Laboratory Spill	300	1	600	600	0.077
Seismic-Induced Fire	300	1	600	600	0.077

CMRR = Chemistry and Metallurgy Research Building Replacement; EIS = environmental impact statement; g = grams; kg = kilograms; LPF = leak path factor; MAR = material at risk; PuE = plutonium-239 dose equivalent; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Accident scenarios, material at risk, leak path factor, and releases from Chapter C, Section C.4.1 of the *CMRR EIS* (DOE 2003b).

[b] RLUOB releases based on scaling the quantities of material at risk for the specific *CMRR EIS* accident scenarios down to the facility limit for RLUOB and not taking credit for building filtration.

[c] RLUOB does not have a main vault so this scenario is not applicable.

Source: DOE 2003b.

Table 8 demonstrates that potential accident releases of plutonium (or its equivalent) would be much smaller for RLUOB than for those evaluated specifically for CMRR-NF even if no credit were taken for the safety features designed into RLUOB, such as a robust structure and building confinement system. For the individual process spill, fire, and explosion accidents where the *CMRR EIS* assumed an LPF of 0.016, the unfiltered release from RLUOB would be about a third or less of the filtered CMRR release. For the large-scale, multi-room accidents, releases from both RLUOB and CMRR-NF were assumed to be unfiltered; so the RLUOB releases, and impacts, would be 0.013 percent or less of the CMRR-NF releases and impacts.

Table 9 presents the impacts to the MEI, to the population within 50 miles (80 kilometers), and to a downwind noninvolved worker for accident scenarios evaluated in the *CMRR EIS*, as well as doses for the same hypothetical scenarios in RLUOB, assuming the much lower building inventory and taking no credit for building safety systems. Table 9 indicates that the potential accident impacts associated with the proposed AC and MC operations in RLUOB are well within the projected impacts associated with the CMRR-NF at TA-55 as evaluated in the *CMRR EIS*.

Table 9. *CMRR EIS* Accident Impacts and Equivalent RLUOB Impacts with Lower Inventory

CMRR EIS Accident Scenario	*Maximally Exposed Individual*		*Offsite Population* [c]		*Noninvolved Worker*	
	CMRR EIS Dose [a] *(millirem)*	*RLUOB Dose* [b] *(millirem)*	*CMRR EIS Dose* [a] *(person-rem)*	*RLUOB Dose* [b] *(person-rem)*	*CMRR EIS Dose* [a] *(millirem)*	*RLUOB Dose* [b] *(millirem)*
Process Spill	4.6	1.54	3.19	1.07	190	63.6
Process Fire	4.0	0.32	9.78	0.78	30	2.41
Fire in Main Vault	5,920	NA [d]	14,500	NA [d]	43,900	NA [d]
Process Explosion	3.6	1.21	2.5	0.84	150	50.3
Facility-Wide Spill	243,000	1.56	168,000	1.08	9.35×10^6	60
Facility-Wide Fire	7,000	0.045	17,000	0.11	51,400	0.33
Seismic-Induced Laboratory Spill	12,100	1.55	8,390	1.08	495,000	64
Seismic-Induced Fire	2,500	0.32	6,110	0.78	18,500	2.37

CMRR = Chemistry and Metallurgy Research Building Replacement; EIS = environmental impact statement; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Doses from Table 4–14 of the *CMRR EIS* for Alternatives 1 and 3 which would have moved AC and MC to two new facilities at TA-55 (DOE 2003b).

[b] RLUOB doses based on scaling the quantities of material at risk for the specific *CMRR EIS* accident scenarios down to the facility limit for RLUOB and taking no credit for building filtration.

[c] Population doses are based on a year 2003 population of 309,154 persons residing within 50 miles (80 kilometers) of TA-55.

[d] RLUOB does not have a main vault so this scenario is not applicable.

Source: DOE 2003b.

4.3.3 Combined Accident Implications

With implementation of the proposed changes evaluated in this SA, the accident risks associated with nuclear operations in the TA-55 area would change, but those changes would be small. Those accident risks include those for PF-4 and RLUOB as well as support operations including radioactive management activities in TA-54. In addition, the accident risks associated with ongoing AC and MC activities in the CMR Building and transfer of nuclear material between the CMR Building in TA-3 and TA-55 facilities would be eliminated. Overall, moving AC and MC operations from the CMR Building to a modern or upgraded facility is expected to lower the accident risks associated with the AC and MC activities.

The increment to accident risks in the TA-55 area would be very small. Bounding operational accidents at PF-4 assuming existing operations are projected to release 0.024 to 2.2 grams PuE to the environment. As indicated in Section 4.3.1, replacement of activities in rooms and gloveboxes with the AC and MC activities evaluated in this SA would not result in larger potential releases from these bounding operational accidents. As shown in Table 8, bounding operational accidents (without credit for operational controls and HEPA filters) in RLUOB involving the proposed AC and MC activities would release 0.077 to 0.013 grams PuE to the environment. The bounding operational release from RLUOB would be 0.59 percent of the bounding operational accident release from PF-4. Assuming a very severe seismic event causing in wide-scale spills and fires within PF-4, with or without the proposed AC and MC activities, releases of 29 to 76 grams PuE were estimated for the design-basis earthquake with spill plus fire while 321 to 362 grams PuE were estimated for the beyond-design basis earthquake with spill plus fire (see Section 4.3.1). As indicated in Table 8, the bounding seismic release from RLUOB with the proposed AC and MC activities would be 0.077 grams PuE. Thus, with the addition of AC and MC activities to PF-4 and RLUOB, the incremental accident releases and corresponding impacts would be very small. On the other hand, the accident risks associated with continued AC and MC activities at the CMR Building would be eliminated; these risks are evaluated in the *CMRR EIS* (DOE 2003b) and *CMRR-NF SEIS* (DOE 2011a).

The radioactive waste from the room and enclosure changes in PF-4 and from new AC and MC activities in PF-4 and RLUOB would not introduce new types of hazards to the ongoing waste management activities in TA-54. Similar types of TRU waste (including legacy TRU waste), LLW, and MLLW are routinely handled in TA-54 from the CMR Building, PF-4, and other LANL site activities. Waste volumes associated with the upgrades to PF-4 and RLUOB and AC and MC activities are very small relative to ongoing waste volumes as indicated in Section 4.4. These additional waste volumes would not be expected to substantially change accident probabilities and would be well within historical waste volumes handled at TA-54. The current safety basis documents for waste management activities at TA-54 would accommodate the projected waste volumes and changes. Therefore, the radioactive waste associated with the proposed TA-55 facility modification and new AC and MC activities would not substantially change the overall radioactive waste accident risks associated with LANL support activities at TA-54.

4.4 Waste Management

This section addresses the waste types and quantities projected to be generated from construction and operations. It also addresses waste disposition by comparison to existing waste generation rates and analyses of possible impacts on onsite and offsite waste treatment and disposal capacities.

4.4.1 Construction Waste

The *CMRR EIS* estimated that construction of the CMRR project would generate 589 tons (534 metric tons) of solid nonhazardous waste consisting of gypsum board, wood scraps, nonrecyclable scrap metals, concrete, steel, and other construction waste (DOE 2003b). About 325 tons (295 metric tons) of this nonhazardous waste was projected from construction of the administration building (RLUOB) and 11 tons (10 metric tons) was associated with other construction elements (DOE 2003b). RLUOB was constructed while implementing options for recycle of demolition and construction material, and received Gold Leadership in Energy and Environmental Design (LEED) certification. Of the 5,823 tons (5,283 metric tons) of wood, metal, cardboard, concrete, asphalt, and other waste materials generated during construction, 72 percent (4,210 tons [3,819 metric tons]) was recycled or reused; the remaining material (1.613 tons [1,463 metric tons]) was disposed of in a landfill (LANL 2012c).

The activities evaluated in this SA would generate radioactive wastes of different types plus nonhazardous waste such as construction and demolition debris and very small quantities of hazardous waste. **Table 10** presents a summary of the projected types and quantities of radioactive wastes from all construction and modification activities after onsite processing and packaging for offsite treatment and/or disposal. The volume estimates were made incorporating conservative, bounding assumptions. Additional information is provided below regarding the projected radioactive, hazardous, and nonhazardous wastes from major facility modification and construction activities.

Table 10. Summary of Radioactive Waste Types from Facility Construction or Modification[a]

Waste Type	*Total Waste (cubic feet)* [a]	*Nominal Container Type* [b]	*Nominal Container Capacity (cubic feet)*	*Number of Containers*
TRU waste [c]	3,520	SWB	40	88
LLW	4,420	B-25 box [d]	96	46
LLW [e]	300	55-gallon drum	7.4	41
LLW (glovebox)	1,430	Custom	1 glovebox	19
MLLW	44	55-gallon drum	7.4	6
MLLW (glovebox)	5,400	Custom	1 glovebox	36

LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; SWB = standard waste box; TRU = transuranic.

[a] Projected waste volumes after onsite processing (e.g., size reduction, decontamination, sorting, segregation) and packaging for offsite treatment and/or disposal. All radioactive waste is expected to be contact-handled waste.

[b] Other containers than those listed could be used. For example, some TRU waste could be shipped within drums rather than boxes or some LLW could be shipped within drums or boxes other than B-25 containers.

[c] Some TRU waste could be classified as mixed TRU waste.

[d] A B-25 box is a (typically) steel container used for waste disposal. For this Supplement Analysis, its nominal capacity is assumed to be 96 cubic feet.

[e] The sum of 195 cubic feet of LLW from enclosure reconfiguration at PF-4 and 105 cubic feet of LLW from RLUOB modifications. Drums are assumed for purpose of analysis. Waste could be also shipped within boxes such as B-25 boxes.

Note: Volumes have been rounded.
To convert cubic feet to cubic meters, multiply by 0.028317; feet to meters, multiply by 0.3048.

Source: LANL 2015.

PF-4 Modifications—The great majority of the waste from PF-4 modifications would arise from removal of gloveboxes and other enclosures and associated piping and equipment. Materials identified as TRU waste such as segmented piping sections and discarded equipment of small size would be placed in drums that may be organized for transfer from PF-4 within standard waste boxes (SWBs). Materials identified as LLW would be placed within drums or boxes, while materials such as lead soldered wire or copper tubing joints would be identified as MLLW and placed within drums. Gloveboxes or other enclosures (or discarded equipment of larger size) would be wrapped in plastic for contamination control and braced within reusable primary confinement containers (metal boxes used for safe transfer of large items such as gloveboxes). Drums, boxes, SWBs, and primary confinement containers would be placed within industrial package-2 (IP-2)-certified shipping containers that would be loaded onto trucks for transfer to TA-54. At TA-54, these industrial package shipping containers would be unloaded, decontaminated as needed, and reused if possible. The unloaded containers and boxes would be temporarily stored pending their disposition. Little additional processing would take place for the LLW or MLLW transferred to TA-54 from PF-4; the radionuclide and chemical content would be characterized using existing LANL capabilities, and confirmed to be (certified as) LLW or MLLW. The estimated 4,420 cubic feet (125 cubic meters) of LLW would be shipped off site for disposal; the estimated 44 cubic feet (1.3 cubic meters) of MLLW would be shipped off site for treatment and/or disposal (also see below).

Materials identified as TRU waste would be safely stored at TA-54 until the waste could be processed using existing capabilities at TA-54 into TRU and other radioactive waste streams (LLW, MLLW). TA-54 processing capabilities include size reduction, decontamination, sorting, and segregation capabilities in Buildings 231, 412, and 375. Gloveboxes and other enclosures would be decontaminated to the point that the enclosures would be classified as LLW or MLLW (many enclosures contain lead shielding); the waste from this decontamination process is assumed to be TRU waste (see below).

Decontaminated enclosures would be shipped off site for treatment and/or disposal. About 1,430 cubic feet (40.5 cubic meters) of LLW and 5,400 cubic feet (153 cubic meters) of MLLW would be thus generated, where these volumes represent the sums of the projected outside dimensions of the enclosures. MLLW boxes would be shipped off site to permitted and authorized treatment and/or disposal facilities. In addition, decontamination and other processing operations at TA-54 would generate some LLW and MLLW. The projected volumes of these wastes are included in the estimates provided above (4,420 cubic feet [125 cubic meters] of LLW and 44 cubic feet [1.3 cubic meters] of MLLW). LLW would be shipped off site for disposal; MLLW would be shipped off site for treatment and/or disposal. Consistent with facility-specific waste acceptance criteria, LLW and MLLW could be shipped to facilities such as the Nevada National Security Site, the EnergySolutions site in Clive, Utah, and/or the Waste Control Specialists site in Andrews, Texas.

Reconfiguration of affected PF-4 enclosures may generate small quantities of LLW. It is conservatively assumed that approximately 195 cubic feet (5.5 cubic meters) of LLW could be generated which would be placed within drums or boxes for shipment to TA-54 for staging for shipment for offsite disposal.

Approximately 3,520 cubic feet (100 cubic meters) of TRU waste generated from the decontamination process would be packaged for shipment and disposal. This TRU waste would be placed within drums that would be characterized and certified for WIPP disposal and safely stored pending shipment. The drums would be placed within SWBs before being loaded into TRUPACT-II packages for shipment. Characterization and certification activities would be performed at TA-54 or at the TRU Waste Facility in TA-63 when it is operational (see Chapter 3, Section 3.3.5); waste loading into TRUPACT-II packages would occur at RANT.

Plutonium Facility modifications and equipment installation could generate a small quantity of hazardous waste (or other regulated chemical waste)[13] as well as nonhazardous waste including construction debris such as wooden crates and boxes, metal pipe pieces, scrap drywall, or similar materials. Hazardous waste would be shipped off site for treatment and/or disposal. Nonhazardous waste would be sorted for disposition by recycle or disposal. Liquid sanitary waste would be addressed using existing or modified building capabilities or portable services.

RLUOB modifications—Small quantities (about 105 cubic feet [3 cubic meters]) of LLW could be generated from internal modifications to RLUOB, without generating TRU waste or MLLW. The LLW could be generated while making final connections (hot tie-ins) between laboratory connections and liquid radioactive waste drain lines, and would consist of metal scrap, personal protective equipment, and similar material. LLW would be placed into containers such as 55-gallon drums or B-25 boxes and transferred to TA-54 for staging for offsite shipment.

Activities to modify internal RLUOB space and install equipment could generate a small quantity of hazardous (or other regulated chemical) waste as well as nonhazardous waste including construction debris as discussed above for Plutonium Facility modifications. Hazardous and nonhazardous wastes would be dispositioned as discussed above.

[13] *Chemical waste is a LANL category of material that includes hazardous waste [designated under RCRA regulations]; toxic waste [asbestos and polychlorinated biphenyls, designated under the Toxic Substances Control Act]; and special waste (designated under the New Mexico Solid Waste Regulations and including industrial waste, infectious waste, and petroleum contaminated soils).*

Additional modifications would occur as part of opening the RLUOB tunnel to create an access area for construction personnel and equipment, and for temporary reconfiguration of security and radiological control boundaries. Demolition and construction activities would generate up to 1,200 cubic yards (920 cubic meters) of concrete and asphalt waste which would be appropriately screened for contamination by applying approved procedures and standards and transferred to permitted recycle or disposal facilities.[14]

Sanitary wastes and general trash would be addressed using existing capabilities in RLUOB or trailered sanitary facilities.

Additional construction—The minor modifications that would be made to the existing TA-55 warehouse would generate construction debris such as wood, metal pipe or rebar scrap, empty containers, or similar materials that would be dispositioned by disposal or recycle. Development of a warehouse in TA-48 or office capacity in TA-50 would generate similar types of construction and demolition debris that would be dispositioned by recycle or disposal.

4.4.2 Operational Waste

The *CMRR EIS* (DOE 2003b), *LANL SWEIS* (DOE 2008a), and *CMRR-NF SEIS* (DOE 2011a) estimated the following annual waste volumes from operations under the CMRR project:

- TRU and mixed TRU waste: 2,370 cubic feet (67 cubic meters)
- LLW: 71,280 cubic feet (2,020 cubic meters)
- MLLW: 700 cubic feet (20 cubic meters)
- Hazardous waste: 24,700 pounds (11,200 kilograms)
- Sanitary waste: 7,200,000 gallons (27,000,000 liters)

Due to the reduced scope of operations evaluated in this SA (no large-vessel cleanout activities), operational waste generation would be smaller than that previously projected. Waste from AC and MC activities at RLUOB would generate small quantities of TRU waste as well as LLW, MLLW, and hazardous waste. Nearly all operational TRU waste would arise from AC and MC activities at PF-4; PF-4 would also generate LLW, MLLW, and hazardous waste. The annual quantity of sanitary waste would be smaller than that estimated in the *CMRR EIS* because fewer operational personnel would be required than projected in the *CMRR EIS*.

4.4.3 Waste Disposition

Table 11 summarizes onsite waste generation rates or waste treatment capacities at LANL (DOE 2012a; LANL 2011b, 2012a, 2013a, 2013b). Disposition of the wastes from the activities evaluated in this SA are evaluated by comparison to this table and additional information as shown below.

[14] *Recycle would occur consistent with RLUOB's LEED certification.*

Table 11. Summary of Waste Generation Rates or Treatment Capacities at LANL

Waste Type	*Annual Waste Generation Rate* or *Treatment Capacity*	*Disposition Method*	*Impact Criteria* [a]
TRU [b]	3,975 to 6,333 cubic feet	Offsite disposal at WIPP [b]	As a comparison to existing generation rates
Solid LLW	131,490 to 1,266,521 cubic feet	Offsite NNSS or commercial disposal	As a comparison to existing generation rates
Solid MLLW	475 to 4,020 cubic feet	Offsite NNSS [c] or commercial disposal	As a comparison to existing generation rates
Chemical waste [d]	3,279 to 8,327 pounds	Offsite commercial disposal	As a comparison to existing generation rates
Solid Non-HW	4,964 to 19,327 tons	Offsite commercial landfill disposal	As a comparison to existing generation rates
Liquid LLW	1,100,000 gallons	Onsite Radioactive Liquid Waste Treatment Facility	As a comparison to treatment capacity
Liquid Non-HW	220,000,000 gallons	Onsite Sanitary Wastewater System	As comparison to treatment capacity

HW = hazardous waste; LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; NNSS = Nevada National Security Site; non-HW = nonhazardous waste; TRU = transuranic; WIPP = Waste Isolation Pilot Plant.

[a] Impacts from generation of TRU waste, solid LLW, solid MLLW, chemical waste, and solid nonhazardous waste were estimated by comparing the annual waste quantities estimated in this Supplement Analysis to the annual waste generation rates since publication of the *LANL SWEIS* (DOE 2008a) – that is, from 2009 through 2012; impacts from generation of liquid LLW and liquid nonhazardous wastes were estimated by comparing annual quantities to onsite treatment capacity.

[b] Includes mixed TRU waste. TRU waste generated from LANL activities is being safely stored until WIPP resumes operations.

[c] Provided that the MLLW meets land disposal restrictions, as well as other NNSS waste acceptance criteria.

[d] At LANL, chemical waste is defined as a broad category including hazardous waste (designated under Resource Conservation and Recovery Act regulations); toxic waste (asbestos and polychlorinated biphenyls, designated under the Toxic Substances Control Act); and special waste (designated under the New Mexico Solid Waste Regulations and including industrial waste, infectious waste, and petroleum contaminated soils).

Note: To convert cubic feet to cubic meters, multiply by 0.028317; gallons to liters, multiply by 3.78533; pounds to kilograms, multiply by 0.45359; tons to metric tons, multiply by 0.90718.

Source: DOE 2012a; LANL 2011b, 2012a, 2013a, 2013b).

TRU waste—The TRU waste from PF-4 modifications (3,520 cubic feet [100 cubic meters]) would be generated over approximately 7 years, which represents an average annual generation rate of about 500 cubic feet (14 cubic meters). As shown in **Table 12**, this volume would represent 0.3 to 1.8 percent of the annual TRU waste generation projected in the *LANL SWEIS* (DOE 2008a) for all LANL operations and 8 to 13 percent of the actual TRU waste volume generated annually from LANL operations in recent years. As shown in **Table 13**, the annual TRU waste volume from modification activities (500 cubic feet [14 cubic meters]) would represent 4 percent of the annual TRU waste generation projected in the *LANL SWEIS* from just the Plutonium Facility and 11 to 19 percent of actual TRU waste volumes from the Plutonium Facility in recent years.[15] Furthermore, the total projected volume of TRU waste (3,520 cubic feet [100 cubic meters]) would represent 38 percent of the volume of TRU waste (9,180 cubic feet [260 cubic meters]) projected from implementation of the TA-55 Refurbishment Project evaluated in the *LANL SWEIS*. To date, some LLW and no TRU waste has been generated from implementation of the TA-55 Refurbishment (Reinvestment) Project (Booth 2014).

[15] *TRU waste generation was similarly reduced compared to expectations in the years prior to publication of the* LANL SWEIS. *From 1999 through 2008, except for a single year, annual site-wide TRU waste volumes were considerably smaller than those projected in the 1999* LANL SWEIS *(DOE 1999).*

Table 12. LANL Annual Site-Wide Waste Generation Compared to *LANL SWEIS* Projections

Waste Volume or Mass	*Year*			
	2009	***2010***	***2011***	***2012***
Transuranic and Mixed Transuranic Waste [a]				
Projected (cubic feet)	27,545	169,931	61,305	40,258
Actual (cubic feet)	3,975	4,063	6,333	4,484
Percent of Projection	14	2.4	10	11
Low-Level Radioactive Waste				
Projected (cubic feet)	917,987	5,728,778	3,865,824	3,730,818
Actual (cubic feet)	133,201	946,192	1,266,521	131,490
Percent of Projection	15	17	33	3.5
Mixed Low-Level Radioactive Waste				
Projected (cubic feet)	114,982	1,381,025	498,139	498,139
Actual (cubic feet)	475	4,020	3,286	1,443
Percent of Projection	0.41	0.29	0.66	0.29
Chemical Waste [b]				
Projected (pounds)	13,684	19,619	9,422	7,752
Actual (pounds)	3,798	8,327	3,942	3,279
Percent of Projection	28	42	42	42

SWEIS = site-wide environmental impact statement.
[a] Refers to newly generated transuranic and mixed transuranic wastes.
[b] At LANL, chemical waste is defined as a broad category including hazardous waste (designated under Resource Conservation and Recovery Act regulations); toxic waste (asbestos and polychlorinated biphenyls, designated under the Toxic Substances Control Act); and special waste (designated under the New Mexico Solid Waste Regulations and including industrial waste, infectious waste, and petroleum contaminated soils) (DOE 2008a).
Note: To convert cubic feet to cubic meters, multiply by 0.028317; pounds to kilograms, multiply by 0.45359.
Source: LANL 2011b, 2012a, 2013a, 2013b.

Table 13. Plutonium Facility Transuranic and Mixed Transuranic Waste Generation Compared to *LANL SWEIS* Projections

Waste Volume [a]	*Year*			
	2009	***2010***	***2011***	***2012***
Projected (cubic feet)	11,866	11,866	11,866	11,866
Actual (cubic feet)	3,401	3,526	4,557	2,646
Percent of Projection	29	30	38	22

SWEIS = site-wide environmental impact statement.
[a] Refers to newly generated transuranic and mixed transuranic wastes.
Note: To convert cubic feet to cubic meters, multiply by 0.028317.
Source: LANL 2011b, 2012a, 2013a, 2013b.

Newly generated TRU waste would be safely stored onsite in addition to existing inventories of legacy waste. Although the applicable Resource Conservation and Recovery Act (RCRA) permit provides for storage of several thousand TRU drum equivalents at Area G, the storage capacity is constrained by safety basis analyses independent of the RCRA permit. In accordance with commitments made by DOE/NNSA to the New Mexico Environment Department (DOE/NNSA/NMED 2012), the authorized storage capacity has decreased as waste stored above grade at TA-54 has been shipped off site for disposal at WIPP. TRU waste in above-grade storage currently contains about 28,000 plutonium-equivalent curies of activity, with an authorized storage limit of 57,000 plutonium-equivalent curies

(LANL 2014c). Temporary augmentation of TRU waste storage capacity at LANL may be needed for all newly generated TRU waste, of which the TRU waste generated from the proposed changes evaluated in this SA would represent only a minor part.

The 3,520 cubic feet (100 cubic meters) of TRU waste projected from PF-4 modifications would use a small percentage of the WIPP disposal capacity. The total WIPP capacity for TRU waste disposal is set at 6.2 million cubic feet (175,600 cubic meters) pursuant to the Waste Isolation Pilot Plant Land Withdrawal Act. Based on agreements between DOE and the State of New Mexico, this volume includes 5.95 million cubic feet (168,485 cubic meters) of contact-handled TRU (CH-TRU) waste (DOE 2008c). From estimates in DOE's four most recent *Annual Transuranic Waste Reports* (DOE 2011b, 2012b, 2013c, 2014b), approximately 578,000 cubic feet (16,400 cubic meters) of WIPP unsubscribed CH-TRU waste capacity[16] could support the activities evaluated in this SA.[17] The 3,520 cubic feet (100 cubic meters) of TRU waste from the evaluated activities would represent only about 0.6 percent of this unsubscribed capacity. In any event, the projected volume is bounded by the TRU waste volume projected from implementation of the TA-55 Refurbishment Project evaluated in the *LANL SWEIS* (DOE 2008a) which is included in the volumes anticipated for WIPP disposal in DOE's *Annual Transuranic Waste Reports*.

Operational TRU waste from AC and MC activities would be less than the generation rate projected in the *CMRR EIS*, which was 2,370 cubic feet (67 cubic meters) per year (DOE 2003b). The TRU waste generation rate projected in the *CMRR EIS* represents about 37 to 60 percent of the total LANL TRU waste generation rate from 2009 through 2012 (see Table 12), and about 52 to 90 percent of the PF-4 generation rate during these same years (see Table 13). Annual TRU waste generation would increase at TA-55 resulting from the proposed AC and MC activities but would decrease at the CMR Building when AC and MC activities end. From 2009 to 2012, annual TRU and mixed TRU waste generation at the CMR Building ranged from 110 to 1,524 cubic feet (3.1 to 43.2 cubic meters) (LANL 2011b, 2012a, 2013a, 2013b).

The annual TRU waste volume from AC and MC activities is included in the volumes anticipated by LANL for WIPP disposal in DOE's *Annual Transuranic Waste Reports*. It is not expected that the annual quantities of TRU waste from AC and MC activities, when generated, would impact then available LANL storage capacity.

LLW—A total of 6,150 cubic feet (174 cubic meters) of LLW is projected from PF-4 and RLUOB modifications, which represents 18 percent of the 34,830 cubic feet (986 cubic meters) of LLW projected to be generated from implementation of the TA-55 Refurbishment Project evaluated in the *LANL SWEIS* (DOE 2008a). The LLW from PF-4 and RLUOB modifications would be generated at an average rate over 7 years of about 880 cubic feet (25 cubic meters) per year. This small volume of waste would represent about 0.07 to 0.7 percent of the LANL LLW generation rate from 2009 through 2012 (see Table 12), and would not impact offsite disposal capacities. Offsite disposal facilities include DOE's Nevada National Security Site (NNSS) in Nevada and the Waste Control Specialists (WCS) site in Andrews, Texas. At NNSS, the remaining authorized LLW and MLLW disposal capacity as of April 2014 was 6,400,000 cubic feet (181,000 cubic meters) (Gordon 2014). At the WCS site, the

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[16] *The term "unsubscribed" refers to that portion of the total WIPP capacity that is not being used or needed for the disposal of DOE's currently estimated inventory of TRU waste.*

[17] *About 2,550,000 cubic feet (72,200 cubic meters) of CH-TRU waste was emplaced in WIPP through the end of 2010 (DOE 2011b). Disposal operations from 2011 through 2013 resulted in emplacement of about 630,000 cubic feet (17,800 cubic meters) of additional CH-TRU waste (DOE 2012b, 2013c, 2014b). Adding the total emplaced volume to anticipated (stored plus projected) volumes from the last available* Annual Transuranic Waste Report *(DOE 2014d) (2,193,000 cubic feet [62,100 cubic meters]) results in a total volume of about 5,370,000 cubic feet (152,000 cubic meters). Subtracting this volume from the WIPP CH-TRU capacity of 5.95 million cubic feet (168,500 cubic meters) leaves 578,000 cubic feet (16,400 cubic meters) of unsubscribed CH-TRU waste capacity. TRU waste volumes include mixed TRU waste.*

authorized containerized LLW and MLLW disposal capacity for DOE waste is 8,100,000 cubic feet (230,000 cubic meters) through September 2024 (WCS 2014).[18]

During operations, the annual volume of LLW generated would be less than that estimated in the *CMRR EIS* (DOE 2003b), which was annually 71,280 cubic feet (2,020 cubic meters). The LLW generation rate that was projected in the *CMRR EIS* represents about 6 to 54 percent of the LANL LLW generation rate from 2009 through 2012 (see Table 12). Annual LLW generation would increase at TA-55 resulting from the proposed AC and MC activities but decrease at the CMR Building as AC and MC activities end. From 2009 to 2012, annual LLW generation at the CMR Building ranged from about 3,020 to 22,400 cubic feet (85.5 to 634 cubic meters) (LANL 2011b, 2012a, 2013a, 2013b).

This waste would be sent to an offsite disposal facility such as those referenced above, with no expected impacts on offsite disposal capacity.

MLLW—About 5,440 cubic feet (154 cubic meters) of MLLW is projected from PF-4 modifications, which represents 93 percent of the 5,830 cubic feet (165 cubic meters) of MLLW projected to be generated from implementation of the TA-55 Refurbishment Project evaluated in the *LANL SWEIS* (DOE 2008a). MLLW from PF-4 modifications would be generated at an average annual rate over 7 years of about 780 cubic feet (22 cubic meters). This annual quantity of waste would represent 19 to 160 percent of the LANL MLLW generation rate from 2009 through 2012 (see Table 12). During operations, annual generation of MLLW from AC and MC activities would be less than the 700 cubic feet (20 cubic meters) projected in the *CMRR EIS* (DOE 2003b). The MLLW generation rate projected in the *CMRR EIS* represents about 17 to 150 percent of the MLLW that was annually generated at LANL from 2009 through 2012 (see Table 12). Annual MLLW generation would increase at TA-55 resulting from the proposed AC and MC activities but decrease at the CMR Building as AC and MC activities end. From 2009 to 2012, annual MLLW generation at the CMR Building ranged from 1.4 to 159 cubic feet (0.04 to 4.5 cubic meters) (LANL 2011b, 2012a, 2013a, 2013b).

MLLW may be temporarily stored on site in compliance with permitted storage requirements before being sent offsite for treatment and/or disposal. Because MLLW storage would generally occur only until accumulation of a sufficient quantity of waste to warrant efficient offsite shipment, generation of MLLW due to the activities addressed in this SA would not impact onsite MLLW storage capacity. All MLLW would be sent off site for treatment and/disposal at NNSS or commercial facilities such as the Waste Control Specialists site in Andrews, Texas, consistent with the waste acceptance criteria for these facilities. The small expected volume of MLLW from the activities evaluated in this SA would not impact offsite treatment and/or disposal capacities.

Hazardous waste—Meaningful quantities of hazardous or other regulated chemical waste are not expected from construction or modification activities. In contrast, 2,000 pounds (907 kilograms) of chemical waste were projected from implementation of the TA-55 Refurbishment Project evaluated in the *LANL SWEIS* (DOE 2008a). During AC and MC operations, annual generation of hazardous waste from AC and MC activities would be less than the 24,700 pounds (11,200 kilograms) projected in the *CMRR EIS* (DOE 2003b). The hazardous waste generation rate projected in the *CMRR EIS* may be compared with the 3,279 to 8,327 pounds (1,487 to 3,777 kilograms) of chemical waste annually generated at LANL from 2009 through 2012 (see Table 12). Annual hazardous waste generation would increase at TA-55 resulting from the proposed AC and MC activities but decrease at the CMR Building as AC and

[18] *The WCS Federal Waste Disposal Facility was designed, permitted, and constructed for disposal of LLW and MLLW that are the responsibility of the Federal Government as defined by the Low-Level Radioactive Waste Policy Act, as Amended. The facility opened on June 6, 2013, for disposal of DOE LLW and MLLW containing radionuclides in concentrations that do not exceed Class C limits per 10 CFR Part 61. The facility has a licensed capacity of 26,000,000 cubic feet (650,000 cubic meters) and 5,600,000 curies, and may accept 8,100,000 cubic feet (230,000 cubic meters) and 5,500,000 curies of containerized waste through September 2024 (WCS 2014).*

MC activities end. From 2009 to 2012, annual hazardous waste generation at the CMR Building ranged from about 1,010 to 13,600 pounds (459 to 6,170 kilograms) (LANL 2011b, 2012a, 2013a, 2013b).

Hazardous or other regulated chemical waste may be temporarily stored on site in compliance with permitted storage requirements before being sent offsite for treatment and/or disposal. Because waste storage would generally occur only until accumulation of a sufficient quantity of waste to warrant efficient offsite shipment, LANL onsite storage capacity would not be negatively impacted. Because numerous offsite facilities are available for treatment or disposal of the variety of wastes managed as chemical waste at LANL, the waste generated from the activities evaluated in this SA would not impact offsite facility capacities.

Other wastes—AC and MC operations at PF-4 and RLUOB would annually generate small quantities of liquid LLW that would be routed to the onsite RLWTF for treatment. No impacts on the current RLWTF annual treatment capacity of 1.1 million gallons (4.2 million liters) are expected.

Construction and modification activities would generate nonhazardous wastes such as construction and demolition debris; ordinary rubbish such as paper, plastic, and cans; and liquid sanitary waste. Operations would generate similar types of rubbish and liquid sanitary waste. Consistent with LANL procedures, most of the construction and demolition debris and much of the rubbish would be recycled. In calendar year 2012, for example, 94 percent of the 8,191 tons (7,431 metric tons) of the generated construction and demolition debris was recycled, as well as 48 percent of the 2,970 tons (2,694 metric tons) of nonhazardous waste from routine LANL office and laboratory activities (LANL 2013b).

Liquid sanitary waste would be generated during construction and operations in quantities somewhat larger than current waste generation rates due to the larger personnel presence. Sanitary waste collected in construction trailers would be shipped off site for treatment. Sanitary waste generated at PF-4 or RLUOB would be routed to the onsite Sanitary Wastewater System (SWS) for treatment and discharge to permitted outfalls. Assuming generation of 50 gallons (190 liters) of sanitary waste per person per day, and 260 working days per year (DOE 2003b:4-29), about 6.2 million gallons (23 million liters) of sanitary waste would be generated during the peak year of facility modification activity, while 260,000 gallons (980,000 liters) would be annually generated during operations. No impacts on the SWS annual treatment capacity of 220 million gallons (840 million liters) are expected.

4.5 Transportation

This section summarizes the potential impacts associated with shipping radioactive waste from LANL to offsite treatment and/or disposal facilities (DOE/NNSA and/or commercial sites) under incident-free and accident conditions. All waste transportation and traffic control plans are reviewed by the LANL Traffic Systems Engineer to ensure compliance with the Manual on Uniform Traffic Control Devices and American Association of State Highway and Transportation requirements.

Human health impacts could result from transporting radioactive wastes during incident-free transport and accident conditions. For incident-free transport, the potential human health impacts from the radiation fields surrounding packages containing radioactive material were estimated for transportation workers and populations along the route (off-traffic, or off-link), people sharing the route (in-traffic or on-link), and people at rest areas and stops along the route. The impact of a specific radiological accident is expressed in terms of probabilistic risk (dose-risk), which is defined as the accident probability (accident frequency) multiplied by the accident consequence. The analysis of accident risks accounts for a spectrum of accidents ranging from high-probability accidents of low severity (fender benders) to hypothetical high-severity accidents that have corresponding low probabilities of occurrence. Only as a result of a severe fire or a powerful collision, both extremely low-probability events, could a transportation package of the types used to transport radioactive material be damaged to the extent that radioactivity could be released to the environment with significant consequences.

In addition, transporting radioactive waste could result in nonradiological risks to members of the public that are independent of the nature of the cargo being transported, and are expressed as fatal traffic accidents resulting only from the physical forces that accidents could impart to humans. These risks are estimated as the product of the total distance traveled by the transport vehicle and the statistical risk of an accident fatality per unit distance.

No specific offsite transportation risks were evaluated in the *CMRR EIS* (DOE 2003b). The *LANL SWEIS* (DOE 2008a), however, includes a detailed analysis of the impacts from transporting various types of radioactive waste to DOE/NNSA and commercial disposal facilities, and to MLLW treatment facilities in Oak Ridge, Tennessee. The analysis was performed using the population data from the year 2000 census and the RADTRAN 5 computer program (Neuhauser and Kanipe 2003) to estimate the impacts to transport workers, populations, and an MEI who may be a worker or a member of the public (for example, a person stuck in traffic, a gas station attendee, or an inspector).

For this SA, the transportation risks associated with the projected wastes were evaluated assuming similar types and forms of wastes as those evaluated in the *LANL SWEIS*, and updated using the projected 2020 population along the routes and the updated RADTRAN 6.02 (Weiner et al. 2013) computer program. The RADTRAN 6.02 computer program uses more-recent inhalation dose conversion factors from the International Commission on Radiological Protection Publication 72 (ICRP 1996), which is used in Federal Guidance Report Number 13 (EPA 1999).

Risks from shipment of nonradioactive wastes to offsite treatment and/or disposal facilities, or transport of construction or other nonradioactive materials (e.g., equipment) to LANL, would occur only from the physical forces that accidents could impart to humans. These accident risks would be no greater than the risks associated with transport of nonradioactive materials to and from LANL during normal operations.

4.5.1 Construction Waste Transportation

Reconfiguration of TA-55 facilities to accommodate AC and MC activities would generate one-time volumes of TRU waste, LLW, and MLLW from removal of existing ventilated enclosures, gloveboxes, equipment, and materials; reconfiguration of existing enclosures; and installation of new enclosures, instrumentation, and ancillary equipment. These wastes would be similar to those evaluated in the *LANL SWEIS*, Appendix G, Section G.7, under the PF-4 Refurbishment Project that entailed removal and replacement of outdated and degraded gloveboxes and equipment, ventilation ductwork, and other materials. Similar types of waste would also be generated during operational maintenance activities at PF-4. Therefore, it is reasonable to compare the transportation impacts of the wastes from the activities evaluated in this SA with the transportation impacts evaluated in the *LANL SWEIS*.

Table 14 compares the radioactive wastes projected for this SA with those analyzed in the *LANL SWEIS* for the TA-55 Refurbishment Project. As shown, the total volumes of all types of radioactive wastes projected for this SA are smaller than the total volumes estimated for the TA-55 Refurbishment Project. Furthermore, the total volumes of all types of radioactive wastes projected for this SA are much smaller than the annual waste volumes projected in the *LANL SWEIS* for TA-55 alone and for the entire LANL site (see Tables 12 and 13).

Table 14. Waste Generation for TA-55 Modifications Compared to *LANL SWEIS* TA-55 Refurbishment Project Projections

Waste Type	*Waste Volumes (cubic feet)*	
	Proposed TA-55 Modifications under this SA	*TA-55 Refurbishment Project in LANL SWEIS*
TRU waste [a]	3,520	9,180
LLW	6,150	34,830
MLLW [b]	5,440	5,832

LLW = low-level radioactive waste; MLLW = mixed low-level radioactive waste; SA = Supplement Analysis; SWEIS = site-wide environmental impact statement; TA = technical area; TRU = transuranic.

[a] Estimates include both TRU and mixed TRU wastes.

[b] Includes about 5,400 cubic feet of MLLW consisting of packaged and decontaminated gloveboxes or other enclosures plus about 44 cubic feet consisting of other MLLW.

Note: Volumes have been rounded.
To convert from cubic feet to cubic meters, multiply by 0.028317.

Source: DOE 2008a.

Given the information in Tables 12 through 14, the impacts of transporting wastes generated by the activities evaluated in this SA are within those analyzed in the *LANL SWEIS*, Appendix G, Section G.7 (DOE 2008a). Specifically, Tables G–38 and G–39 in the *LANL SWEIS* provide the impacts of transporting LLW to NNSS (formerly the Nevada Test Site) or a commercial disposal facility in Utah, indicating a very small risk to the public from radiation or traffic accidents.

The proposed PF-4 modifications are projected to result in 15 shipments of TRU waste to WIPP. This number of shipments is less than half of the 37 shipments analyzed in the *LANL SWEIS* for the TA-55 Refurbishment Project. Nevertheless, because of population growth in the State of New Mexico, a new per-shipment risk of transporting TRU waste to WIPP was calculated for comparison to the values in the *LANL SWEIS*. **Table 15** presents a comparison of per-shipment transportation risks as evaluated in the *LANL SWEIS* (using 2000 census data) with those using projected 2020 population data in New Mexico. The current analysis was performed using the RADTRAN 6.02 (Weiner et al. 2013) computer program.

Table 15. Comparison of Per-Shipment Risk [a] for Transuranic Waste Shipments from LANL to the Waste Isolation Pilot Plant

Analysis Methods	*Incident-Free*				*Accident*	
	Crew Dose (person-rem)	*Crew Risk (LCF)*	*Population Dose (person-rem)*	*Population Risk (LCF)*	*Radiological Risk (LCF)*	*Nonradiological Risk (traffic fatalities)*
LANL SWEIS	0.023	0.00001	0.00725	4×10^{-6}	3×10^{-11}	0.000014
This SA	0.023	0.00001	0.00729	4×10^{-6}	6×10^{-12}	0.000014

LCF = latent cancer fatality; SA = Supplement Analysis; SWEIS = site-wide environmental impact statement.

[a] LCF risks were determined by using a risk estimator of 0.0006 LCFs per person-rem, and reduced for this SA to one significant figure in accordance with DOE guidance (DOE 2003a).

Source: DOE 2008a.

Table 15 indicates that even with the projected population increase along the waste transport route of 28 percent from 2000 to 2020, the increase in risk from a shipment of TRU waste to the WIPP site is minimal. The same would be true for shipments of LLW. Although a larger population was used in the analysis for this SA, the radiological risk from accidents is lower as a result of the more up-to-date dose factors used in the RADTRAN 6.02 computer program.

In the *LANL SWEIS*, it was assumed that MLLW would be sent to NNSS in Nevada, or to the Eastern Tennessee Waste Treatment Complex (ETWC) in Oak Ridge, Tennessee. For the latter option, the MLLW treated in Tennessee was returned to LANL for repackaging for subsequent transport to a final disposition location. In this SA, the WCS facility in Andrews, Texas, is considered an option for treatment and disposal of MLLW. **Table 16** shows the per-shipment risk of transporting the MLLW to Texas or Tennessee. The *LANL SWEIS* values presented in this table are for the transport of MLLW in the form of evaporator bottoms (the sludge remaining after the liquid is evaporated) from LANL to ETWC. This table indicates that the per-shipment transport risks are very small. The number of projected MLLW shipments to WCS in this SA is about 12. The *LANL SWEIS* evaluated 143 to 176 shipments of MLLW as evaporator bottoms and processed LLW to and from ETWC (DOE 2008a). In addition, the results presented in Table 16 account for the projected population growth along the analyzed route from 2000 to 2020 and the dose conversion factors used in RADTRAN 6.02 for radiological accident risks. Therefore, as indicated in this table, the transportation risks evaluated in the *LANL SWEIS* would envelop the potential risks from transporting the materials to WCS.

It should be noted that about 99 percent of the MLLW evaluated in this SA consists of decontaminated gloveboxes or similar enclosures. The contamination in the gloveboxes would primarily consist of fixed rather than loose or removable contamination, which would lead to a smaller release in the event of a severe accident as compared to that evaluated in the *LANL SWEIS* for MLLW in the form of evaporator bottoms.

Table 16. Per-Shipment Risk [a] of Transporting MLLW to the Waste Control Specialists in Texas Compared to the Eastern Tennessee Waste Treatment Complex in Tennessee

		Incident-Free				*Accident*	
Analysis Methods	*Transport Origin or Destination*	*Crew Dose (person-rem)*	*Crew Risk (LCF)*	*Population Dose (person-rem)*	*Population Risk (LCF)*	*Radiological Risk (LCF)*	*Non-radiological Risk (traffic fatalities)*
This SA	LANL-WCS	0.0026	0.000002	0.0008	5×10^{-7}	8.8×10^{-12}	0.00001
LANL SWEIS [b]	LANL-ETWC	0.027	0.00002	0.012	7×10^{-6}	3.2×10^{-10}	0.00005

ETWC = Eastern Tennessee Waste Treatment Complex; LCF = latent cancer fatality; MLLW = mixed low-level radioactive waste; SA = Supplement Analysis; SWEIS = site-wide environmental impact statement; WCS = Waste Control Specialists.
[a] LCF risks were determined by using a risk estimator of 0.0006 LCFs per person-rem, and were reduced for this SA to one significant figure in accordance with DOE guidance (DOE 2003a).
[b] Risks were determined accounting for the projected population growth along the waste transportation route to 2020 and using RADTRAN 6.02 dose factors (Weiner et al. 2013).
Source: DOE 2008a.

Therefore, the transportation risks evaluated in the *LANL SWEIS* provide adequate coverage for the risks associated with the transport of the wastes generated by the activities evaluated in this SA.

4.5.2 Operations Waste Transportation

As indicated in the previous sections, the operational characteristics at LANL would not change regardless of the locations of the AC and MC activities. The sampling methods and mission support operations associated with AC and MC would not change, and therefore would not result in generation of operational wastes that were not considered in the *CMRR EIS* (DOE 2003b) and *LANL SWEIS* (DOE 2008a). Therefore, the transportation impacts of the operational wastes will remain the same as those evaluated in the *LANL SWEIS*. The transportation impacts of routine movements of AC and MC samples between PF-4 and RLUOB are also within those analyzed in the *CMRR EIS*.

5.0 CONCLUSION

This SA was prepared because there have been programmatic, environmental, and other changes since publication of the *CMRR EIS* (DOE 2003b) which evaluated the proposed construction and operation of replacement capabilities (CMRR project) for the CMR Building in TA-3. The ROD for the *CMRR EIS* (69 FR 6967) announced DOE's decision to implement its Preferred Alternative which included construction of an Administration Building and a Hazard Category 2 facility. The Administration Building was constructed and is in operation as RLUOB. NNSA has a need for enduring AC and MC capabilities at LANL and plans to cease AC and MC operations at the existing CMR Building by the end of 2019. Therefore, this SA evaluates the environmental impacts of adjusting the capabilities in RLUOB and PF-4 to provide for AC and MC capabilities currently being performed at the CMR Building and planned under the CMRR project. In addition, this SA evaluates the environmental impacts of providing warehouse and office capacity that would support the proposed facility modifications and related activities at TA-55 during and subsequent to the proposed modifications to PF-4 and RLUOB.

After summarizing key *CMRR EIS* assumptions and significant changes to these assumptions and environmental parameters in the LANL region since publication of the *CMRR EIS* (see Chapter 3), this SA presents a screening analysis that evaluates impacts on all environmental resource areas (see Chapter 4, Section 4.1). For the following resource areas, the impacts from the changes evaluated in this SA were readily determined to be less than those previously analyzed or would result in no significant new circumstances or information relevant to environmental concerns: land use, visual resources, geology and soils, water resources, air quality, noise, ecological resources, environmental justice, cultural resources, socioeconomics, and infrastructure. The human health, facility accidents, waste management, and transportation resource areas were evaluated in detail in Sections 4.2 through 4.5.

Conclusions from the detailed analysis are as follows:

- There would be radiation doses among involved workers in addition to those evaluated in the *CMRR EIS* for the CMRR project, arising primarily from enclosure and equipment removal, reconfiguration, and replacement activities at PF-4. Annual average and life-of-project worker population doses of 36 person-rem and 253 person-rem are projected, respectively, with an average annual individual dose of 300 millirem. No LCFs are expected among the worker population on either an annual or life-of-project basis (calculated values of 0.02 and 0.2 LCF, respectively), and the average annual individual dose would represent an annual risk of 0.0002 LCF. Collective annual operational radiation doses among involved workers performing AC and MC activities would be smaller than those estimated in the *CMRR EIS* for the CMRR project, although the average annual individual dose may be somewhat larger than those estimated in the *CMRR EIS* because fewer involved workers are expected than those estimated for the CMRR project.

- Radiation doses to members of the public would be smaller than those estimated in the *CMRR EIS* because of the reduced scope of activities compared to those evaluated for the CMRR project.

- By moving AC and MC activities from the CMR Building to PF-4 and RLUOB, the accident risks associated with nuclear operations in TA-55 would change, but those changes would be small. In addition, the accident risks associated with ongoing AC and MC activities in the CMR Building and transfer of materials between the CMR Building in TA-3 and facilities in TA-55 would be eliminated. Overall, moving AC and MC operations from the CMR Building to facilities in TA-55 is expected to lower the accident risks associated with AC and MC activities.

- Modifications to RLUOB and PF-4 under this SA would generate radioactive wastes including TRU waste, LLW, and MLLW. The estimated 3,520 cubic feet (100 cubic meters) of TRU waste would represent about 0.6 percent of the WIPP unsubscribed disposal capacity for CH-TRU waste. TRU waste generated from facility modifications would be safely stored on site pending shipment to WIPP. The approximately 6,150 cubic feet (174 cubic meters) of LLW and 5,440 cubic feet (154 cubic meters) of MLLW generated from facility modifications would be shipped offsite to authorized and permitted treatment and/or disposal facilities. In addition, the facility modification and construction activities evaluated in this SA would generate nonhazardous waste such as construction debris and very small quantities of hazardous waste that would be shipped to offsite permitted treatment and/or disposal facilities.

- Wastes from operational AC and MC activities are expected to include TRU waste, LLW, MLLW, hazardous waste, and nonhazardous (or other chemical) waste in smaller annual quantities than those evaluated for the CMRR project in the *CMRR EIS*. These wastes would be managed in the same manner as that discussed above for facility modification and construction.

- TRU waste from facility modifications and AC and MC operations would be safely stored pending shipment to WIPP. TRU storage capacity currently exists at LANL; however, depending on the quantities of TRU wastes generated from all LANL activities and the storage time required, temporary augmentation of TRU waste storage capacity may be needed. Ample offsite treatment and/or disposal capacity exists for all other radioactive and nonradioactive wastes projected under this SA.

- Impacts from transporting radioactive wastes to offsite facilities are bounded by the analysis in the *LANL SWEIS* (DOE 2008a) and by DOE's decisions that were informed by this analysis (73 FR 55840, 74 FR 33232).

6.0 DETERMINATION

This SA has been prepared in accordance with DOE NEPA regulations (10 CFR 1021.314(c)) to determine whether a supplemental or new EIS should be prepared. This SA provides an analysis of proposed changes to the implementation of NNSA's decision for providing AC and MC capabilities as originally analyzed in the 2003 *CMRR EIS* (DOE 2003b). The proposed changes involve modifying PF-4 and RLUOB in TA-55 such that they can provide the full suite of AC and MC capabilities, including capabilities currently provided at the CMR Building in TA-3. The analysis was performed to compare potential impacts from the proposed changes to those reported in the *CMRR EIS* (DOE 2003b), the *LANL SWEIS* (DOE 2008a), and the *CMRR-NF SEIS* (DOE 2011a).

The analysis in this SA indicates that the potential environmental impacts of the proposed change do not represent a substantial change that is relevant to environmental concerns; further, the analysis indicates that there are no new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts that are significant. On the basis of this analysis, DOE/NNSA has determined that preparation of a supplemental or new EIS is not warranted and that no further NEPA analysis is required.

Based on my review of the information contained in this SA, as Head of the Field Organization (as required by DOE Order 451.1B, Change 3), I have determined, with the concurrence of the Los Alamos Field Office Counsel, that no further documentation is required at this time.

Kim Davis Lebak — 1/22/15

Kim Davis Lebak
Manager, Los Alamos Field Office

Date

In accordance with DOE Order 451.1B, Change 3, this determination is concurred with by the Los Alamos Field Office NEPA Compliance Officer.

Karen Oden — 1/23/2015

Karen Oden
NEPA Compliance Officer, Los Alamos Field Office

Date

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