DOE/EIS-0350-S1
August 2011

Final 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

Volume 1
Chapters 1 through 10
Appendices A through D

Conceptual Drawing CMRR Facility

AVAILABILITY OF THE
FINAL 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 (CMRR-NF SEIS)

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COVER SHEET

Responsible Agency: U.S. Department of Energy (DOE)
National Nuclear Security Administration (NNSA)

Title: *Final 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 (CMRR-NF SEIS)* (DOE/EIS-0350-S1)

Location: Los Alamos, New Mexico

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This document is available on the DOE NEPA website (http://www.energy.gov/nepa) and the NNSA NEPA website (http://www.nnsa.energy.gov/nepa/cmrrseis) for viewing and downloading.

***Abstract*:** NNSA, a semiautonomous agency within DOE, proposes to complete the Chemistry and Metallurgy Research Building Replacement (CMRR) Project at Los Alamos National Laboratory (LANL) by constructing the nuclear facility portion (CMRR-NF) of the CMRR Project to provide the analytical chemistry and materials characterization capabilities currently or previously performed in the existing Chemistry and Metallurgy Research (CMR) Building. This *CMRR-NF SEIS* examines the potential environmental impacts associated with NNSA's proposed action.

The existing CMR Building, most of which was constructed in the early 1950s, has housed most of the analytical chemistry and materials characterization capabilities at LANL. Other capabilities at the CMR Building include actinide processing and waste characterization that support a variety of NNSA and DOE nuclear materials management programs. In 1992, DOE initiated planning and implementation of CMR Building upgrades to address specific safety, reliability, consolidation, and security and safeguards issues. Later, in 1997 and 1998, a series of operational, safety, and seismic issues surfaced regarding the long-term viability of the CMR Building. Because of these issues, DOE determined at that time that the extensive upgrades originally planned would be time-consuming and of only marginal effectiveness. As a result, DOE decided to perform only the upgrades necessary to ensure the continued safe and reliable short-term operation of the CMR Building and to seek an alternative path for long-term reliability. Operational, safety, and seismic issues at the CMR Building also prompted NNSA to cease performing certain activities and to reduce the amounts of special nuclear material allowed in the CMR Building.

NNSA completed the *Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico (CMRR EIS)* in 2003. In 2004, NNSA issued a Record of Decision (ROD) to construct a two-building replacement facility in LANL Technical Area 55 (TA-55), with one building providing administrative space and

support functions and the other building providing secure laboratory space for nuclear research and analytical support activities (a nuclear facility). The first building, the Radiological Laboratory/Utility/Office Building (RLUOB), has been constructed and is being outfitted with equipment and furniture. Enhanced safety requirements and updated seismic information have caused NNSA to re-evaluate the design concept of the second building, the CMRR-NF. The proposed Modified CMRR-NF design concept would result in a more structurally sound building.

The proposed action is to complete the CMRR Project by constructing the CMRR-NF to provide the needed nuclear facility capabilities. The Preferred Alternative is to construct a new CMRR-NF in TA-55, in accordance with the Modified CMRR-NF design concept. Construction options for the Modified CMRR-NF Alternative include a Deep Excavation Option, in which a geologic layer of poorly welded tuff would be removed and replaced with low-slump concrete, and a Shallow Excavation Option, in which the foundation would be constructed in a geologic layer above the poorly welded tuff layer. As envisioned in the 2003 *CMRR EIS*, tunnels would be constructed to connect the CMRR-NF to the TA-55 Plutonium Facility and RLUOB. The No Action Alternative would be to construct the new CMRR-NF as envisioned in the 2004 ROD. Another alternative would be to continue using the existing CMR Building, implementing necessary maintenance and component replacements to ensure its continued safe operation. This *CMRR-NF SEIS* evaluates the potential direct, indirect, and cumulative environmental impacts associated with the alternatives analyzed. This *CMRR-NF SEIS* also presents an analysis of the impacts associated with disposition of all or portions of the existing CMR Building and a new CMRR-NF at the end of their useful lives.

Public Comments: In preparing this *Final CMRR-NF SEIS*, NNSA considered comments received during the scoping period (October 1 through November 16, 2010) and during the public comment period on the *Draft CMRR-NF SEIS* (April 29 through June 28, 2011) and late comments received after the close of the public comment period on the *Draft CMRR-NF SEIS*. Public hearings on the *Draft CMRR-NF SEIS* were held in Albuquerque, Los Alamos, Española, and Santa Fe, New Mexico. Comments on the *Draft CMRR-NF SEIS* were requested during a period of 60 days following publication of the U.S. Environmental Protection Agency's (EPA's) Notice of Availability in the *Federal Register*. NNSA considered every comment received at the public hearings or by U.S. mail, e-mail, or by toll-free phone or fax lines. All comments, including late comments received through July 31, 2011, were considered during preparation of this *Final CMRR-NF SEIS*.

This *Final CMRR-NF SEIS* contains revisions and new information based in part on comments received on the draft. Vertical change bars in the margins indicate the locations of these revisions and new information. Volume 2 contains the comments received on the *Draft CMRR-NF SEIS* and NNSA's responses to the comments. NNSA will use the analysis presented in this *Final CMRR-NF SEIS*, as well as other information, in preparing a ROD regarding the construction of the CMRR-NF. NNSA will issue the ROD no sooner than 30 days after EPA publishes a Notice of Availability of this *Final CMRR-NF SEIS* in the *Federal Register*.

OVERVIEW

The National Nuclear Security Administration (NNSA) is a semiautonomous agency within the U.S. Department of Energy (DOE). NNSA is responsible for the management and security of the Nation's nuclear weapons, nuclear nonproliferation programs, and naval reactor programs. NNSA is also responsible for administration of Los Alamos National Laboratory (LANL).

Since the early 1950s, DOE has conducted analytical chemistry and materials characterization work in the Chemistry and Metallurgy Research (CMR) Building at LANL. The CMR Building supports various national security missions, including nuclear nonproliferation programs; the manufacturing, development, and surveillance of pits (the fissile core of a nuclear warhead); life extension programs; dismantlement efforts; waste management; material recycle and recovery; and research. The CMR Building is a Hazard Category 2 nuclear facility with significant nuclear material and nuclear operations and has a potential for significant consequences.

The CMR Building is almost 60 years old and near the end of its useful life. Many of its utility systems and structural components are aged, outmoded, and deteriorated. In the 1990s, geological studies identified a seismic fault trace located beneath two of the wings of the CMR Building, which raised concerns about the structural integrity of the facility. Over the long term, NNSA cannot continue to operate the mission-critical CMR support capabilities in the existing CMR Building at an acceptable level of risk to worker safety and health. NNSA has already taken steps to minimize the risks associated with continued operations at the CMR Building. To ensure that NNSA can fulfill its national security mission for the next 50 years in a safe, secure, and environmentally sound manner, NNSA proposed in 2002 to construct a CMR replacement facility, known as the Chemistry and Metallurgy Research Building Replacement (CMRR).

NNSA has undertaken extensive environmental review of the CMRR Project; after thoroughly analyzing its potential environmental impacts and considering public comments, NNSA issued a final environmental impact statement (EIS) in November 2003 and a Record of Decision (ROD) in February 2004. The ROD announced that the CMRR would consist of two buildings: a single, aboveground, consolidated, special-nuclear-material-capable, Hazard Category 2 laboratory building (the CMRR-NF), as well as a separate but adjacent administrative office and support building, the Radiological Laboratory/Utility/Office Building (RLUOB). Construction of RLUOB is complete, and radiological operations are scheduled to begin in 2013.

Since issuance of the 2004 ROD, new developments have arisen indicating that changes to the CMRR are appropriate. Specifically, a new site-wide analysis of the geophysical structures that underlie the LANL area was prepared. In light of this new geologic information regarding seismic conditions at the site, NNSA has proposed changes to the design of the CMRR-NF. NNSA has also developed more-detailed information on the various support functions and infrastructure needed for construction, such as concrete batch plants and laydown areas. Even with these changes, the scope of operations remains the same as before (the 2004 ROD), as does the quantity of special nuclear material that can be handled and stored in the CMRR-NF.

Though the changes would affect the structural aspects of the building and not its purpose, NNSA decided to prepare a supplemental EIS (SEIS) to address the ways in which the potential environmental effects of the proposed CMRR-NF have changed since the project was analyzed in the 2003 EIS. Development of an SEIS includes a scoping process, public meetings, and a comment period on a draft SEIS to ensure that the public has a full opportunity to participate in this review. Because NNSA decided in the 2004 ROD to build the CMRR—as a necessary step in maintaining critical analytical chemistry and materials characterization capabilities at LANL—this SEIS is not intended to revisit that decision. Instead, this SEIS supplements the previous analysis by examining the potential environmental impacts related to the proposed change in the CMRR design. So, in addition to the No Action Alternative (to proceed with the CMRR-NF as announced in the 2004 ROD), this SEIS considers two action alternatives: (1) construct a new Modified CMRR-NF that would result in a more structurally sound building (construction options include shallow and deep excavation); and (2) continue using the CMR Building, with minor upgrades and repairs to ensure safety, together with RLUOB.

On March 11, 2011, as the draft SEIS was in its final stages of preparation, the Fukushima Daiichi Nuclear Power Plant in Japan was damaged by a tsunami generated as a result of a magnitude 9.0 earthquake. A number of comments received by NNSA on the draft SEIS expressed concerns regarding the nuclear consequences of a seismic event affecting LANL. In response to these concerns, NNSA revised the final SEIS to include additional information about the seismic environment of the LANL sites being considered in the alternatives analyzed, the potential seismically initiated accidents that might occur at the CMR Building or a CMRR-NF facility, and the critical differences between a nuclear power plant and a nuclear materials research laboratory. NNSA remains committed to improving our understanding of the events affecting the Fukushima Daiichi Nuclear Power Plant and learning from Japan's experience.

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ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

AASHTO	American Association of State Highway and Transportation Officials
AC and MC	analytical chemistry and materials characterization
ACHP	Advisory Council on Historic Preservation
AEA	Atomic Energy Act
AEI	areas of environmental interest
ALARA	as low as reasonably achievable
AOC	Area of Concern
ARF	airborne release fraction
ATSDR	Agency for Toxic Substances and Disease Registry
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
CAIRS	Computerized Accident/Incident Reporting System
CD	Critical Decision
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CMR	Chemistry and Metallurgy Research
CMRR	Chemistry and Metallurgy Research Building Replacement
CMRR-NF	Chemistry and Metallurgy Research Building Replacement Nuclear Facility
CRD	Comment Response Document
CWA	Clean Water Act
DART	days away, restricted, or transferred
dB	decibels
dBA	decibels A-weighted
DD&D	decontamination, decommissioning, and demolition
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DR	damage ratio
DSA	Documented Safety Analysis
EA	environmental assessment
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
FR	*Federal Register*
FY	fiscal year
g	gravitational acceleration
GHG	greenhouse gases
GTCC	greater-than-Class C
HABS/HAER	Historic American Building Survey/Historic American Engineering Record
HCM	Highway Capacity Manual
HEPA	high-efficiency particulate air filter

HEWTF	High Explosive Wastewater Treatment Facility
HLW	high-level radioactive waste
IPCC	Intergovernmental Panel on Climate Change
LANL	Los Alamos National Laboratory
LANSCE	Los Alamos Neutron Science Center
LCF	latent cancer fatality
LEED	Leadership in Energy and Environmental Design
LEED-NC	Leadership in Energy and Environmental Design for New Construction and Major Renovations
LLW	low-level radioactive waste
LOS	level of service
LPF	leak path factor
MAR	material at risk
MDA	Material Disposal Area
MEI	maximally exposed individual
MLLW	mixed low-level radioactive waste
MMI	Modified Mercalli Intensity
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
NMAC	New Mexico Administrative Code
NMDOT	New Mexico Department of Transportation
NMED	New Mexico Environmental Department
NMSSUP	Nuclear Materials Safeguards and Security Upgrades Project
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
OSHA	Occupational Safety and Health Administration
PC	Performance Category
PCB	polychlorinated biphenyl
PDSA	preliminary documented safety analysis
PF-4	Plutonium Facility in TA-55
PHV	peak hourly volume
PIDADS	perimeter intrusion, detection, assessment and delay system
P.L.	Public Law
PM_n	particulate matter less than or equal to *n* microns in aerodynamic diameter
POVs	privately owned vehicles
ppm	parts per million
PRSs	potential release sites
PSHA	Probabilistic Seismic Hazard Analysis
RCNM	Roadway Construction Noise Model

RCRA	Resource Conservation and Recovery Act
RF	respirable fraction
RLUOB	Radiological Laboratory/Utility/Office Building
RLWTF	Radioactive Liquid Waste Treatment Facility
RMP	Resource Management Plan
ROD	Record of Decision
ROI	Region of Influence
RSL	Remote Sensing Laboratory
SA	supplement analysis
SC	Safety Class
SEIS	supplemental environmental impact statement
SERF	Sanitary Effluent Reclamation Facility
SWMU	solid waste management unit
SNM	special nuclear material
SR	New Mexico State Route
SSC	structure, system, and component
SWEIS	site-wide environmental impact statement
SWPPP	Storm Water Pollution Prevention Plan
SWWS	Sanitary Wastewater Systems Plant
TA	technical area
TRAGIS	Transportation Routing analysis Geographic Information System
TRCs	total recordable cases
TRU	transuranic waste
TSD	treatment storage and disposal
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
VAP	Vehicle Access Portals
VMT	vehicle miles traveled
WETF	Weapons Engineering Test Facility
WIPP	Waste Isolation Pilot Plant
°C	degrees Centigrade
°F	degrees Fahrenheit

CONVERSIONS

METRIC TO ENGLISH			ENGLISH TO METRIC		
Multiply	**by**	**To get**	**Multiply**	**by**	**To get**
Area					
Square meters	10.764	Square feet	Square feet	0.092903	Square meters
Square kilometers	247.1	Acres	Acres	0.0040469	Square kilometers
Square kilometers	0.3861	Square miles	Square miles	2.59	Square kilometers
Hectares	2.471	Acres	Acres	0.40469	Hectares
Concentration					
Kilograms/square meter	0.16667	Tons/acre	Tons/acre	0.5999	Kilograms/square meter
Milligrams/liter	1 [a]	Parts per million	Parts per million	1 [a]	Milligrams/liter
Micrograms/liter	1 [a]	Parts per billion	Parts per billion	1 [a]	Micrograms/liter
Micrograms/cubic meter	1 [a]	Parts per trillion	Parts per trillion	1 [a]	Micrograms/cubic meter
Density					
Grams/cubic centimeter	62.428	Pounds/cubic feet	Pounds/cubic feet	0.016018	Grams/cubic centimeter
Grams/cubic meter	0.0000624	Pounds/cubic feet	Pounds/cubic feet	16,025.6	Grams/cubic meter
Length					
Centimeters	0.3937	Inches	Inches	2.54	Centimeters
Meters	3.2808	Feet	Feet	0.3048	Meters
Kilometers	0.62137	Miles	Miles	1.6093	Kilometers
Temperature					
Absolute					
Degrees Celsius + 17.78	1.8	Degrees Fahrenheit	Degrees Fahrenheit - 32	0.55556	Degrees Celsius
Relative					
Degrees Celsius	1.8	Degrees Fahrenheit	Degrees Fahrenheit	0.55556	Degrees Celsius
Velocity/Rate					
Cubic meters/second	2118.9	Cubic feet/minute	Cubic feet/minute	0.00047195	Cubic meters/second
Grams/second	7.9366	Pounds/hour	Pounds/hour	0.126	Grams/second
Meters/second	2.237	Miles/hour	Miles/hour	0.44704	Meters/second
Volume					
Liters	0.26418	Gallons	Gallons	3.78533	Liters
Liters	0.035316	Cubic feet	Cubic feet	28.316	Liters
Liters	0.001308	Cubic yards	Cubic yards	764.54	Liters
Cubic meters	264.17	Gallons	Gallons	0.0037854	Cubic meters
Cubic meters	35.314	Cubic feet	Cubic feet	0.028317	Cubic meters
Cubic meters	1.3079	Cubic yards	Cubic yards	0.76456	Cubic meters
Cubic meters	0.0008107	Acre-feet	Acre-feet	1233.49	Cubic meters
Weight/Mass					
Grams	0.035274	Ounces	Ounces	28.35	Grams
Kilograms	2.2046	Pounds	Pounds	0.45359	Kilograms
Kilograms	0.0011023	Tons (short)	Tons (short)	907.18	Kilograms
Metric tons	1.1023	Tons (short)	Tons (short)	0.90718	Metric tons
ENGLISH TO ENGLISH					
Acre-feet	325,850.7	Gallons	Gallons	0.000003046	Acre-feet
Acres	43,560	Square feet	Square feet	0.000022957	Acres
Square miles	640	Acres	Acres	0.0015625	Square miles

[a] **This conversion is only valid for concentrations of contaminants (or other materials) in water.**

METRIC PREFIXES

Prefix	Symbol	Multiplication factor
exa-	E	1,000,000,000,000,000,000 = 10^{18}
peta-	P	1,000,000,000,000,000 = 10^{15}
tera-	T	1,000,000,000,000 = 10^{12}
giga-	G	1,000,000,000 = 10^{9}
mega-	M	1,000,000 = 10^{6}
kilo-	k	1,000 = 10^{3}
deca-	D	10 = 10^{1}
deci-	d	0.1 = 10^{-1}
centi-	c	0.01 = 10^{-2}
milli-	m	0.001 = 10^{-3}
micro-	μ	0.000 001 = 10^{-6}
nano-	n	0.000 000 001 = 10^{-9}
pico-	p	0.000 000 000 001 = 10^{-12}
femto-	f	0.000 000 000 000 001 = 10^{-15}
atto-	a	0.000 000 000 000 000 001 = 10^{-18}

CHAPTER 1
INTRODUCTION AND PURPOSE AND NEED FOR AGENCY ACTION

1 INTRODUCTION AND PURPOSE AND NEED FOR AGENCY ACTION

Chapter 1 presents an overview of the U.S. Department of Energy/National Nuclear Security Administration *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 (CMRR-NF SEIS)* (DOE/EIS-0350-S1). This chapter briefly relates the progression of project planning and National Environmental Policy Act environmental impact reviews, provides background information, and discusses the purpose and need for action and the alternatives analyzed in this *CMRR-NF SEIS* for constructing and operating the Nuclear Facility portion of the Chemistry and Metallurgy Research Building Replacement Project. The chapter further summarizes the associated environmental impact reviews, discusses decisions to be made now, and describes public participation actions conducted for this *CMRR-NF SEIS*.

1.1 Introduction

This *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 (CMRR-NF SEIS)* (DOE/EIS-0350-S1) has been prepared in accordance with the National Environmental Policy Act (NEPA), as amended (42 *United States Code* [U.S.C.] 4321 et seq.), as well as Council on Environmental Quality (CEQ) regulations and U.S. Department of Energy (DOE) NEPA implementing procedures codified in Title 40 of the *Code of Federal Regulations* (CFR) Parts 1500–1508 and 10 CFR Part 1021, respectively. CEQ and DOE NEPA regulations and implementing procedures require preparation of a supplemental environmental impact statement (SEIS) if there are substantial changes in the proposed action that are relevant to environmental concerns or there are significant new circumstances or information relevant to environmental concerns that bear on the proposed action or its impacts. An SEIS may also be prepared to further the purposes of NEPA. The following paragraphs summarize the NEPA analyses applicable to the Chemistry and Metallurgy Research Building Replacement Nuclear Facility (CMRR-NF) that the National Nuclear Security Administration (NNSA)[1] has completed over the last 8 years, as well as the changes to the CMRR-NF proposal that are the subject of this *CMRR-NF SEIS*.

Five alternatives were analyzed in the November 2003 *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):

- Alternative 1 (the Preferred Alternative): Construct a new Chemistry and Metallurgy Research Building Replacement (CMRR) Facility at Technical Area 55 (TA-55).
- Alternative 2 (Greenfield Site Alternative): Construct a new CMRR Facility at TA-6.
- Alternative 3 (Hybrid Alternative at TA-55): Construct new Hazard Category 2 and 3 laboratory buildings (above or below ground) at TA-55 and continue use of the Chemistry and Metallurgy Research (CMR) Building.
- Alternative 4 (Hybrid Alternative at TA-6): Construct new Hazard Category 2 and 3 laboratory buildings (above or below ground) at TA-6 and continue use of the CMR Building.
- No Action Alternative: Continue use of existing CMR Building – no new building construction.

The Preferred Alternative (Alternative 1) was selected for implementation in a 2004 Record of Decision (69 *Federal Register* 6967).

[1] *For more information on NNSA, a semiautonomous agency within DOE, see the 1999 National Nuclear Security Administration Act (Title 32 of the Defense Authorization Act for Fiscal Year 2000 [Public Law (P.L.) 106-65]).*

In November 2003, NNSA issued the *Final Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico (CMRR EIS)* (DOE/EIS-0350), which was followed by the issuance of a Record of Decision (ROD) in February 2004 (69 *Federal Register* [FR] 6967) (DOE 2004a). In that 2004 ROD, NNSA stated its decision to implement the preferred alternative, Alternative 1, the construction and operation of a new Chemistry and Metallurgy Research Building Replacement (CMRR) Facility within Technical Area 55 (TA-55) at Los Alamos National Laboratory (LANL). The new CMRR Facility would include two buildings: one for administrative and support functions and one for Hazard Category 2 and 3 special nuclear material[2] (SNM) laboratory operations. Both buildings would be constructed in aboveground locations (under *CMRR EIS* Construction Option 3). The existing Chemistry and Metallurgy Research (CMR) Building located within TA-3 at LANL would undergo decontamination, decommissioning, and demolition (DD&D) in its entirety (under *CMRR EIS* Disposition Option 3). The preferred alternative included the construction of the new CMRR Facility and the movement of operations from the existing CMR Building into the new CMRR Facility, with operations to continue in the new facility over the next 50 years.

> **Nuclear Facilities Hazards Classification (U.S. Department of Energy [DOE] Standard 1027)**
>
> **Hazard Category 1:** Hazard analysis shows the potential for significant offsite consequences.
>
> **Hazard Category 2:** Hazard analysis shows the potential for significant onsite consequences.
>
> **Hazard Category 3:** Hazard analysis shows the potential for only significant localized consequences.
>
> **Special Nuclear Material (SNM) Safeguards and Security (DOE Order 474.2)**
>
> DOE uses a cost-effective, graded approach to providing SNM safeguards and security. Quantities of SNM stored at each DOE site are categorized as Security Category I, II, III, or IV, with the greatest quantities included under Security Category I and lesser quantities included in descending order under Security Categories II through IV. Types and compositions of SNM are further categorized by their "attractiveness" by using an alphabetical system. Materials that are most attractive for conversion into nuclear explosive devices are identified by the letter "A." Less-attractive materials are designated progressively by the letters "B" through "E."

As described in the *CMRR EIS*, the administrative and support building would provide office space in addition to laboratory space used for such activities as glovebox mockup, process testing, chemical experimentation, training, and general research and development. The laboratory areas within it would be allowed to contain only very small amounts of nuclear materials such that it would be designated a radiological facility.[3] All nuclear analytical chemistry (AC) and materials characterization (MC) operations would be housed in one Hazard Category 2 nuclear laboratory building. The Hazard Category 2 building would be constructed with one floor below ground, containing the Hazard Category 2 operations, and one floor above ground, containing Hazard Category 3 operations. Each building would have multiple stories and a total of about 200,000 square feet (19,000 square meters) of floor space. An underground tunnel would link the buildings. In addition, another underground tunnel would be constructed to connect the existing TA-55 Plutonium Facility with the Hazard Category 2 building; this tunnel would also contain a vault spur for the CMRR Facility long-term SNM storage requirements. NNSA would operate both the CMR Building and the CMRR Facility for an overlapping 2- to 4-year period because most AC and MC operations require transitioning from the old CMR Building to the new CMRR Facility buildings.

Since 2004, project personnel have engaged in an iterative planning process for all CMRR Project activities and materials needed to implement construction of the two-building CMRR Facility at TA-55. The administrative and support building, now known as the Radiological Laboratory/Utility/Office

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[2] *SNM includes plutonium, uranium enriched in the isotope 233 or the isotope 235, and any other material that the U.S. Nuclear Regulatory Commission determines to be SNM.*
[3] *Facilities that handle less than Hazard Category 3 threshold quantities, but require identification of "radiological areas," are designated as radiological facilities.*

Building (RLUOB), was fully planned and constructed over the past 6 years, from 2004 through 2010. NNSA prepared 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 (CMRR SA)* (DOE/EIS-0350-SA-01) (DOE 2005a) in 2005 to evaluate a proposal to place RLUOB at a location other than the one analyzed specifically in the 2003 *CMRR EIS*. In the *CMRR SA*, NNSA determined that the *CMRR EIS* impacts analysis encompassed this proposal and that an SEIS was not required. However, the RLUOB site location was later changed back to the location originally considered in the *CMRR EIS*, and the building site considered in the *CMRR SA* was used, as proposed and analyzed in the *CMRR EIS*, for the construction of a permanent paved parking area, with temporary construction trailers and other support functions being located within this parking area. RLUOB is now being outfitted and equipped, and interior finishing is under way. Occupancy of RLUOB is currently estimated to begin in 2011, with radiological laboratory operations commencing in about 2013.

Chemistry and Metallurgy Research Building Replacement Project Terminology

Chemistry and Metallurgy Research Building (CMR Building) – refers to the existing building in Technical Area (TA-3) that was built primarily in the 1950s.

Chemistry and Metallurgy Research Building Replacement Facility (CMRR Facility) – refers to the entire facility conceived to replace the CMR Building; it comprises a nuclear facility and a support facility (see below).

Radiological Laboratory/Utility/Office Building (RLUOB) – refers to the administrative and support facility component of the CMRR Facility. RLUOB has been constructed in TA-55.

Chemistry and Metallurgy Research Building Replacement Project Nuclear Facility (CMRR-NF) – refers to the nuclear facility component or portion of the CMRR Facility. Construction of the CMRR-NF in TA-55 adjacent to RLUOB is the subject of this supplemental environmental impact statement.

Project planning and design for the CMRR-NF was initiated in 2004, but has progressed along a slower timeline than projected in the *CMRR EIS*. In early 2005, NNSA initiated a site-wide environmental impact statement (SWEIS) for the continued operation of LANL, the *Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (2008 *LANL SWEIS*) (DOE/EIS-0380) (DOE 2008a); a year later, in October 2006, NNSA initiated preparation of the *Complex Transformation Supplemental Programmatic Environmental Impact Statement (Complex Transformation SPEIS)* (DOE 2008c) to consider the potential environmental impacts of alternatives for transforming the nuclear weapons complex into a smaller, more efficient enterprise that could respond to changing national security challenges and ensure the long-term safety, security, and reliability of the nuclear weapons stockpile (DOE/EIS-0236-S4). While these two environmental impact statements (EISs) were being prepared, CMRR-NF planning was deliberately limited to preliminary planning and design work, and NNSA deferred implementing its decision to construct the CMRR-NF at LANL so as not to limit the range of reasonable alternatives.

Both the *LANL SWEIS* and the *Complex Transformation SPEIS* were issued in 2008. Among the various decisions supported by the analysis contained in the *Complex Transformation SPEIS* was the programmatic decision to retain manufacturing and research and development capabilities involving plutonium at LANL and, in partial support of those activities, to construct and operate the CMRR-NF at LANL in accordance with the 2004 *CMRR EIS* ROD. These decisions were issued in a December 2008 *Complex Transformation SPEIS* ROD (73 FR 77644). Among the various decisions supported by the analysis contained in the 2008 *LANL SWEIS* were decisions regarding the programmatic level of operations at LANL facilities (including the CMRR Facility) for at least the next 5 years and project-specific decisions for individual projects at LANL, including those at TA-55 and within surrounding and nearby TAs along the Pajarito Road corridor. These decisions were issued in a September 2008 *LANL SWEIS* ROD (73 FR 55833) and a June 2009 *LANL SWEIS* ROD (74 FR 33232). Congressional funding has been appropriated to proceed with CMRR-NF planning and design (DOE 2011e).

Over the past 8 years, the CMRR-NF planning process has identified several design considerations that were not envisioned in 2003, when the *CMRR EIS* was prepared and issued. Several ancillary and support requirements have also been identified in addition to those identified and analyzed in the *CMRR EIS*. Two support actions—installation of an electric power substation in TA-50 and removal and transport of about 150,000 cubic yards (115,000 cubic meters) of geologic material per year from the building site and other LANL construction projects to other LANL locations for storage—were identified early enough to be included in the 2008 *LANL SWEIS* environmental impact analyses and the September 2008 *LANL SWEIS* ROD. Both the 2008 and 2009 *LANL SWEIS* RODs identified NNSA's selection of the No Action Alternative for the baseline level of overall operations for the various LANL facilities, which included the implementation of actions selected in the 2004 *CMRR EIS* ROD. These actions included construction and operation of the two-building CMRR Facility at TA-55, transfer of operations from the old CMR Building and its ultimate demolition, and the two support actions mentioned above. This *CMRR-NF SEIS* addresses the CMRR-NF alternatives, as well as updated information on the ancillary and support activities, that have developed since the *CMRR EIS* and *LANL SWEIS* were published.

NNSA decided in 2008, and again in 2009, to continue to defer certain programmatic decisions until after the release of the Administration's next *Nuclear Posture Review Report*, which was issued in April 2010 (DoD 2010). To date, no further related programmatic decisions have been announced by NNSA since this report was released, although additional decisions may be announced later through the NEPA compliance process.

1.2 Background

LANL was originally established in 1943 as "Project Y" of the Manhattan Project in northern New Mexico, within what is now the Incorporated County of Los Alamos (see **Figure 1–1**). Project Y had a single national defense mission—to build the world's first nuclear weapon. After World War II ended, Project Y was designated a permanent research and development laboratory, the Los Alamos Scientific Laboratory. It was renamed LANL in the 1980s, when its mission was expanded from defense and related research and development to incorporate a wide variety of new assignments in support of Federal Government and private sector programs. LANL is now a multidisciplinary, multipurpose institution primarily engaged in theoretical and experimental research and development.

LANL occupies about 40 square miles (104 square kilometers) of land on the eastern flank of the Jemez Mountains along the area known as the Pajarito Plateau. The terrain in the LANL area consists of mesa tops and canyon bottoms that trend in a west-to-east manner, with the canyons intersecting the Rio Grande to the east of LANL. Elevations at LANL range from about 7,800 feet (2,400 meters) at the highest point on the western side to about 6,200 feet (1,900 meters) at the lowest point along the eastern side, above the Rio Grande. The two primary residential areas within the county are the Los Alamos townsite and the White Rock residential development (see Figure 1–1). Together, these two residential areas are home to about 18,400 people. About 13,000 people work at LANL, only about half of whom reside within Los Alamos County. LANL operations occur within numerous facilities located over 47 designated technical areas within the LANL boundaries and at other leased properties situated near LANL. The 47 contiguous LANL technical areas (which are not numbered sequentially) have been established so that they segregate the entire LANL site (see **Figure 1–2**). Most of LANL is undeveloped forested land that provides a buffer for security and safety, as well as expansion opportunities for future use. About 46 percent of the square footage of LANL facilities is considered laboratory or production space; the rest is considered administrative, storage, service, and miscellaneous space (LANL 2011a:LANL Site, 006).

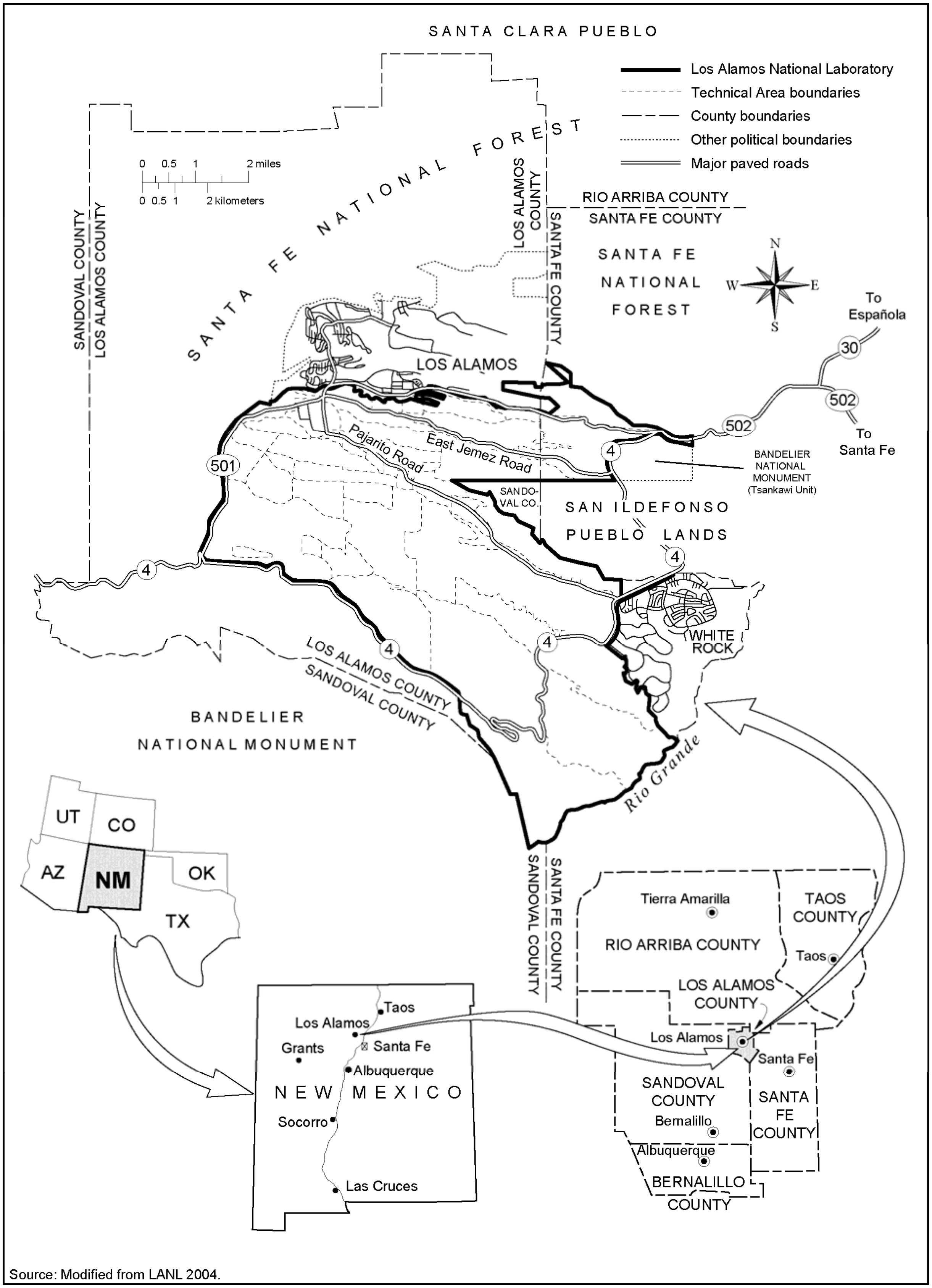

Figure 1–1 Location of Los Alamos National Laboratory

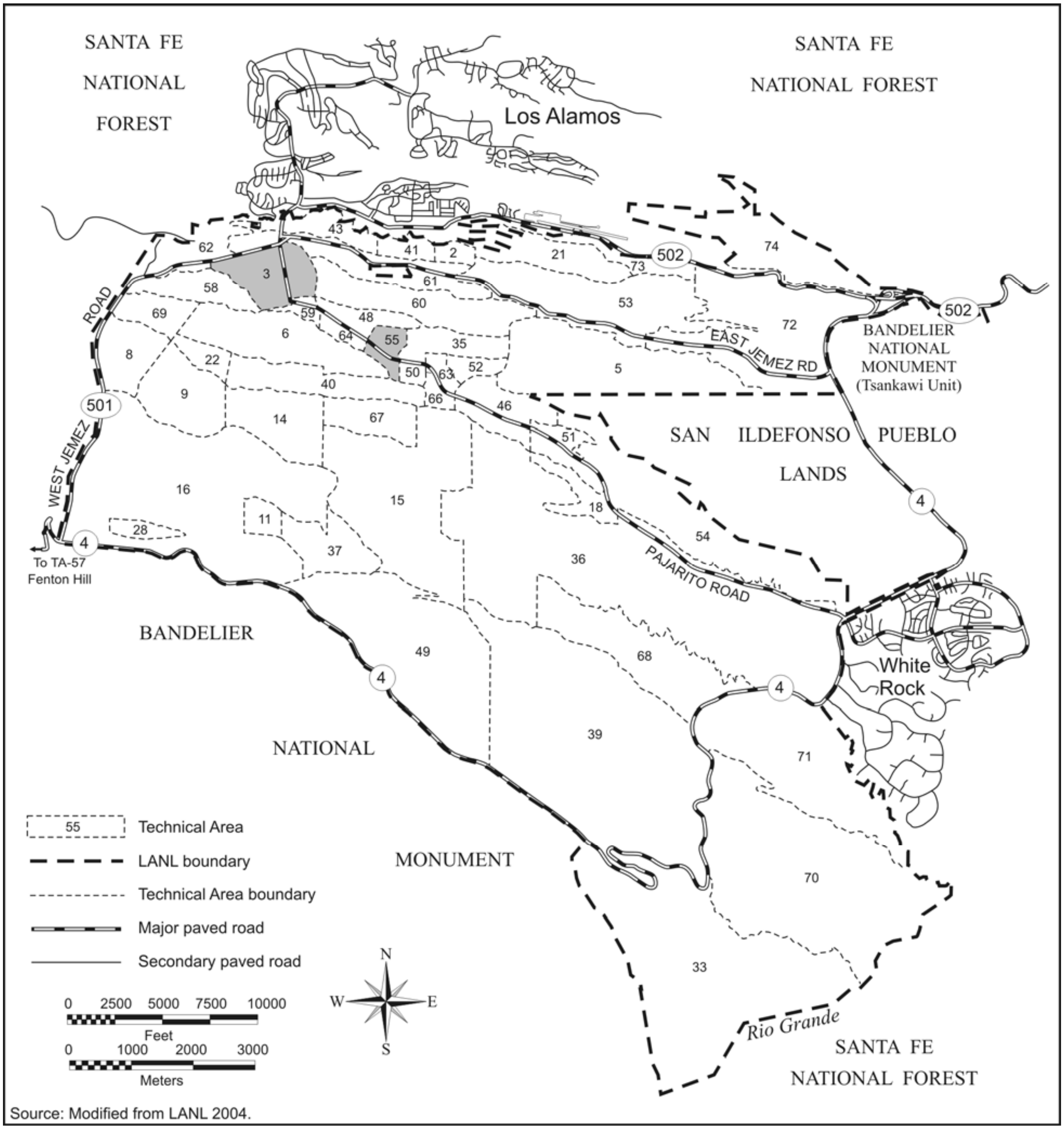

Figure 1–2 Identification and Location of Los Alamos National Laboratory Technical Areas

Since its creation in 2000, NNSA has had the following congressionally assigned missions: (1) to enhance U.S. national security through the military application of nuclear energy; (2) to maintain and enhance the safety, reliability, and performance of the U.S. nuclear weapons stockpile to meet national security requirements, including the ability to design, produce, and test; (3) to provide the U.S. Navy with safe, militarily effective nuclear propulsion plants and to ensure the safe and reliable operation of these plants; (4) to promote international nuclear safety and nonproliferation efforts; (5) to reduce the global danger from weapons of mass destruction; and (6) to support U.S. leadership in science and technology (50 U.S.C. 2401(b)). Congress identified LANL as one of three national security laboratories to be administered by NNSA for DOE. As NNSA's mission is a subset of DOE's original mission assignment, the work performed at LANL in support of NNSA has remained unchanged in character from that performed for DOE prior to NNSA's creation. Specific LANL assignments for the foreseeable future include (1) production of weapons components, (2) assessment and certification of the nuclear weapons stockpile, (3) surveillance of weapons components and weapon systems, (4) assurance of the safe and secure storage of strategic materials, and (5) management of excess plutonium inventories. NNSA mission objectives at LANL include providing a wide range of scientific and technological capabilities that support nuclear materials handling, processing, and fabrication; stockpile management; materials and manufacturing technologies; nonproliferation programs; and waste management activities.

NNSA and DOE generally assign mission element work to LANL[4] based on the facilities and expertise of the staff located there, as well as other factors. Theoretical research (including analysis, mathematical modeling, and high-performance computing), experimental science and engineering, advanced and nuclear materials research, and development of applications (including weapons components testing, fabrication, stockpile assurance, replacement, surveillance, and maintenance) are performed at LANL using the facilities and staff there. These capabilities allow activities—such as high-explosives processing, chemical research, nuclear physics research, materials science research, systems analysis and engineering, human genome mapping, and research and development of biotechnology applications and remote sensing technologies—to be performed that can be applied to resource exploration and environmental surveillance activities conducted at LANL.

In the mid-1990s, DOE, in response to direction from the President and Congress, developed the Stockpile Stewardship and Management Program (now the Stockpile Stewardship Program) to provide a single, highly integrated technical program for maintaining the continued safety and reliability of the nuclear weapons stockpile. Stockpile stewardship comprises activities associated with research, design, and development of nuclear weapons; maintaining the knowledge base and capabilities needed to support testing of nuclear weapons; and the assessment and certification of their safety and reliability. Stockpile management includes operations associated with producing, maintaining, refurbishing, surveilling, and dismantling the nuclear weapons stockpile. Mission-essential work conducted at LANL provides science, research and development, and production support to these NNSA missions, with a special focus on national security.

A particularly important facility at LANL is the nearly 60-year-old CMR Building (Building 3-29) located in TA-3 (see **Figure 1–3**), which has unique capabilities for performing AC, MC and actinide[5] research and development related to SNM. Actinide science-related mission work at LANL ranges from the plutonium-238 heat source program conducted for the National Aeronautics and Space Administration to arms control technology development. CMR Building operations provide AC and MC in support of manufacturing, development, and surveillance of nuclear weapons pits[6] and nuclear nonproliferation programs with critical national security missions. Pit production mission support work was first assigned to LANL in 1996 in the ROD for the *Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (61 FR 68014). DOE later determined how and where it would conduct that mission support work through the 1999 *LANL SWEIS* (DOE 1999a) and its associated ROD (64 FR 50797). Since 2000, pit production at LANL has been established within the Plutonium Facility Complex at TA-55 (see Figure 1–3), and several certified pits[7] have been produced over the past 5 years in that facility. Pit production does not take place at the CMR Building and would not take place in any CMRR facility.

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[4] *Additional information regarding DOE and NNSA work assignments at LANL is presented in both the 1999 and 2008* LANL SWEISs*. These documents and other related documents can be found on the Internet at http://nepa.energy.gov/ and http://www.lanl.gov/.*
[5] *"Actinide" refers to any member of the group of elements with atomic numbers from 89 (actinium) to 103 (lawrencium), including uranium and plutonium. All members of this group are radioactive.*
[6] *A pit is the central core of a primary assembly in a nuclear weapon typically composed of plutonium-239 and/or highly enriched uranium and other materials.*
[7] *A certified pit meets the specifications for use in the U.S. nuclear stockpile.*

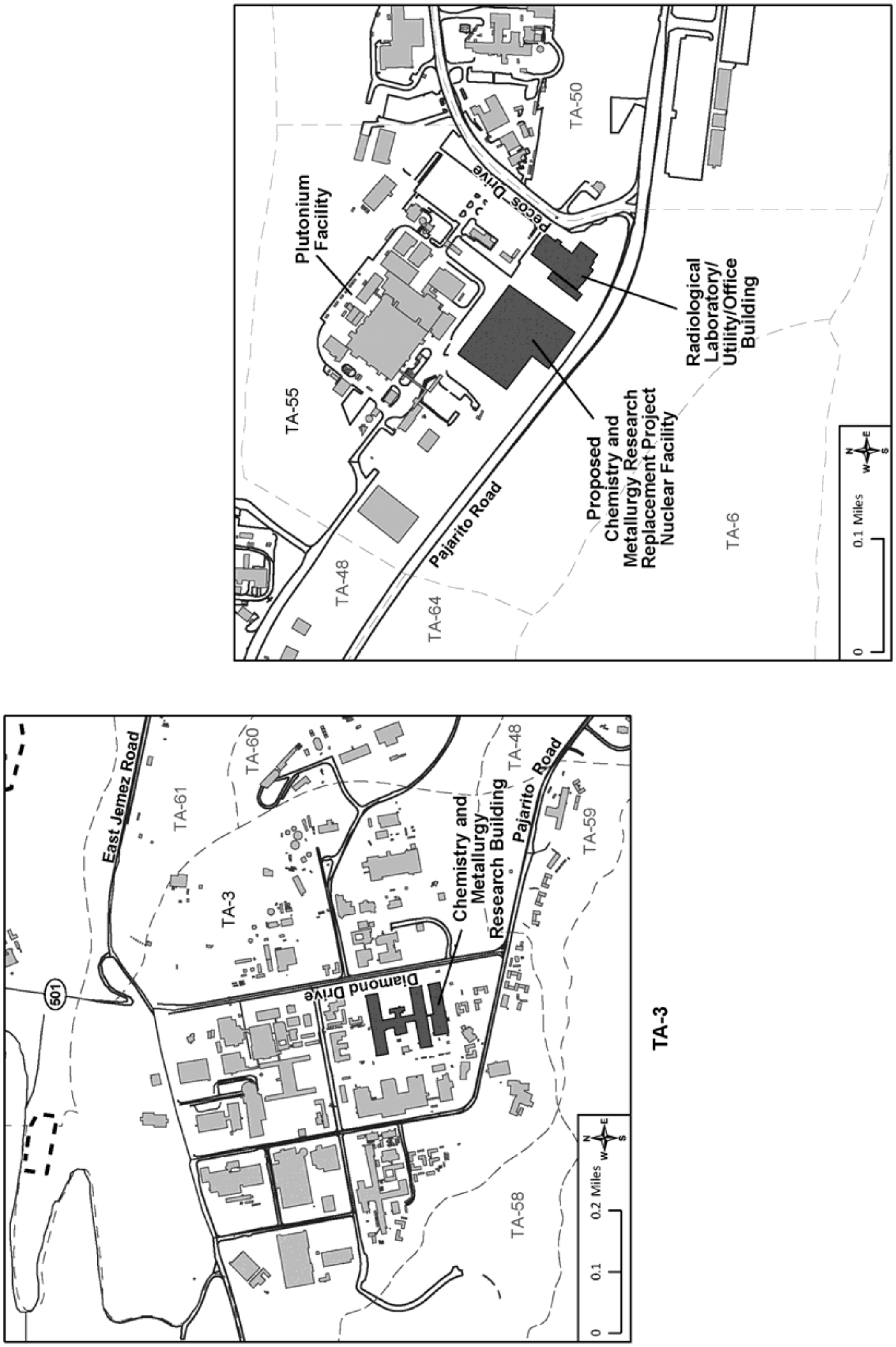

Figure 1–3 Location of Facilities in Technical Areas 3 and 55

Construction of the CMR Building was initiated in 1949 and completed in 1952. The CMR Building is a three-story building composed of a central corridor and eight wings, with over 550,000 square feet (51,000 square meters) of working area, including laboratory spaces and administrative and utility areas. The CMR Building is currently designated as a Hazard Category 2, Security Category III nuclear facility. Its main function is to house research and development capabilities involving AC, MC, and metallurgic studies on actinides and other metals. AC and MC services support virtually all nuclear programs at LANL. These activities have been conducted almost continuously in the CMR Building since it became operational in 1952; however, with the closure of Wing 2, the broad spectrum of MC work once performed at the CMR Building has been relocated to other wings of the CMR Building or has been suspended.

The CMR Building was initially designed and constructed to comply with the building codes in effect during the late 1940s and early 1950s. In the intervening years, a series of upgrades have been performed to address changing building and safety requirements. In 1992, DOE initiated planning and implementation of additional CMR Building upgrades to address specific safety, reliability, consolidation, and safeguards and security issues with the intent to extend the useful life of the CMR Building for an additional 20 to 30 years. Many of the utility systems and structural components were recognized then as being aged, outmoded, and generally deteriorating. Beginning in about 1997 and continuing to the present, a series of operational, safety, and seismic issues have surfaced. A 1998 seismic study identified two small parallel faults beneath the northernmost portion of the CMR Building (LANL 1998). No other faults were detected. The presence of these faults gave rise to operational and safety concerns related to the structural integrity of the building in the event of seismic activity along this portion of the Pajarito fault system. These issues have partially been addressed by administratively restricting the amount of material stored within the building and in use at any given time, completely removing operations from three wings of the building, and generally limiting operations in the other three laboratory wings that remain functional. Upgrades to the building that were necessary at the time have since been undertaken to allow the building to continue functioning while ensuring safe and reliable operations. The planned closeout of nuclear laboratory operations within the CMR Building was previously estimated to occur in or around the year 2010; however, with the limited upgrades on selective facility systems and operational restrictions implemented, NNSA plans to continue to operate the nuclear laboratories in the building until the building can no longer operate safely, a replacement facility is available, or NNSA makes other operational decisions.

Since the *CMRR EIS* ROD was issued in February 2004, advances have been made in the understanding of seismic conditions in the Los Alamos area and at TA-3 and TA-55 in particular. These new data have resulted in changes necessary to meet the performance standard for Performance Category 3 (PC-3)[8] buildings, including the existing CMR Building and the proposed CMRR-NF, from being able to survive a design-basis earthquake with a peak horizontal ground acceleration of about 0.31 *g* [gravitational acceleration] and a peak vertical ground acceleration of 0.27 *g*.[9] Based on the new data, the design-basis earthquake for TA-3 would have a peak horizontal ground acceleration of 0.52 *g* and a peak vertical ground acceleration of 0.6 *g* (LANL 2007a); the design-basis earthquake for TA-55 would have a peak horizontal ground acceleration of 0.47 *g* and a peak vertical ground acceleration of 0.51 *g*

[8] *Each structure, system, and component in a DOE facility is assigned to one of five performance categories depending upon its safety importance. PC-3 structures, systems, and components are those for which failure to perform their safety function could pose a potential hazard to public health, safety, and the environment from release of radioactive or toxic materials. Design considerations for this category are to limit facility damage as a result of design-basis natural phenomena events (for example, an earthquake) so that hazardous materials can be controlled and confined, occupants are protected, and the functioning of the facility is not interrupted (DOE 2002c).*

[9] *The return interval for the obsolete peak horizontal and vertical ground accelerations of 0.31g and 0.27 g, respectively, was 2,000 years; the return interval for the current design-basis earthquake with peak horizontal and vertical ground accelerations of 0.47 g and 0.51 g, respectively, is 2,500 years.*

(LANL 2009b). This change in peak ground accelerations is significant and has resulted in significant changes in the design of the proposed CMRR-NF.

The new peak ground acceleration estimates for TA-55 and TA-3 are the result of ongoing seismic studies of LANL and the surrounding area, as discussed the Probabilistic Seismic Hazard Analysis published in 2007 and updated in 2009 (LANL 2007a, 2009b). These new data increased requirements for seismic performance for LANL plutonium facilities and have caused substantial reexamination of the safety of both the existing CMR Building and the proposed CMRR-NF design. The Defense Nuclear Facilities Safety Board (DNFSB), an independent oversight agency, and NNSA have taken major interest in this enhanced seismic understanding of the LANL area and the implications in terms of safe operations at the CMR Building and the proposed CMRR-NF. It was concluded that the initial CMRR-NF design evaluated in the *CMRR EIS* would not provide the desired safety margins to survive the current design-basis earthquake (with a peak horizontal ground acceleration of 0.47 *g* and a peak vertical ground acceleration of 0. 51 *g*), and that substantial design changes were needed. In addition, it was further concluded that activities involving nuclear materials and the amount of nuclear material stored in the existing CMR Building needed to be significantly reduced to reduce the risks associated with continuing to operate this building in the event of such an earthquake. Both NNSA and DNFSB concurred in these conclusions. As a result, NNSA has significantly modified the design of the CMRR-NF such that the Modified CMRR-NF would provide the needed safety functions even in the event of a design-basis earthquake. Activities at the CMR Building have been significantly reduced since the *CMRR EIS* was published and are expected to continue to be reduced over time as the safety of this building continues to be evaluated.

Additional analysis has been done regarding the Deep and Shallow Construction Options associated with the Modified CMRR-NF Alternative. The original building elevation (as defined by the bottom of the basemat) considered for the CMRR-NF was located sufficiently shallow, such that extensive excavation below the building basemat would not be required and would not extend into the poorly welded tuff layer. This design held through the completion of the conceptual and preliminary design phases of the project.

When the probabilistic seismic hazards analysis was prepared in 2007, the design was changed to increase both the thickness in certain floors and the thickness of the basemat to improve performance in a seismic event. The end result was that the overall building height measured from the bottom of the basemat to the top of the roof was now larger. In response to these changes, the design was revised to provide a deeper building excavation and maintain the aboveground height of the building at the same elevation as the previous design. This design change would have resulted in the penetration of the poorly welded tuff layer requiring additional excavation, and resulted in the Deep Excavation Option. The Deep Excavation Option entails excavating through the poorly welded tuff and filling the hole with low-slump concrete to the elevation of the bottom of the basemat, as discussed in Chapter 2, Section 2.6.2.

In 2011, a review of the requirements for the design of the CMRR-NF identified an opportunity to avoid the activities and costs associated with the additional excavation and concrete fill required for the Deep Excavation Option by raising the bottom of the basemat to near the original design elevation. The overall building height would remain the same, but the top of the roof would be higher aboveground than it was in the conceptual and preliminary design. At the current level of design maturity, this approach, known as the Shallow Excavation Option, appears to provide some reductions in construction impacts and cost without affecting other building design requirements. Both construction options require the same sets of safety controls and are expected to remain close in offsite environmental consequences as shown in the analyses contained in this SEIS. At this time, both construction options are being considered by NNSA. As the design studies continue and more details become available, one option or the other may be judged to have significant advantages in the time and/or cost expected for executing the excavation phase of construction that will facilitate NNSA's selection of a preferred construction option. The Shallow Excavation Option would be reviewed by the DNFSB before it was implemented should the decision be made to construct the Modified CMRR-NF using this construction option. This *CMRR-NF SEIS* has been prepared to address these changes and to evaluate the potential environmental impacts associated with the alternatives discussed in Chapter 2, "Project Description and Alternatives."

1.3 Purpose and Need for Agency Action

The purpose and need for NNSA action has not changed since issuance of the 2003 *CMRR EIS*. NNSA needs to act to provide the physical means for accommodating the continuation of mission-critical AC and MC capabilities at LANL beyond the present time in a safe, secure, and environmentally sound manner. Concurrently, NNSA proposes to take advantage of the opportunity to consolidate AC and MC activities for the purpose of increasing operational efficiency and enhancing security.

AC and MC activities historically conducted at the CMR Building are fundamental capabilities required for support of all DOE and NNSA nuclear mission work at LANL. These AC and MC capabilities have been available at LANL for the entire history of the site since the mid-1940s, and these capabilities remain critical to future work at the site. As discussed above, the CMR Building's nuclear operations and capabilities are currently restricted to maintain compliance with safety requirements. Due to facility limitations, the CMR Building is not being operated to the full extent needed to meet DOE and NNSA operational requirements for the foreseeable future. In addition, consolidation of like activities at TA-55 would enhance operational efficiency in terms of security, support, and risk reduction related to handling and transportation of nuclear materials.

1.4 Scope and Alternatives

This section introduces the three alternatives analyzed in this *CMRR-NF SEIS* for carrying out AC and MC operations at LANL. These alternatives are addressed in more detail in Chapter 2, Section 2.6. See Section 2.7 for a discussion of alternatives that were considered and dismissed from detailed analysis.

- ***No Action Alternative (2004 CMRR-NF):*** Construct and operate a new CMRR-NF at TA-55, adjacent to RLUOB, as analyzed in the 2003 *CMRR EIS* and selected in the associated 2004 ROD and the 2008 *Complex Transformation SPEIS* ROD, with two additional project activities (management of excavated soils and tuff and a new electrical substation) analyzed in the 2008 *LANL SWEIS*. Based on new information learned since 2004, the 2004 CMRR-NF would not meet the standards for a PC-3 structure as required to safely conduct the full suite of NNSA AC and MC mission work. Therefore, the 2004 CMRR-NF would not be constructed.

- ***Modified CMRR-NF Alternative:*** Construct and operate a new CMRR-NF at TA-55, adjacent to RLUOB, with certain design and construction modifications and additional support activities that address seismic safety, infrastructure enhancements, nuclear safety-basis requirements and sustainable design principles (sustainable development – see glossary). This alternative has two construction options: the Deep Excavation Option and the Shallow Excavation Option. All necessary AC and MC operations could be performed as required to safely conduct the full suite of NNSA mission work. The Modified CMRR-NF embodies the maturation of the 2004 CMRR-NF design to meet all safety standards and operational requirements.

- ***Continued Use of CMR Building Alternative:*** Do not construct a replacement facility to house the capabilities planned for the CMRR-NF, but continue to perform operations in the CMR Building at TA-3, with normal maintenance and component replacements at the level needed to sustain programmatic operations for as long as feasible. Certain AC and MC operations would be restricted. Administrative and radiological laboratory operations would take place in RLUOB at TA-55.

1.4.1 No Action Alternative

Under the No Action Alternative, NNSA would implement the decisions made in the 2004 *CMRR EIS* ROD, the *Complex Transformation SPEIS* ROD, and the 2008 *LANL SWEIS* RODs. NNSA would construct the new CMRR-NF (referred to as the "2004 CMRR-NF") at LANL within TA-55 next to the already constructed RLUOB (see Figure 1–3). The 2004 CMRR-NF would be an aboveground building described under Alternative 1, Construction Option 3, in the 2003 *CMRR EIS*. As part of the No Action Alternative, which was selected in the *LANL SWEIS* ROD, the 2008 *LANL SWEIS* evaluated (1) the transportation and storage of up to 150,000 cubic yards (115,000 cubic meters) per year of excavated soil or spoils (soil and rock material) from the 2004 CMRR-NF construction and other construction projects that could be undertaken at the site and (2) installation of a new substation on the existing 13.8-kilovolt power distribution loop in TA-50 to provide an independent power feed to the existing TA-55 Plutonium Complex and the new CMRR Facility.

AC and MC operations and associated research and development Hazard Category 2 and 3 laboratory capabilities would be relocated in stages over 2 to 4 years from their current locations at the CMR Building to the 2004 CMRR-NF; those operations and activities would continue in the 2004 CMRR-NF over about a 50-year period. After laboratory operations are removed from the CMR Building, it would undergo DD&D activities. Following the closeout of operations at the new 2004 CMRR-NF toward the end of the twenty-first century, DD&D activities at that facility would occur. The phased elimination of CMR Building operations was originally estimated to be completed by around 2010; completion is now projected by about 2023.

Construction of the 2004 CMRR-NF would include the construction of connecting tunnels to RLUOB and the TA-55 Plutonium Facility, material storage vaults, utility structures and trenches, security structures, parking area(s), and a variety of other support areas (such as material laydown areas, a concrete batch plant, and equipment storage and parking areas). The construction force would peak at 300 workers. Each of these actions and activities was described in the 2003 *CMRR EIS*, the 2008 *LANL SWEIS*, and the 2008 *Complex Transformation SPEIS*. Specifically, NNSA would build the 2004 CMRR-NF at TA-55 as one building of a two-building CMRR Facility (under Alternative 1, Construction Option 3, as analyzed in the *CMRR EIS* and selected in the *CMRR EIS* ROD).

The 2004 CMRR-NF would be entirely designed as a Hazard Category 2 facility. The 2004 CMRR-NF would have a building "footprint" measuring about 300 by 210 feet (91 by 64 meters) and would comprise approximately 200,000 square feet (18,600 square meters) of solid floor space divided between two stories, and would also include one steel grating "floor" where mechanical and other support systems would be located and one small roof cupola enclosing the elevator equipment. The 2004 CMRR-NF would have an aboveground portion (consisting of a single story) that would house the Hazard Category 3 laboratories and a belowground portion (consisting of a single story) that would house the Hazard Category 2 laboratories and extend an average of 50 feet (15 meters) below ground. The total amount of laboratory workspace where mission-related AC and MC operations would be performed was not stated in the 2003 *CMRR EIS*. In 2004, the estimate of 22,500 square feet (2,100 square meters) of laboratory space was provided as a result of NNSA/LANL integrated nuclear planning activities (DOE 2004b). Fire protection systems for the 2004 CMRR-NF would be developed and integrated with the existing exterior TA-55 site-wide fire protection water storage tanks and services.

As it was envisioned to be constructed in the *CMRR EIS*, the 2004 CMRR-NF could not satisfy current facility seismic and nuclear safety requirements. Therefore, the 2004 CMRR-NF would not be able to safely function at a level sufficient to fully satisfy DOE and NNSA mission support needs, and thus would not fully meet DOE's stated purpose and need for taking action. The 2004 CMRR-NF would not be constructed.

1.4.2 Modified CMRR-NF Alternative

Under the Modified CMRR-NF Alternative, which is NNSA's Preferred Alternative, NNSA would construct the new CMRR-NF (referred to as the "Modified CMRR-NF") at TA-55 next to the already constructed RLUOB, as identified in the No Action Alternative, with certain construction enhancements and additional associated construction support activities. These enhancements and associated construction support activities are necessary to make the facility safe to operate based on new seismic information available since the issuance of the *CMRR EIS* ROD in 2004. The structure would be constructed to meet the current International Building Code; Leadership in Energy and Environmental Design® (LEED) certification requirements, as applicable; and DOE requirements for nuclear facilities, including projected seismic event response performance and nuclear safety-basis requirements based on new site geologic information, and fire protection and security requirements. As under the No Action Alternative, AC and MC operations and associated research and development Hazard Category 2 and 3 laboratory capabilities would be relocated in stages from their current locations at the CMR Building and the TA-55 Plutonium Facility to the Modified CMRR-NF, where operations and activities are expected to continue over about the next 50 years. The phased elimination of CMR Building operations is projected to be completed by about 2023. Both the CMR Building and the Modified CMRR-NF would undergo DD&D after operations are discontinued, as identified under the No Action Alternative.

Under this alternative, the Modified CMRR-NF construction phase would also include the construction of connecting tunnels, material storage vaults, utility structures and trenches, security structures, parking area(s), and a variety of other support areas identified under the No Action Alternative. Implementing the Modified CMRR-NF Alternative construction would require the use of additional structural concrete and reinforcing steel for the construction of the building's walls, floors, and roof; additional soil excavation, soil stabilization, and special foundation work would also be necessary. Also, a set of fire suppression water storage tanks would be located within the building, rather than connecting with the existing fire suppression system at TA-55. Additional temporary and permanent actions required to construct the Modified CMRR-NF under this alternative beyond those actions identified under the No Action Alternative would include (1) additional construction personnel, (2) the installation and use of additional parking areas, construction equipment and building materials storage areas, excavation spoils storage areas, craft worker office and support trailers, and personnel security and training facilities; (3) the installation and use of up to two additional concrete batch plants (for a total of three) and a warehouse building; and (4) the installation of overhead and/or underground power lines, site stormwater detention ponds, road realignments, turn lanes, intersections, and traffic flow measures at various locations.

Under the Modified CMRR-NF Alternative, the Modified CMRR-NF would also be an above- and below-ground structure. The amount of laboratory floor space where AC and MC operations would occur would be about the same as described under the No Action Alternative (22,500 square feet [2,100 square meters]). The estimated building "footprint" is about 342 feet long by 304 feet wide (104 meters long by 93 meters wide), with about 344,000 square feet (32,000 square meters) of usable floor space divided among four stories and a partial roof level.

The footprint of the Modified CMRR-NF is larger than that of the 2004 CMRR-NF due to space required for engineered safety systems and equipment, such as an increase in the size and quantity of heating, ventilation, and air conditioning ductwork and the addition of safety-class fire suppression equipment, plus the associated electrical equipment. This equipment added 42 feet (13 meters) to the building in one dimension. The addition of 94 feet (29 meters) in the other dimension was to provide corridor space for movement of equipment, to avoid interference between systems (mechanical, electrical, piping), and to allow enough space for maintenance, repair and inspection, and mission support activities (maintenance shop, waste management areas, and radiological protection areas). Part of the increase in building footprint over the 2004 CMRR-NF is due to thicker walls and other structural features required by current seismic and nuclear safety requirements.

The Modified CMRR-NF Alternative includes two construction options, designated as the Deep Excavation Option and the Shallow Excavation Option. Under either option, the Modified CMRR-NF would be designed to meet all current facility operations requirements. Under the Deep Excavation Option, NNSA would excavate and backfill the building footprint area down to a depth below a poorly welded tuff layer that lies from about 75 feet (23 meters) to 130 feet (40 meters) below the original ground level. Then the excavated site would be partially backfilled with low-slump concrete to form a 60-foot-thick (18-meter-thick) engineered building site. Three of the building's floors would be located below ground; the fourth floor and a roof equipment penthouse would be above ground. The removed geologic material would be transported to storage areas at LANL for reuse in other construction projects or for landscaping purposes. The Shallow Excavation Option would avoid the poorly welded tuff layer by constructing the basemat well above that layer in the overlying stable geologic layer, which would act in a raft-like fashion to allow the building to "float" over the poorly welded tuff layer. Under this option, the Modified CMRR-NF's base elevation would be about 8 feet (2.4 meters) lower than the excavation described under the No Action Alternative. Engineered backfill would be used to partially bury the building. The building would have three stories below ground and one above ground on the northwest. Due to site sloping, there would be two stories below ground and two stories and a partial roof level above ground on the southeast.

The Modified CMRR-NF, as envisioned to be constructed under this alternative (either construction option), would meet all applicable codes and standards for new nuclear facility construction. Therefore, implementing this alternative would allow operations within the Modified CMRR-NF that would fully satisfy DOE and NNSA mission support needs. This alternative would fully meet NNSA's stated purpose and need for taking action.

1.4.3 Continued Use of CMR Building Alternative

Under the Continued Use of CMR Building Alternative, NNSA would continue to carry out laboratory operations in the CMR Building at TA-3, with radiological laboratory and administrative support operations moving to the newly constructed RLUOB, located in TA-55. The continued operation of the CMR Building over an extended period (years to decades) would result in continued reduction of laboratory space as operations are further consolidated or eliminated due to safety concerns. It may also include the administrative reduction of "materials at risk" as necessary within portions of the CMR Building as part of routine safety and security measures to ensure continued safe worker conditions.

This alternative would result in very limited AC and MC capabilities at LANL over the extended period, and these capabilities could gradually become more limited and more focused on supporting plutonium operations, depending on the overall ability of the CMR Building to be safely operated and maintained in a physically prudent fashion. Moving the TA-3 CMR Building personnel and radiological laboratory functions into RLUOB over the next couple of years would result in considerable operational inefficiencies because personnel would have to travel by vehicle between offices and radiological laboratories at RLUOB and Hazard Category 2 laboratories that remain in the CMR Building. Additionally, the overall laboratory space allotted for certain functions might have to be duplicated at the two locations. When AC and MC laboratory operations eventually cease in the CMR Building, the building would undergo DD&D.

This alternative does not completely satisfy NNSA's stated purpose and need to carry out AC and MC operations at a level to satisfy the entire range of DOE and NNSA mission support functions. However, this alternative is analyzed in this *CMRR-NF SEIS* as a prudent measure in light of possible future fiscal budgetary constraints.

1.5 Decisions to be Supported by this *CMRR-NF SEIS*

NNSA must decide whether to implement one of the alternatives wholly or one or more of the alternatives in part. NNSA may choose to implement either of the action alternatives in its entirety as described and analyzed in this *CMRR-NF SEIS*, or it may elect to implement only a portion of the alternatives.

The environmental impact analyses of the alternatives considered in this *CMRR-NF SEIS* provide the NNSA decisionmakers with important environmental information to assist in the overall CMRR-NF decisionmaking process. The 2008 *Complex Transformation SPEIS* provided the environmental impacts basis for the NNSA Administrator's decision to programmatically retain the plutonium-related manufacturing and research and development capabilities at LANL and, in support of those activities, to maintain AC and MC functions at LANL during CMRR-NF construction and operations in accordance with the earlier *CMRR EIS* ROD. These decisions were issued in the 2008 *Complex Transformation SPEIS* ROD. Remaining project-specific decisions to be made by the NNSA Administrator regarding the CMRR-NF include (1) whether to construct a Modified CMRR-NF to meet recently identified building construction requirements and implement all or some of the additional construction support activities identified under the Modified CMRR-NF Alternative, which is NNSA's Preferred Alternative; or (2) whether to forgo construction of the CMRR-NF in favor of continuing to operate the CMR Building as a Hazard Category 2 Nuclear Facility with a restricted level of operations for mission support work under the Continued Use of CMR Building Alternative. The remaining alternative, to construct the 2004 CMRR-NF as it was described and analyzed in the 2003 *CMRR EIS* and its associated 2004 ROD, the 2008 *LANL SWEIS*, the *Complex Transformation SPEIS* and its associated ROD, and in this *CMRR-NF SEIS* as the No Action Alternative, does not meet NNSA's purpose and need and thus, would not be implemented.

NNSA is not planning to revisit decisions at this time that it reached in 2008 and issued through the 2008 *Complex Transformation SPEIS* ROD related to maintaining CMR operational capabilities at LANL to support critical NNSA missions. AC and MC capabilities were a fundamental component of Project Y during the Manhattan Project era, and the decision to establish these capabilities at the Los Alamos site was made originally by the U.S. Army Corps of Engineers, Manhattan District. DOE's predecessor agency, the Atomic Energy Commission, made the decision to continue support for and expand AC and MC capabilities at LANL after World War II; the CMR Building was constructed to house these needed capabilities. DOE considered the issue of maintaining CMR capabilities (along with other capabilities at LANL) in 1996 as part of its review of the Stockpile Stewardship Program and made decisions at that time that required the retention of CMR capabilities at LANL. DOE concluded in the 1999 *LANL SWEIS* ROD that, due to a lack of information on proposal(s) for replacement of the CMR Building to provide for its continued operations and capabilities, it was not the appropriate time to make specific decisions on the project. With the support of the 1999 *LANL SWEIS* impact analyses, however, DOE made a decision on the level of operations at LANL that included the capabilities housed by the CMR Building. In 2003, NNSA prepared the *CMRR EIS* and, in 2004, issued its implementation decisions for locating the CMRR Facility at LANL in TA-55, for constructing a two-building CMRR Facility with Hazard Category 2 operations below ground, and for the DD&D of the existing CMR Building after all operations were re-established at the new CMRR Facility. The 2008 *LANL SWEIS* supported NNSA decisions on the level of operations at LANL that included both the operational capabilities housed by the CMR Building and the construction of the CMRR Facility at TA-55. However, NNSA deferred implementing decision(s) on the CMRR-NF until completion of the programmatic impact analysis (the *Complex Transformation SPEIS*) for transforming the nuclear weapons complex into a smaller, more-efficient enterprise. In December 2008, NNSA issued its decisions on the nuclear enterprise, which included the decision to construct and operate the CMRR-NF at LANL as identified in the *CMRR EIS* ROD. There is no current proposal to change or modify the operation of the CMRR-NF as it was described in these prior NEPA documents, nor is there any current proposal to change the disposition of the existing CMR Building after it has been decommissioned and decontaminated.

NNSA is not planning to revisit decision(s) made recently on actions geographically located along the LANL Pajarito Mesa (where TA-55 is located) or along the Pajarito Road corridor (which traverses portions of Pajarito Mesa and Pajarito Canyon). These actions include the following:

- Nuclear Materials Safeguards and Security Upgrades Project (NMSSUP) activities, which focus on upgrading various intrusion alarm systems and related security measures for existing LANL facilities
- The Plutonium Facility Complex Refurbishment Project, also referred to as the "TA-55 Reinvestment Projects," which focuses on refurbishing and repairing the major building systems at the TA-55 Plutonium Facility to extend its reliable future operations
- Replacement of the existing, aging Radioactive Liquid Waste Treatment Facility with a new smaller-capacity facility
- Replacement of the TRU [Transuranic] Waste Facility with a new smaller-capacity facility, which is necessary to facilitate implementation of the TA-54 Material Disposal Area G low-level radioactive waste disposal site closure
- Closure of various material disposal areas at LANL at the direction of the New Mexico Environment Department and in compliance with a Compliance Order on Consent (Consent Order)[10]
- Continuation of waste disposal projects and programs, including the Waste Disposition Project at TA-54
- Occupancy and operation of RLUOB

With the exception of NNSA's 2004 decision to construct and operate RLUOB, the other projects and programs listed above were analyzed in the 2008 *LANL SWEIS*, and decisions were made to implement these actions in the 2008 and 2009 *LANL SWEIS* RODs. These actions are not connected to or dependent on the alternatives evaluated in this *CMRR-NF SEIS.*

NNSA may make new, additional decisions in the future on other actions analyzed in the *LANL SWEIS* and *Complex Transformation SPEIS*, such as the need for the construction of some additional replacement buildings to house ongoing LANL operations and to make modifications to facility operations at LANL. As appropriate, any such decision(s) would be announced in one or more new RODs, which would be published in the *Federal Register* and be made publicly available on the Internet. New NEPA documents appear on the DOE NEPA website at http://nepa.energy.gov/.

1.6 Other National Environmental Policy Act Documents

Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management (Stockpile Stewardship and Management PEIS) (DOE/EIS-0236). In September 1996, DOE issued the

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[10] *In March 2005, the New Mexico Environment Department, DOE, and the LANL management and operating contractor entered into a Compliance Order on Consent (Consent Order) (NMED 2005). The purposes of the Consent Order are (1) to define the nature and extent of releases of contaminants at, or from, LANL; (2) to identify and evaluate, where needed, alternatives for corrective measures to clean up contaminants in the environment and prevent or mitigate the migration of contaminants at, or from, LANL; and (3) to implement such corrective measures.*

Stockpile Stewardship and Management PEIS (DOE 1996a), which evaluated the potential environmental impacts resulting from activities associated with nuclear weapons research, design, development, and testing, as well as the assessment and certification of weapons' safety and reliability. The document analyzed the development of three new facilities to provide enhanced experimental capabilities. In the December 26, 1996, *Stockpile Stewardship and Management PEIS* ROD (61 FR 68014), DOE elected to downsize a number of weapons complex facilities, build the National Ignition Facility at Lawrence Livermore National Laboratory, and re-establish a pit fabrication capability at LANL. A supplement analysis (DOE/EIS-0236-SA) was prepared to examine the plausibility of a building-wide fire at the TA-55 Plutonium Facility and to examine new studies regarding seismic hazards at LANL. The supplement analysis concluded that there was no need to prepare an SEIS. The impacts of this decision were included in the baseline assessment and in the potential cumulative impacts resulting from the *CMRR EIS* proposed action. In addition, as identified in the *CMRR EIS* Notice of Intent (67 FR 48160), CMR capabilities at LANL supported the Stockpile Stewardship Program mission addressed in the *Stockpile Stewardship and Management PEIS*.

Environmental Assessment for the Proposed CMR Building Upgrades at the Los Alamos National Laboratory, Los Alamos, New Mexico (DOE/EA-1101). In February 1997, DOE issued this environmental assessment (DOE 1997a) that analyzed the effects that could be expected from performing various necessary extensive structural modifications and systems upgrades at the existing CMR Building. Changes to the CMR Building included structural modifications needed to meet then-current seismic criteria and building ventilation, communications, monitoring, and fire protection systems upgrades and improvements. A Finding of No Significant Impact was issued on the environmental assessment for the CMR Building Upgrades Project on February 11, 1997.

As mentioned in Section 1.2, these upgrades were intended to extend the useful life of the CMR Building for an additional 20 to 30 years. However, beginning in 1997 and continuing through 1998, a series of operational, safety, and seismic issues surfaced regarding the long-term viability of the CMR Building. In the course of considering these issues, DOE determined that the extensive upgrades originally planned for the CMR Building would be much more time-consuming than had been anticipated and would be only marginally effective in providing the operational risk reduction and program capabilities required to support NNSA mission assignments at LANL. As a result, DOE reduced the number of CMR Building upgrade projects to only those needed to ensure safe and reliable operations through at least the year 2010. CMR Building operations and capabilities are currently being restricted to ensure compliance with safety and security constraints. The CMR Building is not fully operational to the extent needed to meet DOE and NNSA requirements. In addition, continued support of NNSA's existing and evolving mission roles at LANL was anticipated to require additional capabilities, such as the ability to remediate large containment vessels.

Final Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico (CMRR EIS) (DOE/EIS-0350). Issued in 2003, the *CMRR EIS* (DOE 2003b) examined the potential environmental impacts associated with the proposed action of consolidating and relocating the mission-critical CMR capabilities from an aging building to a new modern building (or buildings). NNSA issued its decision to construct a two-building CMRR Facility adjacent to the Plutonium Facility Complex in TA-55 in the 2004 ROD (69 FR 6967). Design and construction of RLUOB has been completed, and that building is currently being outfitted for office occupancy in 2011 and radiological operations in 2013.

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 (CMRR SA) (DOE/EIS-0350-SA-01). Issued in 2005, the *CMRR SA* (DOE 2005a) was prepared to evaluate placement of the administrative and support building (now called RLUOB) for the CMRR Project in the same vicinity, but at locations other than those detailed in the *CMRR EIS* ROD. NNSA concluded that the environmental impacts of the proposed action were adequately bounded by the analyses of impacts presented in the 2003 *CMRR EIS*, and no SEIS was required. However, the RLUOB site location was later changed back to the location originally considered in the 2003 *CMRR EIS*, and the building site considered in the *CMRR SA* was used, as proposed and analyzed in the 2003 *CMRR EIS*, as a location for a permanent paved parking area and temporary construction trailers and other support functions.

Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico (2008 *LANL SWEIS*) (DOE/EIS-0380). In the 2008 *LANL SWEIS* (DOE 2008a), NNSA analyzed the potential environmental impacts associated with continued operation of LANL. The LANL SWEIS analyzed the environmental impacts of three alternatives for the level of operations: No Action, Reduced Operations, and Expanded Operations. Under the No Action Alternative, LANL would operate at the levels selected in the 1999 *LANL SWEIS* ROD and implement other LANL activities that had undergone NEPA analyses since 1999. The 2008 *LANL SWEIS* stated that construction of RLUOB had begun, but construction of the CMRR-NF would be delayed until NNSA had completed and issued certain programmatic NEPA analyses and decisions. Two support actions that would potentially support CMRR-NF construction and operation (installation of an electric power substation in TA-50 and removal and transport of about 150,000 cubic yards [115,000 cubic meters] of geologic material per year during construction from the CMRR-NF building site and other construction sites to other LANL locations for storage) were included in the 2008 *LANL SWEIS* environmental impact analyses. The first ROD for the 2008 *LANL SWEIS* was signed on September 19, 2008 (73 FR 55833), and a second ROD was signed on June 29, 2009 (74 FR 33232). Both RODs selected implementation of the No Action Alternative, which included construction and operation of the CMRR Facility as described in the No Action Alternative for this *CMRR-NF SEIS*, and the additional support activities analyzed under that alternative, as well as certain elements from the Expanded Operations Alternative, including seismic upgrades to the TA-55 Plutonium Facility.

Complex Transformation Supplemental Programmatic Environmental Impact Statement (Complex Transformation SPEIS) (DOE/EIS-0236-S4). The *Complex Transformation SPEIS* was issued on October 24, 2008 (DOE 2008c); it analyzed the environmental impacts of alternatives for transforming the nuclear weapons complex into a smaller, more-efficient enterprise that could respond to changing national security challenges and ensure the long-term safety, security, and reliability of the nuclear weapons stockpile. Programmatic alternatives considered in the *Complex Transformation SPEIS* specifically addressed facilities that use or store significant (that is, Security Category I/II) quantities of SNM. In the associated 2008 ROD (73 FR 77644) for the programmatic alternatives, NNSA announced its decision to transform the plutonium and uranium manufacturing aspects of the complex into smaller and more-efficient operations while maintaining the capabilities NNSA needs to perform its national security missions. The ROD also stated that manufacturing and research and development involving plutonium would remain at LANL. To support these activities, the *Complex Transformation SPEIS* ROD stated that NNSA would construct and operate the CMRR-NF at LANL as a replacement for portions of the CMR Building, a structure that is nearly 60 years old and faces significant safety and seismic challenges to its long-term operation.

1.7 Public Involvement

During the NEPA process, there are two opportunities for public involvement (see **Figure 1–4**). These opportunities include the scoping process and the public comment period. Although scoping is optional for an SEIS under DOE's NEPA implementing procedures (10 CFR 1021.314(d)), NNSA invited public participation in the scoping process and held two scoping meetings. A public comment period on the draft SEIS is required by 40 CFR 1503.1 and 10 CFR 1021.314(d). Section 1.7.1 summarizes the scoping process and the major comments received from the public. Section 1.7.2 summarizes the public comment process for the *Draft CMRR-NF SEIS* and the major comments received from the public.

1.7.1 Scoping Process

On October 1, 2010, NNSA published a Notice of Intent to prepare this *CMRR-NF SEIS* in the *Federal Register* (75 FR 60745) and on the DOE NEPA website. In this Notice of Intent, NNSA invited public comment on the *CMRR-NF SEIS* proposal. The Notice of Intent listed the issues initially identified by NNSA for evaluation in this *CMRR-NF SEIS*. Public citizens, civic leaders, and other interested parties were invited to comment on these issues and to suggest additional issues that should be considered in this *CMRR-NF SEIS*. The Notice of Intent informed the public that comments on the proposed action could be submitted via U.S. mail, e-mail, a toll-free phone line, a fax line, and in person at public meetings to be held in the vicinity of LANL. The public scoping period was originally scheduled to end on November 1, 2010. In response to public comments, NNSA extended the public scoping period through November 16, 2010 (75 FR 67711).

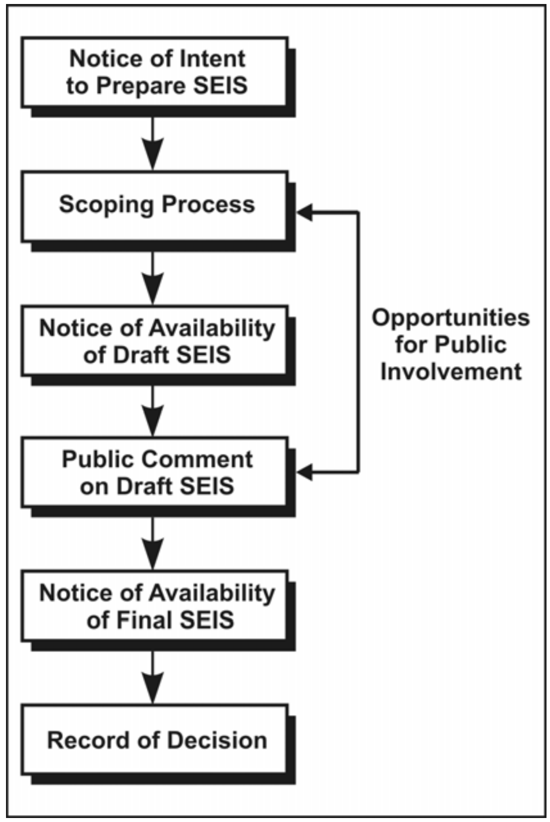

Figure 1–4 National Environmental Policy Act Process for this *CMRR-NF SEIS*

Public scoping meetings were held on October 19, 2010, in White Rock, New Mexico, and on October 20, 2010, in Pojoaque, New Mexico. NNSA representatives were available to respond to questions and comments on the NEPA process and the proposed scope of this *CMRR-NF SEIS*. Members of the public were encouraged to submit written comments, enter comments into a computer database, or record oral comments during the meetings, in addition to submitting comments via letters, the DOE website, or the fax line until the end of the scoping period. All comments were considered by NNSA in preparing this *CMRR-NF SEIS*.

For purposes of this NEPA document, a comment is defined as a single statement concerning a specific issue. An individual commentor's statement may contain several such comments. Most of the oral and written public statements submitted during the *CMRR-NF SEIS* scoping period contained multiple comments on various specific issues. These issues are summarized in the following paragraphs.

Summary of Major Scoping Comments

Approximately 85 comment statements or documents were received during the scoping process from citizens, interested groups, local officials, and representatives of Native American Pueblos in the vicinity of LANL. Where possible, comments on similar or related topics were grouped into common categories for the purpose of summarizing them. After the issues were identified, they were evaluated to determine whether they were relevant to this *CMRR-NF SEIS*. Issues found to be relevant to this SEIS are addressed in the appropriate chapters or appendices of this *CMRR-NF SEIS*.

Many comments were received regarding the type of document that NNSA should prepare, calling for a new EIS rather than an SEIS. Others called for a programmatic EIS, reopening the question of whether the CMRR-NF should be constructed at all and whether it should be constructed at another NNSA site. Similarly, a commentor called for a review of available space throughout the DOE complex (nationwide) for alternative locations for CMR operations. As indicated in Section 1.5, NNSA has determined that a supplement to the *CMRR EIS* is the appropriate level of analysis, based on CEQ and DOE NEPA regulations (40 CFR 1502.9c and 10 CFR 1021.341(a)-(b), respectively). NNSA is not planning to revisit the decisions regarding the need for the capabilities that would be housed in the proposed CMRR-NF or the decision to locate these capabilities at LANL, as decided in the 2008 *Complex Transformation SPEIS* ROD. There were comments about the alternatives and requests that the No Action Alternative analyze not constructing the CMRR-NF, constructing only a vault structure, or continuing use of the existing CMR Building for AC and MC operations. NNSA has determined that the No Action Alternative considered in this *CMRR-NF SEIS* is the Preferred Alternative that was selected by NNSA for implementation in the 2004 ROD based on the 2003 *CMRR EIS*, and the Continued Use of CMR Building Alternative in this *CMRR-NF SEIS* analyzes the continued use of the CMR Building. Others suggested that NNSA consider locating AC and MC operations in available space in other LANL facilities, such as the TA-55 Plutonium Facility or RLUOB, or building a separate vault that could be used in conjunction with existing LANL facilities so that the CMRR-NF would not be required. In response, RLUOB was not constructed to address the security and safety requirements of Hazard Category 2 or 3 levels of nuclear material. Thus, NNSA would not operate RLUOB as anything other than a radiological facility, which would significantly limit the total quantity of special nuclear material that could be handled in the building. As a result, AC and MC operations requiring Hazard Category 2 and 3 work spaces could not be carried out in RLUOB. Likewise, constructing only the vault structure would not meet NNSA's purpose and need for action to provide sufficient space to safely conduct mission-required AC and MC operations at LANL.

A commentor questioned the need for deep excavation below the poorly welded tuff layer. Since the issuance of the Notice of Intent in October 2010, NNSA has added an additional construction option to the Modified CMRR-NF Alternative. This *CMRR-NF SEIS* analyzes two construction options: Deep Excavation, which would involve excavation to a nominal depth of 130 feet (40 meters) below the ground surface and removal of the poorly welded tuff layer, and Shallow Excavation, which would involve less excavation (to a nominal depth of 58 feet [18 meters]) and constructing the Modified CMRR-NF above the elevation of the poorly welded tuff layer.

Other concerns identified by commentors were related to analyzing the impacts of waste generation, transportation of waste, traffic, and water usage. Additional areas of concern were jobs and DD&D of the CMR Building. NNSA addressed all of these topics in the *Draft CMRR-NF SEIS* and in this *Final CMRR-NF SEIS.*

1.7.2 Public Comments on the *Draft CMRR-NF SEIS*

NNSA prepared the *CMRR-NF SEIS* in accordance with NEPA and CEQ and DOE NEPA regulations (40 CFR Parts 1500 – 1508 and 10 CFR Part 1021, respectively). An important part of the NEPA process is solicitation of public comments on a draft EIS and consideration of those comments in preparing a final EIS. NNSA distributed copies of the *Draft CMRR-NF SEIS* to those organizations, government officials, and individuals who were known to have an interest in LANL, as well as those organizations and individuals who requested a copy. Copies also were made available on the Internet and in regional DOE public document reading rooms and public libraries.

On April 29, 2011, NNSA published a notice in the *Federal Register* (76 FR 24018), concurrent with the U.S. Environmental Protection Agency (EPA) Notice of Availability (76 FR 24021), announcing the availability of the *Draft CMRR-NF SEIS*, the duration of the comment period, the location and timing of the public hearings, and the various methods for submitting comments. NNSA announced a 45-day comment period, from April 29 to June 13, 2011, to provide time for interested parties to review the *Draft CMRR-NF SEIS.* In response to requests for additional review time, the comment period was extended by 15 days, through June 28, 2011, giving commentors a total review and comment period of 60 days (76 FR 28222). In addition, because of the Las Conchas wildfire, NNSA also accepted and responded to comments submitted after the June 28, 2011, deadline through July 31, 2011.

Three public hearings were scheduled at regional venues near LANL from May 24 through May 26, 2011 (Los Alamos, Española, and Santa Fe). In response to requests for additional public hearings, NNSA held a fourth public hearing in Albuquerque on May 23 (76 FR 28222), and provided informal meetings as requested. Newspaper advertisements related to the public hearings, including the Albuquerque hearing, began to run in local newspapers on May 8 and continued through May 19, 2011. NNSA representatives were available to respond to questions on the NEPA process and the *Draft CMRR-NF SEIS* at the hearings and informal meetings. A court reporter was present at each hearing to record the proceedings and prepare a transcript of the public comments. These transcripts are available on the *CMRR-NF SEIS* website at http://nnsa.energy.gov/nepa/cmrrseis. To facilitate participation from hearing attendees, NNSA provided a number of other ways to submit comments at each hearing: a court reporter to record individual comments, computers for entering comments into a computer database, a voice recorder to receive oral comments, and comment forms that could be received at the hearing or mailed by the commentor at a later date. For those unable to attend the hearings, NNSA indicated that comments could be submitted by U.S. mail, e-mail, a toll-free phone line, and a toll-free fax line.

The following is a summary of the comments received on the *Draft CMRR-NF SEIS*. All comments submitted to NNSA during the public comment period and late comments were considered in preparing this *Final CMRR-NF SEIS*. Comments determined not to be within the scope of the *CMRR-NF SEIS* are acknowledged as such in the Comment Response Document (CRD) (Volume 2 of this *Final CMRR-NF SEIS*). The remaining comments were reviewed and responded to by policy experts, subject matter experts, and NEPA specialists, as appropriate. The comment letters, including campaign letters, as well as the public hearing transcripts, are provided with NNSA responses in the CRD. The CRD is organized as follows:

- Section 1 describes the public comment process for the *Draft CMRR-NF SEIS*; the format used in the public hearings on the draft SEIS; the organization of the CRD and how to use the document; and the changes made by NNSA to this *Final CMRR-NF SEIS* in response to the public comments and recent developments that occurred since publication of the *Draft CMRR-NF SEIS*.

- Section 2 presents summaries of the major issues identified from the public comments received on the *Draft CMRR-NF SEIS* and NNSA's response to each issue.

- Section 3 presents a side-by-side display of all comments received by NNSA on the *Draft CMRR-NF SEIS* and NNSA's response to each comment.

- Section 4 contains the references cited in the CRD.

Summary of Comments on the *Draft CMRR-NF SEIS*

Commentors requested changes in the scope of the SEIS. A large number of commentors stated that NNSA should prepare an EIS that would address the need for the nuclear weapons mission or the need for the CMRR-NF. Other comments criticized the No Action Alternative, suggesting that it should analyze not constructing the CMRR-NF as selected in the 2004 *CMRR EIS* ROD. Commentors objected to the range of alternatives because two of the three alternatives would not meet NNSA's stated purpose and need. Others suggested different alternatives that NNSA should consider, including use of RLUOB, the TA-55 Plutonium Facility, or other onsite and offsite locations for AC and MC operations.

A number of commentors suggested that a capacity study or a "plutonium infrastructure" study should be conducted. Commentors made a variety of comments related to the need for and function of the CMRR-NF. Commentors stated directly or implied that the CMR Building, the proposed CMRR-NF, or both, were or would be used to manufacture plutonium pits or "triggers." Some commentors questioned the need for the CMRR-NF, indicating that a production rate of 20 pits per year supported by current facilities and the number of pits in storage should be sufficient. Commentors also questioned the need for pit production because pits are reported to have a greater than 100-year life. Other commentors asked what pit production rate the CMRR-NF was intended to support.

Many commentors expressed concerns and opinions about the geologic features of the LANL area in general and the proposed construction site specifically. In addition to concerns expressed regarding the nearness of a fault and the potential for a seismic event, it was also noted that the construction site lies over a layer of soft volcanic ash that could be compacted by the weight of the building.

Additionally, commentors expressed the fear that an accident similar to that which occurred recently in Japan at the Fukushima Daiichi Nuclear Power Plant could happen at LANL. Specific comments referenced other nuclear accidents, such as those at the Rocky Flats Plant, the Church Rock spill, and the accidents at Three Mile Island and Chernobyl. Many commentors expressed a desire to ensure that similar accidents would not occur at LANL by not building the proposed CMRR-NF or by shutting down other nuclear facilities at LANL. One commentor cited a recent report on volcanic activity in the LANL region. Due to the recent Las Conchas fire of June 2011, commentors were concerned about the impact of wildfires on the CMRR-NF.

Commentors expressed concerns that the Compliance Order on Consent (Consent Order) signed with the State of New Mexico would not be honored if a new nuclear facility were constructed at LANL. Specifically, commentors were doubtful that the cleanup of the Material Disposal Area G in TA-54 would be implemented by December 31, 2015, as required by the Consent Order. Commentors also expressed a desire that funds should be spent on cleanup activities at LANL rather than on a new nuclear facility.

Commentors did not agree with the results of the environmental justice analysis. The U.S. Environmental Protection Agency (EPA) suggested that the analysis be revised to specifically address minority and low-income populations within 5-, 10-, and 20-mile (18-, 16-, and 32-kilometer) distances of the CMRR-NF site.

As with the individual comments, responses to these major topics are included in Volume 2, CRD, of this *CMRR-NF SEIS*. In preparing this *Final CMRR-NF SEIS*, NNSA incorporated changes in response to the comments and more recent information, as discussed in the following section.

1.8 Changes from the *Draft CMRR-NF SEIS*

In preparing the *Final CMRR-NF SEIS,* NNSA made revisions in response to comments received from other Federal agencies, state and local government entities, Native American tribal governments, and the public. In addition, the *Final CMRR-NF SEIS* was changed to provide additional environmental baseline information, include additional analyses, correct inaccuracies, make editorial corrections, and clarify text. The following summarizes the more important changes made in the *Final CMRR-NF SEIS*.

Chapter 1, "Introduction and Purpose and Need for Agency Action," was updated to discuss the reason why the design of the CMRR-NF needed to be modified and how this change resulted in the need to develop an SEIS. Section 1.7, Public Involvement, was modified to summarize the comments received during the scoping period and to include information related to the public comment period and public hearings on the *Draft CMRR-NF SEIS*. Section 1.8, Changes from the *Draft CMRR-NF SEIS*, was added to summarize the changes that have been made. Section 1.9, Organization of this *CMRR-NF SEIS*, was modified to include a paragraph on the addition of the CRD as Volume 2 of this *Final CMRR-NF SEIS*.

Chapter 2, "Project Description and Alternatives," was updated to include additional project-related information. Section 2.4, Proposed Chemistry and Metallurgy Research Building Replacement Project Capabilities, was updated to include additional information on the AC and MC capabilities that would be present in the proposed facility. Section 2.6.2, Modified CMRR-NF Alternative, was updated to include additional information on the evolution of the Deep and Shallow Construction Options and to add propane to the construction requirements associated with this alternative. Propane would be used to heat the building during the winter months for 3 to 6 years. The addition of propane use resulted in small changes in the air quality and greenhouse gas impacts for this alternative, as shown in Chapter 4, Section 4.3.4, Air Quality and Noise, as well as changes in Section 4.3.3, Infrastructure. Information was added in Section 2.6.2 regarding the weight of the proposed CMRR-NF and the ability of the ground beneath the proposed facility to support this weight. A bus parking lot that would be constructed on the boundary of TA-48/55 was also added to this alternative to provide room for buses from the proposed construction workers parking lot in TA-72 to remain near the proposed construction site. This change resulted in a small increase in land use for this alternative, as discussed in Section 4.3.2, Land Use and Visual Resources. The description of potential power upgrades associated with this alternative was modified to indicate that the potential power upgrades from TA-5 to TA-55 to support the Modified CMRR-NF could be temporary or permanent, depending on future power requirements. This does not change the amount of land that may be affected, but could change the impacts from temporary to permanent, as indicated in Section 4.3.2. Section 2.7, Alternatives Considered and Dismissed, was revised to describe in more detail the alternatives that NNSA considered and determined not to be reasonable for meeting the purpose and need for continuing CMR operations into the future. Section 2.7.4 was added to describe other alternatives and proposals considered and to explain why they were not analyzed further in this *CMRR-NF SEIS*. Section 2.10, Summary of Environmental Consequences, was modified to show how the environmental impacts associated with the Modified CMRR-NF Alternative and Continued Use of CMR Building Alternative have changed as a result of the changes discussed in Chapter 4. These changes are all relatively small and do not significantly change any of the environmental consequences presented in the *Draft CMRR-NF SEIS*. Section 2.10 has also been modified to include a summary of the intentional destructive acts sections of Chapter 4 (Sections 4.2.10.3, 4.3.10.3, and 4.4.10.3).

Chapter 3, Affected Environment, was updated in a number of sections. Information was updated in this *Final CMRR-NF SEIS* to reflect the most recent environmental data from the 2009 *SWEIS Yearbook* (LANL 2011b). Information was included in Sections 3.2, Land Use and Visual Resources, and 3.7, Ecological Resources, on the Las Conchas wildfire. None of this information affects the impacts analyses presented in Chapter 4. Section 3.3 was updated to include new estimates of the amount of electricity available to LANL and Los Alamos County. The amount of peak power was reduced from 150 megawatts to 140 megawatts, reflecting the unavailability of two steam-driven turbine generators in TA-3 and increased power available from the Abiquiu Turbine Hydropower Project. These changes resulted in a change in the estimated amount of available electricity and are reflected in changes in the infrastructure sections in Chapter 4, Sections 4.3.3 and 4.4.3, for the Modified CMRR-NF Alternative and Continued Use of CMR Building Alternative, respectively, as well as in Section 4.6, Cumulative Impacts. The availability of electricity continues to cover expected requirements under any of the alternatives. However, peak demand could theoretically exceed available power under the Modified CMRR-NF Alternative, as discussed in the draft SEIS, but this is not expected to occur because actual LANL peak demand has consistently been lower than the estimate included in the 2008 *LANL SWEIS* and used in future forecasts. Additional information was included in the *Final CMRR-NF SEIS* to better describe the seismic studies and information developed for the proposed CMRR-NF site and LANL. This information is included in Chapter 3, Section 3.5, Geology and Soils, and includes information from the 2009 update (LANL 2009b) to the 2007 probabilistic seismic hazards analysis (LANL 2007a). An error in the reported vertical peak ground acceleration at LANL (0.3 *g*) was corrected to 0.6 *g*. This typographical error in the Executive Summary of the source document (LANL 2007a) is not reflective of information presented elsewhere in the probabilistic seismic hazard analysis and was not used in the design of the proposed Modified CMRR-NF. The 2009 update changed the peak horizontal and vertical ground accelerations for the proposed CMRR-NF site in TA-55. The updated factors were lower than the factors included in the 2007 analysis (0.47 *g* compared to 0.52 *g* for peak horizontal ground acceleration and 0.51 *g* compared to 0.6 *g* for peak vertical ground acceleration). The updated values were factored into the design of the proposed Modified CMRR-NF, as described in the *Draft CMRR-NF SEIS*, and do not change any of the analyses presented in this *Final CMRR-NF SEIS*. (This updated information was not available for unlimited public distribution when the *Draft CMRR-NF SEIS* was issued.) Information was included in Section 3.5, Geology and Soils, describing the volcanic history in the region. This information is factored into a revised discussion of potential accidents included in Appendix C. Section 3.9, Socioeconomics, was updated to include the latest information from the 2010 census on the region of influence and to show later unemployment data for the region. These changes did not result in any significant changes to the socioeconomics impacts sections in Chapter 4.

The 2010 census data were used to update the population projections to 2030 for total population, minority populations, and low-income population. As a result of slower than previously projected growth through 2010, the 2030 population projection for the 50-mile (80-kilometer) radius area surrounding TA-55 was reduced from about 545,000 to 511,000, and for the area surrounding TA-3, from about 536,000 to 502,000. Chapter 3, Section 3.10, Environmental Justice, was updated to include changes as a result of 2010 census data and to break the information down to smaller areas for evaluation (5-, 10-, and 20-mile [8-, 16-, and 32-kilometer] radii) in addition to the area within 50 miles (80 kilometers) of TA-55 and TA-3, as requested by EPA. The distribution of the population over the 50-mile (80-kilometer) radius was also updated using the latest census data, and more refined data were used (block data versus block group data; see Appendix B) to estimate the population within 10 miles (16 kilometers) of TA-55 and TA-3. As a result, more people are located closer to LANL (within 5 miles [8 kilometers]) than previously projected. The updated population projections and distributions were used to re-estimate the human health impacts associated with the No Action Alternative (2004 CMRR-NF) (Chapter 4, Section 4.2.10.2, for accidents); the Modified CMRR-NF Alternative (Section 4.3.10); and the Continued Use of CMR Building Alternative (Section 4.4.10), as well as the environmental justice analysis presented in Sections 4.3.11 and 4.4.11. The projected population doses from normal operations and the population accident doses changed slightly as a result of these changes, but not to the extent that the assessment from the draft SEIS would change. Similarly, the doses included in the environmental justice analysis changed, but not significantly. Additional information was included in Chapter 3, Section 3.11, Human Health, on historical health effects studies that have been done on the area surrounding LANL. This information is presented for background and does not affect any of the impacts analyses presented in Chapter 4.

In addition to the updates to Chapter 4 discussed above, other changes have been made to Chapter 4 since the *Draft CMRR-NF SEIS* was issued. Information has been added in Section 4.2.10.2 on the accident analysis that was performed for this *CMRR-NF SEIS*, as presented in Appendix C, as well as the changes in the accident analysis since the *Draft CMRR-NF SEIS* was issued. These changes do not significantly change the results, with the exception of significantly higher doses to the maximally exposed individual (MEI) and noninvolved worker under the seismically induced spill and fire accident at the CMRR-NF. In this *Final CMRR-NF SEIS*, this accident assumes that the earthquake initiates a radioactive material spill that is followed shortly thereafter by a fire, instead of both accidents occurring simultaneously, as was assumed in the *Draft CMRR-NF SEIS*. This change in assumptions results in a larger dose to the MEI and noninvolved worker because the radioactive materials associated with the assumed spill are not immediately lofted by the fire, which would lessen doses to persons close to the accident site. Additional discussion also was added to the accident analysis section for the Modified CMRR-NF Alternative

(Section 4.3.10.2) regarding the potential for a wildfire affecting the facility and the effects of a seismic event that damages the Modified CMRR-NF and other plutonium facilities in TA-55.

A special pathways consumer analysis was added to the environmental justice sections in Chapter 4, Sections 4.3.11 and 4.4.11, to show the potential impacts of the alternatives on individuals who may subsist on fish and wildlife caught within the vicinity of LANL. This analysis shows that special pathway consumers would not be exposed to significant risks as a result of implementing either of these alternatives. Section 4.6, Cumulative Impacts, was updated to account for newly acquired information about other projects in the vicinity of LANL, but these projects do not change the impacts discussions presented in this section.

Appendix B was updated to include a revised Section B.3, Air Quality, which factors in the requirement for propane use during construction at the Modified CMRR-NF and a revised number of emergency backup generators associated with the proposed CMRR Facility. Section B.5, Geology and Soils, was modified to eliminate Table B–9, which was related to the Modified Mercalli Intensity Scale. The Modified Mercalli Intensity Scale is not considered in the design of buildings. The design of the CMRR-NF is influenced by peak ground acceleration factors, as discussed in Chapter 3, Section 3.5. Section B.10, Environmental Justice, was modified to include a discussion of changes related to the use of 2010 census data in projecting the affected population to the year 2030, as well as an evaluation of a special pathways receptor.

Appendix C, Evaluation of Human Health Impacts from Facility Accidents, was updated to include a discussion of the Fukushima Daiichi Nuclear Power Plant accident (Section C.9) and wildfires and volcanic activity in the LANL vicinity (Section C.4.1) as they relate to the proposed action in this *CMRR-NF SEIS*. Section C.6 was added to discuss the potential for offsite land contamination in the event of a severe earthquake that results in the release of radioactive materials. Appendix C was also updated to include a discussion of the impact of a severe earthquake on the multiple plutonium facilities in TA-55 should the CMRR-NF be built there (Section C.7). In the event of such an earthquake, it is expected that the consequences would be dominated by releases from the TA-55 Plutonium Facility, which is currently being upgraded to address seismic concerns.

The population consequences and risks shown in Appendix C have been re-estimated using the latest population projections and distributions, as discussed above. The estimated consequences for some accidents have changed as a result of these changes, but the risks associated with these accidents are not significantly different from those presented in the *Draft CMRR-NF SEIS*. The accident with the largest changes is the seismically induced spill, followed by a fire accident scenario for the CMRR-NF that was changed, as discussed above. This accident scenario was changed from that presented in the *Draft CMRR-NF SEIS* to reflect changes in the understanding of how it would progress and to present a more conservative accident scenario with respect to doses to the MEI and noninvolved worker.

1.9 Organization of this *CMRR-NF SEIS*

This *CMRR-NF SEIS* consists of Chapters 1 through 10 and Appendices A through D. The CMRR-NF alternatives are described in Chapter 2, which also includes a comparison of potential impacts under each of the alternatives. In Chapter 3, the LANL environment is described in terms of resource areas to establish the baseline for the impact analysis. Chapter 4 provides descriptions of the potential impacts of the alternatives on the resource areas. Chapter 4 also includes discussions of DD&D, cumulative impacts, irreversible and irretrievable commitments of resources, the relationship between short-term uses of the environment and long-term productivity, and mitigation. Chapter 5 provides a description of the environmental, health, and safety compliance requirements governing implementation of the alternatives, including permits and consultations. Chapters 6, 7, 8, 9, and 10 are the glossary of terms, the list of references, the list of preparers, the *CMRR-NF SEIS* distribution list, and the index, respectively.

Appendices A, B, C, and D are the list of applicable *Federal Register* notices, the methodologies to assess impacts on environmental resource areas, evaluation of human health impacts from facility accidents, and the contractor disclosure statement, respectively.

Volume 2 is the CRD for this *CMRR-NF SEIS.* Section 1 of Volume 2 provides an overview of the *Draft CMRR-NF SEIS* public comment process. Section 2 identifies the major topics from the public comments and NNSA responses. Section 3 shows the public comment documents with the individual comments delineated and corresponding NNSA responses in a side-by side format. Section 4 presents the references for Volume 2.

CHAPTER 2
PROJECT DESCRIPTION AND ALTERNATIVES

2 PROJECT DESCRIPTION AND ALTERNATIVES

Chapter 2 begins with a summary description of the current and future support that the Los Alamos National Laboratory analytical chemistry (AC) and materials characterization (MC) capabilities are providing to the Stockpile Stewardship Program. It provides descriptions of the existing Chemistry and Metallurgy Research Building and current AC and MC capabilities, as well as the proposed new Chemistry and Metallurgy Research Building Replacement Nuclear Facility Project. This chapter includes a description of the reasonable alternatives, the alternatives considered and subsequently eliminated from detailed evaluation, and the planning assumptions and bases for the analyses presented in this *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 (CMRR-NF SEIS)*; identifies the National Nuclear Security Administration's Preferred Alternative; and presents a comparison of the impacts of the three alternatives addressed in this *CMRR-NF SEIS*.

2.1 Current and Future Support of Stockpile Stewardship

Los Alamos National Laboratory (LANL) has been assigned a variety of science, research and development, and production missions that are critical to the accomplishment of the U.S. Department of Energy (DOE) National Nuclear Security Administration (NNSA) national security objectives, as reflected in the *Programmatic Environmental Impact Statement for Stockpile Stewardship and Management (SSM PEIS)* (DOE 1996a) and its associated Record of Decision (ROD), which was published in the *Federal Register* (FR) on December 26, 1996 (61 FR 68014), and the *Complex Transformation Supplemental Programmatic Environmental Impact Statement (Complex Transformation SPEIS)* (DOE 2008c) and its associated RODs, which were published in the *Federal Register* on December 19, 2008 (73 FR 77644; 73 FR 77656). Specific LANL assignments for the foreseeable future include production of weapons components, assessment and certification of the nuclear weapons stockpile, surveillance of weapons components and weapons systems, ensuring safe and secure storage of strategic materials, and management of excess plutonium inventories. In addition, LANL supports actinide[1] science missions ranging from the plutonium-238 heat-source program for the National Aeronautics and Space Administration to arms control and technology development.

Special nuclear material (SNM) is a category of material subject to regulation under the Atomic Energy Act, consisting primarily of fissile materials. It is defined to mean plutonium, uranium-233, uranium enriched in the isotopes of uranium-233 or -235, and any other material that the U.S. Nuclear Regulatory Commission determines to be SNM, but it does not include source material.

The capabilities needed to execute the NNSA and DOE missions require facilities at LANL that can be used to handle actinide metals and other radioactive materials in a safe and secure manner. Of primary importance are the facilities located within Technical Area 3 (TA-3) (primarily the Chemistry and Metallurgy Research [CMR] Building) and TA-55 (the Plutonium Facility) that are used for processing, characterizing, and storing large quantities of special nuclear material (SNM). The operations in these two facilities, along with those in several support facilities, are critical to the Stockpile Stewardship Program and to critical programs supporting the DOE Offices of Science; Environmental Management; Nonproliferation and National Security; and Nuclear Energy, Science, and Technology.

[1] *"Actinide" refers to any member of the group of elements with atomic numbers from 89 (actinium) to 103 (lawrencium), including uranium and plutonium. All members of this group are radioactive.*

In January 1999, NNSA approved a strategy for managing operational risks at the CMR Building. This strategy recognized that the 60-year-old CMR Building could not continue its mission support at an acceptable level of risk to public and worker health and safety without operational restrictions. The strategy also committed NNSA and its operating contractor to manage the facility to a planned end-of-life in or about the year 2010. In addition, it committed NNSA and its operating contractor to develop long-term facility and site plans to relocate CMR capabilities elsewhere in LANL as necessary to maintain support of national security missions into the future. Since this strategy was approved, CMR capabilities have been restricted substantially, both by planned NNSA actions and by unplanned facility outages, including the shutdown of operations within three of the eight wings of the CMR Building. As time passes, additional CMR operations and capabilities are being restricted due to safety and security constraints. For example, the Security Category I SNM storage vault at the CMR Building has been reclassified to a Security Category III/IV storage vault, which limits material inventories. It is apparent that action is required to ensure that LANL can maintain its support of critical national security missions. The Chemistry and Metallurgy Research Building Replacement Nuclear Facility (CMRR-NF) Project seeks to ensure long-term support of NNSA Stockpile Stewardship Program strategic objectives; these capabilities are necessary to support the current and future directed stockpile work and campaign activities at LANL.

2.2 Description of the Existing Chemistry and Metallurgy Research Building

2.2.1 Overview

The CMR Building (Building 3-29) was designed and built within TA-3 as an actinide chemistry and metallurgy research facility (see **Figure 2–1**). The main corridor, with seven wings (Wings 1, 2, 3, 4, 5, 7, and an Administration Wing), was constructed between 1949 and 1952. In 1960, a new wing (Wing 9) was added for activities that must be performed in hot cells (enclosed, shielded areas that safely facilitate the remote manipulation of radioactive materials). The planned Wings 6 and 8 were never constructed. In 1986, an SNM storage vault was added underground. The three-story CMR Building now has eight wings connected by a spinal corridor and contains a total of 550,000 square feet (51,000 square meters) of space. It is a multiple-user facility in which specific wings are associated with different activities. In the past, the CMR Building provided full capabilities for performing SNM analytical chemistry (AC) and materials characterization (MC). The broad spectrum of MC work once performed in Wing 2 of the CMR Building has been suspended or relocated as a result of restrictions on the quantity of SNM allowed in the building. Now only a limited set of MC work is performed in Wings 5 and 7. Pit production does not take place at the CMR Building.

Waste management conducted within the CMR Building is designed to meet waste acceptance criteria for onsite or offsite waste management and disposal facilities. The aqueous waste from radioactive activities and other nonhazardous aqueous chemical wastes from the CMR Building are discharged from each wing into a network of drains specifically designated to transport waste solutions to the existing Radioactive Liquid Waste Treatment Facility (RLWTF) in TA-50 for treatment and disposal. The primary sources of radioactive liquid waste at the CMR Building are laboratory sinks, duct washdown systems, and overflows and blowdowns from circulating chilled water systems.

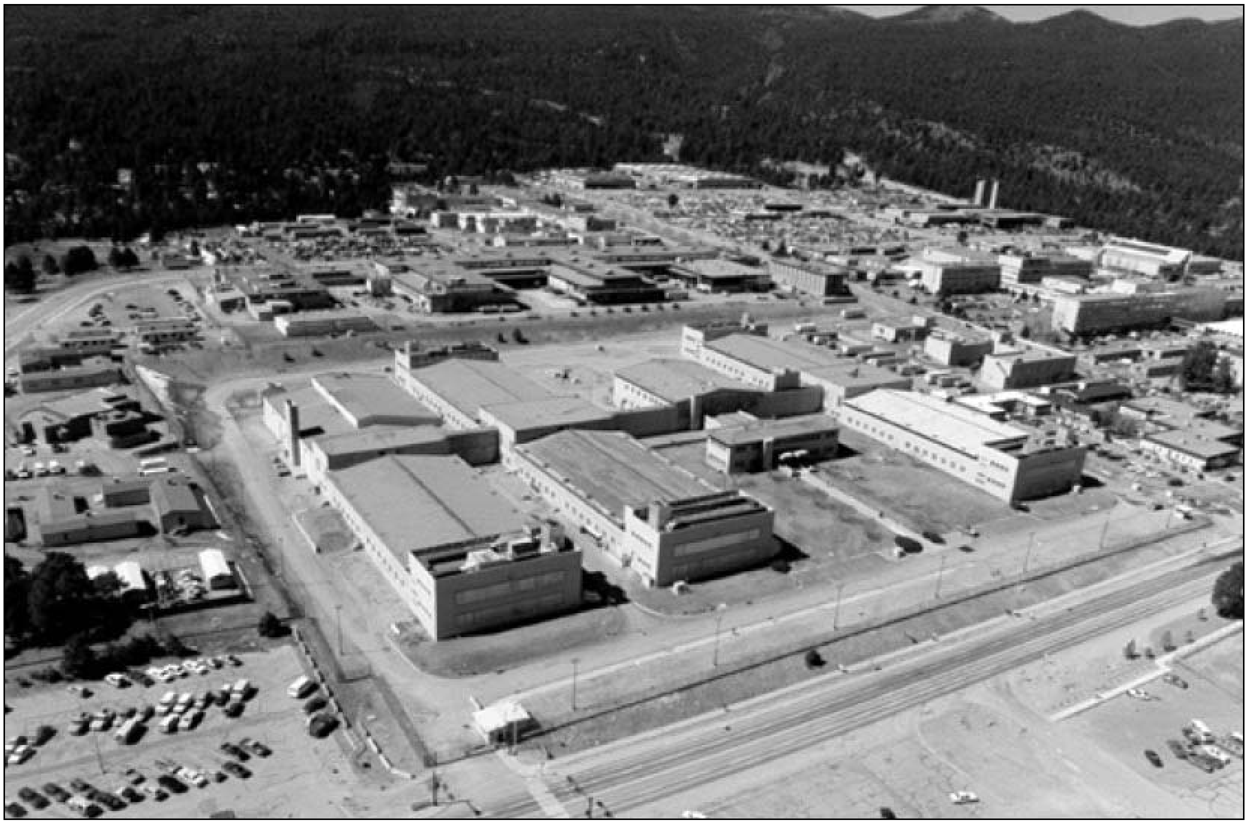

Figure 2–1 Existing Chemistry and Metallurgy Research Building

The CMR Building infrastructure was designed with air, temperature, and power systems that are operational nearly 100 percent of the time. Short-term backup power is provided for these systems by an uninterruptible power supply; longer-term backup power is provided by the TA-3 Power Plant.

The CMR Building was constructed between 1949 and 1952 to the building code standards in effect at that time. Over the intervening years, DOE has systematically identified and corrected some deficiencies and upgraded some systems to address changes in standards or to improve safety performance. However, over time, the effects of facility aging, combined with changes to safety codes, standards, and requirements, have resulted in a situation in which the building cannot be safely operated for mission support work without restrictions on the types and levels of activities and limits on material inventories. Although completed upgrades to the CMR Building allow for continued safe nuclear operations at an acceptable level of risk, it cannot be relied upon to meet mission support requirements for 50 years into the future. Major upgrades to building structural and safety systems would be required to sustain nuclear operations of the type and at the levels required to meet all DOE and NNSA mission support work requirements. Furthermore, geologic studies and seismic investigations completed at LANL from 1996 through 1998 and supplemented by a 2007 probabilistic seismic hazard analysis (LANL 2007a) identified possible connections between several faults in the surrounding area that could increase the likelihood of fault rupture in TA-3 and beneath the CMR Building that would result in an unacceptable level of damage and potentially destroy the building in the event of a severe earthquake. Upgrades to the structure of the CMR Building to address these concerns and meet the latest seismic code requirements so that the building could be operated as needed to fully support the building's identified mission were recognized as being physically very complicated and difficult to the point of being almost impossible to address without tearing down several wings of the existing structure and rebuilding them from the basements up.

The CMR Building was originally designated as a Hazard Category 2, Security Category II nuclear facility under the criteria contained in DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance With DOE Order 5480.23, Nuclear Safety Analysis Reports*; and DOE Order 474.2, *Nuclear Material Control and Accountability*. The security category designation of a facility is determined by the type, quantity, and attractiveness level (that is, how readily the material could be converted into a nuclear explosive device) of the material of concern. A Hazard Category 2 facility is defined as a nuclear facility for which a hazard analysis shows the potential for significant onsite consequences. As noted previously, NNSA and its operating contractor have restricted CMR Building operations and have reduced SNM quantities allowed within the building. The CMR Building is currently operated as a Hazard Category 2, Security Category III nuclear facility.

2.2.2 Administrative Wing and Wing 1

The Administrative Wing and Wing 1 consist of individual office spaces, passageways, and conference rooms on three floors (see **Figure 2–2**). Access to the CMR Building is through these wings and is controlled. The CMR Building Operations Center, housed in the Administration Wing, monitors all important system parameters.

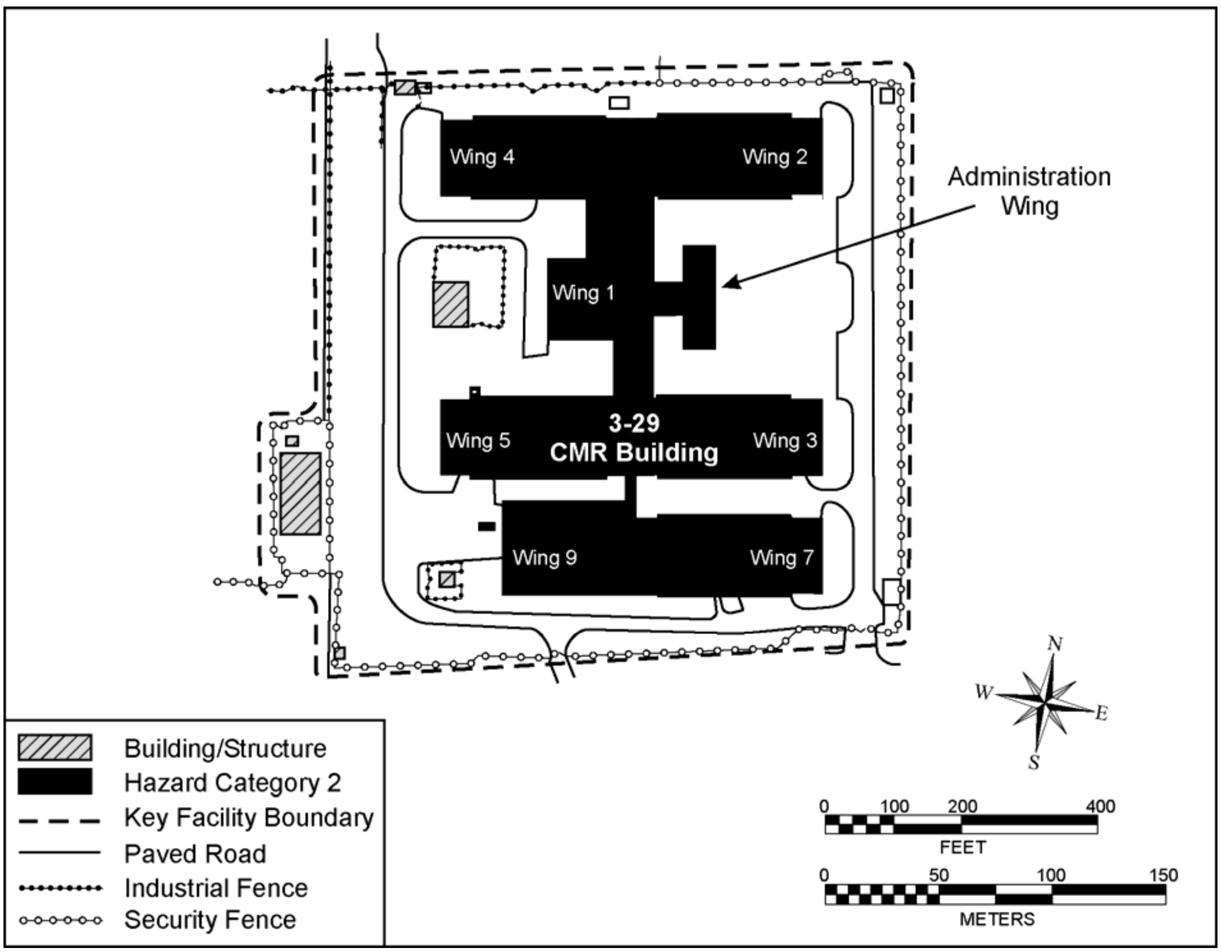

Figure 2–2 Chemistry and Metallurgy Research Building Schematic

2.2.3 Laboratories (Wings 2, 3, 4, 5, and 7)

Each CMR Building wing consists of a basement and a first and second floor. Laboratory Wings 2, 3, 4, 5, and 7 consist of laboratory modules, passageways, office space, change rooms, and electrical and ventilation equipment rooms separated by interior walls. Change rooms are located at the first floor entrance to each wing. Radiological laboratory modules are located in the center of the first floor of the associated wing. Office spaces are typically located outside the laboratory modules, separated by passageways. Filter towers, which contain ventilation and electrical equipment rooms, are located at the end of each wing, opposite the spinal corridor. A large ventilation equipment room is located on the second floor of each wing, adjoining the spinal corridor. Radiological laboratories contain gloveboxes (enclosed stainless steel or painted metal boxes with protective gloves that facilitate the safe handling of hazardous materials) and hoods required for individual processes. A radioactive liquid waste drainline system routes liquid waste from CMR Building laboratories to the existing RLWTF in TA-50. Wings 5 and 7 are currently being operated at reduced levels due to safety and seismic concerns (that is, radiological safety in the event of an earthquake that would cause structural damage to the building). Wings 2 and 3 are shut down to minimize risks related to seismic concerns and are currently undergoing hazard reduction activities. Hazard reduction activities include removal of laboratory hoods, cabinets, and miscellaneous equipment with the goal of reducing the wing inventory to less than 200 plutonium-239-equivalent grams; it does not include removal of gloveboxes or equipment and ventilation systems connected to gloveboxes. Hazard reduction in Wing 4 has been completed. There is no active decontamination or decommissioning work being done at the CMR Building.

2.2.4 Hot Cells (Wing 9)

Wing 9 consists of office spaces, change rooms, hydraulic plant spaces, laboratories, hot cells, and associated operating areas, a radioactive material transfer area, a machine shop, and floor well storage. Typically, utility service sources are located in the attic, with service piping or conduit dropping down to the serviced spaces.

Hot cell operations include transfer of materials between the high-bay area and the hot cell corridors; loading and unloading of radioactive materials or sources from shipping or storage casks; unpackaging and packaging of radioactive materials, sources, or wastes; inspections; remote machining operations; remote welding operations; remote sample preparation; chemical processing; mechanical testing; or any similar remote-handling operation. These operations also include maintenance and setup activities associated with the hot cells and corridors.

2.3 Chemistry and Metallurgy Research Capabilities

The operational CMR capabilities at LANL involve work with both radioactive and nonradioactive substances. Work involving radioactive material (including uranium-235, depleted uranium, thorium-232, plutonium-238, plutonium-239, and americium-241) is performed inside specialized ventilation hoods, hot cells, and gloveboxes. Chemicals such as various acids, bases, and organic compounds are used in small quantities, generally in preparation of radioactive materials for processing or analysis.

The 1999 *Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE 1999a) described ongoing CMR Building capabilities at the time it was issued. This description was updated in the *Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico* (*CMRR EIS*) (DOE 2003b) and the 2008 *Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (2008 *LANL SWEIS*) (DOE 2008a). Some of the capabilities described in these documents are no longer performed at the CMR Building. The principal capabilities currently performed at the CMR Building are described in the following paragraphs.

2.3.1 Analytical Chemistry and Materials Characterization

AC capabilities involve the study, evaluation, and analysis of radioactive materials. In general terms, AC is that branch of chemistry that deals with the separation, identification, and determination of the components in a sample. 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 research and development associated with various nuclear materials programs, many of which are performed at other LANL locations on behalf of or in support of other sites across the DOE complex (such as Lawrence Livermore National Laboratory, the Savannah River Site, and Sandia National Laboratories).

Examples of sample characterization activities include assay and determination of isotopic ratios of plutonium, uranium, and other radioactive elements and 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. A full suite of MC capabilities was previously performed in the CMR Building, but now only a small subset of those activities is performed in Wings 5 and 7. If the decision is made to construct a new CMRR-NF, the full suite of MC capabilities would be re-established.

2.3.2 Destructive and Nondestructive Analysis

Destructive and nondestructive analysis employs AC; metallographic analysis; measurement on the basis of alpha, neutron, or gamma radiation from an item; and other measurement techniques. These activities are used in support of product quality for weapons and nuclear fuels programs, component surveillance, nuclear materials control and accountability, SNM standards development, research and development, environmental restoration, and waste treatment and disposal.

2.3.3 Actinide Research and Processing

Actinide research and processing at the CMR Building typically involve small quantities of solid and aqueous solutions. However, any research involving highly radioactive materials or remote handling may use the hot cells in Wing 9 of the CMR Building to minimize personnel exposure to radiation or other hazardous materials. CMR actinide research and processing may include separation of medical isotopes from targets, research and development of nuclear fuel, processing of neutron sources, and research into the characteristics of materials, including the behavior or characteristics of materials in extreme environments, such as high temperature or pressure.

2.4 Proposed Chemistry and Metallurgy Research Building Replacement Project Capabilities

This section presents the portion of the operational capabilities proposed to be included within the CMRR-NF and identifies those capabilities that have been housed within the CMR Building that are not planned to carry over into the CMRR-NF. Conversely, if the Continued Use of CMR Building Alternative is selected for implementation, these operational capabilities would be subject to progressive limitations based on the suitability of the structure to continue to safely shelter them, new programmatic decisions, and DOE and NNSA mission support needs. Pit production does not take place at the CMR Building and would not take place in the CMRR-NF.

2.4.1 Analytical Chemistry and Materials Characterization Capabilities

These capabilities include the facility space and equipment needed to support nuclear operations, spectroscopic and analytical instrumentation, nonnuclear space and offices, and nonnuclear laboratory space for staging and testing equipment and experimental work with stable (nonradioactive) materials. Most of these capabilities are found at the CMR Building, although a subset of AC and MC capabilities reside in other locations at LANL. This project element includes relocating all mission-essential CMR Building AC and MC capabilities and consolidating other AC and MC capabilities at LANL in the CMRR-NF, where possible, to provide efficient and effective mission support.

AC capabilities at LANL provide the definitive analysis for the references and standards of SNM. They are the reference methods for secondary or field measurements and are used to prepare and certify calibration standards. The national security applications include nondestructive and destructive analysis, standards for international and domestic safeguards measurements, and working reference standards for nuclear forensics and detection in the field.

LANL represents and maintains state-of-the-art MC capabilities. MC includes a variety of sample preparation and characterization methods to evaluate the microstructures and properties of SNM, including plutonium and uranium metal and oxides and mixed-oxide and nitride nuclear fuels. These capabilities are used to develop novel techniques for SNM preparation and characterization; design and execute plutonium alloy castings; investigate plutonium alloy aging effects on material properties; and provide experimental data that are used to validate process and performance models.

LANL is the only site in the United States that can support various plutonium-related national security programs because it maintains both the equipment and facilities to execute such programs and the comprehensive supporting capabilities, including AC and MC, and technical expertise. The Modified CMRR-NF would have the key facility infrastructure, gloveboxes, hoods, and analytical instrumentation for handling and analyzing SNM safely, and continuing to provide these capabilities requires material storage vault space.

At the present time, a set of MC capabilities is provided within the TA-55 Plutonium Facility to (1) streamline material processes associated with pit fabrication and pit surveillance programs and (2) minimize security costs and lost time associated with shipping large SNM items to the CMR Building from the TA-55 Plutonium Facility. An appropriate amount of space and equipment for the purpose of relocating stockpile stewardship AC and MC research capabilities within the TA-55 Plutonium Facility to the new CMRR-NF would be provided as part of the proposed action. These capabilities would be sized consistent with mission capacity requirements.

2.4.2 Special Nuclear Material Storage Capability

A SNM storage capability for 6,000 kilograms of plutonium-239-equivalent would be provided at CMRR-NF. The CMRR-NF storage capability would be designed to replace the storage vault at the CMR Building. The SNM storage requirements would be developed in conjunction with, and would be integrated into, a long-term LANL SNM storage strategy.

2.4.3 Nuclear Materials Operational Capabilities and Space for non–Los Alamos National Laboratory Users

This operational capability would provide research laboratory space for non-LANL users. Research laboratory space within the CMRR-NF would be used by other NNSA nuclear sites to support LANL missions related to defense programs.

2.4.4 Existing Chemistry and Metallurgy Research Capabilities and Activities Not Proposed for Inclusion within the New Chemistry and Metallurgy Research Building Replacement Nuclear Facility Project

Not all capabilities either previously or currently performed within the existing CMR Building at LANL would be transferred to the new CMRR Facility. Such capabilities include the Wing 9 hot cell operations, medical isotope production, uranium production and surveillance activities, nonproliferation training, and other capabilities that are available at DOE or NNSA sites other than LANL. These capabilities could cease to exist at LANL when the CMR Building becomes nonoperational.

2.5 Description of Actions Taken to Date Related to the Chemistry and Metallurgy Research Building Replacement Project

As envisioned in the 2004 ROD associated with the 2003 *CMRR EIS*, an administrative and support function building, now referred to as the Radiological Laboratory/Utility/Office Building (RLUOB), has been constructed in the southeastern corner of TA-55 (see **Figure 2–3**). The RLUOB equipment installation phase is under way, and the building is scheduled to be occupied by workers beginning in October 2011. The operation of RLUOB would be consistent across all three of the alternatives analyzed in this *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 (CMRR-NF SEIS).*

Figure 2–3 Radiological Laboratory/Utility/Office Building in Technical Area 55

RLUOB contains about 208,000 square feet (19,000 square meters) of floor space distributed over several stories, located on a 4.0-acre (1.6-hectare) site. One story and, due to the slope of the building site, part of another story are below ground, and three stories are above ground. RLUOB provides office space for about 400 staff. A large number of the workers with offices in RLUOB would work in the CMRR-NF. RLUOB includes worker training classrooms and facilities and CMRR Facility incident command and emergency response capabilities. In addition to office space, RLUOB contains 19,500 square feet (1,800 square meters) of radiological laboratory space capable of handling less than Hazard Category 3 radioactive materials per DOE-STD-1027. RLUOB was classified by the preliminary hazard analysis as a low-hazard, Performance Category 1[2] (PC-1) facility; however, the structure was designated to be designed and constructed at the PC-2 level based on the prudent management practice to provide defense in depth for safety and to maintain radiation doses as low as reasonably achievable.

A separate structure, the Central Utility Building, houses utility equipment for power, hot water, sanitary sewer, potable water, nonpotable water, de-ionized water, chilled water, heat (natural gas), compressed air, specialty gases, the fuel oil system, and backup power supply of the proposed CMRR Facility in TA-55. The structure is two stories tall with a basement. Although this structure was sized to support both RLUOB and the CMRR-NF, it has not been fully equipped to support both buildings. Equipment has been included to support RLUOB and additional equipment would be added if the decision is made to construct the CMRR-NF at the TA-55 site. The 25,000 square feet (2,300 square meters) of floor space that make up the Central Utility Building are included in the total estimated square footage of RLUOB. RLUOB is separated from the Central Utility Building by a 2-hour fire-rated construction of two concrete walls separated by a 12-inch airspace.

RLUOB is anticipated to be awarded a Silver Certification under the U.S. Green Building Council Leadership in Energy and Environmental Design® for New Construction and Major Renovations (LEED-NC) rating system. In 2010, NNSA awarded the CMRR Project its Pollution Prevention Award for Best in Class for Sustainable Design/Green Building. Later in 2010, the project received the DOE EStar Environmental Sustainability Award in Recognition of Exemplary Environmental Sustainability Projects and Practices. The NNSA and DOE awards were presented for RLUOB integrated planning, design, procurement, and construction. The CMRR-NF is also registered under the LEED-NC rating system, with many of the same credits anticipated to be achievable. Lessons learned from design and construction of RLUOB from a LEED perspective are being incorporated into the Modified CMRR-NF design.

At the time RLUOB was being constructed, the adjacent area proposed for the CMRR-NF was also excavated in support of geologic characterization of the CMRR-NF site and seismic mapping, and was subsequently used as a laydown area for RLUOB construction equipment and materials. As a result, most of the proposed site of the CMRR-NF has been excavated down to about 30 feet (9.1 meters) already. The site is now roughly level with Pajarito Road, as shown in **Figure 2–4**, and would need to be further excavated if the decision is made to proceed with construction of the CMRR-NF (either the 2004 CMRR-NF or the Modified CMRR-NF) in TA-55.

In support of the CMRR Project, a permanent paved vehicle parking lot has been built in TA-50 across Pajarito Road from RLUOB. The parking lot currently contains construction trailers associated with the CMRR Project and provides parking for individuals working on the project and in nearby technical areas.

[2] Each structure, system, and component in a DOE facility is assigned to one of five performance categories (PCs) depending upon its safety importance. For PC-1 structures, systems, and components, the primary concern is preventing major structural damage, collapse, or other failure that would endanger personnel (life safety). A PC-2 structure, system, and component designation is meant to ensure the operability of essential facilities or to prevent physical injury to in-facility workers. The PC-2 structures, systems, and components should result in limited structural damage from design-basis natural phenomena events (such as an earthquake) to ensure minimal interruption of facility operation and repair following the event (DOE 2002c).

Figure 2–4 Proposed Chemistry and Metallurgy Research Building Replacement Nuclear Facility Site in Technical Area 55

2.6 Description of the Alternatives

As previously identified, this *CMRR-NF SEIS* analyzes the potential environmental impacts of three alternatives. This section of Chapter 2 presents detailed descriptions of each of the three alternatives, identifying actions that would be common across one or more of the alternatives and actions that would be different or additive across the alternatives.

No Action Alternative (2004 CMRR-NF): Construct and operate a new CMRR-NF at TA-55, adjacent to RLUOB, as analyzed in the 2003 *CMRR EIS* and selected in the associated 2004 ROD and the 2008 *Complex Transformation SPEIS* ROD, with two additional project activities (management of excavated soils and tuff and a new electrical substation) analyzed in the 2008 *LANL SWEIS*. Based on new information learned since 2004, the 2004 CMRR-NF would not meet the standards for a PC-3[3] structure as required to safely conduct the full suite of NNSA AC and MC mission work. Therefore, the 2004 CMRR-NF would not be constructed.

Modified CMRR-NF Alternative: Construct and operate a new CMRR-NF at TA-55, adjacent to RLUOB, with certain design and construction modifications and additional support functions that address seismic safety, infrastructure enhancements, nuclear safety-basis requirements, and sustainable design principles (sustainable development – see glossary). This alternative has two construction options: the Deep Excavation Option and the Shallow Excavation Option. All necessary AC and MC operations could be performed as required to safely conduct the full suite of NNSA mission work. The

[3] *Each structure, system, and component in a DOE facility is assigned to one of five performance categories depending upon its safety importance. PC-3 structures, systems, and components are those for which failure to perform their safety function could pose a potential hazard to public health, safety, and the environment from release of radioactive or toxic materials. Design considerations for this category are to limit facility damage as a result of design-basis natural phenomena events (for example, an earthquake) so that hazardous materials can be controlled and confined, occupants are protected, and the functioning of the facility is not interrupted (DOE 2002c).*

Modified CMRR-NF embodies the maturation of the 2004 CMRR-NF design to meet all safety standards and operational requirements.

Continued Use of CMR Building Alternative: Do not construct a replacement facility to house the capabilities planned for the CMRR-NF, but continue to perform operations in the CMR Building at TA-3, with normal maintenance and component replacements at the level needed to sustain programmatic operations for as long as feasible. Certain AC and MC operations would be restricted. Administrative and radiological laboratory operations would take place in RLUOB at TA-55.

2.6.1 No Action Alternative

The 2004 CMRR-NF design would not meet the standards for a PC-3 facility and a PC-3 facility is required to safely conduct all of the AC and MC work required to support DOE and NNSA mission work. Therefore, the No Action Alternative is not being evaluated in this *CMRR-NF SEIS* as an alternative that would meet NNSA's stated purpose and need for action to provide a full suite of AC and MC operations at LANL. The following description of the No Action Alternative (construction and operation of the 2004 CMRR-NF within TA-55 as described in the 2003 *CMRR EIS* and selected in the 2004 *CMRR EIS* ROD [69 FR 6967]) is provided as a basis for comparison to other alternatives. The 2004 CMRR-NF was conceived to be constructed as one part of a two-building CMRR Facility; as discussed in Section 2.5, RLUOB has already been constructed at the southeastern corner of TA-55. **Figure 2–5** shows the land areas that have previously been analyzed in support of CMRR Facility construction. The 2004 CMRR-NF would have housed Hazard Category 2 and 3 operations, requiring the entire facility to be designed as a Hazard Category 2 nuclear facility.

The 2004 CMRR-NF would have had a building areal footprint measuring about 300 by 210 feet (91 by 64 meters) and would have comprised approximately 200,000 square feet (18,600 square meters) of solid floor space divided between two stories, and would also have included one steel grating "floor" where mechanical and other support systems would have been located and one small roof cupola enclosing the elevator equipment. The 2004 CMRR-NF would have had an aboveground portion (consisting of a single story) that would have housed Hazard Category 3 laboratories and a belowground portion (consisting of a single story) that would have housed Hazard Category 2 laboratories and extended an average of 50 feet (15 meters) below ground. The total amount of laboratory workspace where mission-related AC and MC operations would be performed was not stated in the *CMRR EIS*. In 2004, the estimate of 22,500 square feet (2,100 square meters) was provided as a result of integrated nuclear planning activities (DOE 2005b). Fire protection systems for the 2004 CMRR-NF would have been developed and integrated with the existing exterior TA-55 site-wide fire protection water storage tanks and services.

As discussed in detail in Chapter 3, Section 3.5.1.4, of this *CMRR-NF SEIS*, a comprehensive update to the LANL seismic hazard analysis was completed in June 2007, providing a better understanding of the seismic behavior of the design-basis earthquake (LANL 2007a). The updated report used more-recent field study data, most notably from the proposed CMRR-NF site, and the application of the most current seismic analysis methods, to update the seismic source model, ground motion attenuation relationships, dynamic properties of the subsurface (primarily the Bandelier Tuff) beneath LANL, as well as the probabilistic seismic hazard, horizontal and vertical hazards, and design-basis earthquake for LANL. Based on this updated seismic hazard analysis, the geotechnical properties of the bedrock (that is, the structural stability of the rock) at the proposed CMRR-NF location have been further evaluated with respect to the proposed CMRR-NF structure and the associated depth of excavation (Kleinfelder 2007a, 2007b). Using this information, it was determined that a design-basis earthquake would result in severe damage to the 2004 CMRR-NF if it were constructed as originally envisioned and described and analyzed in the *CMRR EIS*.

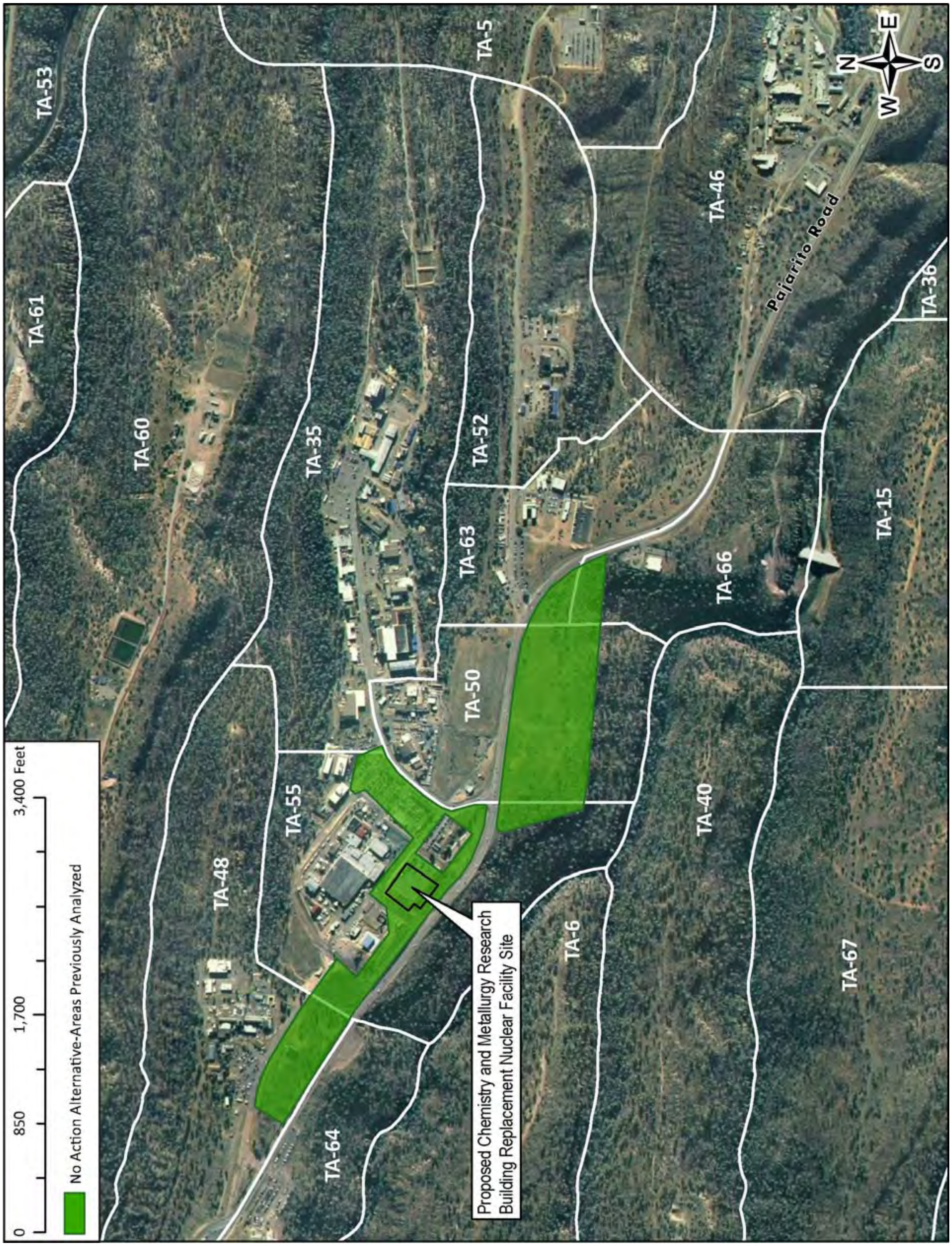

Figure 2–5 No Action Alternative Areas

General requirements necessary for public and worker safety and resulting design criteria are strongly driven by the requirements of "Nuclear Safety Management" (10 CFR Part 830). Since the conceptual design analyzed in the *CMRR EIS* was developed, the maturity of applying the Nuclear Safety Management requirements, and the maturity of understanding seismic impact analysis have led to concerns related to the overall conceptual design parameters used for the 2004 CMRR-NF in the *CMRR EIS*. As discussed in the *CMRR EIS*, the CMRR-NF would need to be safety class PC-3 for seismic events. Because of the updated and refined seismic design criteria, the 2004 CMRR-NF design would not meet today's PC-3 requirements.

A revised accident analysis was performed for the 2004 CMRR-NF in this *CMRR-NF SEIS* as discussed in Chapter 4, Section 4.1. This revised accident analysis determined that the human health risks to workers and the public, should the 2004 CMRR-NF be constructed and operated as originally envisioned, would be unacceptable in the event of an actual design-basis earthquake event. Such an earthquake could be expected to occur every 100 to 10,000 years. The damaged 2004 CMRR-NF building could provide an open pathway for public and worker exposure to radioactive materials being stored or used in the facility at the time of the earthquake.

Concerns about the ability of the 2004 CMRR-NF design to survive a design-basis earthquake have led to the CMRR-NF being redesigned as described in the Modified CMRR-NF Alternative. Updates to the construction parameters have been completed per requirements of the seismic probabilistic hazard curve, and the safety analysis has matured greatly beyond that performed in the preliminary hazards analysis on which the *CMRR EIS* was based. Because of these updates and maturity of the facility design, the Modified CMRR-NF now has a more complete set of safety controls and definitive design criteria. The safety control set is the integrated set of engineered structures, systems, and components that are incorporated into a facility's design to control risks associated with internal and external events that could affect facility operation. It includes systems such as the ventilation system, fire suppression system, and radiological monitoring and alarm system. For a facility that incorporates the safety control set to be designed, constructed and operated, to meet the updated seismic design requirements, additional floor space is required to house the major systems. The Modified CMRR-NF structure would still be required to meet the same functional requirement of PC-3 design today as was described in the *CMRR EIS* and the latest preliminary hazards analysis. The Modified CMRR-NF would be designed to survive a design-basis earthquake (for example, with much thicker walls and more reinforcing steel) without a significant release of radioactive materials to the environment and this alternative is being fully evaluated in this *CMRR-NF SEIS* as discussed in Section 2.6.2.

2.6.2 Modified CMRR-NF Alternative

2.6.2.1 Construction Activities Associated with the Modified CMRR-NF

Nuclear safety requirements stemming from 10 CFR Part 830, "Nuclear Safety Management," mandate a comprehensive analysis of identified hazards and postulated accidents to protect the public, workers, and the environment; this information is used for both developing the engineered designs of facilities and equipment and identifying administrative work requirements. This safety analysis and integration process is an iterative process that would continue as the CMRR-NF design evolves, as the CMRR-NF is constructed, and as operations are conducted. In 2007, the probabilistic seismic hazard analysis (LANL 2007a) for LANL was updated, providing a better understanding of the probable seismic behavior of various geological material layers occurring at LANL and, therefore, a better understanding of the structural building requirements necessary for constructing the proposed CMRR-NF so that the building and equipment within the building would be able to withstand a design-basis earthquake event without major damage. In 2009, the 2007 probabilistic seismic hazard analysis was augmented with a study that provided updated horizontal and vertical design ground accelerations for the proposed CMRR Facility site in TA-55 (LANL 2009b). These updated factors were lower than the factors included in the

2007 analysis (0.47 *g* [gravitational acceleration] compared to 0.52 *g* for peak horizontal ground acceleration and 0.51 *g* compared to 0.6 *g* for peak vertical ground acceleration). These data were factored into the design of the proposed Modified CMRR-NF and do not change any of the analyses presented in this *Final CMRR-NF SEIS*.

In addition to the probabilistic seismic hazard analysis, other seismic and geologic studies have been conducted for the CMRR Project (LANL 2005, 2007b, 2007c, 2008; Kleinfelder 2007a, 2007b, 2010a). To meet the seismic protection design requirements resulting from the probabilistic seismic hazard analysis and the other studies for what is referred to as the "design-basis earthquake," together with the nuclear safety requirements identified through iterative planning processes, it was determined that the 2004 CMRR-NF would need to be designed with various structural and equipment modifications to allow it to fully meet the operational requirements set forth by NNSA for the facility.

The Modified CMRR-NF would require additional structural and reinforcing concrete and steel for the construction of the building's walls, floors, and roof than was estimated and analyzed in the 2003 *CMRR EIS* for the structure as it was conceived of then. These portions of the Modified CMRR-NF would have to be thicker and stronger, with more bracing than previously estimated. Also, most of the worker access areas for building systems and equipment access and repairs would be constructed with solid floors rather than steel grating flooring; fire protection water storage tanks would be located inside the Modified CMRR-NF rather than using existing exterior water storage tanks in TA-55 (the large size and weight of these tanks require additional structural considerations by themselves); various utilities would be installed with added protection measures and bracing; and other seismic protection and safety measures would be incorporated into the building design and the installation requirements for the equipment. (See **Figure 2–6**, photo of RLUOB, which was constructed with some of the same seismic protections with regard to using solid floors rather than steel grating flooring in the worker access areas for building systems and equipment and with regard to equipment bracing and other protective installation measures.) These structural modifications resulted in an overall increase in the size and height of the Modified CMRR-NF. The footprint of the Modified CMRR-NF is larger than that of the 2004 CMRR-NF due to space required for engineered safety systems and equipment, such as an increase in the size and quantity of heating, ventilation, and air conditioning ductwork, addition of safety-class fire suppression equipment, plus the associated electrical equipment. This equipment added 42 feet (13 meters) to the building in one dimension. The addition of 94 feet (29 meters) in the other dimension was to provide corridor space for movement of equipment, to avoid interference between systems (mechanical, electrical, piping), and to allow enough space for maintenance, repair and inspection, and mission support activities (maintenance shop, waste management areas, and radiological protection areas). The increased dimensions noted above also included space required for concrete wall thicknesses for seismic stiffening. **Table 2–1** shows the estimated construction requirements associated with the Modified CMRR-NF.

Among the concerns identified in the seismic and geologic studies is the presence of a poorly welded tuff layer of volcanic ash material beneath the proposed CMRR-NF construction site. This layer, identified as the lower portion of Bandelier Tuff, Unit 3, underlies the proposed facility location in TA-55 and is widespread across LANL. Either the Modified CMRR-NF would need to be constructed at a sufficient distance above this poorly welded tuff layer to ensure the performance of the structure during a seismic event, or the layer would need to be excavated and backfilled with an engineered material (for example, concrete) to provide a stable medium on which to build the structure.

Figure 2–6 Utility System Floorspace in the Radiological Laboratory/Utility/Office Building

Two options are being considered for construction of the Modified CMRR-NF. The Deep Excavation Option would involve excavating through a layer of poorly welded tuff, then partially backfilling the excavation with a low-slump concrete. The 10-foot-thick (3-meter-thick) concrete basemat on which the building foundation would rest would be constructed on top of the concrete backfill. The Shallow Excavation Option would avoid the poorly welded tuff layer by constructing the basemat well above that layer in the overlying stable geologic layer, which would act in a raft-like fashion to allow the building to "float" over the poorly welded tuff layer.

The original building elevation (as defined by the bottom of the basemat) considered for the CMRR-NF was located sufficiently shallow such that extensive excavation below the building basemat would not be required and would not extend into the poorly welded tuff layer. This design held through the completion of the conceptual and preliminary design phases of the project. This building location was reviewed by a number of organizations external to the project team, including NNSA and the Defense Nuclear Facilities Safety Board.

When the probabilistic seismic hazard analysis was published in 2007, the building design was adjusted to increase both the thickness in certain floors and the thickness of the basemat. The end result was the overall building height measured from the bottom of the basemat to the top of the roof was now larger. In response to these changes, the building excavation was deepened to maintain the aboveground height of the building at the same elevation as the previous design. This design change would have resulted in the penetration of the poorly welded tuff layer, requiring additional excavation, and resulted in the Deep Excavation Option.

Table 2–1 Summary of Chemistry and Metallurgy Research Building Replacement Nuclear Facility Project Construction Requirements

Building/Material Usage	*Modified CMRR-NF Alternative Deep Excavation Option* [a]	*Modified CMRR-NF Alternative Shallow Excavation Option* [a]
Land – permanent changes (acres)	12	12
Land – temporary changes (acres)	116 to 135	96 to 115
Building – length by width (feet)	342 by 304	342 by 304
Building size (square feet) [b]	407,600	407,600
Nominal excavation depth (feet)	130	58
Remaining material to be excavated (cubic yards) [c]	545,000	236,000
Water (million gallons per year)	4.6	3.8
Electricity (megawatt-hours per year) [d]	31,000	31,000
Propane (gallons per year for 3 to 6 years)	19,200	19,200
Concrete (cubic yards)	150,000 (structural) 250,000 (low-slump)	150,000 (structural)
Steel (tons)	560 (structural) 18,000 (foundation & reinforcing)	560 (structural) 18,000 (foundation & reinforcing)
Peak construction workers	790	790
Average number of construction workers	420	410
Estimated number of offsite truck trips [e]	38,000	29,000
Nonhazardous waste (metric tons)	2,600	2,600
Construction period (years)	9	9
Transition from CMR Building complete	2023	2023

CMR = Chemistry and Metallurgy Research; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.

[a] The Deep and Shallow Excavation Options refer to options to build the Modified CMRR-NF with a nominal 130-foot excavation or a nominal 58-foot excavation, respectively.

[b] Building size is expressed in gross square feet, including the width of the walls.

[c] Includes tuff remaining to be excavated for the CMRR-NF building and the tunnels that would connect the CMRR-NF to RLUOB and the TA-55 Plutonium Facility. Approximately 30 feet of material have already been excavated from the proposed CMRR-NF site in TA-55 as part of the previous geological investigation of the site.

[d] Annual site infrastructure estimates for electricity use round to 31,000 megawatt-hours for both the Deep and Shallow Excavation construction options. However, the Deep Excavation Option is expected to require more electricity over the life of the alternative to support the creation of additional concrete for the layer of low-slump concrete fill.

[e] Offsite truck trips include the delivery of construction equipment, construction materials, and building equipment and supplies to the building site over the estimated 9-year life of the construction project.

Note: To convert acres to hectares, multiply by 0.404685; feet to meters, by 0.3048; gallons to liters, by 3.7854; cubic yards to cubic meters, by 0.76455; tons to metric tons, by 0.9072.

Source: LANL 2011a:Data Call Tables, 002, 003, 026.

In 2011, a review of the requirements for the design of the CMRR-NF identified an opportunity to reduce the amount of additional excavation and concrete fill required for the Deep Excavation Option by raising the bottom of the basemat to near the original design elevation. The overall building height would remain the same, but the top of the roof would be higher above ground than it was in the conceptual and preliminary design. At the current level of design maturity, this approach, known as the Shallow Excavation Option, appears to provide some reductions in construction impacts and cost without affecting other building design requirements. Both construction options require the same sets of safety controls and are expected to remain close in offsite environmental consequences as shown in the analyses contained in this SEIS. At this time, both construction options are being considered by NNSA. As the design studies continue and more details become available, one option or the other may be judged to have significant advantages in the time and/or cost expected for executing the excavation phase of construction that will facilitate NNSA's selection of a preferred construction option.

The Modified CMRR-NF would have a building footprint measuring about 342 by 304 feet (104 by 93 meters) and would comprise approximately 408,000 gross square feet (37,900 gross square meters), 344,000 net square feet (32,000 net square meters), of floor space divided between four floors plus a partial roof level compared to the 200,000 gross square feet (18,600 gross square meters) estimated in the *CMRR EIS*. One of these floors would be devoted to utility system floor space and, while the square footage of this floor would add to the total building square footage amount because of the hard floor, it would not be occupied full time by building workers. The lowest building floor or level would be devoted to the fire suppression water storage tanks, other facility support equipment, and maintenance areas. This floor would not be occupied full time by building workers. Inclusion of a dedicated water source for fire protection within the building assists in meeting nuclear safety and design requirements. The other two building levels would be occupied by the CMRR-NF workers and AC and MC operations in dedicated laboratories, building systems, the vault, and other direct laboratory support functions such as waste management. The total amount of laboratory workspace where mission-related AC and MC operations would be performed would be the same as estimated for the 2004 CMRR-NF, namely, about 22,500 square feet (2,100 square meters). The maximum amount of radioactive materials that could be in the laboratories at any given time has been restricted to no more than 300 kilograms of plutonium-239-equivalent SNM, the same as originally planned for the 2004 CMRR-NF. The total quantity of plutonium-239-equivalent SNM that would be permitted in the facility (including short-term and long-term storage vaults) would also be the same as estimated for the 2004 CMRR-NF, 6,000 kilograms.

The new structure would be designed and constructed in accordance with the geotechnical analyses and design recommendations provided in the geotechnical reports (Kleinfelder 2007a, 2010a, 2010b). These reports have concluded that the substrate is sufficiently strong to withstand the weight of the proposed structure, such that intolerable amounts of seismically and nonseismically induced settlement and lateral shifting of the foundation would not occur. The seismic weight of the proposed building is about 490 million pounds (220 million kilograms) under the Shallow Excavation Option.[4] The total area, or footprint, of the base slab foundation is 101,000 square feet (9,400 square meters). The load of the building would be distributed over the area of the slab; therefore, about 490 million pounds (220 million kilograms) per 101,000 square feet (9,400 square meters) results in a bearing pressure of about 4,850 pounds per square foot (23,700 kilograms per square meter) (LANL 2011a:LANL Site, 010). The geotechnical report (Kleinfelder 2007a) indicates that the allowable bearing pressure of the soil in the level where the Shallow Excavation Option would sit is 20,000 pounds per square foot (97,600 kilograms per square meter). This allowable bearing pressure of the soil is much greater than the pressure due to the building. Final geotechnical and structural design calculations would also be completed upon completion of the final building design.

NNSA would construct the Modified CMRR-NF in TA-55 next to the already constructed RLUOB (see Figure 2–4). The structure would be constructed to meet or exceed current International Building Code standards; LEED certification initiatives; and internal DOE requirements for nuclear facilities, fire protection, site seismic design, and security such that it could be operated to fully meet DOE and NNSA mission-support work requirements for AC and MC operations. Sustainable design considerations were integrated early in the CMRR Project planning and design phases, and these would be maintained throughout the procurement and construction process for the Modified CMRR-NF to ensure the

[4] Under the Deep Excavation Option, the addition of 60 feet (18 meters) of low-slump concrete would increase the weight of the building by about 980 million pounds (440 million kilograms). The weight of the soil that would be removed for this deeper excavation is estimated to be about 740 million pounds (340 million kilograms). Under the Deep Excavation Option, the building would sit on rock and there are not similar concerns related to allowable bearing pressure of the soil under this option as opposed to the Shallow Excavation Option.

construction and operation of high-performance sustainable buildings. Consistent with DOE Order 413.3B (*Program and Project Management for the Acquisition of Capital Assets*) and the *LANL Sustainable Design Guide* (LANL 2002), sustainable facility designs would include features that would allow the structures to be constructed and operated with reduced electricity and water use. Optimized energy performance would be achieved by using highly reflective roofing materials, energy-efficient equipment, specialized building envelope design and materials, and lighting controls. Low-flow fixtures would reduce water use over the life of the building. Interior and exterior building materials would include recycled content materials and local/regional materials. Native plant species would be used for landscaping. Only temporary irrigation would be used to establish new landscaping. Various control methods would be used to improve indoor air quality, including heating, ventilating, and air conditioning system protection to control dust and debris and use of products (for example, paints, furniture, adhesives, and sealants) that emit low amounts of volatile organic compounds. Permanent exterior safety and security lighting at the buildings and structures, as well as along the facility's fenced boundary, would be designed so that it is directed toward the facility and away from roads and canyons as much as possible. Certification under the LEED-NC rating system would be pursued.

NNSA would continue to operate and maintain the existing CMR Building on a smaller scale, with reduced operations and limited maintenance, during the construction phase and until all necessary functions are moved (transitioned) or otherwise cease. Based on the facility hazard categorization and the safeguards and security requirements, the Modified CMRR-NF would be a Hazard Category 2, Security Category I building, as the CMRR-NF was originally envisioned to be in 2003, and as analyzed in the *CMRR EIS*. As was planned for the 2004 CMRR-NF, the Modified CMRR-NF would be linked to the newly constructed RLUOB via an underground tunnel with a separate security station, and another underground tunnel would be constructed to connect the TA-55 Plutonium Facility with the Modified CMRR-NF. Vaults for long-term and short-term storage of SNM would be located within the footprint of the Modified CMRR-NF.

In general, construction of the Modified CMRR-NF would be accomplished using the same methods of construction, materials, and types of construction equipment originally planned for the 2004 CMRR-NF. However, as already noted, the structure would be stronger, with thicker walls, floors, roof, and other components. As previously mentioned, two different construction options are being considered for the Modified CMRR-NF to address the previously discussed poorly welded tuff layer present beneath the proposed building site: the Deep Excavation Option and Shallow Excavation Option. These two construction options are described in more detail in the following paragraphs.

The Deep Excavation Option would involve excavating the identified footprint another 100 feet (30 meters) to a nominal depth of 130 feet (40 meters) below ground, thus removing the poorly welded tuff layer (see **Figure 2–7**). The resulting excavated site would then be backfilled up to about 60 feet (18 meters) with low-slump concrete. A basemat foundation for the Modified CMRR-NF under the Deep Excavation Option would be constructed directly on this low-slump concrete layer once it has sufficiently cured (see Figure 2–7). The basemat provides additional structural support. The building would have three stories located below ground and one above ground on the northwest. Due to site sloping, there would be two stories below ground and two stories and a partial roof level above ground on the southeast. The aboveground portion would rise approximately 53 feet (16 meters) above ground at its highest point in the northeastern corner.

An estimated 720,000 cubic yards (550,000 cubic meters) of soil and tuff would be removed from the excavation of the Modified CMRR-NF and the connecting tunnels under the Deep Excavation Option. Approximately 175,000 cubic yards (134,000 cubic meters) of soil and tuff has already been removed from the construction site for geotechnical mapping, and another 545,000 cubic yards (417,000 cubic meters) would need to be removed if the Modified CMRR-NF were built using the Deep Excavation Option.

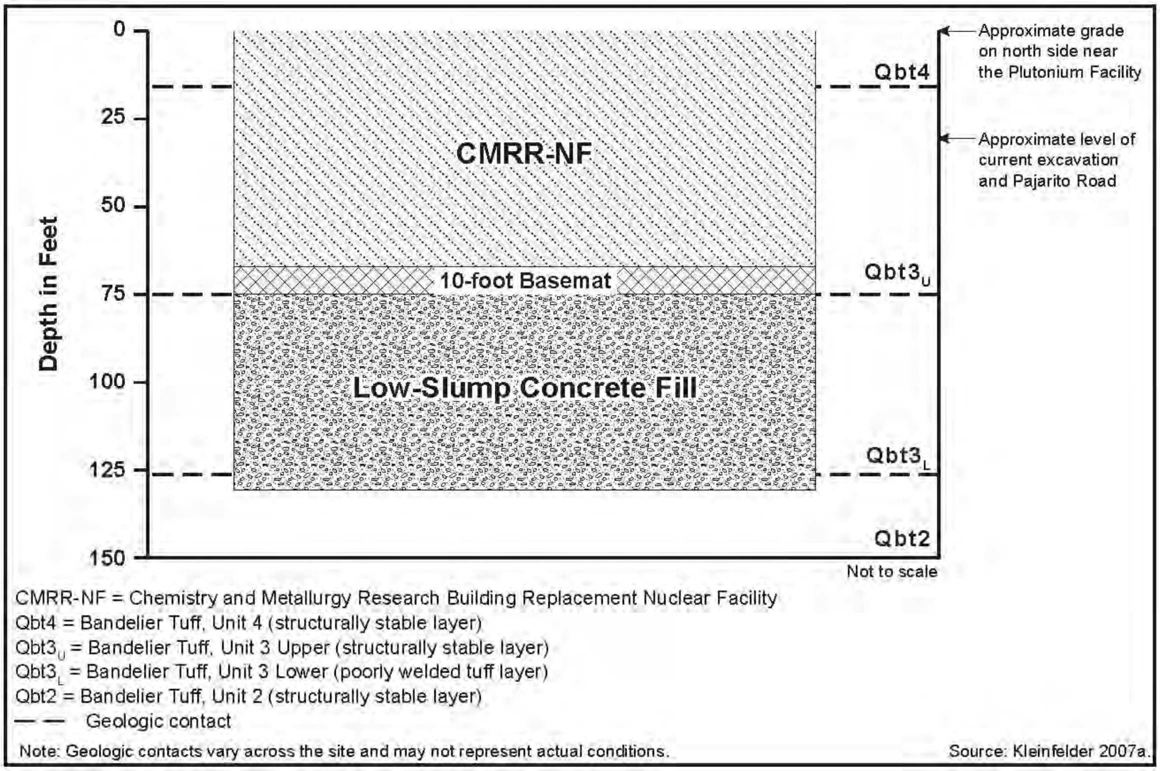

Figure 2–7 Modified CMRR-NF, Deep Excavation Option, Relative to Geologic Stratigraphy

The Shallow Excavation Option would involve much less site excavation than the Deep Excavation Option because the Modified CMRR-NF's base elevation would be located above the poorly welded tuff layer (see **Figure 2–8**). The Shallow Excavation Option would involve excavating the building's footprint an additional 28 feet (8.5 meters) from the current ground level to a nominal depth of 58 feet (18 meters) below ground. A basemat foundation for the Modified CMRR-NF under the Shallow Excavation Option would be constructed directly in the geologic layer overlying the poorly welded tuff layer, about 17 feet (5.2 meters) above the interface with the poorly welded tuff layer. The basemat provides additional structural support. Engineered backfill would be used to partially bury the building. The building would have three stories below ground and one above ground on the northwest side. Due to site sloping, there would be two stories below ground and two stories and a partial roof level above ground on the southeast side.

An estimated 411,000 cubic yards (315,000 cubic meters) of soil and tuff would be removed from the excavation of the CMRR-NF and the connecting tunnels under the Shallow Excavation Option. Approximately 175,000 cubic yards (134,000 cubic meters) of soil has already been removed from the construction site for geotechnical mapping, and another 236,000 cubic yards (180,000 cubic meters) would need to be removed if the Modified CMRR-NF is built using the Shallow Excavation Option.

Under either of the construction options, excavated soil and rock material (spoils) from the Modified CMRR-NF site would be transported by truck to storage areas within LANL in accordance with routine material reuse practices; the spoils would ultimately be beneficially reused. Under the Deep and Shallow Excavation Options, approximately 150,000 cubic yards (115,000 cubic meters) of the material would be reused as fill for other project activities related to CMRR infrastructure and construction support (such as fill for leveling the parking lots and the TA-46/63 and TA-48/55 laydown areas), and the rest (395,000 cubic yards [302,000 cubic meters]) under the Deep Excavation Option and 86,000 cubic yards

[66,000 cubic meters] under the Shallow Excavation Option) would be staged at LANL materials staging areas for future appropriate reuse on other LANL construction and landscaping projects (see discussion below on spoils storage areas). Reuse of this material at LANL would directly offset future needs to purchase and transport fill material from offsite locations because of the limited amount of suitable fill material remaining within existing LANL borrow pits.

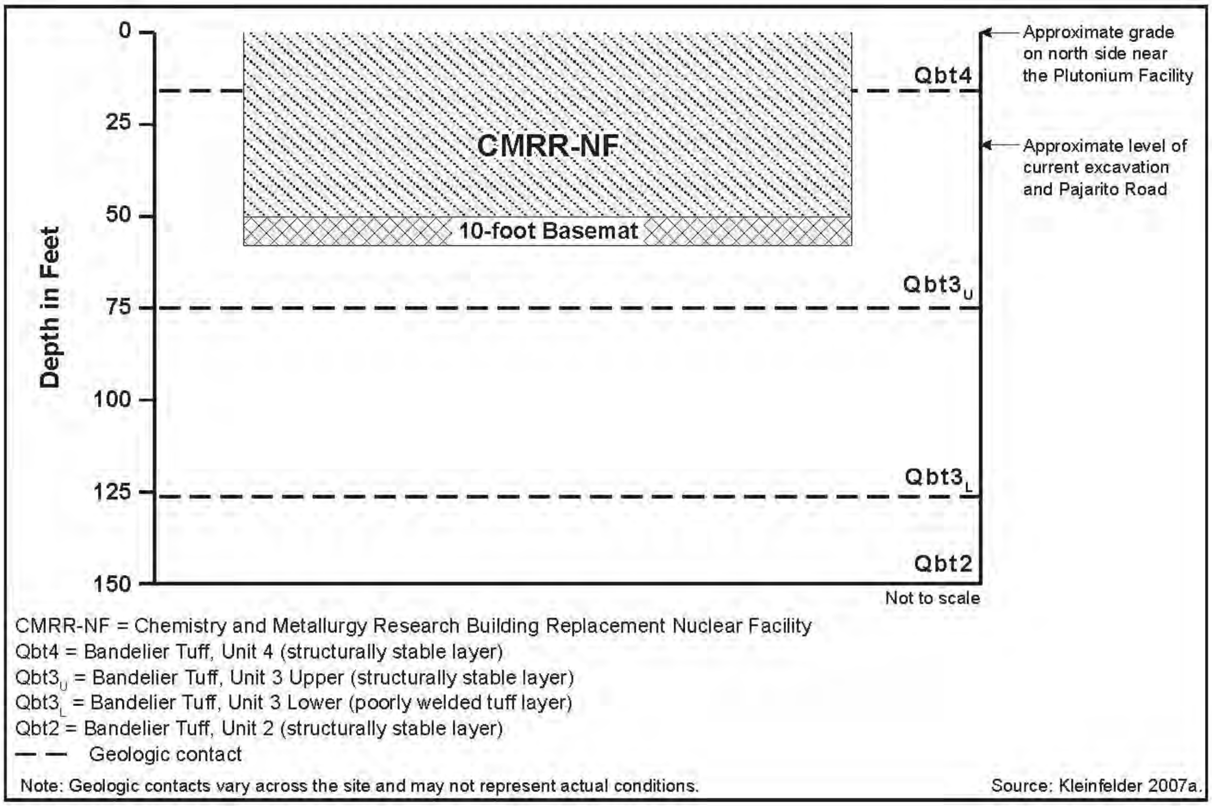

Figure 2–8 Modified CMRR-NF, Shallow Excavation Option, Relative to Geologic Stratigraphy

Because of safety and seismic concerns, additional concrete (including cement and suitable aggregate materials), steel, and other supplies and goods would be needed to construct the stronger Modified CMRR-NF. Under the Deep Excavation Option, it is estimated that an additional 390,000 cubic yards (300,000 cubic meters) of concrete would be needed to build the Modified CMRR-NF beyond that estimated for the 2004 CMRR-NF. The majority of this concrete (250,000 cubic yards [190,000 cubic meters]) would be the low-slump concrete fill upon which the building would be constructed. While the Shallow Excavation Option would not require the low-slump concrete fill included in the Deep Excavation Option, it would still require an additional 140,000 cubic yards (110,000 cubic meters) of concrete compared with the 2004 CMRR-NF estimate. In addition, the Modified CMRR-NF would require over 18,000 tons (16,000 metric tons) of additional concrete-reinforcing steel for construction compared with the 2004 CMRR-NF estimate under either the Deep or Shallow Excavation Option. These additional construction materials and the additional construction waste that would be generated during construction of the Modified CMRR-NF would result in additional truck transportation of materials to and from LANL. The greater quantities of excavated soil and rock material would also require additional transportation within LANL beyond what would have been required for the 2004 CMRR-NF.

In total, it is estimated that the Deep or Shallow Excavation Option would require up to 38,000 or 29,000 offsite truck trips, respectively, to support construction of the Modified CMRR-NF, depending on the size of the trucks used for the construction materials deliveries and waste transportation off site for disposal. The increased truck trips would average from 17 to 22 additional truck trips per day on the roads leading to LANL over the life of the construction project under the Deep or Shallow Excavation Option, compared with 1 additional truck trip per day that would have been required for the 2004 CMRR-NF. The largest number of trips would occur during the period in which the low-slump concrete would be poured and the materials needed to support mixing the required concrete would be delivered. The largest number of trips under the Shallow Excavation Option would occur both during the basemat pour and when engineered backfill would be required to support completion of the Modified CMRR-NF.

About 790 construction workers would be on site during the peak construction period under both the Deep and Shallow Excavation Options, compared with an estimated peak of 300 workers in the *CMRR EIS*. This peak number of workers would add about 500 vehicles to local LANL roadways during peak construction times. Beginning with the basemat pour, most of these workers would park their personal vehicles in the parking area to be built in TA-72 and would be shuttled to the construction site using buses.

Under both construction options, construction of the infrastructure support packages for the Modified CMRR-NF would begin in 2012, with completion expected in 2020. These construction period estimates are longer than the approximately 3-year construction period estimated in the *CMRR EIS*. Under either construction option, there would be a 3-year transition period from the existing CMR Building as the Modified CMRR-NF is completed and approved for startup and operations.

Additional anticipated actions and activities required for the Modified CMRR-NF beyond those included in the *CMRR EIS* and the 2008 *LANL SWEIS* regarding the CMRR-NF are described in the following paragraphs. The locations of these CMRR Project activities are shown in **Figure 2–9**. In general, many of these activities make use of previously developed[5] land that is industrial in character. Most of the undeveloped sites would be used temporarily during the construction period and then reclaimed and revegetated.

Construction Office Trailers and Support Facilities

The Modified CMRR-NF construction phase would install temporary modular office trailers in TA-48 for use by the construction management staff and construction subcontractor management. The construction office trailers and parking lot in TA-50 that were established in earlier phases of the CMRR Project will also support Modified CMRR-NF construction. When Modified CMRR-NF Alternative construction activities reach a point that the temporary office trailers are no longer needed, they would be vacated and removed from LANL site. As the CMRR Project nears completion, the TA-50 parking lot would be converted for use by the CMRR Facility workforce and by other employees working at nearby technical areas.

Due to the expected size of the construction work force to support the project, existing office space in White Rock would be leased for personnel badging and training. All construction workers would be processed through the badging and training facility.

[5] *For the purposes of this impacts analysis, areas that are considered to be "previously developed" are those in which land has been changed such that the former state of the area and its functioning ecological processes have been altered.*

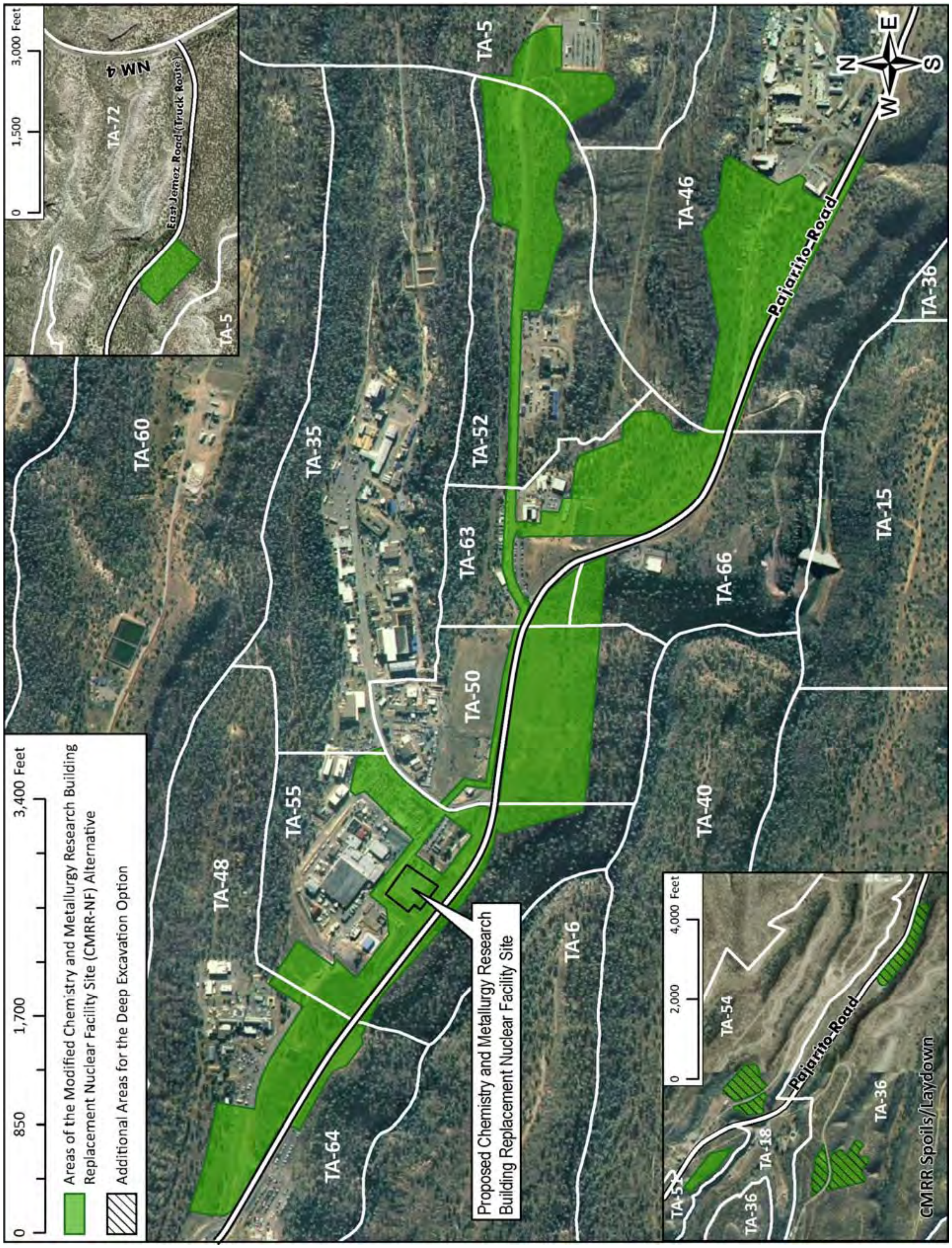

Figure 2–9 Potentially Affected Areas Under the Modified CMRR-NF Construction Plan

TA-72 Parking Lot

A parking lot with a perimeter property protection fence would be constructed in TA-72 along the south side of East Jemez Road, east of the TA-72 firing range. This parking lot would provide 600 to 800 parking spaces and would include a large-truck turn-around loop. Road improvements would be made, including turning lanes and a traffic signal light. Electrical power for the traffic signal would be extended along the East Jemez Road right-of-way from either the intersection with New Mexico State Road 4 or the TA-72 firing range. Between 13 and 15 acres (5.3 and 6.1 hectares) would be disturbed for the parking lot, truck loop, and road improvements as necessary. This total acreage is mostly undeveloped, forested land, but the site was evaluated in the 2008 *LANL SWEIS* for the construction of a large warehouse, security worker building, and permanent truck inspection site; however, NNSA has not yet made a decision on whether to construct and operate that facility. After the Modified CMRR-NF construction phase ends, the parking lot site would be regraded and revegetated.

The Modified CMRR-NF construction personnel would park their vehicles in this temporary lot and would be shuttled to and from the job site in buses. The truck loop area would be used to minimize disturbance of traffic flow along East Jemez Road. The LANL truck inspection station is located near the intersection of East Jemez Road and New Mexico State Road 4; this truck loop would enable Modified CMRR-NF Project supply trucks to change directions after being inspected at the LANL truck inspection station. The trucks would continue west along East Jemez Road, enter a signaled left-turn lane into the parking lot, use the truck loop area, and exit the parking lot, turning right to return to New Mexico State Road 4 and then continue on toward White Rock, then to the CMRR-NF construction site.

TA-48/55 Bus Parking Lot

A bus parking lot with a perimeter property protection fence would be constructed in TA-48 and TA-55 along the northwest border of TA-55. This parking lot would provide room for buses carrying construction personnel from the TA-72 parking lot to the CMRR-NF construction site. About 3.0 acres (1.2 hectares) of previously disturbed land would be used for the parking lot. After the Modified CMRR-NF construction phase ends, the parking lot site would be regraded and revegetated.

Pajarito Road Realignment

The Modified CMRR-NF Project may require the shift of a short segment of Pajarito Road slightly to the south at a location in the vicinity of the entrance to TA-55. The road shift would be needed to integrate permanent security requirements for the CMRR Project and TA-55 site security needs, specifically, to ensure proper placement of the perimeter intrusion fence in proximity to Pajarito Road after construction of the CMRR-NF is nearly complete. The proposed road shift would move an estimated one-half-mile segment of Pajarito Road (near the entrance to TA-55 that is just southeast of RLUOB and extending an estimated 2,100 feet [640 meters] to the northwest) so that the road centerline would be shifted up to 56 feet (17 meters) south of its current position. Underground utilities in the area (sewer line, natural gas line, water line, and electrical and telecommunications duct banks) would be relocated; the existing roadbed would be moved; and up to one-half mile of a new road would be constructed with two driving lanes, shoulders, and a turn lane at the Pecos Drive/Pajarito Road intersection. The shifted road segment may require some buildup of the ground surface along the edge of Twomile Canyon, but the road would remain on the mesa top and would not enter the canyon after realignment. The proposed shift of the road segment would permanently disturb less than 2 acres (0.8 hectares) of previously undeveloped land and 1.4 acres (0.6 hectares) of previously developed land. Pajarito Road is not open to the public; it has vehicle access portals to control access to facilities between TA-64 and New Mexico State Road 4. Construction of the new segment of road is not expected to result in a closure of Pajarito Road to LANL worker traffic or to affect other operating facilities along Pajarito Road. No construction laydown and support areas beyond those established for the Modified CMRR-NF construction would be needed.

Construction Laydown and Support Areas (TA-46/63, TA-48/55, and TA-5/52)

Because of increased construction requirements for the Modified CMRR-NF, additional land would be required for construction equipment and materials laydown and support activities beyond that estimated in the *CMRR EIS*. Three additional areas for construction laydown and support services could be used: one area is located in portions of TA-46 and TA-63, a second area is located in TA-48 and TA-55, and a third is located in TA-5 and TA-52. These areas would be used temporarily and would occupy both undeveloped and developed land, including areas that have been used for prior material storage and laydown activities; after construction activities are complete, these areas would be regraded and revegetated and would then become available for future use by LANL operations.

The TA-46/63 laydown area would occupy an estimated 40 acres (16 hectares) that span the shared boundary of the technical areas. Activities in TA-63 would include the installation of two ten-plex construction office trailers; the construction of short access and haul roads, approximately 110 parking spaces, and two concrete batch plants (discussed separately later); relocation of utilities; and construction of laydown and storage areas. An existing stormwater detention pond would be enlarged. In TA-46, the laydown area would also require utility relocations, the installation of short access and haul roads, a construction office trailer, a parking area, and areas for construction material and equipment laydown and staging. A fully enclosed, climate-controlled storage building of about 60,000 square feet (5,600 square meters) of warehouse space may be installed at this site for specialized equipment storage. The TA-46/63 area contains both undeveloped and developed land, including areas that have been used for prior material storage and laydown activities.

The additional TA-48/55 laydown area would cover an estimated 10 acres (4 hectares) that span the shared boundary of the technical areas; activities at the site would include the installation of short access and haul roads, approximately 45,000 square feet (4,200 square meters) of construction craft and office trailers, and construction laydown areas. A structure being used during remediation of TA-21 may be used as a construction support building in TA-48/55; prior to moving the structure to TA-48/55 it would be surveyed to ensure it meets radiological release criteria. This additional TA-48/55 laydown area would be contiguous to the 10-acre (4.0-hectare) site in TA-55 that was identified for construction trailer, laydown, and concrete batch plant use in the *CMRR EIS*.

The 20-acre (8.1-hectare) site in TA-48/55 that would be required for the Modified CMRR-NF Alternative construction is mostly developed and previously disturbed land. There is a potential release site (PRS 48-001) that may affect a small portion of the TA-48 area proposed for use as a laydown area. During site development of the nearby area, if contamination is suspected, work would be stopped, characterization performed, and the necessary action and disposition completed. The extent of the potential release site is currently being evaluated; appropriate construction and operation measures would be employed to minimize potential disturbance of contaminated soils or other effects on the potential release site.

The additional TA-5/52 laydown and construction support area would cover an estimated 19.1 adjacent acres (7.7 hectares) that span the shared boundary of the technical areas. This additional TA-5/52 area could be used for construction trailers, laydown, or spoils storage, depending on the needs of the Modified CMRR-NF construction project.

Additional Concrete Batch Plants (TA-46/63)

The *CMRR EIS* included the use of a single concrete batch plant located on 5 acres (2 hectares) of land within TA-55 to support the CMRR Project construction (DOE 2003b). More concrete would be needed for the Modified CMRR-NF construction, which would require additional concrete production capability. Under this Modified CMRR-NF Alternative, up to two additional batch plants, for a total of three concrete batch plants, would be established. The production rates of the plants would be approximately 150 to 300 cubic yards (115 to 230 cubic meters) of concrete per hour. As with the concrete batch plant described in the *CMRR EIS*, the additional plants would be operated by electricity. They would be temporary installations operated on an as-needed basis to supply concrete throughout the Modified CMRR-NF construction period and would be subsequently removed. Two batch plants would be located in TA-63 (adjacent to the TA-46/63 laydown area) as a single facility. Only one plant would be used at a time, with the other serving as a backup. The TA-63 plants, including supporting functions, would occupy about 15 acres (6.1 hectares). This area is included in the total area discussed above related to the construction laydown area that would be built in TA-63.

The batch plants are not expected to operate at the same time. Peak operation of the TA-48/55 concrete plant of 150 cubic yards per hour is expected during the first year of Modified CMRR-NF construction (2012) under the Deep Excavation Option; the plant would be used to produce an estimated 250,000 cubic yards (191,000 cubic meters) of low-slump concrete that would be placed in the lower 60 feet (18 meters) of the site excavation to provide a stable surface for construction. In the following years, the plant would supply structural concrete for the Modified CMRR-NF. Under both construction options, a primary and backup concrete batch plant would be established in TA-46/63 to produce structural concrete for the Modified CMRR-NF building.

Power Upgrades (TA-3 to TA-55 and TA-5 to TA-55)

Permanent power service to TA-55 would need to be upgraded for facility operations. This would be done either by building the TA-50 substation, as described in the 2008 *LANL SWEIS*, or by adding a new feed from the TA-3 electrical substation to TA-55. This feed would be extended from the TA-3 substation south along Diamond Drive and would follow Pajarito Road through TA-64 and TA-48 to TA-55. Existing duct banks in previously developed areas along the route would be used.

Additional power service would be needed at the Modified CMRR-NF construction site and for various construction support activities and operations that would extend from the TA-5 East Technical Area substation to the proposed CMRR-NF site. The necessary upgrades could be temporary or permanent, depending on future power requirements, but in either case, the level of environmental impacts would be similar. Power would be brought along a route from the existing TA-5 East Technical Area substation along Puye Road through TA-52 and TA-63, then along Pajarito Road through TA-50, and along Pecos Drive to the Modified CMRR-NF site in TA-55, affecting about 9.1 acres (3.7 hectares). Electric utility easements and overhead power poles that currently exist along this route would be used whenever possible, but some new overhead poles may be needed, and an estimated 2 acres (0.8 hectares) would likely be disturbed during the placement of these new poles and line. It is also possible that underground ducts could be used instead of new overhead poles along this segment of the route.

Additional Spoils Storage Areas (TA-36, TA-51, TA-54)

To carry out the Deep Excavation Option, the Modified CMRR-NF Project would need approximately 25 to 30 acres (10 to 12 hectares) of space for excavated spoils material storage. To carry out the Shallow Excavation Option, only approximately 10 acres (4.0 hectares) would be needed to store excavated spoils materials. Under either of the construction options, the space needed for spoils materials storage would not be collocated at the building site; instead, spoils storage could be distributed across available acreage at LANL. The 2008 *LANL SWEIS* estimated that about 150,000 cubic yards (115,000 cubic meters) per year of excavated soils could be generated and stored on site due to the various construction projects, including the CMRR Project, that were expected to be undertaken at LANL. Available acreage that could be used to store and stage excavated spoils beyond the areas included in the 2008 *LANL SWEIS* has been identified; however, not all of the areas would be used. Identified possible spoils storage areas include approximately 39 acres (16 hectares) in TA-36, 9 acres (3.6 hectares) in TA-51, and 19 acres

(7.7 hectares) in TA-54, as shown in Figure 2–9. Cultural resources and potential release sites in these areas would be avoided.

Stormwater Detention Ponds (TA-48, TA-50, TA-63, TA-64, TA-72)

Stormwater detention ponds would be built in TA-48, TA-50, TA-63, TA-64, and TA-72 to support the Modified CMRR-NF Project. A 0.5-acre (0.2-hectare) detention pond would be built in TA-50 to detain runoff from the CMRR-NF site during operations. An existing stormwater detention pond in TA-63 would be expanded from approximately 0.5 acres (0.2 hectares) to 1 acre (0.4 hectares). A second 1-acre (0.4-hectare) detention pond would also be constructed in TA-63; the detention ponds would be built in TA-63 to collect stormwater from the proposed laydown area and concrete batch plant(s) (the detention ponds in TA-63 are included in the acreage discussed above for construction laydown areas). A 1-acre (0.4-hectare) stormwater detention pond would be built in TA-64 to collect stormwater from the proposed laydown area and concrete batch plant in TA-48/55. Within the areas already identified as potentially disturbed in TA-48 and TA-72, two additional 0.1-acre (0.04-hectare) stormwater detention ponds may be built to support construction activities. When these temporary construction areas are reclaimed, the temporary stormwater detention pond sites would also be regraded and these areas would be reclaimed as well.

2.6.2.2 Operational Characteristics Associated with the Modified CMRR-NF

The following discussion highlights areas where operation of the Modified CMRR-NF would differ from operation of the 2004 CMRR-NF as it was envisioned in the *CMRR EIS.* As noted in Section 2.6, the 2004 CMRR-NF could not meet the standards for a PC-3 structure as required to safely conduct the full suite of NNSA AC and MC mission work; therefore, the 2004 CMRR-NF would not be built. The Modified CMRR-NF would be able to operate to support the full operational requirements of NNSA's nuclear weapons complex, as set forth in the *SSM PEIS,* the 2008 *LANL SWEIS,* and the *Complex Transformation SPEIS* RODs. Estimates of the infrastructure and utility requirements have evolved from those in the *CMRR EIS*. These changes reflect progress in the design of the facility from an early conceptual design to a more detailed design. The current stage of design provides the basis for more-accurate estimates of utility requirements.

Infrastructure Parameters: Additional infrastructure requirements would be needed on an annual basis for the Modified CMRR-NF compared to the 2004 CMRR-NF estimated requirements due to the increased size of the Modified CMRR-NF building and updated estimates. The current design includes a demineralization unit installed in the Central Utility Building to remove silica from all water used in the CMRR-NF and RLUOB. About 6 million gallons (23 million liters) of additional water would be used annually for the Modified CMRR-NF and RLUOB (16 million gallons [61 million liters] compared to the 10 million gallons [38 million liters] required by the 2004 CMRR-NF and RLUOB). The Modified CMRR-NF and RLUOB would also require about 140,000 additional megawatt-hours of electricity annually compared with the estimate included in the *CMRR EIS* and an additional 24 megawatts of peak power (the *CMRR EIS* electricity requirements are now known to have been underestimated). The addition of the substation in TA-50 analyzed in the 2008 *LANL SWEIS* or the extension of a power line from the TA-3 eastern technical area substation along an existing right-of-way would ensure adequate power continues to be available at the site, should additional power availability at the site prove to be necessary. The Modified CMRR-NF would also require about 58 million cubic feet of natural gas annually to heat the larger building; natural gas would be piped to the Central Utility Building, where burners would heat air that would be conveyed to the CMRR-NF for heating. The *CMRR EIS* did not project any requirement for natural gas.

Nonradiological Liquid Effluent: The Modified CMRR-NF would not include any permitted outfalls, so the discharge from this facility would be zero as it was from the 2004 CMRR-NF in the *CMRR EIS*. Nonradiological liquid effluents would be transferred via a pipeline to the TA-46 Sanitary Wastewater Systems Plant for treatment.

Radiological Liquid Effluent: The Modified CMRR-NF would generate about 344,000 gallons (1.3 million liters) of radiological liquid effluent annually (Balkey 2011), far less than the 3.8 million gallons (14 million liters) estimated in the *CMRR EIS*. The current estimate of radioactive liquid waste from the Modified CMRR-NF is based on a recent study (Balkey 2011) performed to provide engineering data regarding the necessary site capacity for radioactive liquid waste treatment. This recent study considered contemporary design and planned operations data; the *CMRR EIS* estimate was an older, conservatively high estimate based on unmetered water usage and a high level of operations at the CMR Building. These wastes would be collected and discharged into a network of drains that would route the solutions to RLWTF in TA-50 for treatment and disposal.

Sanitary Waste Generation: The CMRR Facility would include a demineralization unit (in the existing Central Utility Building) to remove silica from water. Use of this demineralization unit would reduce typical performance problems associated with silica in major equipment, thus reducing maintenance, and would increase durability and operating life. The demineralization unit produces reject water that would be discharged from the Central Utility Building into the CMRR Facility sanitary wastewater collection system, which would be connected to the existing TA-46 Sanitary Wastewater Systems Plant. It is estimated that use of this demineralization unit would produce approximately 3.5 million gallons (13 million liters) of reject water annually. This reject water would be in addition to the 7 million gallons (27 million liters) of wastewater estimated in the *CMRR EIS*.

Workforce: The workforce that would use the Modified CMRR-NF and RLUOB includes a range of users. There are staff members whose assigned work location would be in the CMRR Facility, with most of them assigned to RLUOB. Many of these workers would perform research in the Modified CMRR-NF laboratories; some would perform work in the RLUOB laboratories. Additional workers whose assigned work location is another LANL facility would also perform laboratory work at the CMRR Facility (primarily at the Modified CMRR-NF). Additional workers at the facility would include inspectors and auditors, collaborating researchers from outside of LANL, and workers attending training. The full-time operational workforce at the Modified CMRR-NF and RLUOB would be equivalent to 550 people, the same number estimated in the *CMRR EIS*. The personnel that would work in the CMRR Facility would not be new workers to the site, but rather would be workers moving to the new facility from the existing CMR Building or other LANL locations. It is estimated that there would be the equivalent of about 550 radiological workers, annually, using the CMRR Facility, the same number as estimated in the *CMRR EIS*.

2.6.3 Continued Use of CMR Building Alternative

Continued use of the CMR Building would not involve the construction and operation of new laboratory buildings for AC and MC operations. The existing CMR Building in TA-3 would continue to be used for SNM operations, as described in Sections 2.2 and 2.3, until it was no longer considered safe to do so. As discussed in Section 2.2.1, a portion of the CMR Building is located over a fault that could severely damage or destroy the building in the event of a severe earthquake.

The administrative support, office space, and radiological laboratory functions that were previously performed within the CMR Building would occur within the new RLUOB in TA-55. The CMR Building would receive routine maintenance and limited component replacement. The CMR Building would continue to be operated as a Hazard Category 2, Security Category III nuclear facility for as long as it could continue to be operated safely; this designation limits the amount of SNM that can be used and the level of operations. These limitations do not currently support the missions that NNSA has assigned to LANL through the *SSM PEIS*, *LANL SWEIS*, and *Complex Transformation SPEIS* RODs. This alternative does not completely satisfy NNSA's stated purpose and need to carry out AC and MC operations at a level to satisfy the entire range of DOE and NNSA mission support functions. However, this alternative is analyzed in this *CMRR-NF SEIS* as a prudent measure in light of possible future fiscal budgetary constraints.

The various aspects of continued operation within the CMR Building are described in Section 2.3, and these would be common to the Continued Use of CMR Building Alternative. Operations in the CMR Building are generally expected to continue until the building can no longer be operated safely, a replacement facility is available, or NNSA makes other operational decisions. Eventually, the building would be completely shut down and demolished. Decontamination, decommissioning, and demolition (DD&D) of the CMR Building is discussed in Section 2.8.1.

2.7 Alternatives Considered but Not Analyzed in Detail

A number of alternatives were considered, but were not analyzed in detail in this *CMRR-NF SEIS* because NNSA determined they are unreasonable. As required in the Council on Environmental Quality's (CEQ) NEPA regulations, the reasons for their elimination from detailed study are discussed in this section.

2.7.1 Alternative Sites

As discussed in Chapter 1, Section 1.6, the *Complex Transformation SPEIS* analyzed other possible locations outside of LANL for the activities that would be accomplished in the CMRR-NF. In the ROD for the *Complex Transformation SPEIS* (73 FR 77644), NNSA included its decision to retain plutonium manufacturing and research and development at LANL, and in support of these activities, to proceed with construction and operation of the CMRR-NF at LANL as a replacement for portions of the CMR Building. These decisions support NNSA's goal of consolidating activities and reducing the size of the Nation's nuclear weapons complex, together with modernizing outmoded infrastructure. Therefore, because the alternative sites for key activities within the nuclear weapons complex, as well as the need for the CMRR-NF, have been reviewed in depth and programmatic decisions have been issued as recently as December 2008, no additional sites outside of LANL are being considered further in this *CMRR-NF SEIS*.

In the 2003 *CMRR EIS*, an alternative site in TA-6 at LANL was evaluated as a possible site for the CMRR Facility. The TA-6 site was, in effect, a greenfield site that, if chosen, would have resulted in the central portion of the technical area changing from a largely natural woodland to an industrial site. As indicated in the 2003 *CMRR EIS*, development of the TA-6 site would have resulted in greater environmental impacts than building the proposed CMRR Facility in TA-55. Located near the western boundary of LANL at a slightly higher elevation and about 1 mile (1.6 kilometers) west of TA-55, TA-6 is situated over the same geologic stratigraphy as TA-55. It is also nearer several known fault traces.

In the February 2004 ROD (69 FR 6967) associated with the *CMRR EIS*, NNSA decided that the location for the CMRR Facility would be in TA-55. The site proposed for the CMRR-NF (2004 or Modified) in TA-55 reflects NNSA's goal to bring all LANL nuclear facilities into a nuclear core area. Siting of the CMRR-NF in TA-55 would collocate the AC and MC capabilities near the existing TA-55 Plutonium Facility, where the programs that make most use of these capabilities are located. As discussed in Section 2.5, RLUOB (which contains a training facility, incident control center, and radiological laboratories, as well as offices for personnel who would work in the CMRR-NF) has already been constructed in TA-55. No other sites at LANL have been identified as appropriate candidates for the CMRR-NF and none are being considered further in this *CMRR-NF SEIS*.

2.7.2 Extensive Upgrades to the Existing Chemistry and Metallurgy Research Building In Whole or In Part

In the 2003 *CMRR EIS*, DOE considered the proposal to complete extensive upgrades to the existing CMR Building's structural and safety systems to meet current mission support requirements for another 20 to 30 years of operations and dismissed it from detailed analysis. Beginning in 1997 and continuing through 1998, a series of operational, safety, and seismic issues surfaced regarding the long-term structural viability of the CMR Building. In the course of considering these issues, DOE determined that the extensive facility-wide upgrades originally planned for the CMR Building would be less technically feasible than had been anticipated and would be only marginally effective in providing the operational risk reduction and program capabilities required to support NNSA mission assignments at LANL. The technical challenges of implementing extensive seismic upgrades to the entire CMR Building are exacerbated by the findings of the subsequent seismic hazard analysis and the magnitude of the current design-basis earthquake (LANL 2007). Structurally upgrading the entire structure to a significant extent would require construction of new walls and other building components adjacent to the existing ones that have utilities and structural building features already in place. In addition, the floors of the building would need to be significantly upgraded. This work would have to occur while continuing to provide mission-essential operations in the CMR Building using nuclear materials and hazardous chemicals.

The technical challenges of implementing extensive seismic upgrades to the entire CMR Building as discussed in the 2003 *CMRR EIS* remain. NNSA has considered undertaking a more limited, yet intensive, set of upgrades to a single wing of the CMR Building, Wing 9, to meet current seismic design requirements so that this wing could be used for a limited set of Hazard Category 2 AC and MC operations. After careful consideration of the complex engineering and operational issues, as well as the CMR Building site's seismic concerns, this potential Wing 9 upgrade alternative was also determined not to be a reasonable alternative for meeting NNSA's purpose and need for action.

CMR Building operations and capabilities are currently restricted due to safety and security constraints, as discussed in Section 2.6.3 of this *CMRR-NF SEIS*. Although the limited Wing 9 upgrade would allow the current operational restrictions on material quantities to be relaxed somewhat so that larger quantities of SNM could be used within the laboratories, the size of Wing 9 would limit the amount of laboratory space that could be developed to less than half of that required to meet NNSA's purpose and need for mission support work. In addition, NNSA would not be able to meet its Nuclear Enterprise goal for consolidating plutonium operations at one LANL location as stated in the 2008 ROD for the *Complex Transformation SPEIS* (73 FR 77644). Instead, a portion of the plutonium operations would be located within a security perimeter in TA-3, CMR Building, Wing 9, and the balance would be located in the TA-55 Plutonium Facility (Building PF-4). This physical separation would result in continuing programmatic and operational inefficiencies and ongoing risks associated with transporting nuclear material samples and hazardous materials between the two facilities. Additional life-cycle costs would be incurred by having to maintain separate security infrastructure and nuclear safety authorization basis documentation for the two locations. Additionally, the current set of operational safety controls present within Wing 9 is specific for the current operations; the installation of new engineered safety controls, such as glovebox ventilation and filtration, would be needed to address public and worker hazards protection. These engineered safety controls would be located within or in close proximity to Wing 9. In some cases, these controls would require a large amount of floor space; if installed in Wing 9, they would further limit the available space for operations. In order to maximize the available space within Wing 9 for AC and MC operations, a new, separate structure to house these controls would need to be built close to Wing 9 as part of the upgrade effort.

The CMR Building is located in close proximity to geologic faults within TA-3; a fault trace has been identified beneath two wings of the structure. Before design of the new support structures could begin, it would be necessary for NNSA to determine the full extent of probable ground motion behaviors during a significant seismic event for the general Wing 9 location. This determination would require a thorough geotechnical characterization of the site, both to assess the potential for seismic surface rupture at the new support structure locations and to determine the potential horizontal and vertical ground motion during a seismic event. The geotechnical characterization, in turn, would entail the collection of detailed geotechnical data (by drilling of boreholes, excavating characterization trenches, and other sample collection methods) in order to support structural design. The subsurface area around Wing 9 has been previously disturbed by LANL activities (such as the construction of Wing 9 and the installation of subsurface site utilities); this could severely compromise the quality of the data collected for surface rupture displacement calculations, which are a critical design input for structures located on or near geologic faults. The extensive site geotechnical characterization performed for the TA-55 CMRR-NF site location (including an independent technical review and concurrence process) required about 5 years to complete. Although a limited amount of geotechnical information is already available for the TA-3 CMR Building site from earlier site geologic investigations, the remaining extensive site characterizations required for the Wing 9 area would be complicated by the existence of the existing structure, buried utilities, surface infrastructure, and ongoing facility operations and would take several years to accomplish.

Furthermore, the Wing 9 upgrades would require the installation of an enhanced security perimeter, the construction of a separate utilities building, and a materials storage vault. Because the upgrades would be made to a structure that is already over 50 years old, the expected lifetime of an upgraded Wing 9 would be significantly less than the 50-year design life of a new facility. Costs for the Wing 9 geotechnical investigations, structural and security upgrades, and construction of new support buildings and utilities installations, would be substantial, although not likely to approach those associated with either of the construction options considered under the Modified CMRR-NF Alternative. However, after consideration of the various engineering and geological issues; the costs of implementing upgrades to an older structure and developing a new security infrastructure; the costs of maintaining a second security infrastructure and safety basis (in addition to that for TA-55); the mission work disruptions associated with construction; operational constraints due to the limited laboratory space; and programmatic and operational issues and risks from moving SNM between TA-3 and TA-55, this action was not analyzed further as a reasonable alternative to meet NNSA's purpose and need for action in this *CMRR-NF SEIS*.

NNSA also has considered the possibility of renovating, upgrading, and reusing other CMR Building wings and additional wing combinations to provide the space needed for continuing AC and MC work in the building. However, for the reasons cited in the previous paragraphs, the other wings and wing combinations are not reasonable alternatives for providing adequate safe and secure space for future operations in a feasible, cost-effective manner and are not considered further in this *CMRR-NF SEIS*.

2.7.3 Distributed Capabilities at Other Existing Los Alamos National Laboratory Nuclear Facilities, Including New Vault Construction

The distribution of AC and MC capabilities among multiple facilities at LANL has been suggested. Because of the quantities of SNM involved, to fully perform the AC and MC and plutonium research capabilities, facilities would need to be classified as Hazard Category 2 and Security Category 1. Due to seismic concerns and limitations on the quantity of SNM that can be safely managed, the CMR Building has a limited ability to support continued operations. Using space and capabilities in the TA-55 Plutonium Facility would interfere with performing work currently being conducted there and reduce the space available in the building that could be used to conduct future DOE and NNSA mission support work. Use of other locations at LANL would introduce new hazards for which the facilities were not designed and would not conform to the objective of collocating plutonium operations near the TA-55 Plutonium Facility. Performing work at a location remote from the TA-55 Plutonium Facility would necessitate periodic closure of roadways and heightened security to enable transport of materials between the facilities. In addition, other facilities would not have the available space, vaults, and engineered safety controls required for this type of work.

Other designated Hazard Category 2 facilities at LANL are not candidates because they have been decommissioned for safety and security reasons and are no longer considered Hazard Category 2 facilities, are closure sites (specifically, environmental cleanup potential release sites), or are support facilities. The support facilities would not have the necessary space to perform AC and MC operations and to perform their support functions (for example, waste management facilities). Additionally, as noted above for other facilities, use of these support facilities would introduce new hazards for which the facilities were not designed.

Construction of only the proposed CMRR-NF vault at TA-55 and use of the TA-55 Plutonium Facility was also considered by NNSA to determine whether that proposed combination, together with the planned future use of RLUOB, would provide adequate space for AC and MC operations over the long term. However, augmenting the existing TA-55 Plutonium Facility with only additional vault storage space would not alleviate the need for additional work space for AC and MC laboratory operations. Space does not exist in the TA-55 Plutonium Facility to support this work, and these operations cannot be accomplished within RLUOB because RLUOB is not able to support the level of radiological operations required to support the work needed. As discussed in Section 2.5, RLUOB contains a radiological laboratory capable of handling less-than-Hazard Category 3 radioactive materials per DOE-STD-1027. It is currently authorized to handle up to 8.4 grams (0.3 ounces) of plutonium-239 equivalent. The CMRR-NF is being designed as a Hazard Category 2 facility capable of using kilogram quantities of plutonium-239 equivalent. This alternative was, therefore, not analyzed further in this *CMRR-NF SEIS*.

2.7.4 Other Alternatives Considered

Additional alternatives have also been considered by NNSA for providing the necessary physical means for accommodating the continuation of mission-critical CMR capabilities in a safe, secure, and environmentally sound manner at LANL. These alternatives included delaying any decision on the CMRR-NF at this time and re-examining it at a later date, perhaps as long as several decades from now.

NNSA also considered other suggested construction proposals for building the CMRR-NF, such as constructing a smaller building; reconfiguring the building laboratories and other room partitions; constructing a building with a larger footprint and fewer floors so that the building would require a shallower excavation; constructing a building with more floors above ground so that the building would require a shallower excavation; and reconfiguring the internal walls and laboratory arrangements. However, space is needed to support AC and MC mission-support work, and additional space has been determined necessary for building support systems (for example, air handling and filtration), security requirements, safety requirements and equipment, and general utilities. Building an undersized facility in terms of useful AC and MC laboratory space would not meet NNSA’s needs and would not be a good investment. Space for construction at TA-55 is limited by the geographic features of the mesa and canyon setting; road requirements; other building, utilities, and land use requirements; and security requirements related to the site that reduce the amount of appropriate available building space. A multi-storied building design is also more efficient in terms of heating and cooling for worker comfort, as well as for other general utility consumption.

Another construction proposal considered was a CMRR Facility comprising three buildings (RLUOB and two nuclear facilities). A three-building CMRR Facility, as considered in the 2003 *CMRR EIS*, would have separated the nuclear facility functions by hazard categorization, resulting in two buildings (a Hazard Category 2 nuclear facility and a Hazard Category 3 nuclear facility). A parallel concept that was also considered would be to separate the CMRR Facility functions based on their security classification requirements, which would also result in two nuclear facilities. Segregation based on security requirements would be very similar to segregation according to hazard category because the materials that contain larger quantities of plutonium and thus require a Hazard Category 2 facility are also the materials that would need Security Category I/II levels of protection. The proposed nuclear materials vault would be part of the Security Category I/II building, which would reside inside the TA-55 enhanced security perimeter (that is, a perimeter intrusion, detection, assessment and delay system [PIDADS]); the Security Category III building, which would house Hazard Category 3 activities, could reside at TA-55 outside of the PIDADS.

To meet mission requirements, the needed laboratory space would not change appreciably if two nuclear facilities were built rather than a single nuclear facility. Dividing the laboratory space between two nuclear facilities rather than using a single nuclear facility does not change the task area space requirements for performing the AC, MC, and research functions. However, dividing laboratory space between facilities results in a slight increase in the overall task area space needed, because some task area space would have to be duplicated in each building, specifically, space for sample management and waste/materials management. Both buildings would require specialized ventilation systems that support gloveboxes, open-front gloveboxes, and fume hoods.

NNSA recently performed a qualitative evaluation of constructing a two-building nuclear facility compared to the baseline proposal of constructing a single Hazard Category 2, Security Category I/II facility. For the two-building proposal, the evaluation indicated that an overall increase in the size of the buildings and the building footprint would likely result because certain functions would have to be provided in each building and, therefore, would be duplicated. Although the level of controls would differ, each building would require credited safety controls (structures, systems, and components) to ensure that releases would be controlled in the event of an accident. Systems and support space (for example, change rooms, utilities, air-handling and filtration systems, and monitoring and control systems) would be required in each building. Constructing two buildings (and duplicating the systems and support space) would increase the required amounts of construction materials and, if they were constructed in parallel, would require additional land areas for support space (LANL 2011f).

The two-building proposal could provide flexibility with respect to funding requirements if design and construction were undertaken sequentially. Although segregating the CMRR-NF into two separate buildings could provide short-term budgetary flexibility compared to the single building included in the Modified CMRR-NF alternative, it would extend the schedule and continued reliance on the CMR Building with no increase in function or reduction in facility size (LANL 2011f).

Programmatically, NNSA would prefer construction of the Security Category I/II building first to provide needed vault storage and MC capabilities and capacity. However, addressing the design, construction, or both sequentially would delay the availability of the Security Category III facility and would extend the time (and associated risk) that NNSA would have to continue to rely on the CMR Building and the period of construction-related disruptions at TA-55. Operating two separate buildings would require a slight increase in personnel as a result of more support personnel (for example, radiological control technicians) and more operational personnel (for example, materials and waste packaging and transfer staff).

In summary, various construction proposals have been considered during the iterative planning stages of the project to date, and NNSA has arrived at the current proposed building configuration and size after careful deliberation. Additional building configuration and construction proposals for the CMRR-NF are not, therefore, further analyzed in this *CMRR-NF SEIS.*

2.8 Facility Disposition

2.8.1 Disposition of the Chemistry and Metallurgy Research Building Common to All Three Alternatives

Disposition of the existing CMR Building would involve DD&D of the entire building. While the DD&D procedures for dispositioning the CMR Building would be common actions across each of the alternatives analyzed in this *CMRR-NF SEIS*, the timing of the actions would be different under the Modified CMRR-NF Alternative versus the Continued Use of CMR Building Alternative. The various dispositioning requirements common to the three alternatives are discussed in the following text in detail.

Over the past 60 years of operation, certain areas within the CMR Building, pieces of equipment, and building systems have become contaminated with radioactive material during operations involving SNM. These areas include contaminated conveyors, gloveboxes, hoods and other equipment items; contaminated ducts; contaminated hot cell floor space; and laboratory floor space. It is estimated that DD&D of the CMR Building would result in about 38,000 cubic yards (29,000 cubic meters) of low-level radioactive waste, 150 cubic yards (115 cubic meters) of transuranic waste, and 280 cubic yards (210 cubic meters) of mixed low-level radioactive waste. In addition, after decontamination, demolition of the building would result in about 110,000 cubic yards (84,000 cubic meters) of solid uncontaminated waste and 260 tons (235 metric tons) of chemical waste.

The existing CMR Building has not been completely characterized with regard to types and locations of contamination. In addition, project-specific work plans have not been prepared that would define the actual methods, timing, or workforce to be used for the decontamination and demolition of the building. Instead, general or typical methods of decontamination and demolition are presented in general terms below. Additional National Environmental Policy Act compliance analysis may be required when the specific actions of the disposition of the CMR Building actually become mature for decision.

2.8.2 Overview

The CMR Building consists of three levels and multiple wings, as described in Section 2.2. Except for Wing 9, the CMR Building is constructed of reinforced concrete floors (typically 4 inches [10 centimeters] thick) and walls (typically 18 inches [46 centimeters] thick). The building is supported on reinforced concrete basement walls and columns on spread footings. Wing 9 is constructed with above-grade walls consisting of lightly reinforced concrete masonry walls. The floor and grade slabs are approximately 11 inches (28 centimeters) thick with massive footings and concrete around and under the hot cells (LANL 2003). The total floor space is about 550,000 square feet (51,000 square meters) (DOE 2003b).

Over 60 years of operation, areas within the CMR Building, as well as building systems and equipment have become contaminated, principally with radioactive material. Principal building areas and systems believed to be significantly contaminated are summarized in **Table 2–2**.

Table 2–2 Principal CMR Building Contaminated Areas or Systems

Ventilation System	The exhaust side of the ventilation system is large and contaminated. Most contaminated ductwork is in the basement.
Radioactive Liquid Waste Line	The primary source of CMR Building contamination, this system carries contaminated wastewater to the existing RLWTF at TA-50; it consists of 9,200 feet (2,804 meters) of 5-inch- (13-centimeter-) diameter and 16,100 feet (4,907 meters) of 2.5-inch- (6-centimeter-) diameter stainless steel pipe. It is expected that most of this piping would be transuranic waste, with some portions being mixed transuranic or mixed low-level radioactive waste due to mercury contamination. Also, in areas of leakage there may be contamination in surrounding walls, floors, and adjacent surfaces.
Vacuum Systems	One of the two large vacuum systems in the CMR Building is highly contaminated, while the second, newer, system is expected to have only low levels of contamination.
Walls	Leaks from the radioactive liquid waste line have resulted in contamination within building walls.
Floors	Floor contamination is widespread and ranges from low to high levels. The basement floors have many areas of contamination, some of which have been painted over. Floor contamination in the attic is limited.
Asbestos Pipe Insulation and Floor and Ceiling Tile	Approximately 73,000 feet (22,000 meters) of asbestos pipe insulation have been found in the CMR Building, with another 9,400 square feet (870 square meters) on ducts. Floor tiles (up to 20,000 square feet [1,900 square meters]) and ceiling tiles may also contain asbestos.

CMR = Chemistry and Metallurgy Research; RLWTF = Radioactive Liquid Waste Treatment Facility; TA = technical area.
Source: DOE 2003b.

Of the three CMR Building levels, most of the contamination exists in the basement as summarized below (DOE 2003b):

- **Attic**—Contains primarily facility equipment and is expected to be mostly uncontaminated.
- **Main Floor**—Contains most of the laboratory and office space, with little contamination on the ceilings and increasing potential for contamination toward the floor. About 45 percent of equipment and surfaces are assumed to be contaminated to some degree.
- **Basement**—Contains facility equipment; all equipment and surfaces are assumed to be contaminated to some degree.

The 2003 *CMRR EIS* addressed three disposition options for the CMR Building (DOE 2003b):

- **Disposition Option 1:** Reuse of the building for administrative and other activities appropriate to the physical condition of the structure, with necessary structural and systems upgrades and repairs.
- **Disposition Option 2:** DD&D of some portions of the CMR Building, with other portions reused.
- **Disposition Option 3**: DD&D of the entire CMR Building.

In the ROD for the *CMRR EIS*, DOE decided to implement Disposition Option 3: DD&D of the entire CMR Building (69 FR 6967). This option is assumed for purposes of this *CMRR-NF SEIS*.

2.8.2.1 Decontamination and Demolition Process

The process that would be used to decontaminate and demolish the CMR Building is described in the following text box.[6] Detailed project-specific work plans would be developed and approved by NNSA before work began. These plans would include those requirements for environmental compliance and monitoring. All work would be planned in accordance with established state and Federal laws and

[6] *The decontamination and demolition work elements described in this section are meant to be illustrative, rather than prescriptive.*

regulations, DOE orders, and LANL procedures and best management practices. Waste management and pollution prevention techniques would be implemented.

Decontamination

Radioactive and nonradioactive contamination would be removed using techniques such as vacuum blasting, sand blasting, carbon dioxide bead blasting, scabbling, and mechanical separation of radioactive and nonradioactive materials. Flooring, insulation, and ceiling tiles containing asbestos would be removed, as would paint contaminated with asbestos, lead, and other toxic materials, such as polychlorinated biphenyls. About 50 percent of the asbestos debris is expected to be free of radioactive contamination, while the other 50 percent is expected to require handling as radioactive waste, as would other toxic or hazardous wastes contaminated with radionuclides. Radioactively contaminated debris would be segregated from uncontaminated debris to the extent feasible.

Air emissions generated during decontamination activities would be controlled using tents enclosing highly contaminated areas and high-efficiency particulate air filters to collect contaminated dust particles. Dust suppression techniques would also be used to ensure that particulate emissions are kept to a minimum. Decontamination workers would be protected by personal protective equipment and other engineering and administrative controls.

Worker exposure to ionizing radiation would be controlled in accordance with DOE regulations. The radiological limit for an individual worker is 5,000 millirem per year; however, the maximum dose to a worker involved in operations would be kept well below the DOE Administrative Control Level of 2,000 millirem per year (10 CFR Part 835). At LANL, an additional Notification Action Level of 1,000 millirem per year is imposed and all work is performed to maintain radiation doses as low as reasonably achievable. Occupational safety risks to workers would be mitigated by adherence to Federal and state laws, DOE requirements including regulations and orders, and plans and procedures for performing work. DOE regulations addressing worker health and safety include 10 CFR Part 851, "Worker Safety and Health Program," and 10 CFR Part 850, "Chronic Beryllium Disease Prevention Program." Workers are protected from specific hazards by training, monitoring, use of personal protective equipment, and other engineering and administrative controls.

Demolition

Once the CMR Building is decontaminated, demolition could proceed. All demolition debris would be sent to appropriate recycle or treatment, storage, or disposal facilities. The decontaminated CMR Building is not expected to be technically difficult to demolish and waste debris would be handled, transported, and dispositioned in accordance with standard LANL procedures.

Demolition of uncontaminated portions of the CMR Building would be performed using standard industry practices. A post-demolition site survey would be performed in accordance with the requirements of the *Multi-Agency Radiation Survey and Site Investigation Manual* (NRC/EPA/DOE 2000).

2.8.2.2 Waste Management and Pollution Prevention

Waste management and pollution prevention techniques would be implemented during the demolition of the CMR Building. Some of these techniques could include segregating wastes at the point of generation to avoid mixing and cross-contamination; decontaminating and reusing equipment and supplies; removing surface contamination from items before discarding; avoiding use of organic solvents during decontamination; using impermeable materials such as plastic liners to prevent the spread of contamination; reducing waste volumes using methods such as compaction; and recycling materials such as lead, scrap metals, and stainless steel to the extent practicable.

Decontamination and Demolition Work Elements

Characterization, Segregation of Work Areas, and Structural Evaluation: Walls, floors, ceilings, roof, equipment, ductwork, plumbing, and other building and site elements would be tested to determine the type and extent of contamination present. The Chemistry and Metallurgy Research (CMR) Building would be segregated into contaminated and uncontaminated areas, with contaminated areas being further subdivided by the type of contamination: radioactive materials, hazardous materials, toxic materials including asbestos, and any other Resource Conservation and Recovery Act (RCRA) listed or characteristic contamination. As part of the characterization and segregation of work areas, consideration would also be given to the structural integrity of the CMR Building. Some areas could require demolition work before decontamination.

Removal of Contamination: Workers would remove or stabilize contamination according to the type and condition of materials. If the surface of a wall were found to be contaminated, it might be physically stripped off. If contamination were found within a wall, a surface coating might be applied to keep the contamination from releasing contaminated dust during dismantlement and to keep the surface intact.

Demolition of the CMR Building, Foundation, and Parking Lot: After contaminated materials have been removed, wherever possible and practical, the demolition of all or portions of the CMR Building would begin. Demolition could involve simply knocking down the structure and breaking up large pieces. Knocking down portions of the CMR Building, foundation, and parking lot could require the use of equipment such as backhoes, front-end loaders, bulldozers, wrecking balls, shears, sledge and mechanized jack hammers, cutting torches, saws, and drills. If not contaminated, demolition material could be reused or disposed of as construction waste. Asphalt would be placed in containers and trucked to established storage sites within Los Alamos National Laboratory, at Technical Area 60 on Sigma Mesa.

Segregating, Packaging, and Transport of Debris: Demolition debris from the CMR Building would be segregated and characterized by size, type of contamination, and ultimate disposition. Debris that is radioactively contaminated would be segregated as low-level radioactive waste if no hazardous[1] contamination is present. Radioactively contaminated and uncontaminated asbestos debris would also be segregated. Other types of debris that would be segregated include mixed low-level radioactive waste,[2] uncontaminated construction debris, and debris requiring special handling. Segregation activities could be conducted on a gross scale using heavy machinery or on a smaller scale using hand-held tools. Segregated waste would be packaged as appropriate and stored temporarily, pending transport to an appropriate onsite or offsite facility.

Debris would be packaged for transport and disposal according to waste type, characterization, ultimate disposition, and U.S. Department of Transportation or U.S. Department of Energy transportation requirements. Uncontaminated demolition debris would be recycled or reused to the extent practicable. Nonrecyclable debris would be disposed of by shipment to the Los Alamos County Eco Station or an offsite disposal facility.

Testing and Cleanup of Soil and Contouring and Seeding: The soils beneath the CMR Building would be sampled and tested for contamination. Contaminated soils would undergo cleanup per applicable environmental regulations and permit requirements and would be packaged and transported to the appropriate disposal facility, depending on the type and concentration of contamination. After clean fill and soil are brought to the site as needed, the site would be contoured. Contouring would be designed to minimize erosion and replicate or blend in with the surrounding environment. Subsequent seeding activities would utilize native plant seeds and the seeds of nonnative cereal grains selected to hold the soil in place until native vegetation becomes stabilized.

1 *Hazardous waste is a category of waste regulated under RCRA. Hazardous RCRA waste must exhibit at least one of four characteristics described in 40 Code of Federal Regulations [CFR] 261.20 through 40 CFR 261.24 (ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by the U.S. Environmental Protection Agency in 40 CFR 261.31 through 40 CFR 261.33.*

2 *Mixed low-level radioactive waste contains both hazardous RCRA waste and source material, special nuclear material, or byproduct material subject to the Atomic Energy Act.*

Some of the wastes generated from the decontamination and demolition of the CMR Building would be considered residual radioactive material. DOE Order 458.1, *Radiation Protection of the Public and Environment*, establishes guidelines, procedures, and requirements to enable the reuse, recycle, or release of materials that meet established criteria. The residual radioactive material that would be generated by the decontamination and demolition of the CMR Building could include uncontaminated concrete, soil, steel, lead, roofing material, wood, and fiberglass. Concrete material could be crushed and used as backfill at LANL. Soil could also be used as backfill or topsoil cover. Steel and lead could be stored and reused or recycled. Materials such as wood, fiberglass, and roofing materials could be disposed of by transfer to the Los Alamos County Eco Station or to appropriate offsite facilities.

Radioactive liquid waste lines and other equipment or materials categorized as transuranic or mixed transuranic waste would be packaged for disposal at the Waste Isolation Pilot Plant. Radioactively contaminated soil, concrete, walls, and tiles would be packaged as low-level radioactive waste and disposed of off site at the Nevada National Security Site (formerly known as the Nevada Test Site) or at a commercial disposal facility or could be disposed of on site while Area G continues to accept waste. Mixed low-level radioactive waste would be packaged and shipped to offsite commercial and/or DOE treatment, storage, or disposal facilities.

Toxic, hazardous, or other regulated wastes generated during building disposition would be addressed in accordance with LANL's chemical waste management program. Asbestos that is not radioactively contaminated would be packaged according to applicable requirements and shipped to a permitted asbestos disposal facility. Hazardous wastes would be packaged and possibly temporarily stored at TA-54 at LANL until sufficient quantities are accumulated for shipment to offsite treatment, storage, or disposal facilities. All offsite shipments would be transported by a properly licensed and permitted shipper in compliance with U.S. Department of Transportation regulations and DOE standards.

2.8.3 Disposition of the CMRR-NF Under Both CMRR-NF Alternatives

Common to both the No Action Alternative and the Modified CMRR-NF Alternative, disposition of the new CMRR-NF would be considered at the end of its designed lifetime operation of at least 50 years; it would, therefore, likely occur in the last quarter of the twenty-first century. It is anticipated that the impacts from the disposition of the new CMRR-NF would be similar to those discussed for the disposition of the existing CMR Building. However, advances made by DOE in the design and operation of nuclear facilities since the 1950s are expected to result in much lower levels of contaminated waste from DD&D of the CMRR-NF when compared with the existing CMR Building.

2.9 The Preferred Alternative

CEQ regulations require an agency to identify its preferred alternative in the final EIS unless another law prohibits the expression of such a preference (40 CFR 1502.14(e)). The preferred alternative is the alternative that the agency believes would best fulfill its statutory mission, giving consideration to environmental, economic, technical, and other factors. The Modified CMRR-NF Alternative is NNSA's Preferred Alternative for the replacement of the CMR capabilities. NNSA has not identified a preferred construction option at this time. At this time, both construction options are being considered by NNSA. As the design studies continue and more details become available, one option or the other may be judged to have significant advantages in the time and/or cost expected for executing the excavation phase of construction that will facilitate NNSA's selection of a preferred construction option.

2.10 Summary of Environmental Consequences

This section summarizes the alternatives analyzed in this *CMRR-NF SEIS* in terms of their expected environmental impacts and other possible decision factors. The following subsections summarize the environmental consequences and risks by construction and operations impacts for each alternative. The RLUOB portion of the CMRR Facility has already been constructed in TA-55. The No Action and the Modified CMRR-NF Alternatives would result in the construction of the CMRR-NF in TA-55, adjacent to RLUOB. Environmental impacts common to all alternatives are also summarized. These include CMR Building and CMRR-NF disposition impacts.

2.10.1 Comparison of Potential Consequences of Alternatives

This section provides an overview of the potential environmental consequences of each alternative. Note that the impacts shown for the No Action Alternative reflect impacts as reported in the *CMRR EIS* for the purpose of comparison with the action alternatives, with the exception of the facility accident results, which were reanalyzed for this *CMRR-NF SEIS*, and transportation and traffic impacts and greenhouse gas emissions, which were not analyzed in the *CMRR EIS*. As stated in Section 2.6, the 2004 CMRR-NF could not be constructed to meet the current standards required for a PC-3 facility, and a PC-3 facility is required to safely conduct all of the AC and MC work required to support DOE and NNSA mission work. Therefore, the No Action Alternative is not being evaluated in this *CMRR-NF SEIS* as an alternative that would meet NNSA's purpose and need. **Table 2–3**, at the end of this section, presents a comparison of the environmental impacts of each of the alternatives discussed in detail in Chapter 4, including facility construction and operations impacts.

Land Use and Visual Resources

Under the No Action Alternative, 26.75 acres (10.8 hectares) of land in TA-48, TA-50, and TA-55 were expected to be used to support the construction of the CMRR Facility, including about 4 acres (1.6 hectares) for RLUOB, 5 acres (2.0 hectares) for a parking lot, and 4.75 acres (1.9 hectares) for the proposed CMRR-NF. About 7 acres (2.8 hectares) would have been used to support construction laydown areas and the concrete batch plant proposed under this alternative. About 6 acres (2.4 hectares) of land would have been disturbed by the potential need to realign roads to allow adequate distance between the road and the CMRR-NF site. The 2004 CMRR-NF would have blended in with the industrial look of TA-55.

Under the Modified CMRR-NF Alternative, larger amounts of land at LANL would be affected by the Modified CMRR-NF construction effort. Additional land would be needed to provide space for additional laydown and spoils areas due to the larger amounts of construction materials needed to support construction of the larger building and to store greater amounts of excavated materials due to the larger excavation needed to support construction of the Modified CMRR-NF. Also, the Modified CMRR-NF would require up to three concrete batch plants (not operating concurrently). A total of about 128 to 147 acres (52 to 59 hectares) of land would be used under the Deep Excavation Option and a total 108 to 127 acres (44 to 51 hectares) under the Shallow Excavation Option to support the proposed construction effort, including the proposed site of the Modified CMRR-NF. Many project elements would occur in areas presently designated as "Reserve" (this designation is applied to areas of LANL not assigned other specific use categories). Areas of temporary disturbance could be restored to their original land use designation following project completion. The breakdown of land uses to support the Modified CMRR-NF Alternative includes the following:

- Permanent changes to the CMRR-NF site – 4.8 acres (1.9 hectares)
- Temporary changes for construction laydown areas/concrete batch plants in TA-48/55 and TA-46/63 – 60 acres (24 hectares)
- Temporary changes for spoils storage areas inTA-36, TA-51, and TA-54 – Deep Excavation Option, 30 acres (12 hectares); Shallow Excavation Option, 10 acres (4 hectares)
- Temporary changes for a parking lot in TA-72 – up to 15 acres (6.1 hectares)
- Temporary changes for a bus parking lot in TA-48/55 – up to 3 acres (1.2 hectares)
- Temporary power upgrades along TA-5 to TA-55 – 9.1 acres (3.7 hectares)
- Permanent changes for the Pajarito Road realignment in TA-55 – 3.4 acres (1.4 hectares)
- Stormwater detention ponds in TA-48 (temporary), TA-50 (permanent), TA-63 (one temporary and one permanent), TA-64 (permanent), and TA-72 (temporary) – up to 2.5 acres (1.0 hectares)
- Permanent changes for the TA-50 electrical substation – 1.4 acres (0.6 hectares)
- Temporary changes for construction laydown and support in TA-5/52 – 19.1 acres (7.7 hectares)

Permanent land disturbance under the Modified CMRR-NF Alternative would affect about 12 acres (4.9 hectares), including the building site, which was previously disturbed as a result of the geologic investigation of the TA-55 site, the Pajarito Road realignment, the TA-50 electrical substation, and stormwater detention ponds in TA-50, TA-63, and TA-64. The Modified CMRR-NF would blend with the industrial look of TA-55.

Under the Continued Use of CMR Building Alternative, there would be no new impacts in terms of land use or visual impacts at LANL. No construction activities would be undertaken under this alternative, and operations would be conducted in the existing CMR Building.

Site Infrastructure

Under the No Action Alternative, about 0.75 million gallons (2.8 million liters) of water and 63 megawatt-hours of electricity were estimated to be used annually to support the construction of the 2004 CMRR-NF and RLUOB. Annual operations for the 2004 CMRR-NF and RLUOB were estimated to require about 10.4 million gallons (38 million liters) of water and 19,300 megawatt-hours of electricity. Natural gas requirements were not estimated in the *CMRR EIS*. These water and electrical requirements were pre-conceptual design estimates and are now known to be greatly underestimated (see updated estimates in the discussion of the Modified CMRR-NF Alternative).

Under the Modified CMRR-NF Alternative, about 4 million to 5 million gallons (14 million to 17 million liters) of water and 31,000 megawatt-hours of electricity would be used annually for 9 years to support the construction of the Modified CMRR-NF. These water and electrical requirements would fall within the normal annual operating levels of LANL and would not require the addition of any permanent infrastructure at the site. In addition, approximately 19,200 gallons (73,000 liters) of propane would be needed annually to support construction activities for 3 to 6 years. Annual operations for the Modified CMRR-NF and RLUOB are projected to require about 16 million gallons (61 million liters) of water, 161,000 megawatt-hours of electricity, and 58 million cubic feet of natural gas. These requirements are higher than those estimated for the 2004 CMRR Facility due to the increase in the size of the Modified CMRR-NF and the availability of more-accurate estimates. When compared to the available site capacity, operation of the Modified CMRR-NF and RLUOB would require 12 percent of the available water, 31 percent of the available electricity, and 1 percent of the available natural gas. The peak electrical demand estimate of 26 megawatts, when combined with the site-wide peak demand, could exceed the available capacity at the site. Regardless of the decisions to be made regarding the CMRR-NF, adding a third transmission line and/or re-conductoring the existing two transmission lines are being studied by LANL to increase transmission line capacities up to 240 megawatts to provide additional capacity across the site.[7]

Under the Continued Use of CMR Building Alternative, the infrastructure requirements associated with the continued operation of the existing CMR Building would not change from those included in the site's annual usage estimates and are expected to decrease over time as less work can be safely performed in the building.

Operation of RLUOB would require 7 million gallons (26 million liters) of water, 59,000 megawatts of electricity, and 38 million cubic feet (1.1 million cubic meters) of natural gas, annually. These RLUOB requirements apply to all three alternatives considered in this *CMRR-NF SEIS*.

Air Quality and Noise

Under the No Action Alternative, criteria pollutant concentrations were estimated to remain below New Mexico Ambient Air Quality and Clean Air Act Standards during construction of the 2004 CMRR-NF. There were estimated to be slight noise increases associated with construction activities and increased traffic during the construction period. Annual greenhouse gas emissions during the construction period would have been below the draft CEQ guidance threshold for more-detailed evaluation (CEQ 2010), which suggests that proposed alternatives that are reasonably anticipated to emit 25,000 tons or more of direct carbon-dioxide-equivalent air emissions should be further evaluated, and would have made up about 1 percent of site-wide generation based on LANL's 2008 baseline inventory.[8] Under the No Action Alternative, the air quality and noise associated with the operation of the 2004 CMRR-NF and RLUOB would not have exceeded standards. Annual greenhouse gas emissions during the operation of the 2004 CMRR-NF and RLUOB would have been below the CEQ guidance threshold for more-detailed evaluation and would make up about 3 percent of site-wide generation based on LANL's 2008 baseline inventory. Greenhouse gas emissions associated with electricity use during the operation of the 2004 CMRR-NF are estimated to be approximately 12,700 tons of carbon-dioxide equivalent per year (11,500 metric tons of carbon-dioxide equivalent per year); however, the electrical requirement estimated in the 2003 *CMRR EIS* was based on preconceptual design information and is now known to be greatly underestimated.

Under the Modified CMRR-NF Alternative, criteria pollutant concentrations would remain below New Mexico Ambient Air Quality and Clean Air Act Standards during construction of the Modified CMRR-NF under either the Deep or Shallow Excavation Option. There would also be slight noise increases associated with construction activities and increased traffic during the construction period. Annual greenhouse gas emissions during the construction period under either construction option would be below the CEQ guidance threshold for more-detailed evaluation and would be about 7 percent of site-wide generation based on LANL's 2008 baseline inventory. Under the Modified CMRR-NF Alternative, the air quality and noise associated with the operation of the Modified CMRR-NF and RLUOB would not exceed standards. Annual greenhouse gas emissions during operation of the Modified CMRR-NF and RLUOB would be below the CEQ guidance threshold for more-detailed evaluation and would increase site-wide generation by about 25 percent based on LANL's 2008 baseline inventory.

[7] *Evaluated by NNSA in a 2000 environmental assessment,* Environmental Assessment for Electrical Power Systems Upgrades at Los Alamos National Laboratory *(DOE/EA-1247).*

[8] *The projected LANL site-wide greenhouse gas emissions associated with the electrical usage corresponding to the operations selected in the 2008* LANL SWEIS *RODs would be 543,000 tons per year of carbon-dioxide equivalent; the LANL 2008 baseline inventory is 440,000 tons per year of carbon-dioxide equivalent.*

Under the Continued Use of CMR Building Alternative, the air quality and noise associated with operation of the existing CMR Building and RLUOB would not change from the minimal air quality and noise impacts associated with building operations. Applicable New Mexico Ambient Air Quality and Clean Air Act Standards and noise standards would not be exceeded. Annual greenhouse gas emissions during operation of the CMR Building and RLUOB would be below the CEQ guidance threshold for more-detailed evaluation and would increase site-wide generation by about 10 percent based on LANL's 2008 baseline inventory.

Geology and Soils

Under the No Action Alternative, construction in TA-55 would have occurred in the geologic layer above the poorly welded tuff layer. Operation of the 2004 CMRR-NF and RLUOB would not have impacted geology and soils on the site. (See Chapter 4, Section 4.2.10 and Appendix C for a discussion of the impacts of a design-basis earthquake on the CMRR-NF.)

Under the Modified CMRR-NF Alternative, construction of the Modified CMRR-NF in TA-55 would either occur in the layer below the poorly welded tuff layer, which would be excavated and replaced with low-slump concrete (under the Deep Excavation Option), or in the layer above the poorly welded tuff layer (under the Shallow Excavation Option). In addition to the material already removed from the construction site for geologic characterization, another 545,000 cubic yards (417,000 cubic meters) of material would be excavated from the construction site under the Deep Excavation Option and stored in designated spoils areas for future use at LANL. About 236,000 cubic yards (180,000 cubic meters) of material would be excavated from the construction site under the Shallow Excavation Option and would be stored in designated spoils areas for future use at LANL. Operation of the Modified CMRR-NF and RLUOB would not result in any further impacts in terms of geology and soils at LANL.

Under the Continued Use of CMR Building Alternative, geology and soils at LANL would not be affected by operation of the existing CMR Building and RLUOB. However, there are identified fault traces in association with an identified active and capable fault zone lying below some of the wings of the CMR Building that have called into question the ability of the building to survive a design-basis earthquake. These concerns have resulted in reduced operations at the CMR Building. See Chapter 4, Section 4.4.10, and Appendix C for additional information.

Surface-Water and Groundwater Quality

Under the No Action Alternative, construction of the 2004 CMRR-NF in TA-55 would have resulted in the potential for temporary impacts on surface-water quality from stormwater runoff. Appropriate soil erosion and sediment control measures and spill prevention practices would have been implemented to minimize suspended sediment and material transport and reduce potential water quality impacts. Operation of the 2004 CMRR-NF and RLUOB would not have resulted in any direct discharges of liquid effluent to the environment. Nonradioactive effluent would have been sent to the sanitary wastewater system for treatment. Radiological effluents would have been piped directly to RLWTF for treatment. RLWTF does not discharge liquid to the environment.

Under the Modified CMRR-NF Alternative, construction of the Modified CMRR-NF in TA-55 would result in the potential for temporary impacts on surface-water quality from stormwater runoff. Appropriate soil erosion and sediment control measures and spill prevention practices, in accordance with an approved Storm Water Pollution Prevention Plan, would minimize suspended sediment and material transport and reduce potential water quality impacts. One stormwater detention pond would be expanded and five new ponds would be built at LANL: one in TA-64 to collect runoff from the laydown area in TA-48/55, one in TA-63 to collect runoff from the construction laydown and support areas in TA-46/63, one in TA-50 to collect runoff from the facility site during construction and after operations begin, and one in TA-48 and one in TA-72 to collect runoff from the parking areas, should this alternative be implemented. Operation of the Modified CMRR-NF and RLUOB would have no impact on surface-water or groundwater quality. Radiological effluents would be piped directly to RLWTF for treatment.

Under the Continued Use of CMR Building Alternative, surface-water and groundwater quality would not be impacted by operation of the CMR Building and RLUOB. All nonradioactive liquid effluent from the CMR Building is now sent to the sanitary wastewater system under the LANL Outfall Reduction Project, and there is no longer an outfall permitted by the National Pollutant Discharge Elimination System at the building; all radiological effluents would be piped directly to RLWTF for treatment.

Ecological Resources

Under the No Action Alternative, construction sites would have included some recently disturbed areas that were not vegetated due to site disturbance, as well as others that are vegetated. Where construction would have occurred on previously developed land, there would be little or no impact on terrestrial resources. Some construction activities would have also removed some previously undisturbed ponderosa pine forest and might have led to displacement of associated wildlife. (Since the issuance of the 2004 ROD associated with the *CMRR EIS*, activities at the proposed TA-55 site related to RLUOB construction and geological studies have resulted in the elimination of this forest land.) There would not have been any direct or indirect impacts on wetlands or aquatic resources. Portions of the project areas that would have been impacted by this alternative included both core and buffer zones in an area of environmental interest for the federally threatened Mexican spotted owl. Construction of the 2004 CMRR-NF could have removed a small portion of potential habitat area for the Mexican spotted owl; however, no Mexican spotted owls have been observed in the areas of concern under this alternative. Therefore, NNSA determined this project "may affect, [but] is not likely to adversely affect" the Mexican spotted owl and the U.S. Fish and Wildlife Service (USFWS) concurred (see Chapter 5, Section 5.7). Operation of the 2004 CMRR-NF and RLUOB would not have directly affected any endangered, threatened, or special status species. Noise levels associated with the facility would have been low, and human disturbance would have been similar to that which already occurs within TA-55.

Under the Modified CMRR-NF Alternative, construction-related areas include larger areas than those that would be impacted under the No Action Alternative (up to 147 acres [59 hectares] compared to 26.75 acres [10.8 hectares]). Where construction would occur on previously developed land, there would be little or no impact on terrestrial resources. Within areas of undeveloped ponderosa pine forest and pinyon-juniper woodland, about 5 acres (2 hectares) would be permanently disturbed and 110 to 119 acres (40 to 48 hectares) would be temporarily disturbed. Most of these areas are within or adjacent to developed land or land that has been previously disturbed. Construction on undeveloped land in TA-72 and spoils storage areas would cause loss of some wildlife habitat, but would be timed to avoid disturbance of migratory birds during the breeding season (June 1 through July 31). Under the Deep Excavation Option, only wetlands located in TA-36 could be potentially indirectly affected, due to possible stormwater runoff and erosion into the Pajarito watershed from spoils storage in the area. This may also indirectly affect, due to erosion concerns, potential southwestern willow flycatcher habitat that lies adjacent to the potentially impacted area in TA-36. No willow flycatchers of the southwestern subspecies have been confirmed on LANL. A sediment and erosion control plan would be implemented to control stormwater runoff during construction, preventing impacts on the wetlands located farther down Pajarito Canyon and potential southwestern willow flycatcher habitat. Under the Shallow Excavation Option, there would be no direct or indirect impacts on any LANL wetlands or potential southwestern willow flycatcher habitat. Portions of TA-55 and other technical areas affected by construction under the Modified CMRR-NF Alternative include potential habitat for the Mexican spotted owl, falling within both core and buffer zones in an area of environmental interest. Previously undisturbed land in TA-5/52 used for a construction laydown and support area would impact 9.7 acres (3.9 hectares) of potential core habitat and 12.9 acres (5.2 hectares) of potential buffer habitat for the

Mexican spotted owl. However, no Mexican spotted owls have been observed during annual surveys within any of the areas of concern potentially affected under this alternative. NNSA initiated consultation with the USFWS, as the Federal agency with regulatory responsibility for the Endangered Species Act, in April 2003 regarding the CMRR Facility. As the project has progressed and new areas have been identified for project activities, NNSA performed biological assessments and amended its consultation with the USFWS (see Chapter 5, Section 5.7). NNSA determined, and USFWS concurred, that construction in these potential areas of concern may affect, but is not likely to adversely affect, the Mexican spotted owl or the southwestern willow flycatcher (LANL 2011a:Ecological Resources, 019, 020, 021; see Chapter 5, Section 5.7). All project activities have been reviewed for compliance with the *Threatened and Endangered Species Habitat Management Plan* (LANL 2011c). In accordance with the plan, annual surveys are performed to determine the location of any special status species and to determine whether any additional consultation with USFWS is necessary. Additionally, in accordance with the *Sensitive Species Best Management Practices Source Document, Version 1* (LANL 2010h), best management practices would be implemented for project activities to reduce risks to sensitive state-listed species. Operation of the Modified CMRR-NF and RLUOB is not expected to adversely affect any endangered, threatened, or special status species. Noise levels associated with operating the facility would be low, and human disturbance would be similar to that which already occurs within TA-55.

Under the Continued Use of CMR Building Alternative, ecological resources would not be impacted by operation of the CMR Building and RLUOB because no new areas would be disturbed under this alternative, and no emissions from the building are expected to adversely impact ecological resources.

Cultural and Paleontological Resources

Under the No Action Alternative, project elements would have had the potential to impact cultural resources sites eligible for listing in the National Register of Historic Places; however, no impacts would have been expected to occur through avoidance. All cultural sites would have been clearly marked and fenced to avoid direct or indirect disturbance by construction equipment and workers. If cultural resources sites had been discovered during construction, work would have been stopped and appropriate assessment, regulatory compliance, and recovery measures, including consultation with the State Historic Preservation Officer, would have been undertaken.

Under the Modified CMRR-NF Alternative, Deep Excavation Option, nine technical areas with 31 cultural resources sites eligible for listing in the National Register of Historic Places would be in the vicinity of project activities. In all cases, there would be no effect on these sites through avoidance. Project personnel would work with LANL cultural resources staff to relocate a portion of a cultural resources site access trail that would be impacted by construction of the TA-72 parking lot. Under the Shallow Excavation Option, 16 fewer cultural resources sites could be affected than under the Deep Excavation Option because only TA-5/52 and TA-51 would be needed for spoils storage. All cultural sites would be clearly marked and fenced to avoid direct or indirect disturbance by construction equipment and workers. If cultural resources sites are discovered during construction, work would be stopped and appropriate assessment, regulatory compliance, and recovery measures, including consultation with the State Historic Preservation Officer, would be undertaken.

Under the Continued Use of CMR Building Alternative, cultural resources would not be impacted by operations of the CMR Building and RLUOB.

Socioeconomics

Under the No Action Alternative, an increase in construction-related jobs and businesses in the region surrounding LANL would have been expected. Construction employment, over the course of the

34-month construction period, was projected to peak at about 300 workers. Operation of the 2004 CMRR-NF and RLUOB was estimated to employ about 550 existing workers at LANL.

Under the Modified CMRR-NF Alternative, an increase in construction-related jobs and businesses in the region surrounding LANL is also expected. Construction employment would be needed over the course of a 9-year construction period under either the Deep or Shallow Excavation Option. Construction employment under either option is projected to peak at about 790 workers, which is expected to generate about 450 indirect jobs in the region. Operation of the Modified CMRR-NF and RLUOB would involve about 550 workers at LANL, with additional workers using the facility on a part-time basis. The personnel working in the Modified CMRR-NF and RLUOB, when fully operational, would relocate from other buildings at LANL, including the existing CMR Building, so an increase in the overall number of workers at LANL is not expected.

Under the Continued Use of CMR Building Alternative, about 210 employees would continue to work in the CMR Building until safety concerns force additional reductions in facility operations. In addition, about 140 employees would be employed at RLUOB. A total of about 350 personnel would have their offices relocated to RLUOB. The personnel working in the CMR Building and RLUOB, when fully operational, would not result in an increase in the overall number of workers at LANL.

Human Health Impacts – Normal Operations

The projected human health impacts from normal operations under all of the alternatives analyzed in this SEIS were compared to the impacts included in the 2008 *LANL SWEIS* and were found to be consistent with the incremental impacts associated with CMR operations or the proposed CMRR operations included in the SWEIS. The impacts associated with any of the alternatives included in this SEIS are a small fraction of the impacts associated with overall LANL operations, as estimated in the *LANL SWEIS*. For example, the largest estimated annual population dose associated with any of these alternatives, 1.9 person-rem under the No Action Alternative, would be approximately 6 percent of the total estimated annual population dose from normal LANL operations under the No Action Alternative in the *LANL SWEIS*.

Under the No Action Alternative, the annual projected population dose to persons residing within 50 miles (80 kilometers) of the CMRR Facility in TA-55 would have been about 1.9 person-rem,[9] which would have increased the annual likelihood of a single latent cancer fatality in the population by 1×10^{-3} or 1 in 1,000. The *CMRR EIS* used 2000 census data to estimate the population surrounding the facility (about 309,000).[10] The average individual would have received a dose of 0.0063 millirem annually.[11] This would have equated to an average annual individual risk of developing a latent cancer fatality of about 4×10^{-9}, or 1 chance in 250 million. The maximally exposed individual (MEI) would have received a projected dose of 0.33 millirem annually. This would have equated to an annual risk to the MEI of developing a latent cancer fatality of about 2×10^{-7}, or 1 chance in 5 million. The total annual projected worker dose for the 2004 CMRR-NF and RLUOB would have been about 61 person-rem for the

[9] *Doses shown for the No Action Alternative from the* CMRR EIS *were based on internal dose conversion factors from Federal Guidance Report 11 (EPA 1988) that were used in the then-current version of GENII, Version 1.485. For the same exposure, doses would be slightly lower using the more-recent Federal Guidance Report 13 (EPA 1993b) factors included in the latest version of GENII, Version 2, which was used to conduct the analysis of the Modified CMRR-NF Alternative.*

[10] *The* CMRR EIS *used data from the 2000 census to estimate the population residing within 50 miles (80 kilometers) of TA-55. The No Action Alternative was not updated because the No Action Alternative is not being evaluated in this* CMRR-NF SEIS *as an alternative that would meet NNSA's purpose and need. The Modified CMRR-NF Alternative projects the population surrounding TA-55 out to 2030 using recent data from the U.S. Census Bureau, including data from the 2010 census (DOC 2011a, 2011b).*

[11] *Average individual dose is calculated by dividing the projected population dose by the population of the affected area. In this case, 1.9 person-rem was divided by 309,000 individuals, equaling an average dose of about 0.0063 millirem per individual. The numbers are not exact due to rounding of the population and the projected population dose.*

radiological workers in the facility. The average radiological worker dose would have been 110 millirem annually. This would have equated to an average annual individual worker risk of developing a latent cancer fatality of about 7×10^{-5}, or approximately 1 chance in 14,000.

Under the Modified CMRR-NF Alternative, the annual projected population dose to persons residing within 50 miles (80 kilometers) of TA-55 would be approximately 1.8 person-rem, which would increase the likelihood of a single latent cancer fatality in the population by 1×10^{-3} or 1 in 1,000 per year. This *CMRR-NF SEIS* projects the population to 2030 (about 511,000) using 2010 census data to estimate population dose. The average individual would receive a dose of 0.0035 millirem annually.[12] This equates to an average annual individual risk of developing a latent cancer fatality of about 2×10^{-9}, or 1 chance in 500 million. The MEI would receive a projected dose of 0.31 millirem annually. This equates to an annual risk to the MEI of developing a latent cancer fatality of about 2×10^{-7}, or 1 chance in 5 million. The total annual projected worker dose for the Modified CMRR-NF and RLUOB would be about 60 person-rem for the radiological workers in the facilities. The average radiological worker dose is projected to be 109 millirem annually. This equates to an average annual individual worker risk of developing a latent cancer fatality of about 7×10^{-5}, or approximately 1 chance in 14,000.

Under the Continued Use of CMR Building Alternative, the human health impacts of normal operations of the CMR Building would be smaller than those associated with either the No Action or Modified CMRR-NF Alternative because of the limited amount of radiological work currently allowed in the building due to the safety concerns associated with the seismic threat to the building, as discussed earlier in this chapter. The annual projected population dose to persons residing within 50 miles (80 kilometers) of TA-3 (projected to be about 502,000 in 2030 using 2010 census data (DOC 2011a, 2011b) would be approximately 0.016 person-rem, which would increase the likelihood of a single latent cancer fatality in the population by 1×10^{-5} or 1 in 100,000 per year. The average individual would receive a dose of 0.000032 millirem annually. This equates to an average annual individual risk of developing a latent cancer fatality of about 2×10^{-11}, or essentially zero. The MEI would receive a projected dose of 0.0023 millirem annually. This equates to an annual risk to the MEI of developing a latent cancer fatality of about 1×10^{-9}, or 1 chance in 1 billion. The total annual projected worker dose for the CMR Building and RLUOB would be about 24 person-rem for the radiological workers in these facilities. The average radiological worker dose is projected to be 68 millirem annually. This equates to an average annual individual worker risk of developing a latent cancer fatality from this dose of about 4×10^{-5}, or approximately 1 chance in 25,000.

Human Health Impacts – Facility Accidents

The accidents associated with the 2004 CMRR-NF have been reevaluated in this *CMRR-NF SEIS* to reflect concerns associated with the ability of the 2004 CMRR-NF to survive the latest estimates of ground acceleration in the event of a design-basis earthquake. Based on an updated probabilistic seismic hazard analysis, it was concluded that a design-basis earthquake with a return interval of about 2,500 years would have an estimated peak horizontal ground acceleration of 0.47 *g* and a peak vertical ground acceleration of 0.51 *g* (LANL 2009b). 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*, respectively.[13]

The accident that would have had the highest potential human health risk to the noninvolved worker, located at the TA-55 boundary, and members of the public was determined to be a seismically induced

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[12] *The projected population dose of 1.8 person-rem was divided by 511,000 individuals, equaling an average dose of about 0.0035 millirem per individual.*

[13] *The return period for the obsolete peak horizontal and vertical ground accelerations of 0.31 and 0.27, respectively, was 2,000 years; the return interval for the current design-basis earthquake at TA-55, with peak horizontal and vertical ground accelerations of 0.47 g and 0.51 g, respectively, is 2,500 years.*

spill. The frequency of such an accident was estimated to range from once every 10,000 years to once every 100 years. A design-basis earthquake would have resulted in an unacceptable risk of developing a fatal cancer in the population surrounding the facility if the 2004 CMRR-NF were constructed and operated as originally envisioned in the *CMRR EIS* because it would not be expected to survive a design-basis earthquake of the magnitude included in the latest probabilistic seismic hazard analysis. The annual risk of developing a single fatal cancer in the population from this accident would have been 0.8, or an 80 percent chance of a latent fatal cancer. As a result, latent cancer fatalities would have been expected to occur in the surrounding population if the 2004 CMRR-NF were built and operated as originally envisioned and a design-basis earthquake occurred at LANL. The annual risk of a latent cancer fatality to the offsite MEI would have been 7×10^{-3} from a design-basis earthquake-induced spill, or about 1 chance in 143 per year of facility operation. The risk of a latent cancer fatality to a noninvolved worker would have been 0.01, or about 1 chance in 100 per year of facility operation. The risks associated with seismically induced accidents at the 2004 CMRR-NF, if they were to occur, would have exceeded DOE guidelines (DOE-STD-3009) (DOE 2006a) and would have presented unacceptable risks to the public and the LANL workforce.

Under either the Deep Excavation or Shallow Excavation Option, the Modified CMRR-NF would be constructed to survive the design-basis earthquake included in the latest probabilistic seismic hazard analysis without significant damage. Construction of the Modified CMRR-NF would involve the use of larger amounts of structural concrete (150,000 cubic yards [115,000 cubic meters]) and structural steel (560 tons [508 metric tons]) compared to the amounts estimated for the 2004 CMRR-NF (3,194 cubic yards [2,442 cubic meters] of structural concrete and 267 tons [242 metric tons] of structural steel). For a beyond-design-basis earthquake that results in a spill of nuclear materials in the Modified CMRR-NF, the annual risk of a single fatal cancer developing in the population surrounding the facility would be 2×10^{-5} or about 1 chance in 50,000 of a fatal cancer occurring compared to an 80 percent chance under the No Action Alternative. The risk of a latent cancer fatality to the offsite MEI from this accident would be 9×10^{-8} or about 1 chance in 11 million per year of facility operation compared to 1 chance in 143 under the No Action Alternative. The risk of a latent cancer fatality to a noninvolved worker would be 6×10^{-6} or about 1 chance in 160,000 per year of facility operation compared to 1 chance in 100 under the No Action Alternative.

Under the Modified CMRR-NF Alternative, the accident with the highest potential risk to the offsite MEI would be a loading dock spill/fire caused by mishandling material or an equipment failure. The annual risk of a latent cancer fatality to the offsite MEI from this accident would be 2×10^{-7}, or about 1 chance in 5 million. The accident with the highest potential risk to the offsite population would be a beyond-design-basis seismically induced spill of radioactive materials followed by a fire. This accident would present an increased risk of a single latent cancer fatality in the population surrounding the facility of 5×10^{-5} per year, or about 1 chance in 20,000. Statistically, latent cancer fatalities are not expected to occur in the population from these accidents. The maximum risk of a latent cancer fatality to a noninvolved worker would also be from a beyond-design-basis seismically induced spill of radioactive materials followed by a fire. The risk of a latent cancer fatality to the noninvolved worker, located at the TA-55 boundary, from this accident would be 7×10^{-6}, or about 1 chance in 143,000 per year.

The accident with the highest potential risk to the offsite population under the Continued Use of CMR Building Alternative would be a design-basis earthquake or one of lower magnitude that could severely damage the CMR Building, resulting in a seismically induced spill of radioactive materials. The frequency of such an accident was estimated to range from once every 10,000 years to once every 100 years. For this accident, there would be an increased risk of a single latent fatal cancer in the population surrounding the facility of 4×10^{-3} per year. In other words, the likelihood of developing one fatal cancer in the population surrounding the facility would be about 1 chance in 250 per year. Statistically, the radiological risk for the average individual in the population would be small. This accident would present a risk of a latent cancer fatality for the offsite MEI of 1×10^{-5} per year or 1 chance in 100,000 per year. The risk of a latent cancer fatality to a noninvolved worker located at a distance of 300 yards (240 meters) from the CMR Building would be 3×10^{-4}, or about 1 chance in 3,333 per year.

Intentional Destructive Acts

NNSA has prepared a classified appendix to this *CMRR-NF SEIS* that evaluates the potential impacts of malevolent, terrorist, or intentional destructive acts. Substantive details of terrorist attack scenarios, security countermeasures, and potential impacts are not released to the public because disclosure of this information could be exploited by terrorists to plan attacks. NNSA's strategy for mitigation of environmental impacts resulting from extreme events, including intentional destructive acts, has three distinct components: (1) prevention or deterrence of incidents; (2) planning and timely and adequate response to emergency situations; and (3) progressive recovery through long-term response in the form of monitoring, remediation, and support for affected communities and the environment.

Depending on the intentional destructive acts, the impacts could be similar to the impacts of the accidents analyzed in the *CMRR-NF SEIS*. However, there may be intentional destructive act scenarios for which the impacts exceed those of the accidents analyzed. Analysis of these intentional destructive act impacts provides NNSA with information upon which to base, in part, decisions regarding the construction and operation of the CMRR-NF. The classified appendix evaluates the similarity of scenarios involving intentional destructive acts with those evaluated in the 2008 *LANL SWEIS* and the 2008 *Complex Transformation SPEIS* and presents the potential consequences to a noninvolved worker, an MEI, and the population in terms of physical injuries, radiation doses, and latent cancer fatalities (LCFs). Although the results of the analyses cannot be disclosed, the following general conclusion can be drawn: the potential consequences of intentional destructive acts are highly dependent on the distance to the site boundary and the size and proximity of the surrounding population; the closer and denser the surrounding population, the higher the consequences. In addition, it is generally easier and more cost-effective to protect new facilities because new security and safety features can be incorporated into their design. New facilities can, as a result of design features, better prevent attacks and reduce the impacts of such attacks.

Environmental Justice

Under the No Action Alternative, there would not have been any disproportionately high and adverse environmental impacts on minority or low-income populations due to construction or normal operations of the 2004 CMRR-NF and RLUOB.

Under the Modified CMRR-NF Alternative, the potential impacts on the general population from construction, operations, and transportation would be small, as indicated in the impact analyses presented in Chapter 4, Section 4.3. Additionally, there are not expected to be any disproportionately high and adverse impacts on minority or low-income populations under this alternative. As discussed in Section 4.3.8, there are not expected to be any significant impacts on cultural resources within LANL or surrounding communities, as a result of implementing this alternative. As discussed in Sections 4.3.4 and 4.3.6, there are not expected to be any significant impacts on air or water quality as a result of implementing this alternative during construction or operation. As discussed in Section 4.3.13, there are not expected to be any significant impacts on transportation routes or traffic in the area surrounding LANL during construction or operations as a result of implementing this alternative. A separate analysis was performed on the specific impacts of transporting radioactive materials from LANL to Pojoaque, New Mexico, and from Pojoaque to Santa Fe, New Mexico, transportation routes that include sections through tribal lands. The results of this analysis show that the incident-free population risks are small, at most 2×10^{-5} or 1 chance in 50,000 that the radiological dose to the public from this transportation would result in a latent cancer fatality in the affected population. Similarly, accident risks associated with this transportation on these routes are small, at most 4×10^{-4} or 1 chance in 2,500 that a traffic accident involving one of the trucks would result in a fatality in the affected population. Radiological doses from normal operations to all individuals would be low. Under the Modified CMRR-NF Alternative, the estimated average annual dose to a nonminority individual from operation of the Modified CMRR-NF and RLUOB would be 0.0037 millirem compared to 0.0033 millirem for the average minority individual; the average annual dose to a non-low-income individual would be 0.0036 millirem compared to 0.0027 millirem for the average low-income individual.

A similar analysis was done for individuals living within 5, 10, and 20 miles (8, 16, and 32 kilometers) of TA-55 and the results were largely the same. For the most part, the estimated average annual dose to nonminority and non-low-income individuals would be the same as or higher than the estimated doses to the average minority and low-income individuals (see Section 4.3.11). The only instance where the estimated average annual dose to minority individuals exceeded the estimated average annual dose to nonminority individuals was for those individuals living within 5 miles (8 kilometers) of TA-55 (0.042 millirem compared to 0.039 millirem). In both cases, these doses are very low; the difference in estimated annual dose of 0.003 millirem would be less than 1/1,000 of a percent of the approximately 480 millirem that a person residing near LANL would normally receive annually from background radiation (see Chapter 3, Section 3.11.1).

Under the Continued Use of CMR Building Alternative, the potential impacts on the general population from operations and transportation would be small, as indicated in the impact analyses presented in Chapter 4, Section 4.4. There are no construction impacts under this alternative. There are not expected to be any disproportionately high and adverse impacts on minority or low-income populations under this alternative. As discussed in Section 4.4.8, there are not expected to be any impacts on cultural resources within LANL as a result of implementing this alternative because no land would be disturbed. As discussed in Sections 4.4.4 and 4.4.6, there are not expected to be any significant impacts on air or water quality as a result of implementing this alternative. As discussed in Section 4.4.13, there are not expected to be any significant impacts on transportation routes or traffic in the area surrounding LANL as a result of implementing this alternative. The average annual dose to a nonminority individual from the continued operation of the CMR Building would be 0.000039 millirem compared to 0.000027 millirem for the average minority individual, and the average annual dose to a non-low-income individual would be 0.000034 millirem compared to 0.000019 millirem for the average low-income individual. A similar analysis was done for individuals living within 5, 10, and 20 miles (8, 16, and 32 kilometers) of TA-3 and the results were largely the same. For the most part, the average annual dose to nonminority and non-low-income individuals would be the same or higher than the estimated doses to the average minority and low-income individuals (see Section 4.4.11). The only instances where the estimated average annual dose to minority individuals exceeded the estimated average annual dose to nonminority individuals were for those individuals living within 5 and 10 miles (8 and 16 kilometers) of TA-3 (0.00076 millirem compared to 0.00069 millirem and 0.0005 millirem compared to 0.00048 millirem, respectively). These doses are very low; the difference in estimated annual dose of up to 7×10^{-5} millirem would be 1/7,000 of a percent of the approximately 480 millirem that a person residing near LANL would normally receive annually from background radiation.

Doses under the Continued Use of CMR Building Alternative would be less than those projected under the Modified CMRR-NF Alternative due to the reduced operations in the CMR Building as a result of safety and seismic concerns that are limiting the work that can be safely conducted there.

A special pathways receptor analysis was performed in support of the 2008 *LANL SWEIS*. In this analysis, it was determined that a special pathways receptor who consumed increased amounts of fish, deer, and elk from the areas surrounding LANL, drank surface water and Indian tea (Cota), and consumed other potentially contaminated foodstuffs could receive an additional dose of up to 4.5 millirem per year from these special pathways (see Appendix C, Section C.1.4, of the 2008 *LANL SWEIS* [DOE 2008a]). Doses associated with normal operation of the proposed CMRR-NF would not be expected to increase these doses. Therefore, if the MEI associated with this *CMRR-NF SEIS* were also assumed to be a special pathways receptor, their maximum dose would be up to 4.8 millirem per year (4.5 millirem associated with special pathways and about 0.3 millirem associated with normal operations of the 2004 CMRR-NF or Modified CMRR-NF). This dose is low; it would represent an increase of 1 percent above the approximately 480 millirem that a person residing near LANL would normally receive annually from background radiation. In terms of increased risk of a fatal cancer from the special pathways dose plus the dose from normal operations of the CMRR-NF, it would represent an annual estimated risk of 3×10^{-6} or about 1 chance in 333,000.

Waste Management

Under the No Action Alternative, waste generation from construction of the 2004 CMRR-NF and RLUOB would have been about 578 tons (524 metric tons) and, based on later information from construction of RLUOB, it is now understood that this number was underestimated. Operation of the 2004 CMRR-NF and RLUOB would have resulted in about 88 cubic yards (67 cubic meters) of transuranic waste, 2,640 cubic yards (2,020 meters) of low-level radioactive waste, 26 cubic yards (20 cubic meters) mixed low-level radioactive waste, and about 12.4 tons (11 metric tons) of chemical waste per year. Operation of the 2004 CMRR-NF and RLUOB would have resulted in about 2.7 million gallons (10 million liters) of low-level liquid radioactive waste annually that would have been treated at RLWTF and 7.2 million gallons (27 million liters) of sanitary wastewater per year that would have been sent to the Sanitary Wastewater Systems Plant. The *CMRR EIS* did not include an estimate for solid waste resulting from operations.

Under the Modified CMRR-NF Alternative, waste generation from construction of the Modified CMRR-NF would be larger than what was estimated for construction of the 2004 CMRR-NF (2,600 tons [2,360 metric tons] compared to 578 tons [524 metric tons]) because the Modified CMRR-NF is a larger facility to address the seismic concerns associated with the 2004 CMRR-NF design, and it is now known that the earlier estimate was underestimated based on the amount of waste generated during construction of RLUOB. Operation of the Modified CMRR-NF and RLUOB would result in the same amount of waste annually as estimated for the No Action Alternative, with the exception of 95 tons (86 metric tons) of solid waste that is included in the estimates for the Modified CMRR-NF and RLUOB. Sanitary wastewater would be sent to the Sanitary Wastewater Systems Plant. Also, due to efforts to reduce the amount of liquid waste being generated as a result of LANL operations, modifications of operations at the Modified CMRR-NF and RLUOB are estimated to result in a much smaller amount of low-level liquid radioactive waste, about 344,000 gallons (1.3 million liters), which would be treated at RLWTF. The amount of radioactive waste generated under this alternative would be consistent with the levels analyzed in the 2008 *LANL SWEIS* and would be a fraction of the annual amount generated at LANL. No additional treatment or disposal facilities would be needed at LANL to handle these wastes.

Under the Continued Use of CMR Building Alternative, annual waste generation rates from operation of the CMR Building and RLUOB would be lower than those estimated under the Modified CMRR-NF Alternative because operations in the CMR Building are currently limited due to safety and seismic concerns. The amount of radioactive waste generated under this alternative would be lower than the levels analyzed in the 2008 *LANL SWEIS* and would be a fraction of the annual estimated waste generated at LANL. No new treatment or disposal facilities would be needed at LANL to handle these wastes.

Transportation and Traffic

Transportation impacts associated with construction of the 2004 CMRR-NF were analyzed in this *CMRR-NF SEIS* to augment the analysis in the 2003 *CMRR EIS*. A transportation impact assessment was conducted in the 2003 *CMRR EIS* for the one-time shipment of SNM during the transition from the existing CMR Building to the CMRR-NF. The public would not have received any measurable exposure.

This *CMRR-NF SEIS* estimated that 489 truck trips would have been required for delivery of construction materials. There would have been no change in the level of service of roadways in the vicinity of LANL during the construction period. Employees currently working at the existing CMR Building and other facilities at LANL would have relocated to the CMRR Facility for operations there. There would have been no impact on traffic or transportation on the internal LANL road system, the vehicle access portals, or the public roadways external to LANL over the existing conditions.

Under the Modified CMRR-NF Alternative, transportation requirements associated with construction of the Modified CMRR-NF would be up to 38,000 and 29,000 offsite truck trips (about 4,300 and 3,300 trips per year on average) under the Deep or Shallow Excavation Option, respectively. These trips would be required to deliver construction materials and equipment to LANL in support of the construction effort, as well as offsite trips related to removing construction waste from the site. This number of truck trips is projected to result in up to 3 additional (2.5) truck accidents over the life of the construction project and 0 (0.3) additional fatalities. Operation of the Modified CMRR-NF and RLUOB would result in additional trips off site associated with the transportation of radioactive waste to treatment and disposal facilities. These trips would result in annual doses of about 2.5 person-rem to the crew of the trucks shipping this waste. No latent cancer fatalities are expected among the crews as a result of these doses. The trips would also result in estimated doses of about 0.8 person-rem per year to the public along the transportation routes. No latent cancer fatalities are expected in the public as a result of these doses. These waste shipments are projected to result in less than 1 additional truck accident annually and 0 (7×10^{-3}) additional fatalities. There is a greater chance of structural damage to Pajarito Road under the Modified CMRR-NF Alternative due to the greater total weight of materials that would be transported on the roadway and the longer duration of transports. Pajarito Road may be sufficiently strong to support the transports without damage if the underlying soil is strong. Should damage occur to the roadway surface, Pajarito road may require rehabilitation or repair sooner than currently anticipated. No change in the level of service of roadways in the vicinity of LANL is anticipated during the construction period. Because no net increase in operations employees is anticipated under the Modified CMRR-NF Alternative, there would be no significant impact on traffic or transportation on the internal LANL road system, the vehicle access portals, or the public roadways external to LANL.

Under the Continued Use of CMR Building Alternative, there would be no transportation requirements associated with construction. Operation of the CMR Building and RLUOB would result in additional trips off site associated with the transportation of radioactive waste to treatment and disposal facilities. These trips would result in annual doses of about 0.3 person-rem to the crew of the trucks shipping this waste. No latent cancer fatalities are expected among the crews as a result of these doses. The trips would also result in estimated doses of about 0.1 person-rem per year to the public along the transportation routes. No latent cancer fatalities are expected in the public as a result of these doses. These waste shipments are projected to result in less than 1 additional truck accident annually and 9×10^{-4} additional fatalities. The estimates of doses and accidents associated with these shipments are less than those projected under the Modified CMRR-NF Alternative because less waste is generated annually at the CMR Building and RLUOB due to reduced operations at the facility compared to full operation of the Modified CMRR-NF and RLUOB. Since continued CMR Building and RLUOB operations would not result in an increase in the number of employees currently working on the site, no changes in traffic are anticipated. There would be no change in the impact on traffic or transportation on the internal LANL road system, the vehicle access portals, or the public roadways external to LANL over the existing conditions.

Table 2–3 Summary of Environmental Consequences of Alternatives

Resource/Material Category	*No Action Alternative* [a]	*Modified CMRR-NF Alternative*	*Continued Use of CMR Building Alternative*
Land Use and Visual Resources			
Construction	26.75 acres of land would have been used, much of it presently disturbed. Some activities would have occurred on land previously designated "Reserve." Construction would have altered views along Pajarito Road; however, the road is not open to the public. The breakdown of land uses includes the following: • CMRR-NF site – 4.75 acres • RLUOB site – 4 acres (completed) • Laydown areas/concrete batch plant – 7 acres • Parking lot – 5 acres • Road realignment – 6 acres	Up to 147 acres of land would be used under the Deep Excavation Option and up to 127 acres under the Shallow Excavation Option. Many project elements would occur in areas presently designated as "Reserve." Construction would alter views along Pajarito Road; however, the road is not open to the public. Areas of temporary disturbance (for example, laydown areas and spoils storage areas) would be restored to their original land use designation following project completion. Restoration of the parking lot in TA-72 would mitigate those long-term visual impacts. The breakdown of land uses includes the following: • CMRR-NF site – 4.8 acres • Laydown areas/concrete batch plants – 60 acres • Spoils areas – 30 acres (Deep Excavation Option), 10 acres (Shallow Excavation Option) • Parking lots – up to 18 acres • Power upgrades – 9.1 acres • Pajarito Road realignment – 3.4 acres • Stormwater detention ponds – 2.5 acres • TA-50 electrical substation – 1.4 acres • Construction support/laydown area – 19.1 acres	Not applicable, no new construction
Operations	Permanent land disturbance would have affected about 13.75 acres, including the building site and parking lot. The new CMRR-NF would have blended with the industrial look of TA-55.	Permanent land disturbance under both the Deep and Shallow Excavation Options would affect about 12 acres, including the building site, the Pajarito Road realignment, the TA-50 electrical substation, and stormwater detention ponds. The road realignment, power substation, and stormwater detention ponds would result in changes in present land use. The new CMRR-NF would blend with the industrial look of TA-55.	No change in current land use

CMR = Chemistry and Metallurgy Research; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building; TA = technical area.

[a] The impacts shown for the No Action Alternative reflect the impacts analysis in the *CMRR EIS*, with the exception of the facility accident results, which were reanalyzed for this *CMRR-NF SEIS*, and transportation and traffic impacts and greenhouse gas emissions, which were not analyzed in the *CMRR EIS*. This information is provided for purposes of comparing the No Action Alternative with the action alternatives. However, as stated in Section 2.6, the 2004 CMRR-NF would not meet the current standards for a PC-3 facility, and a PC-3 facility is required to safely conduct all of the analytical chemistry and materials characterization work required to support DOE and NNSA mission work. Therefore, the No Action Alternative is not being evaluated in this *CMRR-NF SEIS* as an alternative that would meet NNSA's purpose and need and, accordingly, the impacts analysis for it is not generally being updated.

Note: To convert acres to hectares, multiply by 0.40469.

Resource/Material Category	***No Action Alternative*** [a]	***Modified CMRR-NF Alternative***		***Continued Use of CMR Building Alternative***
Site Infrastructure [b]				
Construction		**Deep Excavation**	**Shallow Excavation**	
Electricity (MW-hours per year)	63	31,000 [c]		Not applicable
Water (million gallons per year)	0.75	5	4	Not applicable
Propane (gallons per year)	Not available	19,200	19,200	Not applicable
Operations				
Electricity (MW-hours per year)	19,300	161,000		59,000 [d]
Natural gas (million cubic feet per year)	Not available	58		38 [d]
Water (million gallons per year)	10.4	16		7 [d]
Air Quality and Noise				
Construction	Criteria pollutant concentrations would have remained below standards. Annual greenhouse gas emissions would have been below CEQ guidance threshold for more-detailed evaluation and about 1 percent of site-wide generation.	Criteria pollutant concentrations would remain below standards. Annual greenhouse gas emissions would be below draft CEQ guidance threshold for more-detailed evaluation and about 7 percent of site-wide generation.		Not applicable
	Slight noise increase to offsite public would have been realized from construction activities and traffic.	Slight noise increase to offsite public would be realized from construction activities and traffic.		Not applicable
Operations	Periodic testing of emergency backup generators would not have caused standards to be exceeded. Annual greenhouse gas emissions would have been below CEQ guidance threshold for more-detailed evaluation and about 3 percent of site-wide generation. No change in noise levels from LANL site operations would have been realized.	Periodic testing of emergency backup generators would not cause standards to be exceeded. Annual greenhouse gas emissions would be below draft CEQ guidance threshold for more-detailed evaluation and about 25 percent of site-wide generation.[e] No change in noise levels from LANL site operations would be realized.		Periodic testing of emergency backup generators would not cause standards to be exceeded. Annual greenhouse gas emissions would be below CEQ guidance threshold for more-detailed evaluation and about 10 percent of site-wide generation. No change in noise levels from LANL site operations would be realized.

CEQ = Council on Environmental Quality; CMR = Chemistry and Metallurgy Research; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; LANL = Los Alamos National Laboratory; MW = megawatts.

[a] The impacts shown for the No Action Alternative reflect the impacts analysis in the *CMRR EIS*, with the exception of the facility accident results, which were reanalyzed for this *CMRR-NF SEIS*, and transportation and traffic impacts and greenhouse gas emissions, which were not analyzed in the *CMRR EIS*. This information is provided for purposes of comparing the No Action Alternative with the action alternatives. However, as stated in Section 2.6, the 2004 CMRR-NF would not meet the current standards for a PC-3 facility and a PC-3 facility is required to safely conduct all of the analytical chemistry and materials characterization work required to support DOE and NNSA mission work. Therefore, the No Action Alternative is not being evaluated in this *CMRR-NF SEIS* as an alternative that would meet NNSA's purpose and need and, accordingly, the impacts analysis for it is not generally being updated.

[b] Site infrastructure estimates for construction and operation have been re-estimated for the Modified CMRR-NF compared to those included in the *CMRR EIS*. Estimates included in the *CMRR EIS* were based on preconceptual design information and are now known to have been underestimated in a number of areas.

[c] Annual site infrastructure estimates for electricity use for the Modified CMRR-NF Alternative round to 31,000 megawatt-hours for both the Deep and Shallow Excavation construction options. Although not apparent due to rounding, the Deep Excavation Option would require more electricity over the life of the alternative for mixing the additional concrete for the layer of low-slump concrete fill.

[d] Operational requirements for the CMR Building are not metered separately and are accounted for in present site usage totals in the infrastructure table in Chapter 3 of this *CMRR-NF SEIS*. Only RLUOB requirements are included in this column to represent the increase in site requirements associated with the Continued Use of CMR Building Alternative.

[e] These greenhouse gases emitted by operations at the Modified CMRR-NF and RLUOB would add a relatively small increment (0.001 percent) to emissions of these gases in the United States.

Note: To convert cubic feet to cubic meters, multiply by 0.028317; gallons to liters, by 3.7854.

Resource/Material Category	*No Action Alternative* [a]	*Modified CMRR-NF Alternative*	*Continued Use of CMR Building Alternative*
Geology and Soils			
Construction	A site survey and foundation study would have been conducted as necessary to confirm site geologic characteristics for facility engineering purposes.	*Deep Excavation Option* – The poorly welded tuff layer would be over-excavated and replaced with concrete fill material. The site would be excavated to a depth of 130 feet; about 545,000 cubic yards of materials remain to be excavated. *Shallow Excavation Option* – Construction would occur in the layer above the poorly welded tuff layer. The site would be excavated to a depth of 58 feet; about 236,000 cubic yards of material remain to be excavated. Under either option, excavated material would be stockpiled for future beneficial reuse.	Not applicable
Operations	There would not have been any impact on geology and soils.	No impact on geology and soils	No impact on geology and soils
Surface-Water and Groundwater Quality			
Construction	Potential temporary impacts could have resulted from stormwater runoff. Appropriate soil erosion and sediment control measures and spill prevention practices would have minimized suspended sediment and material transport and reduced potential water quality impacts.	Same as No Action Alternative, but a larger area of land and additional technical areas would be affected by the construction effort (see Land Use). In addition, under the Deep Excavation Option, control measures would be needed for much larger amounts of excavated spoils. In addition, one stormwater detention pond would be enlarged and five new ponds built to collect runoff during construction.	Not applicable
Operations	No impacts on surface water or groundwater would have been expected.	No impacts on surface water or groundwater.	No impacts on surface water or groundwater

CMR = Chemistry and Metallurgy Research; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.

[a] The impacts shown for the No Action Alternative reflect the impacts analysis in the *CMRR EIS*, with the exception of the facility accident results, which were reanalyzed for this *CMRR-NF SEIS*, and transportation and traffic impacts and greenhouse gas emissions, which were not analyzed in the *CMRR EIS*. This information is provided for purposes of comparing the No Action Alternative with the action alternatives. However, as stated in Section 2.6, the 2004 CMRR-NF would not meet the current standards for a PC-3 facility, and a PC-3 facility is required to safely conduct all of the analytical chemistry and materials characterization work required to support DOE and NNSA mission work. Therefore, the No Action Alternative is not being evaluated in this *CMRR-NF SEIS* as an alternative that would meet NNSA's purpose and need and, accordingly, the impacts analysis for it is not generally being updated.

Note: To convert feet to meters, multiply by 0.3048; cubic yards to cubic meters, by 0.76455.

Resource/Material Category	***No Action Alternative*** [a]	***Modified CMRR-NF Alternative***	***Continued Use of CMR Building Alternative***
Ecological Resources			
Construction	Some vegetation and wildlife habitat would have been removed. Implementation of this alternative may have affected, but would not have adversely affected, the Mexican spotted owl.	*Deep Excavation Option* – Additional habitat loss from use of about five times more land area than under the No Action Alternative. The project may affect, but would not adversely affect, the Mexican spotted owl or the southwestern willow flycatcher. Some project elements may remove a small portion of potential habitat for the Mexican spotted owl. Potential southwestern willow flycatcher habitat may be indirectly affected by stormwater runoff and erosion from spoils storage in the area. *Shallow Excavation Option* – Similar to the Deep Excavation Option; however, slightly less potential habitat would be removed due to the decrease in spoils storage area requirements; potential southwestern willow flycatcher habitat would not be affected.	Not applicable
Operations	None	None	None
Cultural and Paleontological Resources			
Construction/Operations	Resources in affected areas would have been protected by avoidance. Sites would have been protected and monitored to ensure their protection.	Resources in affected areas would be protected by avoidance. Sites would be protected and monitored to ensure their protection.	Not applicable

CMR = Chemistry and Metallurgy Research; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.

[a] The impacts shown for the No Action Alternative reflect the impacts analysis in the *CMRR EIS*, with the exception of the facility accident results, which were reanalyzed for this *CMRR-NF SEIS*, and transportation and traffic impacts and greenhouse gas emissions, which were not analyzed in the *CMRR EIS*. This information is provided for purposes of comparing the No Action Alternative with the action alternatives. However, as stated in Section 2.6, the 2004 CMRR-NF would not meet the current standards for a PC-3 facility, and a PC-3 facility is required to safely conduct all of the analytical chemistry and materials characterization work required to support DOE and NNSA mission work. Therefore, the No Action Alternative is not being evaluated in this *CMRR-NF SEIS* as an alternative that would meet NNSA's purpose and need and, accordingly, the impacts analysis for it is not generally being updated.

Resource/Material Category	*No Action Alternative* [a]	*Modified CMRR-NF Alternative*	*Continued Use of CMR Building Alternative*
Socioeconomics			
Construction	Employment would have resulted in little socioeconomic effect.	Peak direct (790 workers) plus indirect (450 workers) employment would represent a relatively small percentage of the total labor force in the four-county region of influence (less than 1 percent).	Not applicable
Operations	Approximately 550 workers would have been at the CMRR Facility (2004 CMRR-NF and RLUOB); they would have come from the CMR Building and other facilities at LANL so the facility would not have increased employment or changed socioeconomic conditions in the region.	Approximately 550 workers would be at the CMRR Facility (Modified CMRR-NF and RLUOB); they would come from the CMR Building and other facilities at LANL so the facility would not increase employment or change socio-economic conditions in the region.	Approximately 210 workers would continue work at the CMR Building, many of whom would be among the staff members whose offices would be relocated to RLUOB. Another 140 workers would work in RLUOB. Workers would come from the CMR Building and other facilities at LANL so there would not be an increase in employment or a change in socioeconomic conditions in the region.

CMR = Chemistry and Metallurgy Research; CMRR = Chemistry and Metallurgy Research Building Replacement; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; LANL = Los Alamos National Laboratory; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] The impacts shown for the No Action Alternative reflect the impacts analysis in the *CMRR EIS*, with the exception of the facility accident results, which were reanalyzed for this *CMRR-NF SEIS*, and transportation and traffic impacts and greenhouse gas emissions, which were not analyzed in the *CMRR EIS*. This information is provided for purposes of comparing the No Action Alternative with the action alternatives. However, as stated in Section 2.6, the 2004 CMRR-NF would not meet the current standards for a PC-3 facility, and a PC-3 facility is required to safely conduct all of the analytical chemistry and materials characterization work required to support DOE and NNSA mission work. Therefore, the No Action Alternative is not being evaluated in this *CMRR-NF SEIS* as an alternative that would meet NNSA's purpose and need and, accordingly, the impacts analysis for it is not generally being updated.

Resource/Material Category	***No Action Alternative*** [a]	***Modified CMRR-NF Alternative***	***Continued Use of CMR Building Alternative*** [b]
Human Health			
Normal Operations			
Offsite population			
Dose (person-rem per year)	1.9	1.8	0.016
Annual population LCF risk	1×10^{-3}	1×10^{-3}	1×10^{-5}
MEI			
Dose (millirem per year)	0.33	0.31	0.0023
Annual LCF risk	2×10^{-7}	2×10^{-7}	1×10^{-9}
Workers			
Worker dose (person-rem per year)	61	60	24
Annual worker population LCF risk	4×10^{-2}	4×10^{-2}	1×10^{-2}
Average worker dose (millirem per year)	110	109	68
Average worker annual LCF risk	7×10^{-5}	7×10^{-5}	4×10^{-5}
Facility Accidents (maximum annual cancer risk [LCFs]) [c]			
Population (risk)	8×10^{-1}	5×10^{-5}	4×10^{-3}
MEI (risk)	7×10^{-3}	2×10^{-7}	1×10^{-5}
Noninvolved worker (risk)	1×10^{-2}	7×10^{-6}	3×10^{-4}

CMR = Chemistry and Metallurgy Research; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; LCF = latent cancer fatality; MEI = maximally exposed individual.

[a] The impacts shown for the No Action Alternative reflect the impacts analysis in the *CMRR EIS*, with the exception of the facility accident results, which were reanalyzed for this *CMRR-NF SEIS*, and transportation and traffic impacts and greenhouse gas emissions, which were not analyzed in the *CMRR EIS*. This information is provided for purposes of comparing the No Action Alternative with the action alternatives. However, as stated in Section 2.6, the 2004 CMRR-NF would not meet the current standards for a PC-3 facility, and a PC-3 facility is required to safely conduct all of the analytical chemistry and materials characterization work required to support DOE and NNSA mission work. Therefore, the No Action Alternative is not being evaluated in this *CMRR-NF SEIS* as an alternative that would meet NNSA's purpose and need and, accordingly, the impacts analysis for it is not generally being updated.

[b] The impacts shown for normal operations and facility accidents under the Continued Use of CMR Building Alternative reflect reduced operations at the facility due to safety and seismic concerns.

[c] Facility accident risk values include a dose-to-risk factor of 0.0006 LCFs per rem for population risks and MEI and noninvolved worker doses if less than 20 rem; a dose-to risk factor of 0.0012 LCFs per rem for MEI and noninvolved worker doses equal or greater than 20 rem; and the probability of the accident occurring.

Resource/Material Category	*No Action Alternative* [a]	*Modified CMRR-NF Alternative*	*Continued Use of CMR Building Alternative*
Environmental Justice			
Construction/Operations	There would not have been any disproportionately high and adverse environmental impacts on minority or low-income populations due to construction or operations.	Impacts on all individuals would be low. There would be no disproportionately high and adverse environmental impacts on minority or low-income populations due to construction, operations, or transportation. Annual doses to all individuals would be low, and the average individual radiological impacts on members of minority and low-income groups would be less than or comparable to impacts on the average nonminority or non-low-income member of the general population. For the 50-mile (80-kilometer) population: • Average dose to nonminority individual: 0.0037 millirem • Average dose to minority individual: 0.0033 millirem • Average dose to non-low-income individual: 0.0036 millirem • Average dose to low-income individual: 0.0027 millirem	Impacts on all individuals would be low. There would be no disproportionately high and adverse environmental impacts on minority or low-income populations due to operations or transportation. Annual doses to all individuals would be low, and the average individual radiological impacts on members of minority and low-income groups would be less than or comparable to impacts on the average nonminority or non-low-income member of the general population. For the 50-mile (80-kilometer) population. • Average dose to nonminority individual: 0.000039 millirem • Average dose to minority individual: 0.000027 millirem • Average dose to non-low-income individual: 0.000034 millirem • Average dose to low-income individual: 0.000019 millirem

CMR = Chemistry and Metallurgy Research; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.

[a] The impacts shown for the No Action Alternative reflect the impacts analysis in the *CMRR EIS*, with the exception of the facility accident results, which were reanalyzed for this *CMRR-NF SEIS*, and transportation and traffic impacts and greenhouse gas emissions, which were not analyzed in the *CMRR EIS*. This information is provided for purposes of comparing the No Action Alternative with the action alternatives. However, as stated in Section 2.6, the 2004 CMRR-NF would not meet the current standards for a PC-3 facility, and a PC-3 facility is required to safely conduct all of the analytical chemistry and materials characterization work required to support DOE and NNSA mission work. Therefore, the No Action Alternative is not being evaluated in this *CMRR-NF SEIS* as an alternative that would meet the NNSA's purpose and need and, accordingly, the impacts analysis for it is not generally being updated.

Resource/Material Category	***No Action Alternative*** [a]	***Modified CMRR-NF Alternative***	***Continued Use of CMR Building Alternative*** [b]
Waste Management			
Construction			
Solid waste (tons) [c]	578	2,600	Not applicable
Operations (annual generation rates)			
Transuranic waste (cubic yards)	88	88	8.2
Low-level radioactive waste (cubic yards)	2,640	2,640	310
Mixed low-level radioactive waste (cubic yards)	26	26	4.1
Chemical waste (tons)	12.4	12.4	1.4
Solid waste (tons)	Not available	95	60
Sanitary wastewater (gallons)	7,200,000	10,800,000	5,220,000
Liquid low-level radioactive waste (gallons)	2,700,000 [d]	344,000	163,000

CMR = Chemistry and Metallurgy Research; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.

[a] The impacts shown for the No Action Alternative reflect the impacts analysis in the *CMRR EIS*, with the exception of the facility accident results, which were reanalyzed for this *CMRR-NF SEIS*, and transportation and traffic impacts and greenhouse gas emissions, which were not analyzed in the *CMRR EIS*. This information is provided for purposes of comparing the No Action Alternative with the action alternatives. However, as stated in Section 2.6, the 2004 CMRR-NF would not meet the current standards for a PC-3 facility, and a PC-3 facility is required to safely conduct all of the analytical chemistry and materials characterization work required to support DOE and NNSA mission work. Therefore, the No Action Alternative is not being evaluated in this *CMRR-NF SEIS* as an alternative that would meet NNSA's purpose and need and, accordingly, the impacts analysis for it is not generally being updated.

[b] The impacts shown for operations under the Continued Use of CMR Building Alternative reflect reduced operations at the facility due to safety and seismic concerns.

[c] The construction waste estimate for the No Action Alternative was based on preconceptual design information and is now known to have been underestimated.

[d] The liquid low-level radioactive waste estimate for the No Action Alternative was based on assumptions and is now known to have been overestimated.

Note: To convert gallons to liters, multiply by 3.7854; tons to metric tons, by 0.90718; cubic yards to cubic meters, by 0.76455.

Resource/Material Category	*No Action Alternative* [a]	*Modified CMRR-NF Alternative*		*Continued Use of CMR Building Alternative*
Transportation and Traffic				
Transportation				
Construction				
Offsite truck trips	Not estimated	Deep Excavation Option – 38,000	Shallow Excavation Option – 29,000	Not applicable
Traffic fatalities	Not estimated	Deep Excavation Option – 0.3	Shallow Excavation Option – 0.2	Not applicable
Operations [b] **(based on annual shipment rate)**				
Incident-free				
Public: (person-rem/LCF) Total Route LANL to Pojoaque segment Pojoaque to Santa Fe segment	Not estimated [c]	 $0.8 / 5 \times 10^{-4}$ $0.02 / 1 \times 10^{-5}$ $0.04 / 2 \times 10^{-5}$		 $0.1 / 6 \times 10^{-5}$ [d] $0.003 / 2 \times 10^{-6}$ $0.005 / 3 \times 10^{-6}$
Crew (person-rem/LCF)	Not estimated [c]	$2.5 / 2 \times 10^{-3}$		$0.3 / 2 \times 10^{-4}$ [d]
Transportation accidents				
Public radiological risk	Not estimated [c]	1×10^{-7}		1×10^{-8} [d]
Public traffic fatality risk	Not estimated [c]	7×10^{-3}		9×10^{-4} [d]
Traffic				
Construction	Personnel and materials transportation would have increased traffic on local roads but would not have changed the level of service on these roadways. No abnormal damage to roadway pavement would have been anticipated.	Personnel and materials transportation would increase traffic on local roads but would not change the level of service on these roadways. No abnormal damage to roadway pavement would be anticipated.		Not applicable
Operations	Minimal impact on traffic would have been expected; some traffic that previously terminated in TA-3 would have continued through and proceeded down Pajarito Road to TA-55.	Minimal impact on traffic; some traffic that previously terminated in TA-3 would continue through and proceed down Pajarito Road to TA-55.		No change from current traffic conditions in TA-3.

CMR = Chemistry and Metallurgy Research; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; LANL = Los Alamos National Laboratory; LCF = latent cancer fatality; TA = technical area.

[a] The impacts shown for the No Action Alternative reflect the impacts analysis in the *CMRR EIS*, with the exception of the facility accident results, which were reanalyzed for this *CMRR-NF SEIS*, and transportation and traffic impacts and greenhouse gas emissions, which were not analyzed in the *CMRR EIS*. This information is provided for purposes of comparing the No Action Alternative with the action alternatives. However, as stated in Section 2.6, the 2004 CMRR-NF would not meet the current standards for a PC-3 facility, and a PC-3 facility is required to safely conduct all of the analytical chemistry and materials characterization work required to support DOE and NNSA mission work. Therefore, the No Action Alternative is not being evaluated in this *CMRR-NF SEIS* as an alternative that would meet the NNSA's purpose and need and, accordingly, the impacts analysis for it is not generally being updated.

[b] LCF values include a dose-to-risk factor of 0.0006 LCFs per rem for crew and public.

[c] The *CMRR EIS* did not include an analysis of the shipment of radioactive waste off site because it was assumed that nearly all of the waste generated from CMRR Facility operations would be able to be disposed of on site at LANL.

[d] The impacts shown under the Continued Use of CMR Building Alternative reflect reduced operations at the facility due to safety and seismic concerns.

<table>
<tr><th>Resource/Material Category</th><th>No Action Alternative [a]</th><th>Modified CMRR-NF Alternative</th><th>Continued Use of CMR Building Alternative</th></tr>
<tr><td colspan="4">Decontamination, Decommissioning, and Demolition (impacts applicable to all alternatives)</td></tr>
<tr><td colspan="4">CMR Building (annual based on a 2-year decommissioning, decontamination, and demolition period)</td></tr>
<tr><td colspan="4">Waste [b]</td></tr>
<tr><td>Transuranic (cubic yards)</td><td>Not estimated</td><td colspan="2">75</td></tr>
<tr><td>Low-level radioactive (cubic yards)</td><td>16,000</td><td colspan="2">19,000</td></tr>
<tr><td>Mixed low-level radioactive (cubic yards)</td><td>Not estimated</td><td colspan="2">140</td></tr>
<tr><td>Radioactive liquid waste (gallons)</td><td>Not estimated</td><td colspan="2">68,000</td></tr>
<tr><td>Chemical (tons)</td><td>Not estimated</td><td colspan="2">130</td></tr>
<tr><td>Solid (cubic yards)</td><td>20,000</td><td colspan="2">53,000</td></tr>
<tr><td colspan="4">Transportation [c, d]</td></tr>
<tr><td colspan="4">Incident-free</td></tr>
<tr><td>Public: (person-rem/LCFs)
Total
LANL to Pojoaque segment
Pojoaque to Santa Fe segment</td><td>Not estimated</td><td colspan="2">$0.4 / 3 \times 10^{-4}$
$0.01 / 1 \times 10^{-5}$
$0.02 / 1 \times 10^{-5}$</td></tr>
<tr><td>Crew (person-rem/LCFs)</td><td>Not estimated</td><td colspan="2">$1.9 / 1 \times 10^{-3}$</td></tr>
<tr><td colspan="4">Transportation accidents</td></tr>
<tr><td>Public radiological risk</td><td>Not estimated</td><td colspan="2">1×10^{-7}</td></tr>
<tr><td>Public traffic fatality risk</td><td>Not estimated</td><td colspan="2">4×10^{-2}</td></tr>
<tr><td>CMRR-NF</td><td colspan="2">Due to the relative sizes of the facilities, waste quantities are expected to be comparable to those for CMR Building decontamination and demolition.</td><td>Not applicable</td></tr>
</table>

CMR = Chemistry and Metallurgy Research; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; LANL = Los Alamos National Laboratory; LCF = latent cancer fatality.

[a] The impacts shown for the No Action Alternative reflect the impacts analysis in the *CMRR EIS*, with the exception of the facility accident results, which were reanalyzed for this *CMRR-NF SEIS*, and transportation and traffic impacts and greenhouse gas emissions, which were not analyzed in the *CMRR EIS*. This information is provided for purposes of comparing the No Action Alternative with the action alternatives. However, as stated in Section 2.6, the 2004 CMRR-NF would not meet the current standards for a PC-3 facility, and a PC-3 facility is required to safely conduct all of the analytical chemistry and materials characterization work required to support DOE and NNSA mission work. Therefore, the No Action Alternative is not being evaluated in this *CMRR-NF SEIS* as an alternative that would meet the NNSA's purpose and need and, accordingly, the impacts analysis for it is not generally being updated.

[b] The *CMRR EIS* included estimates of the amount of low-level radioactive waste and solid waste expected from decontamination and decommissioning of the CMR Building. Updated waste projections for this effort are included in the estimates for the Modified CMRR-NF and Continued Use of CMR Building Alternatives.

[c] LCF values include a dose-to-risk factor of 0.0006 LCFs per rem for crew and the public.

[d] The *CMRR EIS* did not include an analysis of the offsite shipment of radioactive waste from decontamination and decommissioning of the CMR Building for disposal.

Note: To convert gallons to liters, multiply by 3.7854; tons to metric tons, by 0.90718; cubic yards to cubic meters, by 0.76455.

2.10.2 Environmental Impacts Common to Multiple Alternatives

2.10.2.1 Impacts During the Transition from the CMR Building to the New CMRR-NF and RLUOB

Under the No Action or Modified CMRR-NF Alternative, there would be a transition period during which CMR operations at the existing CMR Building and other locations at LANL would be moved to the new CMRR-NF. Because RLUOB is already constructed, activities that do not rely on the CMRR-NF could be transitioned to RLUOB earlier. During CMRR-NF construction, the CMR Building and RLUOB would be operating. During the 3-year transition, both the CMR Building and the CMRR-NF would be operating, although at reduced levels, while RLUOB operations would continue. At the existing CMR Building, where operational restrictions would remain in effect, operations would decrease as operations move to the new CMRR-NF (beginning in 2014 for the 2004 CMRR-NF and 2020 for the Modified CMRR-NF). At the new CMRR-NF, levels of operations would increase as the facility becomes fully operational. In addition, routine onsite shipment of AC and MC samples would continue to take place while both facilities are operating. With both facilities operating at reduced levels at the same time, the combined demand for electricity, water, and manpower to support transition activities during this period may be higher than what would be required by the separate facilities. Nevertheless, the combined total impacts during this transition phase are expected to be less than the impacts attributed to the level of CMR operations analyzed under the Expanded Operations Alternative in the 2008 *LANL SWEIS.*

Also during the transition phase, the risks for accidents would change at both the existing CMR Building and the new CMRR-NF. At the existing CMR Building, the radiological material at risk and associated operations and storage would decline as material is transferred to the new CMRR-NF. This would have the positive effect of reducing the risk for accidents at the CMR Building. Conversely, at the new CMRR-NF, as the amount of radioactive material at risk and associated operations increase towards full operation, the risk from accidents would increase. However, the improvements in design and technology at the new CMRR-NF would have the positive effect of reducing overall accident risks when compared to the accident risks at the existing CMR Building. Because neither facility would be operating at its full capacity during transition, the expected net effect would be for the risk for accidents at each facility to be lower than the accident risks at either the existing CMR Building or the fully operational new CMRR-NF.

2.10.2.2 CMR Building and CMRR Facility Disposition Impacts

Under all alternatives in this *CMRR-NF SEIS*, the CMR Building would undergo DD&D. CMR Building DD&D would be conducted in a manner protective of all environmental resources, including air quality, surface-water and groundwater quality, ecological and cultural resources, and human health. The CMR Building has been deemed eligible for listing in the NRHP due to its association with important events during the Cold War years and its architectural and engineering significance (Garcia, McGehee, and Masse 2009). In conjunction with the State Historic Preservation Office, NNSA has developed documentation measures to reduce adverse effects on NRHP-eligible properties at LANL. These measures are incorporated into formal memoranda of agreement between NNSA and the New Mexico Historic Preservation Division. Typical memorandum of agreement terms include the preparation of a detailed report containing the history and description of the affected properties; such a report may need to be prepared for the CMR Building prior to any demolition activities.

Because activities at the CMR Building over more than a 50-year period have resulted in areas having varying levels of contamination, DD&D is projected to generate a relatively large annual quantity of radioactive, chemical, and solid wastes, as summarized in Table 2–3. Annual waste generation rates in Table 2–3 may be higher than those that would actually occur because they are based on completing DD&D in 2 years. Nonetheless, the quantities and types of wastes to be generated are expected to be within the capacity of existing waste management systems. Risks associated with transporting DD&D wastes to offsite treatment and disposal facilities are expected to be very small; no fatalities are expected along waste transport routes.

DD&D of the new CMRR-NF would be considered at the end of its lifetime, designed to be 50 years. For either the 2004 CMRR-NF or the Modified CMRR-NF, impacts of DD&D of the CMRR-NF are expected to be comparable to those of DD&D of the CMR Building. Although activities involving radioactive materials that would be performed at the CMRR-NF are similar to those currently performed at the CMR Building, construction and operation of the CMRR-NF would reflect over 50 years of experience in facility design and operation and contamination control, with implementation of pollution prevention and waste minimization practices.

2.10.2.3 Summary of Cumulative Impacts

In accordance with CEQ regulations, a cumulative impacts analysis was conducted for this *CMRR-NF SEIS* that included the incremental impacts of the action added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Based on this analysis, the only area of concern that would be significantly impacted by the actions being considered in this *CMRR-NF SEIS* in combination with other actions would be infrastructure requirements. Implementation of the Modified CMMR-NF Alternative would result in the greatest cumulative infrastructure impacts when added to the projected infrastructure requirements for other LANL activities and the demands of other non-LANL users. In the near term, no infrastructure capacity constraints are anticipated. LANL operational demands to date on key infrastructure resources, including electricity and water, have been below the levels projected in the 2008 *LANL SWEIS* (DOE 2008a) and well within site capacities. For example, actual electric peak load for LANL in 2010 was approximately 69 megawatts compared to the 109 megawatts projected in the 2008 *LANL SWEIS* (LANL 2010a).

Utility requirements to operate the Modified CMRR-NF are higher than those associated with operating either the existing CMR Building (under the Continued Use of CMR Building Alternative) or those estimated for the 2004 CMRR-NF (under the No Action Alternative). Should the utility requirements be fully realized, LANL and Los Alamos County could cumulatively require more than 100 percent of the current electric peak load capacity, 71 percent of its total available electrical capacity, 92 percent of the available water capacity, and 28 percent of the available natural gas capacity. Inclusion of infrastructure requirements associated with the construction of alternatives being analyzed in the *Draft Environmental Impact Statement for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste* at LANL could result in an additional increase in the requirements for electric peak load by 3 percent, electricity by 1 percent, and water by less than 1 percent (DOE 2011b).

Of most concern is the potential to exceed peak electric load capacity. However, regardless of the decisions to be made regarding the CMRR-NF, LANL is studying the possibility of adding a third transmission line and/or re-conductoring the existing two transmission lines to increase transmission line capacities from 107 (firm) to 240 megawatts, which would provide additional capacity across the site (LANL 2011a:Infrastructure, 007).

As owner and operator of the Los Alamos Water Supply System, Los Alamos County is now the primary water supplier serving LANL. DOE transferred ownership of 70 percent of its water rights to the county and leases the remaining 30 percent. LANL is currently using approximately 76 percent of its water allotment, and the county is using about 98 percent of its allotment. County concerns about its water availability will be heightened if development plans move forward for additional homes in White Rock and Los Alamos on land that is being conveyed to the county from LANL.

Los Alamos County has implemented a *Conservation Plan for Water and Electricity*. In this plan, the county describes a number of steps it has taken to conserve water, including an effluent reuse washwater system associated with the county's wastewater treatment plant that is estimated to conserve approximately 12 million gallons (45 million liters) annually (LADPU 2010a). Los Alamos County has the right to use up to 390 million gallons (1.5 billion liters) of San Juan-Chama Transmountain Diversion Project water annually and is in the process of determining how best to make this water accessible to the county (LADPU 2010a). Neither the conservation savings nor the San Juan-Chama water has been included in the analysis shown above.

In addition, the use of the Sanitary Effluent Reclamation Facility at LANL may be expanded to include other areas of LANL. Plans are to expand the Sanitary Effluent Reclamation Facility to provide additional treatment to treated effluent from the Sanitary Wastewater Systems Plant to allow the reclaimed water to be used to support the nonpotable water demands for the TA-3 Power Plant, the Metropolis Center for Modeling and Simulation, and the Laboratory Data Communications Center. Such expansions could save millions of gallons of water annually.

CHAPTER 3
AFFECTED ENVIRONMENT

3 AFFECTED ENVIRONMENT

Chapter 3 describes the affected environment at Los Alamos National Laboratory (LANL). This information provides the context for understanding the environmental consequences described in Chapter 4 and serves as a baseline against which any environmental changes brought about by implementing the proposed action can be evaluated. The affected environment at LANL is described for the following impact areas: land use and visual resources; site infrastructure; air quality and noise; geology and soils; surface-water and groundwater quality; ecological resources; cultural and paleontological resources; socioeconomics; environmental justice; human health; waste management and pollution prevention; and transportation.

3.1 Introduction

In accordance with Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) implementing regulations (40 *Code of Federal Regulations* [CFR] Parts 1500 through 1508) for preparing an environmental impact statement (EIS), the affected environment is "interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment." The affected environment descriptions presented in this chapter provide the context for understanding the environmental consequences described in Chapter 4. They serve as a reference from which environmental changes brought about by implementing the proposed action can be evaluated; the reference conditions are the currently existing conditions and reflect any changes that have occurred since publication of both the *Final Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico (CMRR EIS)* (DOE 2003b) and the 2008 *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (2008 *LANL SWEIS*) (DOE 2008a). These changes have included a reduction in the size of Los Alamos National Laboratory (LANL) due to the conveyance and transfer of land; closure of the outfall from the Chemistry and Metallurgy Research (CMR) Building; and progress on environmental remediation in accordance with the Compliance Order on Consent.

Within this *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 (CMRR-NF SEIS)*, the current affected environment at LANL is described for the following resource areas: land use and visual resources; site infrastructure; air quality and noise; geology and soils; surface-water and groundwater quality; ecological resources; cultural and paleontological resources; socioeconomics; environmental justice; human health; waste management and pollution prevention; and transportation. Additional detailed information on the existing environmental conditions may be found in the *CMRR EIS* (DOE 2003b) and 2008 *LANL SWEIS* (DOE 2008a).

The National Nuclear Security Administration (NNSA) evaluated the environmental impacts within defined regions of influence (ROIs) for each resource area. The ROIs are specific to the type of effect evaluated, and encompass geographic areas within which any significant impact would occur. For example, human health risks to the general public from exposure to airborne contaminant emissions were assessed for an area within a 50-mile (80-kilometer) radius of the proposed action, while economic effects were evaluated within the Incorporated County of Los Alamos (also informally known as Los Alamos County) and nearby counties in which substantial portions of the site's workforce reside. Brief descriptions of the ROIs are given in **Table 3–1**; more-detailed discussions are presented in Appendix B.

Table 3–1 General Regions of Influence for the Affected Environment

Environmental Resources	*Region of Influence*
Land Use and Visual Resources	LANL and the areas immediately adjacent
Site Infrastructure	LANL and Los Alamos County for water and electricity
Air Quality and Noise	LANL, nearby offsite areas within local air quality control regions, where significant air quality impacts may occur (air quality); the site, nearby offsite areas and access routes to the site (noise)
Geology and Soils	LANL and nearby offsite areas
Surface-Water and Groundwater Resources	LANL and adjacent surface water bodies and groundwater
Ecological Resources	LANL and adjacent areas
Cultural and Paleontological Resources	LANL and adjacent to the site boundary
Socioeconomics	The counties in which approximately 90 percent of LANL employees reside
Environmental Justice	The minority and low-income populations within 50 miles of LANL
Human Health	The site and offsite areas within 50 miles of LANL
Waste Management and Pollution Prevention	LANL
Transportation	LANL and adjacent areas

LANL = Los Alamos National Laboratory.
Note: To convert miles to kilometers, multiply by 1.6093.

3.2 Land Use and Visual Resources

LANL is located on 37 square miles (23,680 acres [9,583 hectares]) of land in north-central New Mexico (LANL 2011a:LANL Site, 008) (see Chapter 1, Figure 1–1). The site is located 60 miles (97 kilometers) north-northeast of Albuquerque, 25 miles (40 kilometers) northwest of Santa Fe, and 20 miles (32 kilometers) southwest of Española. LANL is owned by the Federal Government and administered by the U.S. Department of Energy (DOE)/NNSA. Portions of LANL are located in Los Alamos and Santa Fe Counties.

3.2.1 Land Use

LANL is divided into 47 contiguous technical areas with location and spacing that reflect the site's historical development patterns, regional topography, and functional relationships (see Chapter 1, Figure 1–2). The various technical areas are used for building sites, experimental areas, and waste disposal locations. In total, about 20 percent of the site is developed, with facilities and structures (LANL 2011a:Data Call Tables, 001); however, major constraints to development exist and include such factors as topography, slope, soils, vegetation, geology and seismology, climate, endangered species, archaeological and cultural resources, and surface hydrology (LANL 2000b). Undeveloped portions of the site provide security, safety, and expansion possibilities for future mission-support requirements.

The *Los Alamos National Laboratory Comprehensive Site Plan 2000: Los Alamos National Laboratory Project Management and Planning* (LANL 2000b) identifies 10 land use categories. These include administration, experimental science, high-explosives research and development, high-explosives testing, nuclear materials research and development, physical/technical support, public/corporate interface, reserve, theoretical/computational science, and waste management (**Figure 3–1**). The 10 land use categories are defined as follows:

- *Administration, Service, and Support*—Administrative functions, nonprogrammatic technical expertise, support, and services for LANL management and employees.

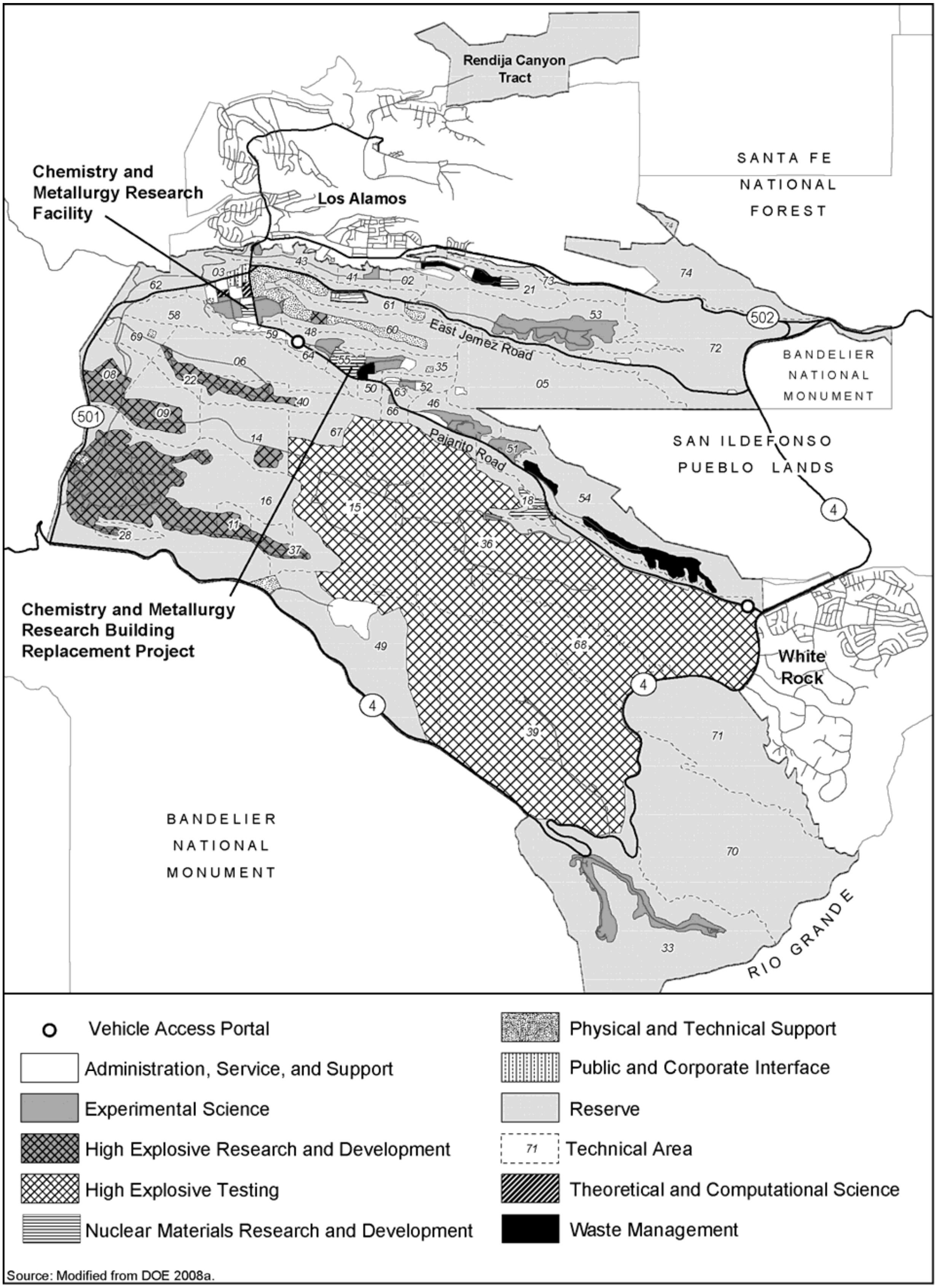

Figure 3–1 Los Alamos National Laboratory Site-Wide Land Use

- *Experimental Science*—Applied research and development activities tied to major programs.
- *High-Explosives Research and Development*—Research and development of new explosive materials. This land is isolated for security and safety.
- *High-Explosives Testing*—Large, isolated, exclusive-use areas required to maintain safety and environmental compliance during testing of newly developed explosive materials and new uses for existing materials. This land also includes exclusion and buffer areas.
- *Nuclear Materials Research and Development*—Isolated, secured areas for conducting research and development involving nuclear materials. This land use includes security and radiation hazard buffer zones. It does not include waste disposal sites.
- *Physical and Technical Support*—Includes roads, parking lots, and associated maintenance facilities; infrastructure such as communications and utilities; facility maintenance shops; and maintenance equipment storage. This land use generally is free from chemical, radiological, or explosives hazards.
- *Public and Corporate Interface*—Provides link with the general public and other outside entities conducting business at LANL, including technology transfer activities.
- *Reserve*—Areas that are not otherwise included in one of the other categories. It may include environmental core and buffer areas, vacant land, and proposed land transfer areas.
- *Theoretical and Computational Science*—Interdisciplinary activities involving mathematical and computational research and related support activities.
- *Waste Management*—Provides for activities related to the handling, treatment, and disposal of all generated waste products, including solid, liquid, and hazardous materials (chemical, radiological, and explosive).

In 1977, DOE designated LANL as a National Environmental Research Park for use by the national scientific community as an outdoor laboratory to study the impacts of human activities on pinyon-juniper woodland ecosystems (DOE 1996b). In 1999, the 1,000-acre (405-hectare) White Rock Canyon Reserve, located on the southeast perimeter of LANL, was dedicated to preserve its significant ecological and cultural resources (LANL 2000a). In 2000, land on and to the north and west of the site was affected by the Cerro Grande Fire. The fire burned a total of 43,150 acres (17,462 hectares), of which 7,684 acres (3,110 hectares) were within the boundaries of LANL (DOE 2002d). On June 26, 2011, the Las Conchas Fire began as a result of a wind-thrown tree striking and shorting out a power line, burning southwest, west, north, and northwest of LANL. As of July 20, 2011, 156,590 acres (63,370 hectares) had been burned, including 118 acres (47.8 hectares) on LANL, most of which was an intentional back-burn (LANL 2011a:LANL Site, 029; USDA 2011).[1] There are no agricultural activities on the LANL site, nor are there any prime or unique farmlands present as defined in the Farmland Protection Policy Act of 1981 located within the Incorporated County of Los Alamos (NRCS 2011).

As a result of the passage of Public Law 105-119, Section 632, 10 tracts on LANL were designated for possible conveyance from DOE to the Incorporated County of Los Alamos or to the Department of the

[1] *Back-burning is a way of reducing the amount of flammable material during a wildfire by starting small fires along a manmade or natural firebreak in front of a main fire front. The basic purpose of back-burning is so that there is little material that can burn when the main fire reaches the burnt area.*

Interior to be held in trust for the Pueblo of San Ildefonso by 2007 (DOE 2008a). This program was analyzed in the *Final Environmental Impact Statement for the Conveyance and Transfer of Certain Land Tracts Administered by the U.S. Department of Energy and Located at the Los Alamos National Laboratory, Los Alamos and Santa Fe Counties, New Mexico* (DOE 1999c). Due to changes in the program, the total acreage designated for conveyance or transfer is now estimated to be 4,309 acres (1,744 hectares) and the completion date is 2022. To date 2,441 acres (988 hectares) have been conveyed or transferred to either the county or the Secretary of the Interior, in trust for San Ildefonso Pueblo (LANL 2011a:LANL Site, 008, 009).

Land use in the LANL region is linked to the economy of northern New Mexico, which depends heavily on tourism, recreation, agriculture, and the state and Federal governments. Area communities are generally small, including the Los Alamos townsite and White Rock, which are home to about 11,000 and 7,000 residents, respectively, and primarily support urban uses, including residential, commercial, light industrial, and recreational. The region also includes Native American communities; lands of the Pueblo of San Ildefonso share a border with LANL on its east side, while the Santa Clara and Pojoaque Pueblos are located approximately 20 miles (32 kilometers) to the northeast and east, respectively. Numerous other pueblos are also located in the Los Alamos area (DOE 2008a). Major governmental bodies that serve as land stewards and determine land uses within Los Alamos and Santa Fe Counties include county governments, DOE, the U.S. Department of Agriculture (U.S. Forest Service, Santa Fe National Forest), the U.S. Department of the Interior (National Park Service, Bandelier National Monument, and the Bureau of Land Management [BLM]), the State of New Mexico, and several Native American pueblos. Bandelier National Monument and Santa Fe National Forest border LANL primarily to the southwest and northwest, respectively; however, small portions of each also border the site to the northeast.

Land use within Los Alamos and Santa Fe Counties is controlled by the counties' comprehensive plans. LANL is designated as "Federal" in the Los Alamos County Plan (DOE 2008a). The Santa Fe County Plan designates LANL as "Agricultural and Residential"; there are no agricultural activities on the site, nor are there any residential uses on LANL property (DOE 2003b). However, the privately owned Royal Crest Trailer Park, located along East Jemez Road, is surrounded by TA-61. Although the county governments have no jurisdiction over Federal lands, they seek Federal cooperation to achieve the goals set forth in their comprehensive plans.

Table 3–2 provides information on the technical areas of concern considered for the analysis of impacts across the three alternatives analyzed in this SEIS. The table provides the following information for each technical area: a description, land use categories present, and total acreage.

3.2.2 Visual Resources

The topography of northern New Mexico is rugged, especially in the vicinity of LANL. Mesa tops are cut by deep canyons, creating sharp angles in the landform. In some cases, slopes are nearly vertical. Often, little vegetation grows on these steep slopes, exposing the geology, with contrasting horizontal planes varying from fairly bright reddish orange to almost white in color. A variety of vegetation occurs in the region, the density and height of which may change over time and can affect the visibility of an area within the LANL viewshed. Undeveloped lands within LANL have a BLM Visual Resource Contrast rating of Classes II and III. Management activities within these classes may be seen, but should not dominate the view. The contrast rating system was developed by BLM as a guide for evaluating the visual impacts of a project (BLM 1986).

Table 3–2 Technical Areas of Concern

Technical Area	*Technical Area Description*	*Land Use Category*
3	The main technical area housing approximately half of the LANL employees and about half of its floor space. Site of the present Chemistry and Metallurgy Research Building facility. The area is nearly completely developed.	Administration, Service, and Support; Experimental Science; Nuclear Materials Research and Development; Public and Corporate Interface; Reserve; Theoretical and Computational Science
5	Contains five physical support facilities, an electrical substation, and test wells, as well as archaeological sites and environmental monitoring and buffer areas. The area is largely undeveloped and includes vegetated mesas and canyons.	Administration, Service, and Support; Reserve
36	Contains four active sites that support explosives testing. The area is largely undeveloped, with predominantly natural vegetation.	High-Explosives Testing
46	Supports basic laboratory research and site of the Sanitary Wastewater Systems Plant. The central and southeastern portions of the technical area are highly developed, while the remainder is forested.	Administration, Service, and Support; Experimental Science; Reserve
48	Supports research in nuclear and radiochemistry, geochemistry, production of medical isotopes, and chemical synthesis. The central portion of the technical area is developed. Remaining portions of the mesa top are open or sparsely vegetated, and Mortandad Canyon is largely forested.	Experimental Science; Reserve
50	Contains 33 waste support structures. Much of the technical area is developed or disturbed grassland. The southern portion of the technical area within Twomile Canyon is forested.	Reserve
51	Used for research and studies on the long-term impact of radioactive materials on the environment. Development within the technical area is scattered; the north wall of Pajarito Canyon is the most heavily vegetated area.	Experimental Science; Reserve
52	Supports theoretical and computational research and development. The central portion of the technical area is developed; the remainder is largely vegetated, especially the south wall of Mortandad Canyon	Administration, Service, and Support; Experimental Science; Reserve
54	Supports management of radioactive solid and hazardous chemical wastes. Some development and open fields occur in the western portion of the technical area; remaining areas are largely vegetated.	Waste Management; Reserve
55	Supports research of and applications for the chemical and metallurgical processes of recovering, purifying, and converting plutonium and other actinides into many compounds and forms, as well as research into material properties and fabrication of parts for research and stockpile applications. The technical area is largely developed; only the south wall of an extension of Mortandad Canyon has significant vegetative cover.	Nuclear Materials Research and Development; Reserve
63	Contains physical support facilities, a trailer, and transportable office space. The mesa-top portion of this technical area is largely developed; however, the south-facing wall of Twomile Canyon and north-facing wall of Mortandad Canyon are forested.	Administration, Service, and Support/Experimental Science; Reserve
64	Contains Central Guard Facility, office and storage space for the Hazardous Materials Response Team, as well as several storage sheds and water tanks. Development and open fields dominate the mesa top within this technical area; however, the south-facing wall of Twomile Canyon is forested.	Administration, Service, and Support; Reserve
72	Contains the live firing range used by LANL protective force personnel for required training, as well as a truck inspection station. The area is sparsely developed and remains largely in a natural vegetated state.	Administration, Service, and Support; Reserve

LANL = Los Alamos National Laboratory.
Note: To convert acres to hectares, multiply by 0.40469.
Source: DOE 2008a.

For security reasons, much of the development within LANL, which is generally austere and utilitarian, has occurred out of the public's view. Passing motorists or nearby residents can see only a small fraction of what is actually there. Prior to the 2000 Cerro Grande Fire, the view of most LANL property from many stretches of area roadways was that of woodlands and brushy areas. Views from various locations in Los Alamos County and its immediate surroundings were altered by the Cerro Grande Fire. Although the visual environment is still diverse, interesting, and panoramic, portions of the visual landscape are dramatically stark, with the rock layers forming the mountains now visible. Grasses and shrubs initially will replace forest stands and will contribute to the visual contrast between the burned and unburned areas for many years. Since the fire, mechanical thinning of the forests has been in progress within LANL and nearby areas to reduce the existing fuel loads. This tree-thinning process has increased the visibility of industrial and residential areas within LANL and Los Alamos County (DOE 2000). A total of 955 acres (386 hectares) were thinned from 2008 through 2010; an additional 397 acres (161 hectares) will be thinned in 2011 (LANL 2010f).

The most visible developments at LANL are a limited number of very tall structures; facilities at relatively high, exposed locations; or those beside well-traveled, publicly accessible roads. A number of new buildings have been constructed in recent years, including the National Security Sciences Building in TA-3 and the Radiological Laboratory/Utility/Office Building (RLUOB) in TA-55. The National Security Sciences Building is eight stories high and is visible from most locations throughout the Los Alamos townsite. RLUOB is visible from a number of locations throughout LANL and is the key visible structure along Pajarito Road. Many of the older structures on the site have been demolished over the past several years, which has improved the appearance of the built environment. Developed areas within LANL are consistent with a BLM Class IV Visual Resource Contrast rating, in which management activities dominate the view and are the focus of viewer attention (BLM 1986).

At lower elevations, at a distance of several miles away from LANL, the site is primarily distinguishable in the daytime by views of its water storage towers, and white dome storage structures at TA-54. Similarly, the Los Alamos townsite appears mostly residential in character, with its white water storage towers visible against the backdrop of the Jemez Mountains. At elevations above LANL, along the upper reaches of the Pajarito Plateau rim, the view of LANL is primarily of scattered austere buildings and groupings of several-storied buildings. Similarly, the residential character of the Los Alamos townsite is predominantly visible from higher elevation viewpoints. At night, the lights of LANL, the Los Alamos townsite, and the community of White Rock are directly visible from various locations across the viewshed and as far away as the towns of Española and Santa Fe.

Table 3–2 presents a general description of the appearance of the various technical areas that may be affected by actions proposed in this *CMRR-NF SEIS*. In general, development along Pajarito Road decreases toward the east; there is little development to the south of the road. The visual resources along the road generally are consistent with BLM Visual Contrast Ratings of Class III and Class IV. Under a Class III rating, development may attract attention, but the natural landscape dominates; however, under a Class IV rating, development dominates the view and is the major focus of the landscape. However, these views are limited to LANL workers, as the road is closed to the public. When viewed from higher elevations to the west along the upper reaches of the Pajarito Plateau rim, development along Pajarito Road would be most prominent within TA-3 and would become more scattered to the east. Development in the eastern portion of TA-72 (the area of a proposed parking lot) is limited to a shooting range and temporary truck inspection station. Considering the presence of these facilities, the visual resources of this area would be consistent with a BLM Visual Contrast Ratings of Class III.

3.3 Site Infrastructure

Site infrastructure characteristics are summarized in **Table 3–3**. Each infrastructure characteristic is further discussed in the following paragraphs.

Table 3–3 Los Alamos National Laboratory Site-Wide Infrastructure Characteristics

Resource	*Usage* [a]	*Site Capacity*	*Available Capacity*
Transportation			
Roads (miles)	80 [b]	Not applicable	Not applicable
Railroads (miles)	0	Not applicable	Not applicable
Electricity			
Energy (megawatt-hours per year)	LANL 563,000 Other 150,000	1,226,000 [c]	513,000
Peak load demand (megawatts)	LANL 101 Other 23	140 [c]	16
Fuel			
Natural gas (million cubic feet per year)	LANL 1,197 Other 1,018	8,070 [c]	5,860
Water (million gallons per year)	LANL 412 Other 1,241	LANL 542 [d] System Total 1,807	LANL 130 Total 153

LANL = Los Alamos National Laboratory.

[a] Usage values for electricity, fuel and water are shown for fiscal year 2010 or the projected levels of usage included in the 2008 *LANL SWEIS* adjusted for decisions made in the associated Records of Decision, whichever is higher. Other usage is shown when capacity is shared by all Los Alamos County users, including LANL.

[b] Includes paved roads and paved parking areas only.

[c] Capacity values are for the entire service area, which includes LANL and other Los Alamos County users.

[d] Equivalent to DOE's leased water rights.

Note: To convert miles to kilometers, multiply by 1.6093; cubic feet to cubic meters, by 0.0283; gallons to liters, by 3.7853. A decatherm is equivalent to 1,000 cubic feet.

Values may be rounded.

Source: DOE 2008a; LANL 2011a:Data Call Tables, 001; Infrastructure, 014.

3.3.1 Ground Transportation

About 80 miles (130 kilometers) of paved roads and parking surface have been developed at LANL (see Table 3–3). There is no railway service connection at the site. Local and linking regional transportation systems, including roadways, are detailed in Section 3.13.

3.3.2 Electricity

Electrical service to LANL is supplied through a cooperative arrangement with Los Alamos County, known as the Los Alamos power pool, which was established in 1985. Electric power is supplied to the pool through two existing regional 115-kilovolt electric power lines. The first line (the Norton-Los Alamos line) is owned by DOE and originates from the Norton substation east of White Rock; the second line (the Reeves Line) is owned by the Public Service Company of New Mexico and originates from the Bernalillo-Algodones Substation south of LANL. Both substations are owned by the Public Service Company of New Mexico (DOE 2008a).

Import capacity is now limited only by the physical capability (thermal rating) of the transmission lines, that is, to approximately 110 to 120 megawatts supplied from a number of hydroelectric, coal, and natural gas power generators throughout the western United States (LANL 2011b). In addition, renewable energy sources such as wind farms and solar plantations are providing a small (about 5 percent) but growing percentage of Public Service Company of New Mexico's total power portfolio (DOE 2008a).

In April 2011, Los Alamos County completed construction of the Abiquiu Low-Flow Turbine Hydropower Project. As a result, the low-flow turbine increased energy generation at the Abiquiu facility from 13.8 megawatts to 16.8 megawatts and currently provides additional power to Los Alamos County, including LANL (DOE 2011d).

Within LANL, NNSA operates a natural gas-fired steam and electrical power generating plant at TA-3 (TA-3 Co-Generation Complex or Power Plant), which is capable of generating 27 megawatts from the combustion turbine generator, and up to 10 megawatts from steam-driven turbine generators #1 and #2, for a total of 37 megawatts, all shared by the power pool. However, the two steam-driven turbine generators are currently unavailable and have not been used for several years. A third steam-driven turbine generator is also out of service due to a condenser failure.

The DOE-maintained electric distribution system at LANL consists of various low-voltage transformers at LANL facilities and approximately 34 miles (55 kilometers) of 13.8-kilovolt distribution lines. It also consists of two older power distribution substations, the Eastern Technical Area Substation and the TA-3 Substation, and a new substation built in 2002, the Western Technical Area Substation. This 115-kilovolt (13.8-kilovolt distribution) substation has a main transformer rated at 56 megavolt-amperes or about 45 megawatts. The new substation provides redundant capacity for LANL and the Los Alamos townsite in the event of an outage at either of LANL's two older substations (DOE 2008a).

Electric power availability from the existing transmission system of the power pool is conservatively estimated at 990,000 megawatt-hours, including recent upgrades to the Abiquiu Hydroelectric Facility. The additional 27 megawatts available from LANL via the combustion turbine generator at the TA-3 Co-Generation Complex give the power pool a total electric energy availability of 1,226,000 megawatt-hours. This does not include the megawatts from the unavailable steam-driven turbine generators.

In 2010, the total peak load was 69.23 megawatts for LANL and 23.3 megawatts for the rest of the power pool users. The system peak for fiscal year (FY) 2010 was 82.72 megawatts. A total of 419,908 megawatt-hours of electricity were used at LANL in 2010. Other Los Alamos County users consumed an additional 150,000 megawatt-hours for a power pool total electric energy consumption of 569,908 megawatt-hours. Peak demand and consumption of electricity are below those projected for the level of operations that NNSA selected in the September 2008 and June 2009 *LANL SWEIS* RODs (73 FR 55833 and 74 FR 33232). LANL annual requirements as projected in the *LANL SWEIS*, adjusted for decisions made since then, was 101 megawatts peak demand and 563,000 megawatt-hours.

Historically, year-to-year fluctuations in LANL's total electrical energy use have largely been attributable to Los Alamos Neutron Science Center (LANSCE) operations. Since 2003, an increase in LANL base peak load demand and particularly in base electrical energy use, independent of LANSCE operations, is evident. This is punctuated by the observed spike both in LANL base electrical energy use and in use by other Los Alamos County consumers. Nevertheless, operations at several of the large LANL load centers continue to change, which complicates attempts to forecast future electricity demands.

The need for upgrades and the limitations of the electric transmission lines that deliver electric power to the Los Alamos power pool was documented in the 2008 *LANL SWEIS*. LANL has completed several construction projects to expand and enhance existing power capabilities (LANL 2010a). Additional upgrades are being considered, including construction of a portion of the line from the Norton substation to the Southern Technical Area substation. The existing underground ducts need upgrading to fully realize the capabilities of the Western Technical Area substation and the upgraded Eastern Technical Area substation. Redundant feeders need to be added to critical facilities, and the aging TA-3 substation needs upgrading to complete the 13.8-kilovolt distribution and 115-kilovolt transmission systems. The current CMR Building and RLUOB are served by the TA-3 substation.

3.3.3 Fuel

Natural gas is the primary heating fuel used at LANL and in Los Alamos County. The natural gas system includes a high-pressure main and distribution system to Los Alamos County and pressure-reducing stations at LANL buildings. LANL and Los Alamos County both have delivery points where gas is monitored and measured. In August 1999, DOE sold the 130-mile-long (210-kilometer-long) main gas supply line and associated metering stations to the Public Service Company of New Mexico. This gas pipeline traverses the area from Kutz Canyon Processing Plant south of Bloomfield, New Mexico, to Los Alamos County. Approximately 4 miles (6.4 kilometers) of the gas pipeline are within LANL boundaries. Natural gas is distributed to the point of use via some 42 miles (68 kilometers) of distribution piping (DOE 2008a).

Natural gas used by LANL is currently used for heating (both steam and hot air), with the TA-3 Co-Generation Complex being the principal user of natural gas at the site. About 200 other smaller boilers are maintained at LANL, which are primarily natural gas fired (DOE 2008a). Relatively small quantities of fuel oil are stored at LANL as a backup fuel source for emergency generators.

FY 2010 natural gas consumption for LANL and the Los Alamos service area was 1,104 million cubic feet (31 million cubic meters) and 1,018 million cubic feet (29 million cubic meters), respectively. Total natural gas consumption for LANL remains below that projected for the level of operations that NNSA selected in the September 2008 and June 2009 *LANL SWEIS* RODs (73 FR 55833 and 74 FR 33232). LANL usage projected in the 2008 *LANL SWEIS*, adjusted for decisions made since then, was 1,197 million cubic feet (34 million cubic meters), annually.

Natural gas usage at TA-55 is limited to boilers used for heating. TA-55 is estimated to use approximately 45 million cubic feet (1.3 million cubic meters) of natural gas annually (DOE 2008a).

3.3.4 Water

The Los Alamos County water production system consists of 14 deep wells, 153 miles (246 kilometers) of main distribution lines, pump stations, and storage tanks. The system supplies potable water to all of Los Alamos County, LANL, and Bandelier National Monument. The deep wells are located in three well fields (Guaje, Otowi, and Pajarito). Water is pumped into production lines, and booster pump stations lift this water to reservoir tanks for distribution. Prior to distribution, the entire water supply is disinfected (DOE 2008a).

The system was originally owned and operated by DOE. On September 8, 1998, DOE transferred operation of the system to Los Alamos County under a lease agreement. Under the agreement, DOE retained responsibility for operating the distribution system within LANL boundaries, whereas Los Alamos County assumed full responsibility for ensuring compliance with Federal and state drinking water regulations. DOE retained the right to withdraw an equivalent of about 5,541 acre-feet or 1,806 million gallons (6,840 million liters) of water per year from the main aquifer and its right to purchase a water allocation of 1,200 acre-feet or 391 million gallons (1,480 million liters) per year from the San Juan-Chama Transmountain Diversion Project (DOE 2008a).

On September 5, 2001, DOE transferred ownership of the water production system to Los Alamos County, along with 70 percent (3,879 acre-feet or 1,264 million gallons [4,780 million liters] annually) of the DOE water rights. DOE leased the remaining 30 percent (1,662 acre-feet or 542 million gallons [2,050 million liters] annually) of the water rights to Los Alamos County for 10 years, with the option to renew the lease for four additional 10-year terms. LANL is now considered a Los Alamos County water customer, and DOE is billed and pays for the water LANL uses. The current 10-year agreement (water service contract) with Los Alamos County, includes an escalating projection of future LANL water consumption (DOE 2008a). While the contract does not specify a supply limit to LANL, the water right owned by DOE and leased to Los Alamos County (that is 1,662 acre-feet or 542 million gallons [2,050 million liters] per year) is a target ceiling quantity under which total water consumption at LANL should remain. The distribution system serving LANL facilities consists of a series of reservoir storage tanks, pipelines, and fire pumps. The LANL distribution system is gravity fed with pumps for high-demand fire situations at limited locations (DOE 2008a).

Los Alamos County has signed a contract with the Bureau of Reclamation for accessing up to 391 million gallons (1,480 million liters) of water per year from the San Juan-Chama Transmountain Diversion Project. The water is currently inaccessible while the project completes engineering studies that will lead directly to the environmental clearance, enabling the county to utilize its entire annual allocation of the San Juan-Chama water supply in the most economical and beneficial way (LACBPU 2010). Use of the San Juan-Chama water, along with conservation, is integral to Los Alamos County's Long-Range Water Supply Plan (DOE 2008a).

Water use for LANL and other Los Alamos County users is shown in Table 3–3. In 2010, LANL operations consumed about 412 million gallons (1,560 million liters) of water. This is greater than the 408 million gallons (1.5 billion liters) annual usage projected for the level of operations that NNSA selected in the September 2008 and June 2009 *LANL SWEIS* RODs (73 FR 55833 and 74 FR 33232). In recent years, total and consumptive water use for both LANL and other Los Alamos County users has increased. Water use at LANL has increased by about 10 percent from 2007 to 2010, whereas from 1999 to 2005 water use at the site decreased (LANL 2010e).

NNSA continues to maintain the onsite distribution system by replacing portions of the more-than-50-year-old system as problems arise. The LANL contractor is also in the process of installing additional water meters and a Supervisory Control and Data Acquisition and Equipment Surveillance System on the water distribution system to keep track of water usage and to determine the specific water use for various applications. Data are being accumulated to establish a baseline for conserving water. NNSA has instituted a number of conservation and water-reuse projects, including improvements to the Sanitary Effluent Recycling Facility to reduce potable water usage (DOE 2008a).

3.3.5 High Performance and Sustainable Buildings

NNSA's commitment to the principles of sustainable buildings is evident in several requirements specified in various DOE orders (for example, 413.3B, 436.1). In 2002, the *LANL Sustainable Design Guide* (LANL 2002) was developed to provide a specific planning and design process for creating and meeting site sustainability goals in buildings through energy reduction, indoor environmental quality, water efficiency and quality, and site preservation (LANL 2002). The LANL contractor has incorporated sustainable design into its Engineering Standards Manual, with guidance on siting, circulation, and landscape design, and has hosted sustainable design workshops. The LANL contractor incorporates specific requirements into design/build contracts that are designed to achieve the U.S. Green Building Council's Leadership in Energy and Environmental Design™ (LEED) certification for sustainable design proficiency. Further, the LANL and Sandia National Laboratories contractors have convened a High-Performance Group to share knowledge about sustainable design and lessons learned from ongoing projects. In all cases, security and safety must be priorities in achieving energy goals.

Recently, LANL completed the *Fiscal Year 2011 Site Sustainability Plan, Los Alamos National Laboratory* (LANL 2010e), which sets up specific goals for reduced energy and water use and greenhouse gas reduction. Several strategies and measures are laid out as part of a site-wide, holistic path to achieving sustainability goals.

Of note, LANL recently won the 2010 NNSA Pollution Prevention Award for Best in Class for Sustainable Design/Green Building and the 2010 EStar DOE Environmental Sustainability Award in Recognition of Exemplary Environmental Sustainability Projects and Practices (DOE's highest environmental award). These awards were presented for RLUOB integrated planning, design, procurement, and construction. RLUOB, which is part of the CMRR Project, is expected to be awarded the level of Silver Certified under the LEED for New Construction and Major Renovations (LEED-NC) rating system and will be the first building at LANL to register and participate in the formal process to submit required documentation for review by the U.S. Green Building Council. The CMRR-NF is also registered under the LEED-NC rating system, with many of the same credits anticipated to be achievable. Lessons learned from design and construction of RLUOB from a LEED perspective are already being incorporated into the CMRR-NF and are shared with other LANL planned construction projects.

3.4 Climate, Air Quality, and Noise

3.4.1 Climate

Climate information for an area does not change drastically over time; thus, the information presented in the *CMRR EIS* (DOE 2003b) and *LANL SWEIS* (DOE 2008a) is still applicable. Los Alamos County is a semiarid, temperate mountain climate characterized by seasonable, variable rainfall. Precipitation ranges from 10 to 20 inches (25 to 51 centimeters) per year and precipitation rates within the county decline toward the Rio Grande Valley. The town of Los Alamos is less arid (dry) than the area near the Rio Grande, which is arid continental. Mean temperatures range from 17.4 degrees Fahrenheit (°F) (-8.1 degrees Centigrade [°C]) in January to 80.6 °F (27 °C) in July, with an extreme low temperature of -18 °F (-28 °C) and an extreme high temperature of 95 °F (35 °C). Normal temperatures (30-year mean) in the town of White Rock range from 14.6 °F (-9.7 °C) in January to 85.6 °F (29.8 °C) in July. Temperatures in Los Alamos County vary with altitude, averaging 5 °F (3 °C) higher in and near the Rio Grande Valley, which is 6,500 feet (1,981 meters) above sea level, and 5 to 10 °F (3 to 5.5 °C) lower in the Jemez Mountains, which are 8,500 to 10,000 feet (2,590 to 3,050 meters) above sea level (DOE 2003b).

Precipitation in Los Alamos County during July and August is 36 percent of the annual average value due to thunderstorms. Los Alamos County averages 60 thunderstorms per year, with intense and frequent lightning that has caused fires. Local lightning density is estimated at 15 strikes per square mile (5.6 strikes per square kilometer) per year, commonly observed between May and September (LANL 2009a). Flash flooding from heavy thunderstorms in canyons and low-lying areas does occur. Winter precipitation falls as snow, with an average snowfall of 59 inches (150 centimeters). Snowfall levels vary year to year, ranging from 9 inches (23 centimeters) to 153 inches (389 centimeters). Los Alamos County experienced drought conditions from 1998 through 2003, the longest and most severe drought experienced by this area during the last 80 years. Above-average precipitation in 2004 and 2005 helped to restore normal conditions. Precipitation levels were slightly below normal in 2009 (18.6 inches [47.2 centimeters]) (LANL 2010b).

Windspeed averages 7 miles per hour (3 meters per second) in Los Alamos County. Due to storms and cold fronts, windspeeds are lowest in December and January and highest in March through June. Due to the complex terrain surface, winds vary dramatically with time of day, location, and elevation. Generally, an upslope airflow occurs in the morning, with winds shifting from the south over the entire plateau by noon. During the night, winds come from the west-southwest to the northwest over the western portion of the plateau due to cold air drainage off the Jemez Mountains and the Pajarito Plateau (DOE 2008a).

3.4.2 Air Quality

Air quality is determined by the type and amount of the pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. The baseline standards for pollutant concentrations are the National Ambient Air Quality Standards (NAAQS) and state air quality standards. These standards represent the maximum allowable atmospheric concentration that may occur and still protect public health and welfare. Based on measured ambient air pollutant concentrations, the U.S. Environmental Protection Agency (EPA) designates whether areas of the United States meet NAAQS. Those areas demonstrating compliance with NAAQS are considered "attainment" areas, while those that are not are known as "nonattainment" areas. Those areas that cannot be classified on the basis of available information for a particular pollutant are "unclassifiable" and are treated as attainment areas.

The State of New Mexico has established ambient air quality standards for the criteria pollutants and total suspended particulates, hydrogen sulfide, and total reduced sulfur (**Table 3–4**). The Clean Air Act gives the authority to states to establish air quality rules and regulations. EPA is the regulating authority for the Clean Air Act; however, EPA has granted the New Mexico Environment Department (NMED) primacy for regulating nonradioactive air emissions under an approved State Implementation Plan. New Mexico has adopted all Clean Air Act regulations as part of the State Implementation Plan, except the National Emission Standards for Hazardous Air Pollutants for radionuclides (40 CFR Part 61), provisions of the Stratospheric Ozone Protection section (40 CFR Part 82), and the Risk Management Program (40 CFR Part 68).

Bi-annual public meetings on the status of the CMRR Project are held as a result of a formal negotiated settlement between NNSA and local public citizens groups. A number of public citizens groups raised concerns with NMED on the air quality construction permit application submitted in February 2005 for RLUOB. As a means of settling raised concerns, an agreement was reached to hold public briefings on the CMRR Project, as well as including the interested groups in the review of future air quality permit submissions. As of March 10, 2011, eleven public meeting have been held. Transcripts of the meetings can be viewed at http://www.lanl.gov/orgs/cmrr/publicmeetings/index.shtml.

Air quality permits have been obtained from the NMED Air Quality Bureau for various activities at LANL, including beryllium operations; open burning of high-explosives waste; and operation of an air curtain destructor, an asphalt plant, a rock crusher, the TA-3 power plant, and the TA-33 generator. Each of these operations was modified or constructed after August 31, 1972. In accordance with Title V of the Clean Air Act and New Mexico Administrative Code 20.2.70, a site-wide operating permit application was submitted to NMED in December 1995. A modified application was submitted in 2005; a renewal application was submitted in 2008. The current approved operating permit was issued in August 2009. The LANL site-wide operating permit has voluntary facility-wide emission limits to ensure that LANL remains a minor stationary source for the purposes of the Prevention of Significant Deterioration Construction Permit Program and the Clean Air Act Title III requirements for hazardous air pollutants. Prior to construction NMED requires air permits for new buildings depending on the design and operation. An application to modify the LANL Title V permit would be submitted to NMED prior to operation of the new facility.

LANL is located within the Upper Rio Grande Valley Intrastate Air Quality Control Region (#157). The area encompassing LANL and Los Alamos County is classified as an attainment area for all six criteria pollutants (40 CFR 81.332). Baseline emissions for the Upper Rio Grande Valley Intrastate Air Quality Control Region utilized in this *CMRR-NF SEIS* are presented in **Table 3–5**. The county data include emissions data from point sources, area sources, and mobile sources. "Point sources" are stationary sources that can be identified by name and location. "Area sources" are point sources of emissions too small to track individually, such as individual homes, small office buildings, or diffuse stationary sources (e.g., wildfires or agricultural tilling equipment). "Mobile sources" are vehicles or equipment with gasoline or diesel engines, e.g., an airplane or a ship. Two types of mobile sources are considered: on-road and nonroad. On-road mobile sources are vehicles such as cars, light trucks, heavy trucks, buses, engines, and motorcycles. Nonroad mobile sources are aircraft, locomotives, diesel- and gasoline-powered boats and ships, personal watercraft, landscaping equipment, agricultural and construction equipment, and recreational vehicles (for example, snowmobiles) (EPA 2009b).

Table 3–4 Federal and New Mexico State Ambient Air Quality Standards

Air Pollutant	*Averaging Time*	*New Mexico Standards*	*Federal Standards*	
			Primary	*Secondary*
Carbon Monoxide	8-hour 1-hour	8.7 ppm 13.1 ppm	9 ppm 35 ppm	— —
Nitrogen Dioxide	AAM 24-hour	0.05 ppm 0.10 ppm	0.053 ppm —	0.053 ppm —
Sulfur Dioxide	AAM 24-hour 3-hour	0.02 ppm 0.10 ppm —	0.030 ppm 0.140 ppm —	— — 0.50 ppm
Particulate Matter (PM_{10})	AAM 24-hour	— —	50 $\mu g/m^3$ 150 $\mu g/m^3$	50 $\mu g/m^3$ 150 $\mu g/m^3$
Particulate Matter ($PM_{2.5}$) [a]	AAM 24-hour	— —	15 $\mu g/m^3$ 65 $\mu g/m^3$	15 $\mu g/m^3$ 65 $\mu g/m^3$
Total Suspended Particulates	AGM 30-day 7-day 24-hour	60 $\mu g/m^3$ 90 $\mu g/m^3$ 110 $\mu g/m^3$ 150 $\mu g/m^3$	— — — —	— — — —
Hydrogen sulfide	1-hour [c]	0.010 ppm	—	—
Total Reduced Sulfur [b]	½-hour [c]	0.003 ppm	—	—
Ozone	8-hour	—	0.08 ppm	0.08 ppm
Lead	3-month	—	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$

AAM = annual arithmetic mean; AGM = annual geometric mean; PM_n = particulate matter with an aerodynamic diameter less than or equal to *n* micrometers; ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter.

[a] The $PM_{2.5}$ standard was promulgated in January 2005 and will be implemented over the next few years.

[b] Total reduced sulfur does not include hydrogen sulfide.

[c] Entire state except for the Pecos–Permian Air Basin, which includes De Baca, Chaves, Curry, Quay, and Roosevelt Counties.

Source: EPA 2009a; NMAC 20.2.3. 2006.

Table 3–5 Upper Rio Grande Valley Intrastate Air Quality Control Region Emissions

Source Type	*Emissions (tons per year)*				
	Carbon Monoxide	*Nitrogen Oxides*	*PM_{10}*	*Sulfur Dioxide*	*Volatile Organic Compounds*
Area Source	4,608	631	271,212	259	3,943
Nonroad Mobile	13,807	1,416	166	145	1,628
On-Road Mobile	75,197	8,454	214	269	5,306
Point Source	4,119	2,970	266	35	2,652
Total	97,730	13,472	271,858	707	13,530

PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers.
Total may not equal the sum of the contributions due to rounding.
Note: To convert tons to metric tons, multiply by 0.90718.
Source: EPA 2002.

Operations at LANL emit criteria pollutants primarily from combustion sources, such as boilers, emergency generators, and motor vehicles. Emissions at LANL are provided in **Table 3–6**.

Table 3–6 Air Emissions at Los Alamos National Laboratory as Reported in the Los Alamos National Laboratory Title V Operating Permit Emissions Reports

Pollutants	*2008* **LANL SWEIS** *(tons per year)*	*Title V Facility-wide Emission Limits (tons per year)*	*2009 Emissions (tons per year)*
Carbon Monoxide	58	225	33.5
Nitrogen Oxides	201	245	46.6
Particulate Matter	11	120	4.3
Sulfur Oxides	0.98	150	0.7

Note: The Title V Operating Permit Emissions Report includes two categories of sources not required in the annual emission inventory: small, exempt boilers and heaters, and exempt standby emergency generators.
To convert tons to metric tons, multiply by 0.90718.
Source: DOE 2003b, 2008a; LANL 2011b.

The Bandelier Wilderness Area is designated as a Class I area (an area that exceeds 10,000 acres [4,047 hectares]) in accordance with the Clean Air Act, as amended, and New Mexico regulations. This means that facilities located within a 62-mile (100-kilometer) radius of the area must not cause appreciable deterioration in air quality. NMED monitored levels of air pollutants of interest (sulfur dioxide, nitrogen dioxide, ozone, and particulate matter with an aerodynamic diameter less than or equal to 10 microns) at a station adjacent to Bandelier National Monument between 1990 and 1994. Operation of the station was discontinued in 1995 because the recorded values were well below applicable standards. Visibility is considered to be an important value (40 CFR Part 81; 20 New Mexico Administrative Code [NMAC] 2.74]) and requires protection. Visibility has been officially monitored by the National Park Service at Bandelier National Monument since 1988. The visual range has not deteriorated during the period for which data are available (DOE 2003b).

3.4.3 Radiological Releases

Radiological air emissions in 2009 from all LANL technical areas, as well as emissions solely from TA-55, are presented in **Table 3–7**. Uranium releases for the year did not change significantly from releases in 2008. Plutonium releases were higher by a factor of three over previous years. Tritium releases are mainly from TA-16, which accounted for 47.6 curies (62 percent) of the tritium released at LANL over the entire year. Standards for emissions of radionuclides are discussed in Section 3.11.1.

A radiological ambient air-sampling network is fielded in Los Alamos, Santa Fe, and Rio Arriba Counties and is designed to measure levels of airborne radionuclides (plutonium, tritium, and uranium) that may be emitted from LANL operations. Radionuclides emitted from stacks and/or diffuse sources may be captured. The network comprises more than 50 ambient air-sampling stations. Each sampler is equipped with a filter to collect a particulate matter sample (for gross alpha/beta and radiochemical determination) and a silica gel cartridge to collect a water sample (for tritium determination). **Table 3–8** presents the average ambient air concentrations calculated from the field and analytical data for the last 5 years by the type of radioactivity and specific radionuclides.

Table 3–7 Radiological Airborne Releases to the Environment at Los Alamos National Laboratory in 2009

Radionuclide	*LANL (curies)*	*TA-3 (curies)*	*TA-55 (curies)*
Tritium	76.7	—	7.45
Americium-241	2.5×10^{-6}	2.5×10^{-6}	5.1×10^{-10}
Plutonium (includes isotopes -238, -239, -240)	1.3×10^{-5}	1.29×10^{-5}	8.6×10^{-10}
Uranium (includes isotopes -234, -235, -238)	1.1×10^{-5}	1.06×10^{-5}	—
Thorium	2.5×10^{-7}	2.50×10^{-7}	—
Strontium-90	1.62×10^{-7}	2.34×10^{-8}	—
Particulates/vapor activation products	1.4×10^{-2}	—	—
Gaseous/mixed activation products	775	—	—
Total	852	2.6×10^{-5}	7.5

LANL = Los Alamos National Laboratory; TA = technical area.
Note: Dashed lines indicate no measurable releases.
Source: LANL 2010b.

Table 3–8 Average Background Concentration of Radioactivity in the Regional Atmosphere near Los Alamos National Laboratory [a]

Radioactivity (units)	*EPA Concentration Limit [b]*	*2005*	*2006*	*2007*	*2008*	*2009*
Gross Alpha (fCi/m^3) [c]	Not applicable	0.9	1.0	1.0	0.9	1.0
Gross Beta (fCi/m^3) [c]	Not applicable	16	17	19	17	19
Tritium (pCi/m^3)	1,500	0.1	-0.2	0.2	0.8	0.2
Plutonium-238 (aCi/m^3)	2,100	0.1	-0.3	-0.3	0.1	0.4
Plutonium-239, -240 (aCi/m^3)	2,000	0.0	0.1	0.6	-0.1	1.0
Americium-241 (aCi/m^3)	1,900	0.1	0.2	-0.1	-0.3	-0.6
Uranium-234 (aCi/m^3)	7,700	12	17	15	18	17
Uranium-235 (aCi/m^3)	7,100	1.2	0.8	0.8	1.3	0.7
Uranium-238 (aCi/m^3)	8,300	13	16	15	17	16

EPA = U.S. Environmental Protection Agency; aCi = attocuries (10^{-18} curies); fCi = femtocuries (10^{-15} curies); pCi = picocuries (10^{-12} curies); m^3 = cubic meters.
[a] Data from regional air-sampling stations during the last 5 years. Locations can vary by year.
[b] Each EPA limit is from 10 CFR Part 40 and corresponds to 10 millirem per year.
[c] Alpha and beta values are gross air concentrations; all others are net air concentrations.
Note: Some values in the tables indicate measured negative concentrations, which is physically impossible. However, it is possible for measured concentrations to be negative because the measured concentrations are a sum of the true value and all random errors. As the true value approaches zero, the measured value approaches the total random errors, which can be negative or positive and overwhelm the true value. Arbitrarily discarding negative values when the true value is near zero will result in overestimated ambient concentrations.
Source: LANL 2010b.

3.4.4 Greenhouse Gases and Climate Change

Greenhouse gases (GHGs) are gases that trap heat in the atmosphere. These emissions are generated by both natural processes and human activities. The accumulation of GHGs in the atmosphere affects the Earth's temperature. Assessments by the Intergovernmental Panel on Climate Change (IPCC) indicate that the Earth's climate has warmed between 1.08 and 1.62 °F (0.6 and 0.9 °C) over the past century and that it is "very likely" (that is, there is a 90 percent chance) that the effect of human activity on the atmosphere is an important driving factor. In the IPCC Fourth Assessment Report (IPCC 2007), scientists conclude that "most of the observed increase in globally-averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations." The IPCC goes on to state, "The observed widespread warming of the atmosphere and ocean, together with ice mass loss, support the conclusion that it is extremely unlikely that global climate change of the past 50 years can be explained without external forcing, and very likely that it is not due to known natural causes alone."

The six primary GHGs, which are defined in Section 19(i) of Executive Order 13514 and internationally recognized and regulated under the Kyoto Protocol, are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

Each GHG has an estimated global warming potential, which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the Earth's surface. To allow GHGs to be compared to each other, each GHG quantity is translated into a common unit called the "carbon-dioxide equivalent." A description of this methodology along with the full list of GHGs and global warming potentials can be found in Appendix B.

NMED prepared the *Inventory of New Mexico's Greenhouse Gas Emissions: 2000-2007* (NMED 2010). The state-wide inventory has been compiled as mandated in State of New Mexico Executive Orders 2005-033 and 2006-69 to provide an update regarding trends of GHG emissions in the state. The inventory reported 85,900,000 tons (78,000,000 metric tons) of carbon-dioxide equivalent in 2000, and 84,000,000 tons (76,000,000 metric tons) of carbon-dioxide equivalent in 2007 for New Mexico. The focus of the report was to provide a top-down inventory; however, some bottom-up data are included. Top-down data (for example, statewide fuel consumption) are used to estimate emissions from a broad cross section of GHG-emitting sources, whereas bottom-up data are estimated from specific emitting unit(s) (for example, a facility with an air permit). The year 2008 marked the first year for which NMED received GHG reporting data from the largest sources of air pollutants that it regulates (that is, sources that are subject to the Title V air permitting program). However, they only required reporting of carbon dioxide. A LANL GHG inventory is shown in **Table 3–9**. As noted in the table, the carbon-dioxide-equivalent inventory at LANL for FY 2008 is 439,673 tons (398,865 metric tons). The inventory focuses on FY 2008 because Executive Order 13514 established greenhouse gas emissions percentage reduction targets for three scoping categories (discussed below) to be reached by FY 2020, using FY 2008 as the baseline.

Scope 1 emissions include direct stationary and mobile sources, as well as direct fugitive emissions from refrigeration or air conditioning equipment owned and controlled by NNSA at LANL, and various other sources of fluorinated gases.

Scope 2 and 3 emissions are defined as indirect greenhouse gas emissions generated outside the boundaries of NNSA's direct control at LANL. Originally, these were defined by the World Resources Institute and the World Business Council for Sustainable Development to avoid double counting emissions. Double counting would occur if two different entities were to report the same emissions. Scope 2 sources account for emissions from the generation of purchased electricity or renewable electricity consumed at LANL. The electricity-generating facility on site, which is currently not operating at full capacity, is owned by LANL, and, therefore, is included under Scope 1 emissions. Scope 3 sources are derived from business travel, employee commutes in vehicles not owned by NNSA at LANL, and municipal solid waste and wastewater treatment.

Table 3–9 Los Alamos National Laboratory Site-Wide Greenhouse Gas Inventory for Fiscal Year 2008

Emissions Scope	*Category*	*Tons Carbon-Dioxide Equivalent*
Scope 1	Sulfur Hexafluoride	6,805
	Hydrofluorocarbon-23	3
	Hydrofluorocarbon-134a	674
	Asphalt Plant	162
	Boilers	31,876
	Permitted Generators	52
	Power Plant	29,931
	Combustion Turbine	1,046
	Standby Generators	240
	Fleet Vehicles	6,714
	Other Onsite Vehicles	1,983
Total Scope 1		**79,485**
Scope 2	Purchased electricity	269,597
	Purchased renewable electricity	9,218
Total Scope 2		**278,814**
Total Scope 1 and 2		**358,300**
Scope 3	Transmission and Distribution Losses	18,671
	Employee Commuting	53,608
	Business Air Travel	9,055
	Municipal Solid Waste	31
	Wastewater Treatment	9
Total Scope 3		**81,374**
Total Scope 1, 2, and 3		**439,673**

Note: To convert tons to metric tons, multiply by 0.90718.
Total may not equal the sum of the contributions due to rounding.
Source: LANL 2011a:Greenhouse Gases, 015.

3.4.5 Noise

Noise is defined as any unwanted sound. Defining characteristics of noise include sound level (amplitude), frequency (pitch), and duration. Each of these characteristics plays a role in determining the intrusiveness and level of impact that noise may have on a receptor, that is, any person, animal, or object that hears or is affected by noise. The standard unit used to report sound pressure levels is the decibel (dB); the A-weighted frequency scale (decibels A-weighted, or dBA) is an expression of adjusted pressure levels by frequency that accounts for human perception of loudness.

Existing noise related to LANL facilities that is detectable by the public comes from a variety of sources, including construction, truck and automobile movements to and from the LANL technical areas, high-explosives testing, and firearms practice by security guards. Non-LANL noise occurring within Los Alamos County is dominated by traffic movement and, to a much lesser degree, other residential-, commercial-, and industrial-related activities. Measurements of nonspecific background ambient noise in the LANL area have been taken at a couple of locations near LANL boundaries next to public roadways. Background noise levels were found to range from 31 to 35 dBA at the vicinity of the entrance to Bandelier National Monument and New Mexico State Route (SR) 4. At White Rock, background noise levels range from 38 to 51 dBA (1-hour equivalent sound level); the slight increase compared to Bandelier National Monument is probably due to higher levels of traffic and the presence of a residential neighborhood, as well as the different physical setting (DOE 2003b).

Peak noise levels from LANL operations are represented by the detonation of high explosives. The higher-frequency, audible air pressure waves that accompany detonation of explosives can be heard by both workers and the area public. The lower-frequency air pressure waves are not audible, but may cause secondary and audible noises within a testing structure that may be heard by personnel.

Noise attenuation (reduction) is affected by vegetation, topography and meteorology. Much of LANL is forested, particularly where explosive test sites are located, and varied elevations and rock formations influence and channel noise and vibrations away from receptors. Booming noises from explosives are similar to thunder and startle receptors and LANL workers alike. The Cerro Grande Fire reduced vegetative cover, thereby decreasing the ability of the surrounding environment to absorb noise (DOE 2008a).

LANL operational noise (both audible and vibration) is regulated by worker protection standards (29 CFR 1910.95) that are consistent with the Los Alamos County Code. Los Alamos County promulgated a local noise ordinance that establishes noise level limits for residential land uses. Noise levels that affect residential receptors are limited to a maximum of 65 dBA during daytime hours (between 7 A.M. and 9 P.M.) and 53 dBA during nighttime hours (between 9 P.M. and 7 A.M.). During daytime hours, the permissible noise level can be increased to 75 dBA in residential areas, provided the noise is limited to 10 minutes in any 1 hour. Activities that do not meet the noise ordinance limits require a permit. It was determined by the Los Alamos County Community Development Department that LANL does not need a special permit under the Los Alamos County Code, as explosive test noise is not prolonged. Traffic noise is exempted from the Los Alamos County Code. Wildlife and sensitive, federally protected bird populations are vigorous in the LANL area, suggesting that noise generated at LANL is within the acceptable tolerance range for most wildlife species and sensitive nesting birds.

3.5 Geology and Soils

3.5.1 Regional Geology

LANL is located on the Pajarito Plateau, within the Southern Rocky Mountains Physiographic Province. The Pajarito Plateau lies between the Sierra de los Valles, located in the Jemez Mountains, to the west, and the Rio Grande to the east (see **Figure 3–2**). The Sierra de los Valles form the eastern rim of the Valles caldera, which is a cauldron-like volcanic feature, typically formed by the collapse of land following a volcanic eruption. The first of two major caldera-forming eruptions occurred 1.61 million years ago (Izett and Obradovich 1994), forming the Toledo caldera and producing the lower, or Otowi Member, of the Bandelier Tuff (Spell et al. 1996). The second major caldera-forming eruption occurred 1.256 million years ago (Phillips et al. 2007), forming the Valles caldera and depositing the upper, or Tshirege Member, of the Bandelier Tuff. The gently sloping surface of the Pajarito Plateau is divided into multiple narrow east-southeast-trending mesas, dissected by deep parallel canyons that extend from the Jemez Mountains to the Rio Grande. The major tectonic feature in the region is the Rio Grande rift, which begins in central Colorado, trends southward through central New Mexico, and extends into northern Mexico. This rift comprises a complex system of north-trending basins, formed from down-faulted blocks of the Earth's crust. In the LANL area, the rift is approximately 35 miles (56 kilometers) wide and contains the Española Basin. The Sangre de Cristo Mountains border the rift on the east. The Jemez Mountains and associated Pajarito fault system form the western margin of the rift (DOE 2003b).

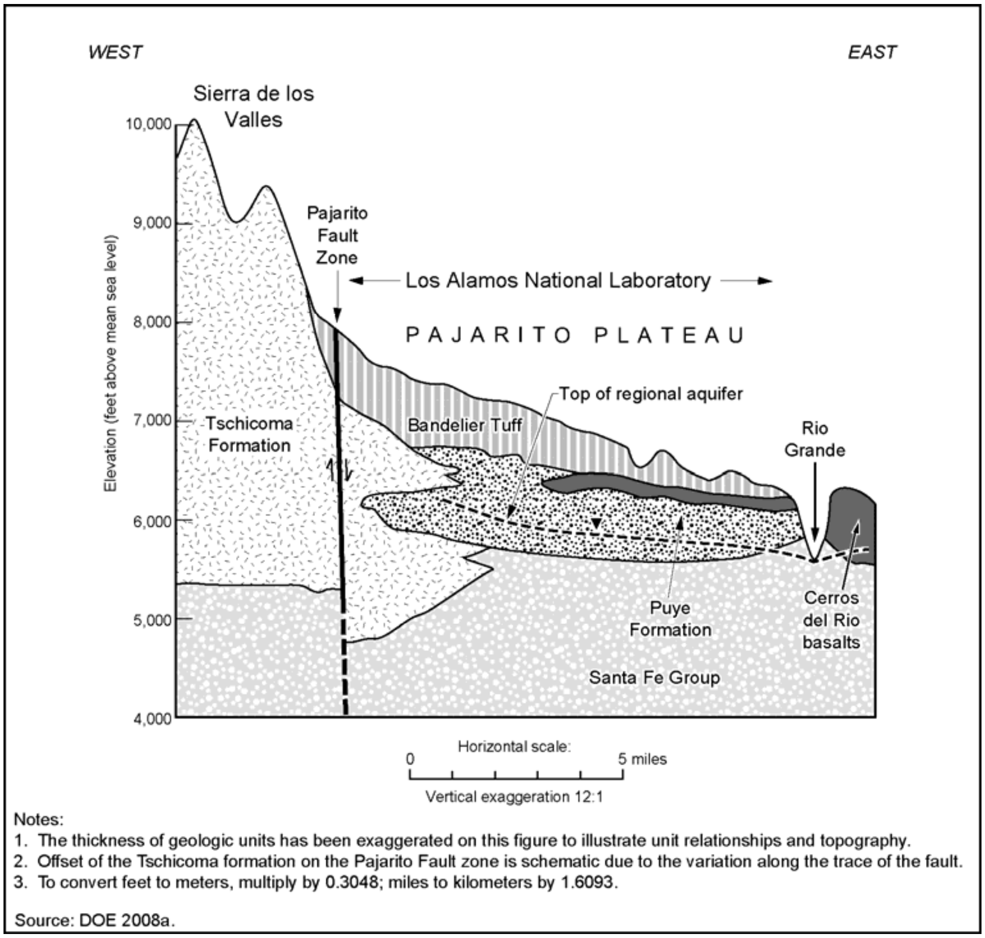

Figure 3–2 Generalized Cross Section of the Los Alamos National Laboratory Area

Rocks in the LANL region are volcanic and sedimentary. Volcanic activity began forming the Jemez Mountains approximately 16.5 million years ago and has continued sporadically to the most recent eruptions that produced the El Cajete pumice fall, about 50,000 to 60,000 years ago (Reneau et al. 1996). The unusually low amount of seismic activity in the Jemez Mountains has been reinterpreted to indicate that seismic signals of magma movement are partially absorbed deep in the subsurface, due to elevated temperatures and high heat flow (LANL 2004). The significance of this to LANL is that magma movement indicates that the Jemez Mountains continue to be a zone of potential volcanic activity.

3.5.2 Stratigraphy

3.5.2.1 Surficial Geologic Units

In the LANL area, the youngest surficial geologic units consist of sediment deposited by flowing water (alluvium) and rock debris accumulated at the bases of slopes along stream channels and in canyons (colluvium). Artificial fill is also present as a result of modern development. Extensive areas on the Pajarito fault escarpment show evidence of mass erosion and landslides. Detailed mapping and trench studies of the Pajarito fault system have identified multiple alluvial fan deposits, the youngest of which were formed in the Holocene period (in the past 11,000 years). The El Cajete pumice fall, which dates back 50,000 to 60,000 years, is contained within intermediate-aged alluvial fan deposits. Older surficial geologic deposits are remnants from once-extensive alluvial fans, predating the incision of the present canyons. These older alluvial deposits contain pumice beds approximately 1.1 million years old (DOE 2003b).

3.5.2.2 Bedrock Units

Bedrock outcrops occur on more than 50 percent of the surface at LANL. The geologic formations that are most relevant to TA-55 are those that would influence seismic ground response and foundation performance. Seismic ground response, as determined by two deep seismic characterization borings, is affected by the relatively high seismic wave velocity of the Cerro del Rio basalt and Tschicoma Formation dacite (which is a relatively hard volcanic rock) and the much lower seismic wave velocities of the overlying, softer Bandelier Tuff (Kleinfelder 2007a).

The 1.2- to 1.6-million-year-old Bandelier Tuff is a variably consolidated ash-flow unit and forms the bedrock on which nearly all LANL facilities are constructed. These rock layers dip gently southeastward, representing the paleotopographic surface and thinning of units away from the volcanic source to the west (DOE 2003b, 2008a). As described above, the Bandelier Tuff was formed in two eruptive pulses from the nearby Valles caldera, located approximately 10 miles west of TA-55. The older member, or Otowi Member, of the Bandelier Tuff has been dated at 1.61 million years (Izett and Obradovich 1994). The younger member, or Tshirege Member, of the Bandelier Tuff has been dated at 1.256 million years (Phillips et al. 2007) and is widely exposed as the mesa-forming unit around Los Alamos. Several discrete subunits constitute the Tshirege Member of the Bandelier Tuff, and commonly accepted stratigraphic nomenclature is described in detail by Broxton and Reneau (1995) and Lewis et al. (2009). The subunits exposed at TA-55 include Qbt2, Qbt3, and limited exposure of Qbt4. Because of their continuity and age, these subunits provide excellent stratigraphic marker horizons for identifying faults that have been active in the past 1.25 million years. Therefore, understanding and identifying the differences between the Tshirege Member subunits and the nature of the contacts between the subunits is critical to identifying fault-generated displacements around the Pajarito Plateau.

Based on borings drilled at the CMRR Facility site within TA-55, approximately 700 feet (210 meters) of Bandelier Tuff is present beneath the proposed CMRR-NF location (see **Figure 3–3**). The upper portion of this geologic unit comprises Units 3 (Qbt3) and 4 (Qbt4) of the Tshirege member of the Bandelier Tuff. The upper unit, Qbt4, is composed of soft volcanic tuff, with slight to moderate welding (which is a term that refers to depositional heat consolidation and compaction) and substantial random fracturing. Some fractures are deeply weathered and clay-filled. The upper part of underlying Unit 3 ($Qbt3_U$) is similar to Qbt4, but less fractured and weathered (Kleinfelder 2007a, 2010a).

The lower part of Unit 3 ($Qbt3_L$) is nonwelded to slightly welded, is weak and friable, does not sustain fractures, and exhibits more soil-like properties. This unit is, on average, approximately 56 feet (17 meters) thick across LANL, from a depth of approximately 75 feet (23 meters) to approximately 125 to 131 feet (38 to 40 meters) below ground surface, with upper and lower transition zones composed of slightly stiffer and slightly more dense material. Compared to the units above and below it, $Qbt3_L$ has lower bearing capacity, higher porosity, and less cohesion, and is more compressible. This unit also has a slight to moderate potential for hydro-collapse, due to wetting. $Qbt3_L$ displays properties more typical of slightly cemented, nonplastic, medium to dense silty sand. The apparent cementation is actually weak welding caused by vapor-phase minerals that form fragile connections between the volcanic ash particles that constitute the matrix of this unit. This weak welding is easily broken by even slight disturbance. The properties of $Qbt3_L$ that are most problematic to nuclear facility construction are those that affect the seismic response of the unit, specifically, the estimated seismic wave velocities (the speed at which seismic waves travel) associated with this rock type.

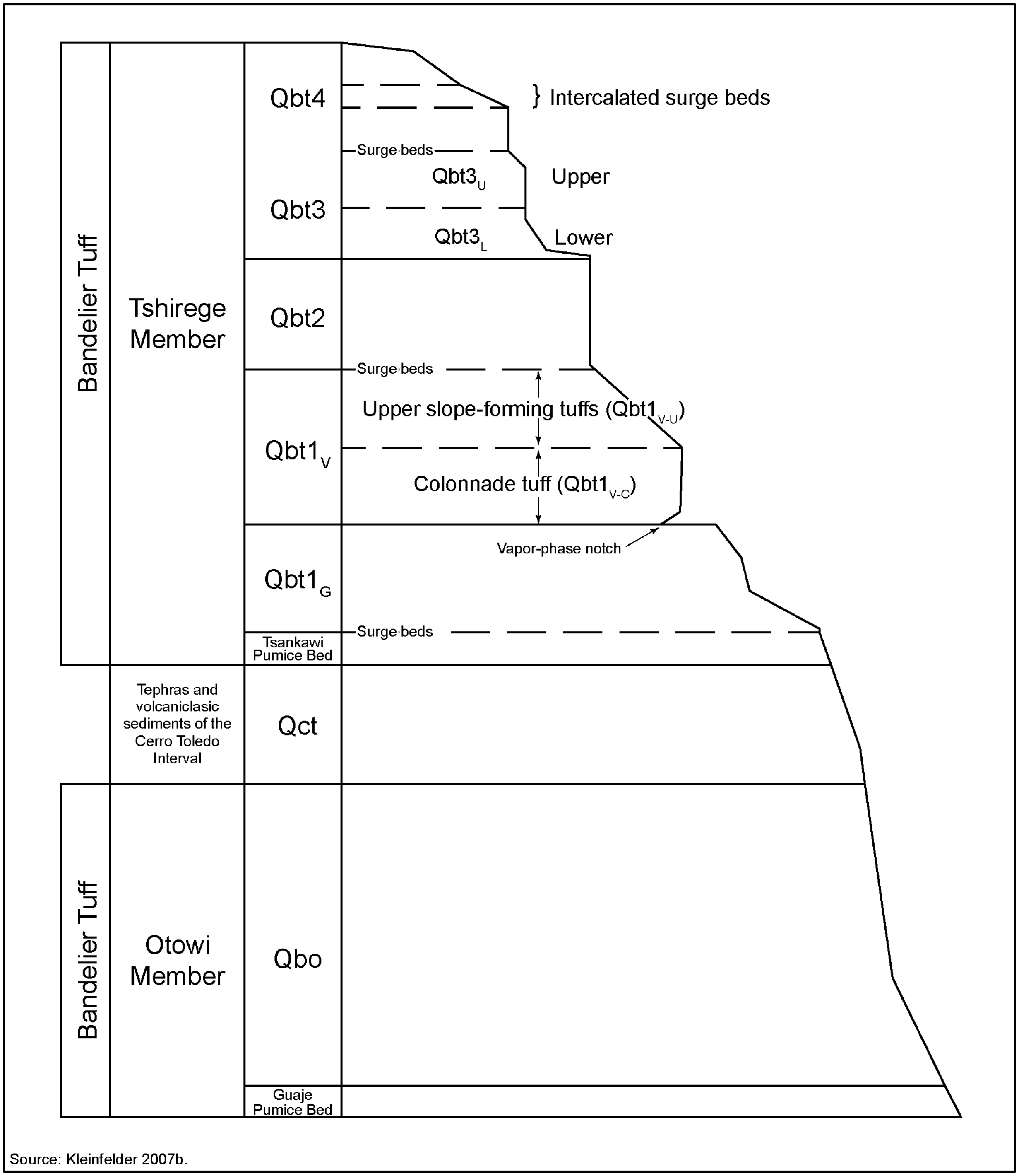

Figure 3–3 Bandelier Tuff Nomenclature

Beneath the Bandelier Tuff is approximately 18 feet (5.5 meters) of fine sand and silt, which may be a fine-grained interval of the older alluvial Puye Formation (see Figure 3–2). Underlying the Puye Formation is several hundred feet (hundreds of meters) of the Cerro del Rio basalt and Tschicoma Formation dacitic lava (Kleinfelder 2007a). Overall, the complex interfingering and interlaying of strata beneath LANL results in variable properties that affect canyon wall formation, slope stability, subsurface fluid flow, seismic stability, and the engineering properties of the rock (DOE 2003b, 2008a).

3.5.3 Faulting

The Pajarito fault system defines the current active western boundary of the Rio Grande rift. This seismically active fault system is a complex zone of deformation, consisting of many laterally discontinuous faults and associated folds and fractures that interact in ways that have important implications for addressing potential seismic hazards at LANL. The Pajarito fault system extends for about 31 miles (50 kilometers) along the western margin of LANL and consists of the Pajarito, Santa Clara, Rendija Canyon, Guaje Mountain, and Sawyer Canyon faults. These are all roughly north–south striking, nearly parallel, and interconnected normal slip faults that overall accommodate extension in the Earth's crust (see Figure 3–4).

The Pajarito, Santa Clara, and Sawyer Canyon are east-dipping faults, whereas the Rendija Canyon and Guaje Mountain are west-dipping faults. Of these faults, the Pajarito is the longest, has the largest Quaternary displacement (during the past 1.8 million years), and together with the Santa Clara, delineates the boundary between the Pajarito Plateau and Jemez Mountains, which is characterized by a broad, east-facing escarpment. The Rendija Canyon, Guaje Mountain, and Sawyer Canyon faults constitute a broad zone of smaller faults within the downthrown block of the main Pajarito and Santa Clara faults.

Locally, the Pajarito and Rendija Canyon faults define a downthrown block of the Bandelier Tuff that lies beneath the western part of the Los Alamos townsite and TA-3, called the Diamond Drive graben. The main trace of the Rendija Canyon fault dies out near the latitude of Los Alamos Canyon, although a complex distribution of associated, smaller, discontinuous faults continue another couple of miles southward, curving southwest toward the Pajarito fault (see **Figures 3–4** and **3–5**). Thus, the CMR Building lies within this zone of faults, whereas the proposed CMRR-NF site lies about 3,300 feet (1,000 meters) east of the closest mapped surface trace of faults associated with the Pajarito fault system.

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 of moment magnitude (**M**) 6.5 to 7.3 (LANL 2007a; Lewis et al. 2009). Early Quaternary deposits have been displaced down to the east by as much as 650 feet (200 meters) along this fault zone, which also shows compelling evidence for repeated, late Quaternary faulting (LANL 2007a; Lewis et al. 2009). Numerous paleoseismic trench studies (Gardner et al. 1990; Olig et al. 1996; Kelson et al. 1996; Reneau et al. 2002; Gardner et al. 2003; McCalpin 2005) have been conducted on several different traces of the fault system, revealing evidence of at least two, possibly three, large surface-faulting earthquakes that occurred since 11,000 years ago and as many as nine large earthquakes that occurred since about 110,000 years ago (LANL 2007a; Lewis et al. 2009). However, individual rupture patterns are complex, and the timing of many events (particularly older earthquakes) is not well constrained.

The Pajarito fault system has been mapped in detail in the northern and western portions of LANL property, as well as in the vicinity of LANL (see Figure 3–5). These detailed fault data include fault mapping from a variety of projects that were performed using different methods, that is, conventional geologic mapping, surveying, drilling, and trenching; at different scales, ranging from 1:1,200 to 1:62,500; and at different times, from 1987 to 2004. Portions of the data include currently unpublished mapping performed by the LANL Seismic Hazards Geology Team. The fault mapping includes faults and related structures, such as folds, fissures, and fault zones.

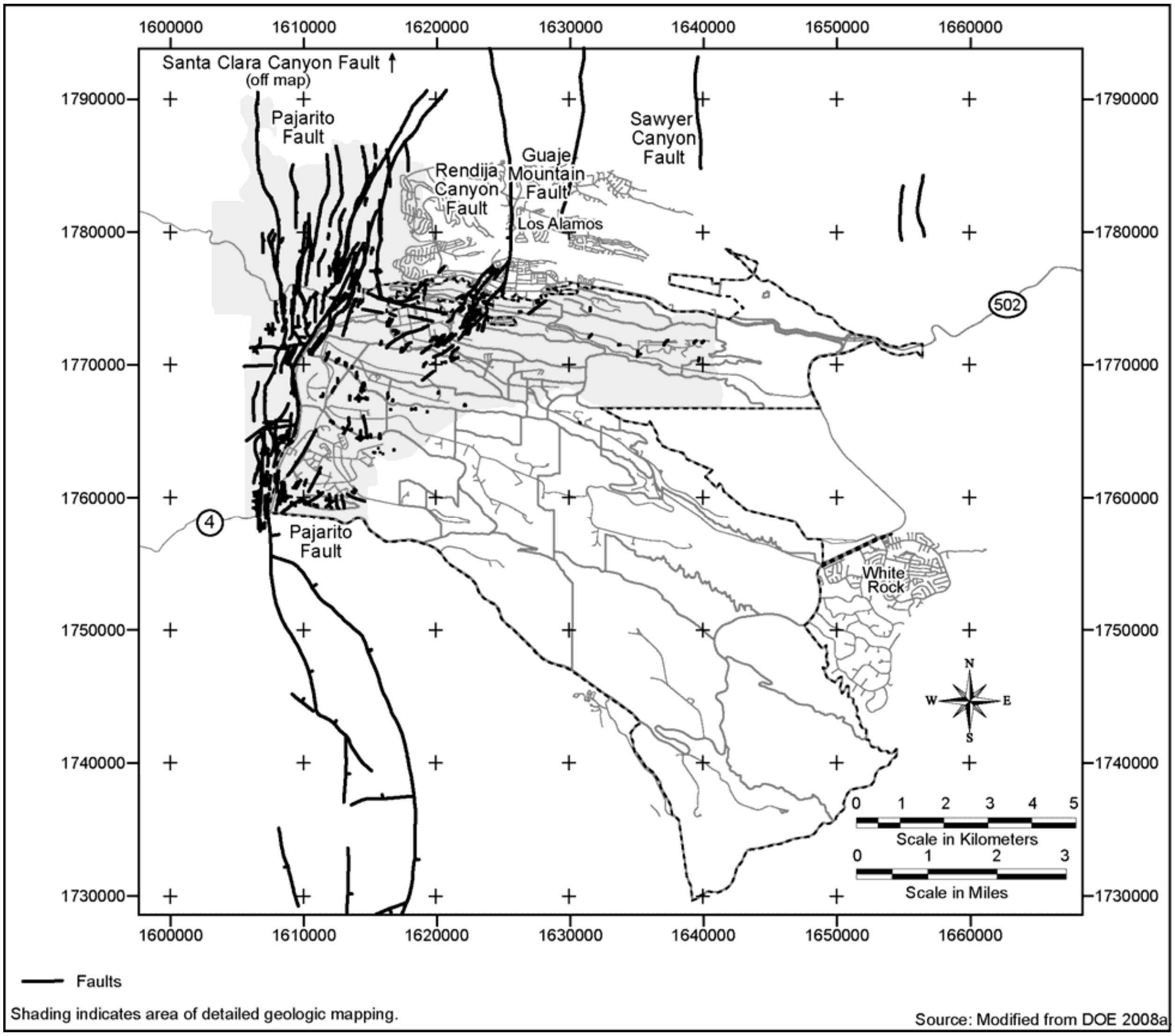

Figure 3–4 Mapped Faults in the Los Alamos National Laboratory Region

Previous geologic studies used methods such as aerial photographic lineament mapping, geophysical techniques, and fracture studies of rock outcrops in particular canyons to postulate that the southern ends of the Rendija Canyon and Guaje Mountain faults may continue as surface faults south of the Los Alamos townsite and trend through sensitive LANL sites (Dransfield and Gardner 1985; Vaniman and Wohletz 1990; Wohletz 1995, 2004). Ensuing site-specific studies at and near TA-55 used careful geologic field investigative techniques, including conventional geologic mapping, trenching, borehole studies, and innovative, high-precision, total station mapping of Tshirege Member subunit contacts to recognize and map vertical fault displacements so small that they would be overlooked and unmapped by conventional geologic mapping techniques (Reneau et al. 1995; Gardner et al. 1998, 1999, 2008; Lavine et al. 2005). This latter procedure allowed the identification of fault locations in real time, with data precision better than 0.05 feet (1.5 centimeters) in the horizontal directions and better than 0.02 feet (0.6 centimeters) in the vertical direction, relative to the position of known and established benchmarks. The high-precision geologic mapping completed by these studies is shown in **Figure 3–6**.

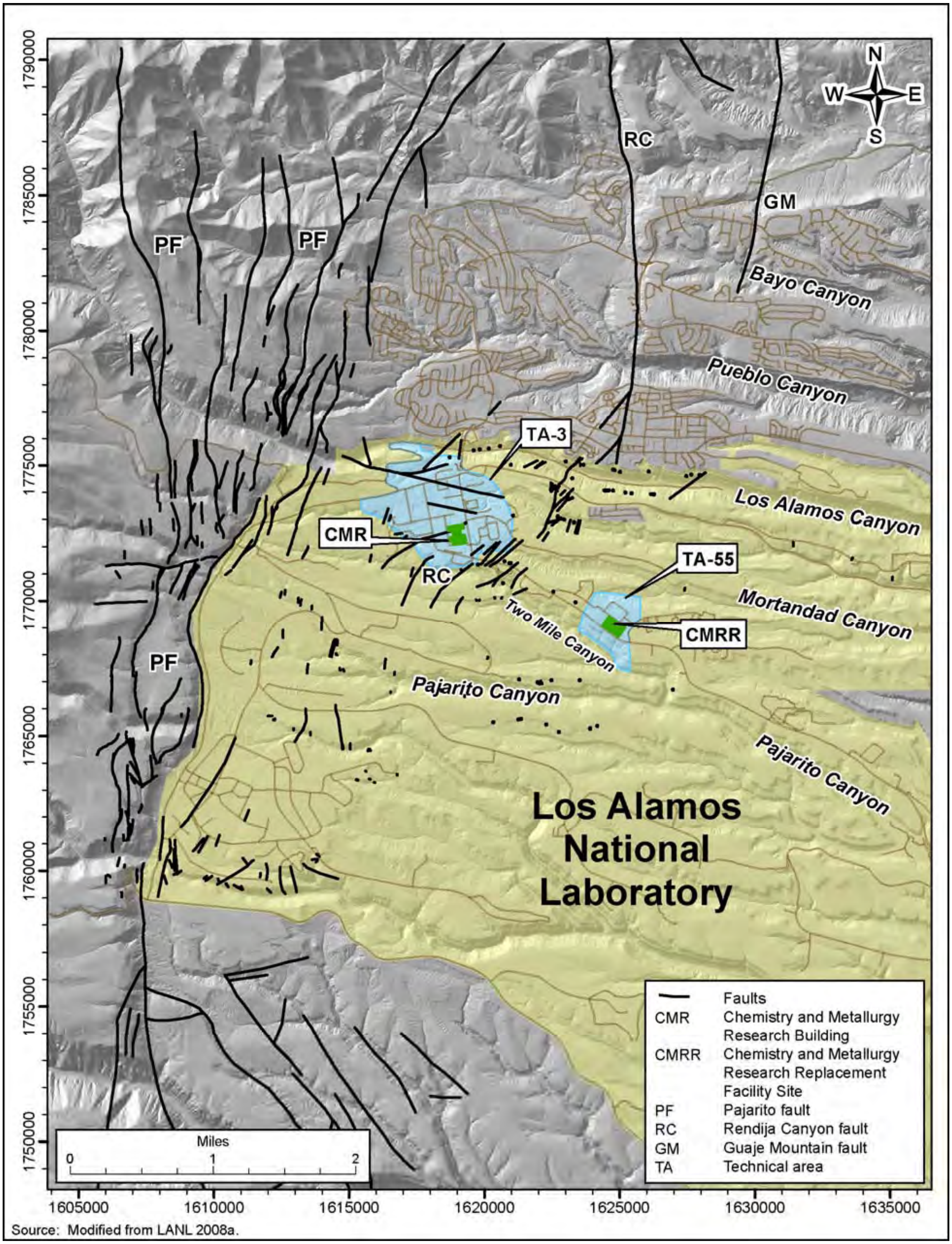

Figure 3–5 Mapped Faults in the Los Alamos National Laboratory Area

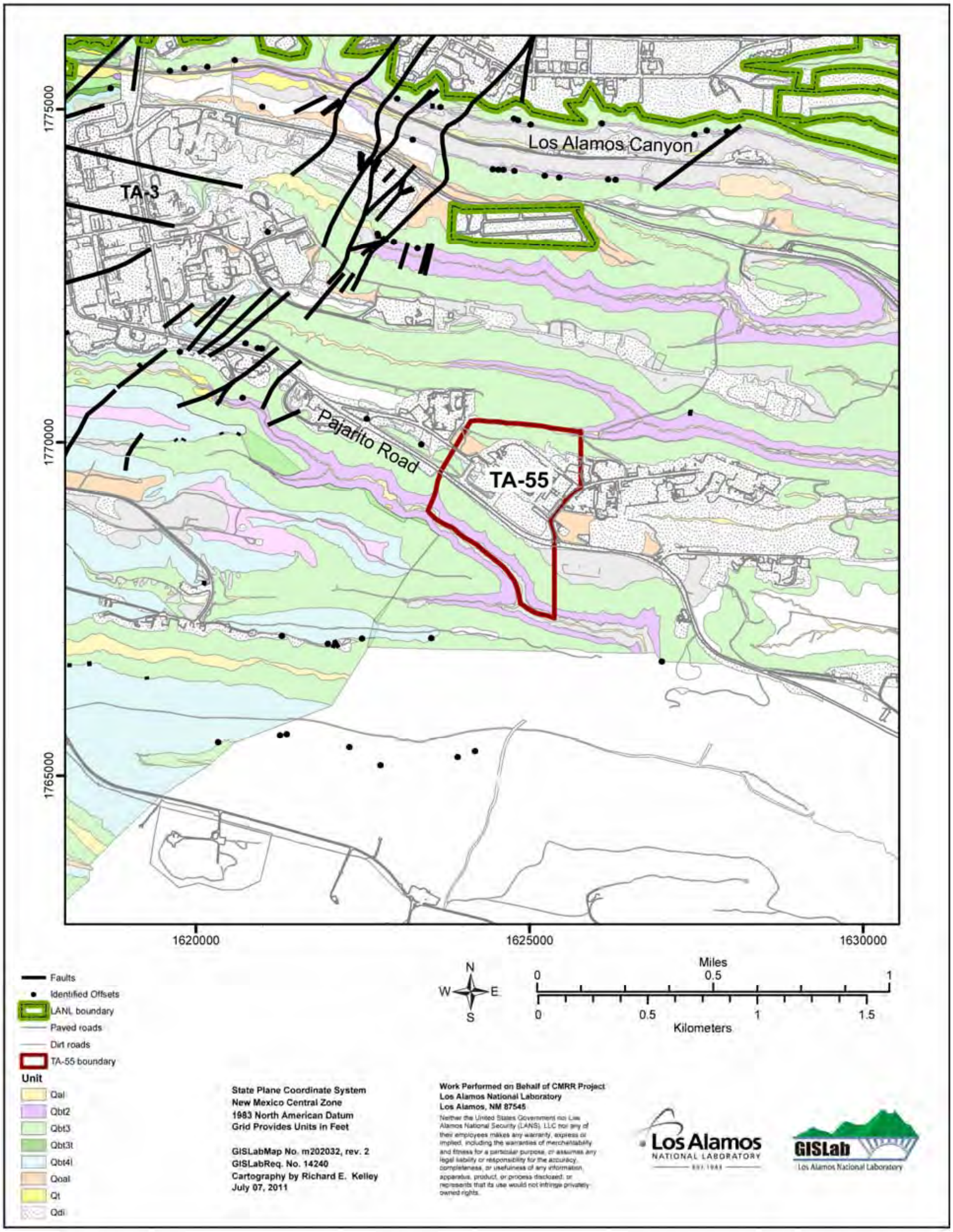

Figure 3–6 Geologic Map of Technical Area 55

At TA-67 (south of TA-55, see Figure 3–1), investigations found small, complex faults with activity older than 50,000 to 60,000 years (the age of the El Cajete pumice), but no correlation between increased fracture density and surficial faulting. At TA-3, a fault with approximately 8 feet (2.4 meters) of displacement was identified. In contrast, around TA-55 and the CMRR Project site, the stratigraphic markers in the 1.25-million-year-old Bandelier Tuff are continuous and show no evidence for laterally continuous surface-rupturing faults using high-precision total station mapping. This is consistent with findings of a subsequent subsurface excavation at the CMRR Project site 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 fractures and faults exposed at the proposed CMRR Project site formed very shortly after emplacement of the tuff at 1.256 million years, as a result of cooling and compaction, and the structures identified at the proposed CMRR Project site pose no independent seismic surface rupture hazard.

3.5.4 Seismic Hazard

Although the LANL region is within an intracontinental rift zone, the area demonstrates a low-to-moderate level of historical seismicity compared to regions bordering on active continental plate boundaries, such as California (LANL 2007a). The largest historical earthquake observed in the Rio Grande rift in northern New Mexico was the 1918 Cerrillos event, which had an estimated Richter local magnitude[2] (M_L) of about 5.3. In contrast to the historical record, paleoseismic investigations beginning in the late 1980s along the Pajarito fault system, as well as elsewhere on other Rio Grande rift faults, indicate that large surface-faulting earthquakes of moment magnitude[3] (**M**) 6.5 have repeatedly ruptured Rio Grande rift faults in Holocene times (the last 11,000 years) (Gardner et al. 2003; LANL 2007a; Lewis et al. 2009; Machette 1998; Reneau et al. 2002). The moment magnitude was developed in the 1970s to succeed the Richter magnitude scale, which was developed in the 1930s. The moment magnitude is now the scale used by the U.S. Geological Survey to estimate the magnitude of all modern large earthquakes, as the Richter magnitude has limited range and applicability and does not accurately measure the size of the largest earthquakes. The moment magnitude is uniformly applicable to all sizes of earthquakes. However, both types of magnitude scales yield approximately the same value for any given earthquake (UC 1999; USGS 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, most notably from the proposed CMRR Project site, and the application of the most current analysis methods, in order to update the seismic source model, ground motion attenuation relationships, 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 updated 2007 analysis follows the Senior Seismic Hazard Analysis Committee's guidelines for a Level 2 analysis, as described in the U.S. 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.

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[2] The Richter local magnitude is determined from the logarithm of the amplitude of waves recorded by seismographs. Adjustments are included for the variation in the distance between the various seismographs and the epicenter of the earthquakes. Each whole number increase in magnitude represents about 31 times more energy.
[3] Moment magnitude is a measure of earthquake magnitude, whereby the total energy released by an earthquake is calculated based on the amount of slip on the fault times the area of the fault surface that slips. The calculated energy released is converted into a number similar to other earthquake magnitudes by a standard formula. The result is the moment magnitude, which is generally used to measure earthquake events greater than a magnitude of 3.5 to 5.5.

In the 2007 seismic hazard update, the probabilistic seismic hazard was calculated for the ground surface at the existing CMR Building location within TA-3 and the proposed CMRR Project site within TA-55 using the new information on the Pajarito fault system and updated ground motion attenuation relationships (LANL 2007a). The peak horizontal ground acceleration value at both sites was 0.52 *g* (52 percent of gravitational acceleration) at the design return period of 2,500 years. The vertical peak ground acceleration value was 0.6 *g*, also at a return period of 2,500 years (LANL 2007a).[4] These peak ground acceleration values were calculated for the Uniform Hazard Response Spectra and Design Response Spectra (see Chapter 6, Glossary) (NRC 2007).

In 2009, the probabilistic seismic hazard analysis was updated again to incorporate a new set of ground motion attenuation relationships and to examine potential conservatisms in the 2007 study (LANL 2009b). The results of the 2009 updated analysis were reviewed and accepted by an external review panel, DOE, and the Defense Nuclear Facilities Safety Board (DNFSB). Based on the 2009 study, the TA-55 horizontal and vertical peak ground acceleration values for a 2,500-year return period are 0.47 *g* and 0.51 *g*, respectively, a reduction from the 2007 study (LANL 2009b). These ground accelerations were based on the latest geologic data, including that published in Lewis et al. (2009) and documented in the 2007 probabilistic seismic hazard analysis (LANL 2007a). Expected maximum magnitudes for the various rupture scenarios of the Pajarito fault system range from **M** 6.5 to 7.3. The 2007 analysis assumed that the dominant earthquake that controlled the seismic analysis was a single **M** 7.0 earthquake, at a close-in distance. However, earthquakes of **M** 4.5, 5.5, 6.5, 7.5, and 8.5 were also modeled in the distance range of 1 to 248 miles (1.6 to 400 kilometers), using the stochastic ground motion modeling approach (LANL 2007a). The expected magnitudes were calculated using well-established and widely accepted empirical relations (Wells and Coppersmith 1994). Results were checked and peer-reviewed by an internationally recognized Participatory Peer Review Panel during the 2007 study.

The 2009 updated study refined the estimate for the dominant earthquake, determining that a range in magnitude of **M** 6.0 to **M** 7.0 was more appropriate at close distances. The new set of empirical ground motion attenuation models used in the 2009 study have become available as part of the Pacific Earthquake Engineering Research Center's Next Generation Attenuation (NGA) Models for the Western United States Project. The NGA models have been accepted by the seismic hazard community and have been used by the U.S. Geological Survey as part of the National Seismic Hazards Map. The 2007 study was to have used the NGA models relationships, but the models were not published in time. The NGA models have a substantially better scientific bases than current relationships, such as Abrahamson and Silva (1997), because they were developed through the efforts of five selected attenuation relationship developer teams, working in a highly interactive process with other researchers who have developed, expanded, and improved databases of strong motion recordings; conducted additional research regarding ground motion effects; and developed improved statistical methods to develop attenuation relationships. These relationships have benefited greatly from a large amount of new strong motion data from large earthquakes (**M** greater than 7) at close distances (less than 15.5 miles [25 kilometers]) (DNFSB 2009; LANL 2009b).

During earthquakes, facilities near a cliff edge or in a canyon bottom are potentially susceptible to slope instability, rock falls, and landslides. Slope stability studies have been performed at LANL facilities where a hazard has been identified. The potential for seismically induced land subsidence at LANL is considered low and, for soil liquefaction, negligible (DOE 2003b).

Deep geotechnical borings were drilled at TA-55 to characterize the complete geologic column down to the basement bedrock level. These borings were completed for the purpose of geotechnical characterization and not for the purpose of identifying the presence or absence of faults. Three boring locations were

[4] *An error in the reported vertical peak ground acceleration at LANL (0.3 g) was corrected to 0.6 g. This typographical error in the Executive Summary of the source document (LANL 2007a), is not reflective of information presented elsewhere in the probabilistic seismic hazard analysis and was not used in the design of the proposed Modified CMRR-NF.*

initially identified; however, only two borings were deemed necessary to provide corroborative characterization of the deeper portions of the geologic column. The third boring was identified as an alternative and would have been drilled only if the currently planned site at TA-55 were not deemed viable. Borehole DSC-1B was drilled to a depth of 741 feet (226 meters) below ground surface, while borehole DSC-2A reached a total depth of 550 feet (168 meters) below ground surface. The geologic formations that are most relevant to TA-55 are those that would influence seismic ground response and foundation performance. Seismic ground response, as determined by data derived from these two deep seismic characterization borings, is affected by the relatively high seismic wave velocity of the denser basement rocks, consisting of the Cerros del Rio basalt and Tschicoma Formation dacite, and the much lower seismic wave velocities of the overlying, softer Bandelier Tuff. From data provided by Kleinfelder (2007a), DSC-1B was the only deep borehole to penetrate into the Tschicoma Formation dacite. In addition, the presence of the relatively soft $Qbt3_L$ between two stiffer units, $Qbt3_U$ and Qbt2, is important with respect to the seismic ground response of the site (Kleinfelder 2007a).

Kleinfelder (2007a) states that the sampled portion of the Cerros del Rio basalt and Tschicoma Formation dacite was highly fractured and vesicular. Fractures and vesicles are common features of chilled upper portions of relatively harder volcanic flows (Fink and Anderson 2000), and such features are expected in the upper 40 to 50 feet (12 to 15 meters) of a dacite flow that is hundreds of feet thick, such as the Tschicoma Formation dacite below the proposed CMRR-NF.

3.5.5 Volcanic Activity

Geophysical studies of the Jemez Mountains Volcanic Field have identified likely zones of molten magma at shallow to mid-crustal depths. The U.S. Geological Survey recently rated the Valles caldera a “moderate threat” and recommended enhanced monitoring of the Jemez Mountains Volcanic Field.

Volcanic activity began forming the Jemez Mountains approximately 16.5 million years ago and has continued sporadically to the most recent eruptions, which occurred about 35,000 to 45,000 years ago. Two main types of Quaternary volcanic activity have occurred close to LANL, including explosive and effusive rhyolite (i.e., silicic) eruptions in the Valles caldera, located approximately 6 miles (10 kilometers) west of LANL, and explosive and effusive basalt eruptions in the Cerros del Rio volcanic field, located in the nearby (to the east) Rio Grande valley and partially underlying the eastern portions of LANL.

Silicic Eruptions. Potential future silicic eruptions within the Jemez Mountains Volcanic Field would likely be similar to the most recent, 35,000-to 60,000-year-old rhyolitic eruptive cycle, which consisted of relatively small rhyolite domes and flow eruptions. Potential future silicic eruptions could consist of explosive eruption columns that produce proximal and downwind tephra fallout and pyroclastic flows in topographic lows. In addition, proximal rhyolite lava flows and domes are expected to fill topographic low areas near the vent, up to a distance of several kilometers. Eruptive activity may continue for days to months for explosive eruptions and several years to tens of years for a single eruption cycle. The total period for a phase of eruption could last thousands of years. Tephra deposits, which are undifferentiated volcanic deposits up to several meters thick and associated with several post-Bandelier Tuff eruptions (see Section 3.5.2, Stratigraphy), have been documented on the Pajarito Plateau and at LANL (LANL 2010i).

If silicic volcanism occurred within the Valles caldera topographic rim, the Pajarito Plateau would likely be impacted by centimeter-to-meter thicknesses of tephra fallout. Tephra deposits on the slopes of the Sierra de los Valles, west of LANL, could result in the production of volcanic mudflows in the canyons as rainfall and snowmelt mobilized the loose tephra. Tephra fallout may deposit greater than 4 inches (10 centimeters) of ash within about 12 to 24 miles (20 to 40 kilometers) downwind, which would encompass LANL technical areas. Volcanic blast effects, pyroclastic flows, and lava flows would be unlikely to directly affect LANL due to distance and topographic considerations (LANL 2010i).

Basaltic Eruptions. In addition to silicic volcanism, basaltic (mafic) volcanism has occurred over the past 30 million years. Evidence of basaltic volcanism includes the approximately 1-million-year-old Cerros de Rio volcanic field beneath LANL and stretches tens of kilometers to the east and south. While the main activity in the Cerros del Rio volcanic field occurred more than 1 million years ago, magmatic activity has more recently occurred in the Rio Grande rift and along the Jemez Lineament, including eruptions near Carrizozo and Grants, New Mexico, located approximately 200 miles (320 kilometers) and 175 miles (280 kilometers), respectively, from LANL. These eruptions occurred 1,100 to 5,200 years ago, albeit farther from LANL than the most recent silicic eruptions within the Jemez Mountains Volcanic Field. Therefore, the potential for new basaltic volcanism in the Espanola Basin cannot be ruled out (LANL 2010i).

Two main types of future basaltic eruption are possible, based on observed deposits of past eruptions, including a Strombolian eruption, which may produce a cinder cone, tephra fallout, and lava flows via fountaining and low ash column, and hydro-magmatic eruption, in which rising magma and surface water combine explosively to form maar craters, surges, ash flows, and tephra fallout. New basaltic activity is most likely within the area of existing Cerros de Rio basalts. Such explosions, surges, and magma effusion may affect areas within several hundred meters of the vent. Lava flows may affect areas within several kilometers of the vent. As described for silicic fallout hazards, tephra fall may produce significant impacts on buildings, roads, and utility infrastructure. A recurrence of volcanic activity could impact the study region for an extended period of time (months to years), until volcanic activity stopped (LANL 2010i).

Recurrence Rate. The unusually low amount of seismic activity in the Jemez Mountains has been interpreted to indicate that seismic signals are partially absorbed deep in the subsurface, due to elevated temperatures and high heat flow (LANL 2004). The presence of magma indicates that the Jemez Mountains continue to be a zone of potential volcanic activity. Based on an integration of available information on the volcanic history of the region surrounding LANL, the preliminary calculation of the recurrence rate for silicic eruptions is about 1×10^{-5} per year in the Valles caldera study region. Although the eruption record shows significant clustering of events, this simple calculation assumes a homogenous (Poisson) distribution of events. Similarly, the preliminary calculation of the recurrence rate for basaltic eruptions along the Rio Grande rift floor is 2×10^{-5} per year. The recurrence rate for an eruption that could produce major impacts at LANL would be less than the rates listed above for the expected recurrence of volcanic activity in the study region. Volcanism in the vicinity of LANL is very unlikely over the next 50 to 100 years, but cannot be completely ruled out. In any event, 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 for the most hazardous facilities at LANL (LANL 2010i).

3.5.6 Economic Geology

Potential mineral resources at LANL consist of rock and soil for use as backfill or borrow material, or for construction of remedial structures, such as waste unit covers. Rock and mineral resources, including sand, gravel, and volcanic pumice, are mined throughout the surrounding counties. Sand and gravel are primarily used in construction at LANL for road building. Pumice aggregate is used at LANL for landscaping. The major sand and gravel quarry located in the LANL area is situated in the lower member of the Puye Formation. The welded and harder units of the Bandelier Tuff are suitable as foundation rocks, structural and ornamental stone, or insulating material. Volcanic tuff has also been used successfully as aggregate in soil-cement sub-base for roads (DOE 2003b, 2008a).

The only borrow pit currently in use at LANL is the East Jemez Road Borrow Pit in TA-61, which is used for soil and rubble storage and retrieval. This borrow pit is cut into the upper Bandelier Tuff, which represents good source material for certain construction purposes. There are numerous commercial offsite borrow pits and quarries in the vicinity of LANL. Eleven pits or quarries are located within 30 miles

(48 kilometers) of LANL, which is the distance considered the upper economically viable limit for hauling borrow material to a LANL site. In general, these nearby pits and quarries produce sand and gravel (DOE 2008a). The information regarding the quantity of material produced by individual aggregate or stone mines is not publically available (Lucas-Kamat 2010).

3.5.7 Soils

Soils in Los Alamos County have developed from decomposition of volcanic and sedimentary rocks within a semiarid climate and range in texture from clay and clay loam to gravel. Soils that formed on mesa tops of the Pajarito Plateau include the Carjo, Frijoles, Hackroy, Nyjack, Pogna, Prieta, Seaby, and Tocal soils series. All of these soils are well-drained and range from very shallow (0 to 10 inches [0 to 25 centimeters]) to moderately deep (20 to 40 inches [51 to 102 centimeters]), with the greatest depth to the underlying Bandelier Tuff being 40 inches (102 centimeters) (DOE 1999a). More specifically, TA-55 and TA-3 are underlain by rock outcrop-Frijoles-Hackroy soils, which consist of barren or nearly barren areas of bedrock, as benches, ledges, and escarpments, with areas of very shallow to deep, well drained, sandy loam, formed from tuff and pumice on 1 to 8 percent slopes. These soils are characterized by slow to moderate permeability, very low water capacity, high shrink-swell potential, and very high runoff (NRCS 2008).

Soils that develop in canyon settings can be locally much thicker. Soil erosion rates vary considerably at LANL, due to the mesa and canyon topography. The highest erosion rates occur in drainage channels and on steep slopes. Roads, structures, and paved parking lots concentrate runoff. High erosion rates are also caused by past area logging practices, livestock grazing, loss of vegetative cover, and decreased precipitation. The lowest erosion rates occur at the gently sloping central portions of the mesas, away from the drainage channels. Soils at LANL are acceptable for standard construction techniques (DOE 2003b). No prime farmland soils have been designated in Los Alamos County. The closest areas of prime farmland are located approximately 7.5 miles (12 kilometers) east and 10 miles (16 kilometers) south of LANL, adjacent to the Rio Grande (NRCS 2011).

3.6 Surface-Water and Groundwater Quality

3.6.1 Surface Water

The LANL area includes all or portions of seven principal watersheds that drain directly into the Rio Grande (the major river in north-central New Mexico), each delineated by a master canyon. Situated from north to south, the master canyons for these seven watersheds are Los Alamos, Sandia, Mortandad, Pajarito, Water, Ancho, and Chaquehui Canyons, each with tributary canyons of various sizes (**Figure 3–7**). Los Alamos, Pajarito, and Water Canyons have their headwaters west of LANL in the western Jemez Mountains (mostly within the Santa Fe National Forest), while the remainder have their upper reaches on the Pajarito Plateau. Ancho Canyon is the only regional watershed located entirely on LANL property. Canyons that drain LANL property are generally dry for most of the year, and no perennial surface water (that is, water that is present all year) extends completely across LANL in any canyon (LANL 2008a, 2010b).

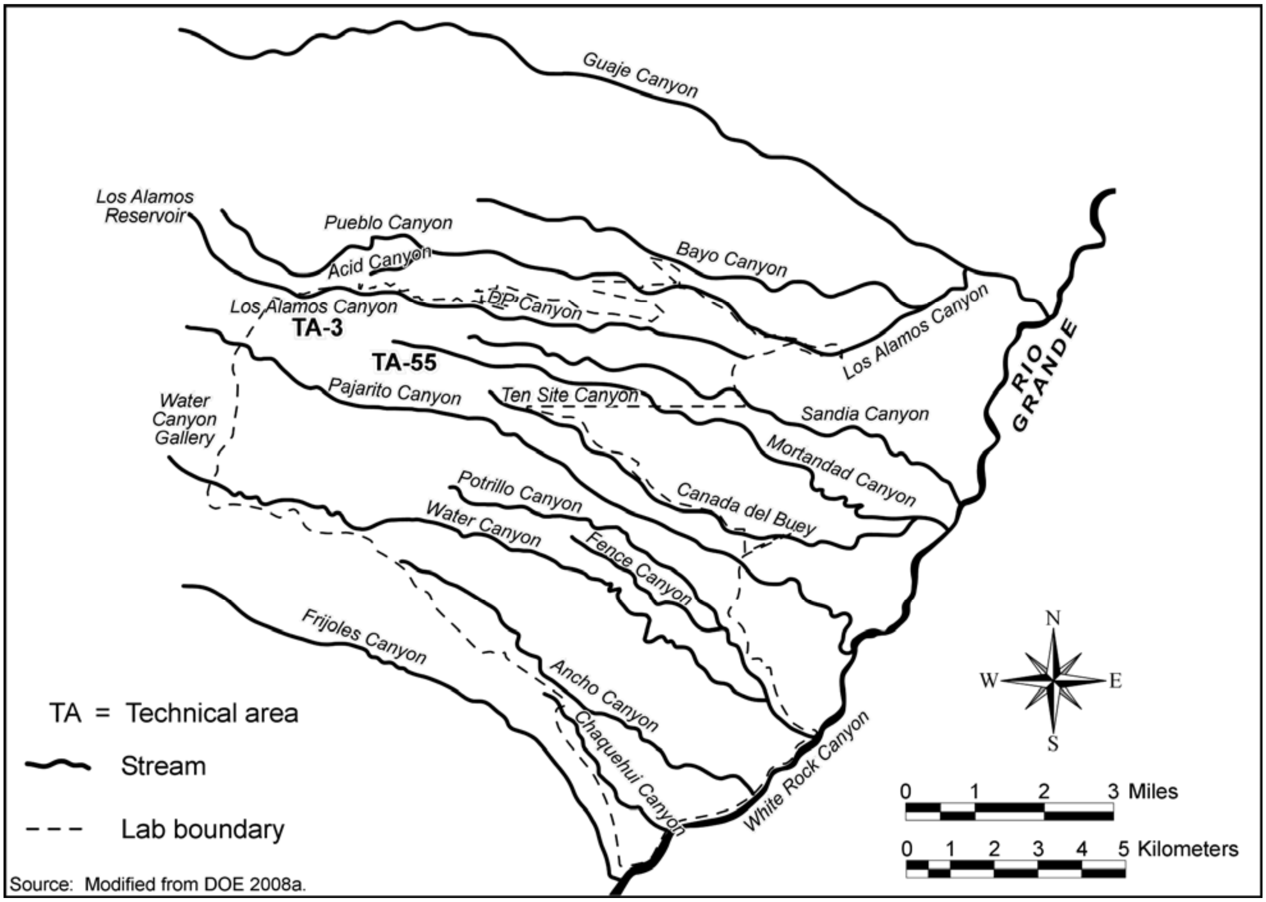

Figure 3–7 Major Watersheds in the Los Alamos National Laboratory Region

Geographically, TA-55 is located on Pajarito Mesa and along the Pajarito Road corridor, which transverses portions of Pajarito Mesa and Pajarito Canyon. TA-55 is situated on a narrow mesa (Mesita del Buey) approximately 1 mile (1.6 kilometers) southeast of TA-3. TA-55 is bordered by Mortandad Canyon to the north and Twomile Canyon to the south. Twomile Canyon converges with Pajarito Canyon south and east of TA-3 near the border of TA-55 with TA-6, and abuts TA-3 on the south and west (see Figure 3–7). Los Alamos Canyon borders TA-3 to the north. Both TA-55 and TA-3 are heavily developed facility complexes with surface-water drainage primarily occurring as sheet flow runoff from impervious surfaces within each complex (DOE 2003b).

Most surface water on the Pajarito Plateau is designated by the New Mexico Water Quality Control Commission for livestock watering, wildlife habitat, and secondary contact. NMED has identified several impaired stream reaches (including two in Pajarito Canyon), based on evaluation of surface-water sampling from streams within and downstream of LANL (DOE 2008a). Within LANL boundaries, four stream segments are classified as perennial; three of these stream segments are spring-fed (Pajarito Canyon, Cañon de Valle, and Water Canyon), and the fourth (Sandia Canyon) is fed by treated sanitary effluent (LANL 2010b). Surface water within LANL boundaries is not a source of municipal, industrial, or irrigation water; however, wildlife living within (or migrating through) the region utilize the water (DOE 2003b).

While direct use of the surface water within LANL property is limited, stream flow during storm events can extend beyond the LANL boundary, where there is greater potential for more direct use of the water. Stream flows sometimes extend onto Pueblo of San Ildefonso land, particularly flows in Pueblo Canyon derived from treated sanitary effluent discharged from the Los Alamos County Wastewater Treatment

Plant. Spring water may be used traditionally and ceremonially by Pueblo of San Ildefonso members, which may result in exposure through ingestion or direct skin contact (LANL 2010b).

Compliance activities performed through the LANL Water Stewardship Program in 2009 to manage and protect surface water resources focused on monitoring surface-water quality and stream sediment in northern New Mexico. Samples are collected at more than 290 sites when sufficient water is present during stormwater runoff events. LANL workers analyze these samples for radionuclides, high explosives, metals, a wide range of organic compounds, and general chemistry (LANL 2010b).

In general, the quality of most surface water in the LANL area is good. In more than 100 surface water and sediment samples taken in 2009, most analytes were at concentrations far below regulatory standards and risk-based advisory levels. LANL operations have affected major watersheds in the area, resulting in sediment contamination in several canyons (mainly due to past industrial effluent discharges). However, radionuclide levels are well below applicable regulatory standards and measured sediment contamination levels are well below screening levels for recreational uses (LANL 2010b). Detailed information on surface-water quality monitoring, including analytical results, is presented in the LANL annual site environmental report (LANL 2010b).

NNSA must comply with 10 CFR Part 1022, which identifies DOE requirements for compliance with Executive Order 11988, *Floodplain Management*, and Executive Order 11990, *Protection of Wetlands*. Floodplains designated within LANL boundaries are generally associated with watershed canyon drainages and are addressed in the 2008 *LANL SWEIS* (DOE 2008a). There are several facilities and structures located within or partially within 100-year floodplains at LANL, none of these are waste management facilities and most are deemed “low hazard” or “no hazard” (such as small storage buildings, guard stations, well heads, water treatment stations, and some light laboratory[5] buildings) (DOE 2008a). No developed areas of TA-55 or TA-3 are located within a delineated floodplain or a wetland (DOE 2003b). (Wetlands as ecological features are also discussed in Section 3.7.2). The proposed Modified CMRR-NF is located approximately 650 feet (200 meters) from the Twomile Canyon 100-year floodplain, 1,900 feet (580 meters) from the Mortandad Canyon 100-year floodplain, and 3,000 feet (910 meters) from the Pajarito Canyon 100-year floodplain. In 2009, there were no unusual stormwater runoff events at LANL.

The largest recorded flood in 2009 was measured in Ancho Canyon below SR-4 (stream gauge E275) on July 30, with an estimated peak discharge of 414 cubic feet (12 cubic meters) per second. In 15 years of monitoring at this station, this was the fourth largest recorded event and resulted from a typical short-duration summer thunderstorm. No significant new sediment deposits occurred from this flood. All other runoff events recorded at LANL in 2009 had peak discharges of 60 cubic feet (1.7 cubic meters) per second or less (LANL 2010b).

Section 404 of the Clean Water Act (CWA), which addresses watercourse dredging and fill activities, requires LANL to obtain permits from the U.S. Army Corps of Engineers for any work within perennial, intermittent, or ephemeral watercourses. Section 401 of the CWA requires states to certify that Section 404 permits issued by the Army Corps of Engineers will not prevent attainment of state-mandated stream standards. During 2009, six Section 404/401 permits were issued to LANL and one Section 404/401 permit was issued to NNSA’s Los Alamos Site Office (LANL 2010b).

[5] *Light laboratory work would involve nonradioactive materials and chemicals as well as very small amounts of radioactive materials. The term is used here to distinguish this work from work requiring Hazard Category 2 and 3 workspace.*

Since 2008, LANL has operated entirely under the current National Pollutant Discharge Elimination System (NPDES) permit (effective August 1, 2007) for industrial and sanitary wastewater discharges. The NPDES outfall permit establishes specific chemical, physical, and biological criteria that effluent from LANL must meet before it is discharged. During 2009, the NPDES permit for industrial point sources at LANL contained 15 permitted outfalls, covering 1 sanitary outfall and 14 industrial outfalls. The NPDES outfall permit requires weekly, monthly, quarterly, and annual sampling at LANL to validate compliance with effluent quality limits. LANL continues to meet requirements under the CWA. During 2009, none of the 76 samples collected from the Sanitary Wastewater Systems Plant (SWWS) outfall exceeded CWA effluent limits. Only 7 of the 1,361 samples collected from industrial outfalls exceeded effluent limits: 3 chlorine exceedances, 2 pH exceedances, 1 total suspended solids exceedance, and 1 polychlorinated biphenyls exceedance (LANL 2010b). As part of a comprehensive LANL Outfall Reduction Project, the NPDES-permitted outfall serving the CMR Building in TA-3 (outfall #03A-021) was closed as of September 2010. All nonradioactive liquid effluent from the CMR Building is now sent to the SWWS Plant. Following field verification by the New Mexico state regulator, a permit modification requesting deletion of the outfall will be made to EPA.

Stormwater discharges from construction activities disturbing areas 1 or more acres (0.4 or more hectares) in size are regulated under the NPDES Construction General Permit Program. Compliance with the program includes developing and implementing a Storm Water Pollution Prevention Plan (SWPPP) before ground disturbance can begin, as well as conducting site inspections once soil disturbance has commenced. During 2009, LANL maintained and implemented 52 SWPPPs (and addenda) for site construction activities and performed 471 stormwater inspections. The inspection compliance record for Construction General Permit at LANL in 2009 was 99.2 percent for this permit. Furthermore, during the summer, when most high-intensity precipitation events occur, all 467 of the inspections were compliant (LANL 2010b).

The NPDES Industrial Storm Water Permit Program at LANL, covered under the EPA 2008 NPDES Storm Water Multi-Sector General Permit for Industrial Activities (MSGP-2008), regulates stormwater discharges from regulated industrial activities and their associated facilities (such as metal fabrication; hazardous waste treatment, storage, and disposal; landfill operations; vehicle and equipment maintenance; recycling activities; electricity generation; warehousing activities; and asphalt manufacturing). MSGP-2008 requires the development and implementation of site-specific SWPPPs. In 2009, LANL implemented and maintained 15 SWPPPs under MSGP-2008 requirements, covering 19 facilities. Compliance with the permit requirements is mainly achieved by implementing the following activities at these sites:

- Identifying potential contaminants and activities that may impact surface-water quality and identifying and providing structural and nonstructural controls to limit the impact of those contaminants

- Developing and implementing facility-specific SWPPPs

- Monitoring stormwater runoff at facility gauging stations and stand-alone samplers for industrial sector-specific benchmark parameters, impaired water constituents, and effluent limitations, and visually inspecting stormwater runoff to assess color; odor; floating, settled, or suspended solids; foam; oil sheen; and other indicators of stormwater pollution (LANL 2010b)

LANL has three principal wastewater treatment facilities—the SWWS Plant in TA-46; the Radioactive Liquid Waste Treatment Facility (RLWTF) in TA-50; and the High Explosives Wastewater Treatment Facility in TA-16**.** Released treated wastewater from NPDES-permitted outfalls at LANL rarely leaves the site. In 2009, LANL facilities discharged a total of 133.3 million gallons (505 million liters) of effluent; discharges were made to Sandia, Mortandad, Los Alamos, and Water Canyons. The majority of discharges came from support facilities, not facilities not tied directly to operations (such as research or production). Two facilities, the TA-46 SWWS Plant and the TA-3 steam plant, accounted for about 78 percent of all water discharged in 2009; these discharges were made to Sandia Canyon (LANL 2011b).

3.6.2 Groundwater

Three types of groundwater are present in the LANL region: (1) perched alluvial groundwater in watershed canyon bottom sediments, (2) intermediate-depth zones of perched groundwater (that is, location is controlled by recharge availability and changes in rock permeability), and (3) the regional aquifer beneath the watersheds. In wet canyons, surface water runoff from streams percolates downward through the alluvium until less-permeable layers of tuff impede its progress. Shallow bodies of perched groundwater are maintained within the alluvium unless the downward flow is not impeded by impermeable (or less permeable) layers of tuff. If not impeded by less permeable layers, surface water eventually reaches the regional aquifer (DOE 2008a).

The Los Alamos area regional aquifer occurs at a depth of approximately 1,200 feet (370 meters) along the Pajarito Plateau's western edge and approximately 600 feet (180 meters) along the plateau's eastern edge. In the central portion of the plateau, the regional aquifer occurs at a depth of approximately 1,000 feet (300 meters)**.** Characterization of the regional aquifer (such as directional movement of water flow, main source of recharge, annual deficit in the groundwater table) can be found in the 2008 *LANL SWEIS*. Shallow perched alluvial groundwater and intermediate-depth perched groundwater is not a source of municipal drinking water in the Los Alamos area. The area of saturation deep below the ground surface that forms the regional groundwater aquifer serves as the only regional aquifer in the area that is capable of providing the public water supply for various customers including LANL, Los Alamos County, Bandelier National Monument, and other consumers located in portions of Santa Fe and Rio Arriba Counties (DOE 2008a).

Compliance activities performed through the Water Stewardship Program at LANL in 2009 to manage and protect groundwater monitoring resources included groundwater monitoring (groundwater sampling to monitor water quality beneath the Pajarito Plateau and the surrounding area), groundwater investigations, and groundwater monitoring well construction. Groundwater monitoring and characterization is performed in compliance with the requirements of Federal and State of New Mexico laws and regulations and DOE orders. Groundwater samples are collected from wells and springs within or adjacent to LANL and from the nearby Pueblo of San Ildefonso. Detailed information on groundwater monitoring, including analytical results, is presented in the LANL annual site environmental report (LANL 2010b).

Groundwater monitoring beyond LANL boundaries is conducted in locations affected by LANL operations in the past, as well as in areas unaffected by LANL for the purpose of providing baseline data. Since the 1940s, liquid effluent discharge at LANL has affected water quality in the shallow perched alluvial groundwater. Liquid effluent discharge is also the primary means by which LANL contaminants have affected the quality of intermediate-depth perched zones and the regional aquifer**.** However, due to the separation of the regional aquifer (600 feet to 1,200 feet [180 to 370 meters] below dry rock on the Pajarito Plateau) from contaminated alluvial and intermediate-depth perched groundwater bodies, less contamination reaches the regional aquifer than is found in the shallow perched groundwater and impacts on the regional aquifer are either reduced or do not occur (LANL 2010b).

Four canyons (Sandia, Water [and its tributary Cañon de Valle], Mortandad, and Los Alamos) continue to receive LANL effluent discharges, although LANL has implemented an Outfall Reduction Program to reduce the total number of outfalls discharging to the environment under NPDES Permit No. NM0028355. Sandia Canyon receives the largest liquid discharge volumes of any watershed canyon due to releases of power plant cooling water and water from the SWWS Plant. Sandia Canyon has a small drainage area that heads at TA-3. Treated effluents from the TA-46 SWWS Plant have been routed to Sandia Canyon since 1992. Past discharges have included accidental releases from experimental reactors and laboratories at TA-46. In the past, LANL also released wastewater into Water Canyon and Cañon de Valle from several high-explosives processing sites in TA-16 and TA-9 (LANL 2010b).

Mortandad Canyon also has a small drainage area that heads at TA-3, receiving inflow from natural precipitation and several NPDES-permitted outfalls, including one from RLWTF at TA-50. Intermediate-depth groundwater sampling in Mortandad Canyon indicates an impact by LANL effluents, with some contaminant concentrations near or exceeding regulatory standards or screening levels (LANL 2010b). Radionuclide levels in Mortandad Canyon alluvial groundwater are, in general, highest just below the RLWTF outfall in TA-50 and decrease down the canyon. Los Alamos Canyon receives stormwater runoff from LANL as well as discharge of effluent from LANL operations. Alluvial and intermediate-depth groundwater in Los Alamos Canyon indicates effects of past effluent releases from LANL. DOE has removed contaminated sediment in the canyon that was known to contain radionuclides from past LANL operations (DOE 2008a).

Drinking water wells in the Los Alamos area have not been affected by LANL discharges, with one exception. Perchlorate was found in Well O-1 in Pueblo Canyon during 2009 at concentrations up to 58 percent of the 4 micrograms per liter 2005 Consent Order[6] screening level and 16 percent of EPA's interim health advisory for perchlorate in drinking water of 15 micrograms per liter. Although perchlorate levels are below regulatory limits, Los Alamos County does not use the well for public water supply. In 2009, no radioactive analyte concentration values in a water supply well exceeded any regulatory standard, including the 4-millirem per year DOE Derived Concentration Guide applicable to drinking water (LANL 2010b). All drinking water produced by the Los Alamos County water supply system meets Federal and state drinking water standards.

In 2009, alluvial groundwater sampling of several wells along Pajarito Road indicated high chloride and total dissolved solids concentrations. Runoff related to winter road salting (resulting in an increase in chloride, sodium, and total dissolved solids levels) is the apparent cause (LANL 2010b).

[6] *In March 2005, NMED, DOE, and the LANL management and operating contractor entered into a Compliance Order on Consent (Consent Order) (NMED 2005). The purposes of the Consent Order are (1) to define the nature and extent of releases of contaminants at, or from, LANL; (2) to identify and evaluate, where needed, alternatives for corrective measures to clean up contaminants in the environment and prevent or mitigate the migration of contaminants at, or from, LANL; and (3) to implement such corrective measures.*

3.7 Ecological Resources

3.7.1 Terrestrial Resources

LANL is located in a region of diverse landform, elevation, and climate. The combination of these features, including past and present human use, has given rise to correspondingly diverse, and often unique, biological communities and ecological relationships at LANL and the region as a whole.

LANL contains diverse ecosystems due partly to changes in elevation, temperature, and moisture along the approximately 12-mile- (19-kilometer-) wide, 5,000-foot (1,520-meter) elevational gradient from the peaks of the Jemez Mountains to the Rio Grande. Approximately 20 percent of the site has been developed (LANL 2011a:Data Call Tables, 001). The remaining land has been classified under five vegetation zones, including: Juniper (*Juniperus monosperma* [Engelm.] Sarg.) Savannas; Pinyon (*Pinus edulis* Engelm.)–Juniper Woodlands; Grasslands; Ponderosa Pine (*Pinus ponderosa* P. & C. Lawson) Forests; and Mixed Conifer Forests composed of Douglas fir (*Pseudotsuga menziesii* [Mimel] Franco), ponderosa pine, and white fir (*Abies concolor* [Gord. & Glend.] Lindl. ex Hildebr.) (**Figure 3–8**). This diversity in vegetation communities is reflected by the presence of over 900 species of vascular plants (DOE 2003b, 2008a).

Terrestrial animals associated with vegetation zones in the LANL area include 57 species of mammals, 200 species of birds, 28 species of reptiles, and 9 species of amphibians, and over 1,200 species of arthropods (DOE 2008a). Common animals found on LANL include the black-headed grosbeak (*Pheuclicus melanocephalus*), western bluebird (*Sialia mexicana*), elk (*Cervus elaphus*), and raccoon (*Procyon lotor*). Numerous raptors, such as the red-tailed hawk (*Buteo jamaicensis*) and great-horned owl (*Bubo virginianus*), and carnivores, such as the black bear (*Ursus americanus*) and bobcat (*Lynx rufus*), are also found on LANL (DOE 2003b). A variety of migratory birds recorded at the site are protected under the Migratory Bird Treaty Act, including the bald eagle, which is currently monitored and protected under the Bald and Golden Eagle Protection Act.

Impacts on site terrestrial resources have resulted from construction of new facilities, the Cerro Grande Fire, a bark beetle outbreak, a period of severe drought, and more recently the Las Conchas Fire (DOE 2008a; USDA 2011). In 2000, the Cerro Grande Fire burned 43,150 acres (17,460 hectares), including 7,684 acres (3,110 hectares) of forest area within LANL, dramatically altering the habitat of many animals. Starting in 1997, forests around LANL have been thinned to reduce future wildfire potential (DOE 2008a). Between 2008 and 2010, 955 acres (386 hectares) of forest have been thinned under a LANL Wildfire Mitigation Plan; an additional 397 acres (161 hectares) will be thinned in 2011 (LANL 2011f). Thinning creates a forest that appears more park-like and has increased the diversity of shrubs, herbs, and grasses in the understory (Loftin 2001).

Within 2 years of the Cerro Grande Fire, a bark beetle outbreak occurred that contributed to high mortality of pinyon, ponderosa pine, and Douglas fir trees. While at least partially the result of the fire, the bark beetle outbreak appears to be more a consequence of stress resulting from drought conditions (DOE 2008a).

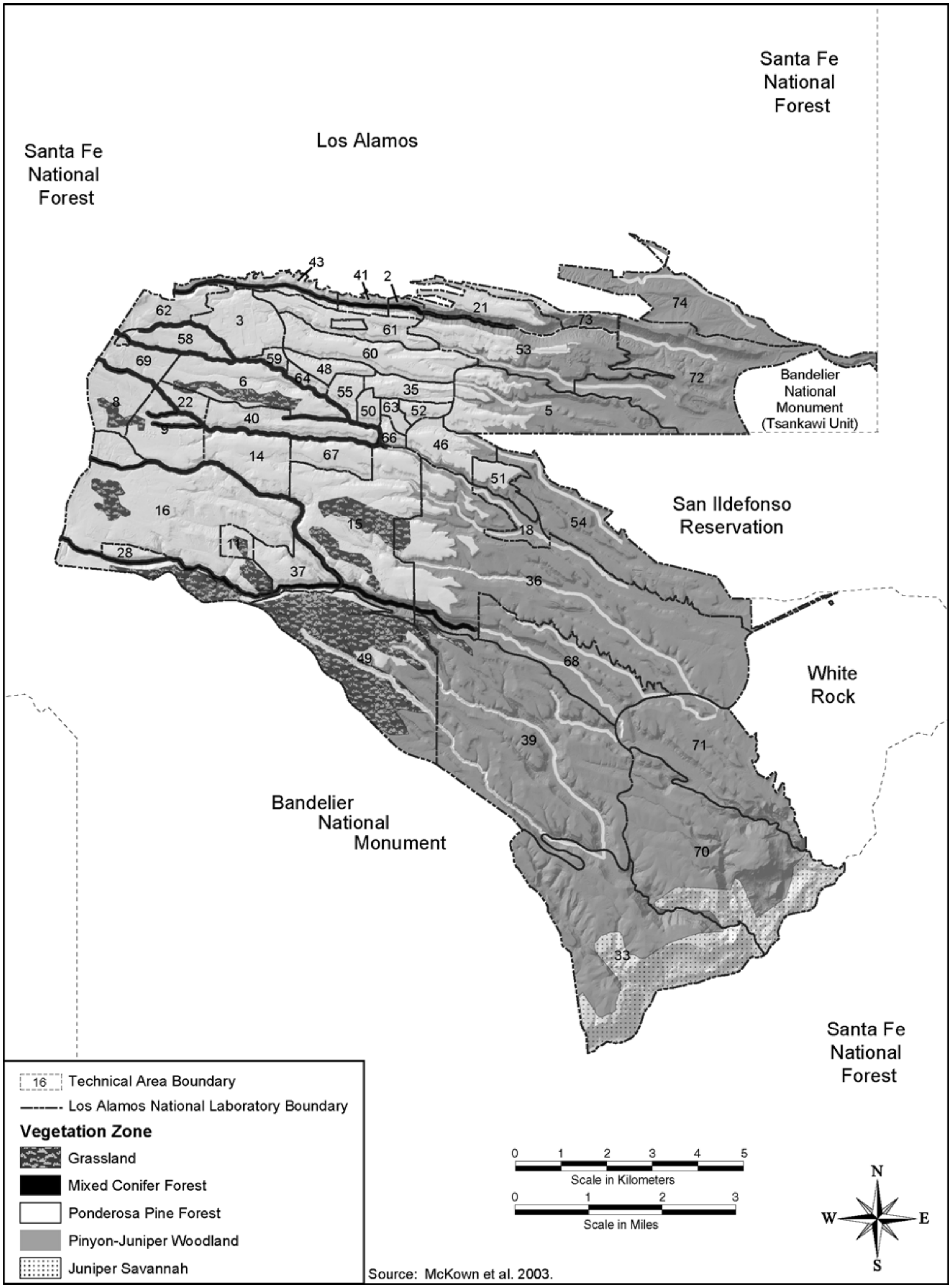

Figure 3–8 Los Alamos National Laboratory Vegetation Zones

As of July 20, 2011, 156,590 acres (63,370 hectares) of land had been burned as a result of the Las Conchas Fire. This includes 118 acres (47.8 hectares) on LANL, most of which was an intentional back-burn and caused loss of vegetation and wildlife habitat. In addition, Lab crews continue to install flood and erosion control measures to protect terrestrial habitats and inhibit the flow of sediments (LANL 2011a:LANL Site, 029; LANL 2011g; USDA 2011).

Table 3–10 identifies the vegetation zones encompassed by the technical areas potentially affected by the proposed action or alternatives. The table also presents the acreage of wetlands occurring within these technical areas, discussed in the following section.

Table 3–10 Terrestrial Resources of Technical Areas of Concern

Technical Area	*Vegetation Zone*	*Wetlands (acres)*
3	Ponderosa Pine Forest, Mixed Conifer Forest	0.13
5	Ponderosa Pine Forest, Pinyon–Juniper Woodland	0
36	Pinyon–Juniper Woodland, Ponderosa Pine Forest; Grassland	15.23
46	Ponderosa Pine Forest, Pinyon–Juniper Woodland	0
48	Ponderosa Pine Forest	1.11
50	Ponderosa Pine Forest, Mixed Conifer Forest	0
51	Ponderosa Pine Forest, Pinyon–Juniper Woodland	0
52	Ponderosa Pine Forest	0
54	Pinyon–Juniper Woodland, Ponderosa Pine Forest	0
55	Ponderosa Pine Forest, Mixed Conifer Forest	1.19
63	Ponderosa Pine Forest	0
64	Ponderosa Pine Forest, Mixed Conifer Forest	0
72	Pinyon–Juniper Woodland, Ponderosa Pine Forest	0

Note: To convert acres to hectares, multiply by 0.40469.
Source: ACE 2005; McKown et al. 2003.

3.7.2 Wetlands

Wetlands in the LANL region provide habitat for reptiles, amphibians, and invertebrates (e.g., insects), and potentially contribute to the overall habitat requirements of a number of federally and state-listed species. A majority of the wetlands in the area is associated with canyon stream channels or are present on mountains or mesas as isolated meadows, often in association with springs, seeps, or effluent outfalls. Cochiti Lake and the area near the LANL Fenton Hill site (TA-57) support lake-associated wetlands. There are also some springs within White Rock Canyon that support wetlands (DOE 2008a).

Approximately 34 acres (14 hectares) of wetlands have been identified within LANL boundaries, with 45 percent of these located in Pajarito Canyon. Of these wetlands, 13 acres (5 hectares) were created or enhanced by process effluent wastewater from NPDES-permitted outfalls. This total has most likely been reduced due in part to closure or rerouting of the outfall sources. Dominant wetland plants found in site wetlands include reed canarygrass (*Phalaris arundinacea* L.), narrowleaf cattail (*Typha angustifolia* L.), coyote willow (*Salix exigua* Nutt.), Baltic rush (*Juncus balticus* Willd.), wooly sedge (*Carex pellita* Muhl. ex Willd.), American speedwell (*Veronica americana* Schwein. ex Benth.), common spike rush (*Eleocharis palustris* [L.] Roem. & Schult.), and curly dock (*Rumex crispus* L.) (ACE 2005).

During the Cerro Grande Fire, 16 acres (6 hectares), or 20 percent of the wetlands occurring at LANL, were burned at a low or moderate intensity. Increased sedimentation as a secondary effect from the fire to wetlands also occurred as a result of increased stormwater runoff due to the loss of vegetation (DOE 2008a).

Thirty separate wetlands occupy portions of 14 technical areas within LANL. This includes two in TA-3, nine in TA-36, four in TA-48, and one in TA-55 (see Table 3–10). The wetlands in TA-3, which total 0.13 acres (0.05 hectares), lie within Sandia Canyon where three NPDES-permitted outfalls discharge effluent to upper Sandia Canyon (NNSA 2010b). Vegetation associated with these wetlands includes rush (*Juncus* spp.), willow (*Salix* sp.), and broadleaf cattail (*Typha latifolia* L.). The nine wetlands located in TA-36 total 15.23 acres (6.16 hectares) and are located along Pajarito Canyon. Plants found within these wetlands include coyote willow, Baltic rush, sedges, common spike rush, American speedwell, and cattail. Three of the four wetlands in TA-48 are located between TA-48 and TA-60 in Mortandad Canyon. These wetlands, which total about 1.11 acres (0.45 hectares), are characterized by coyote willow, Baltic rush, cattail, and wooly sedge. The fourth wetland in TA-48, which is smaller than 0.1 acres (0.04 hectares), is located between TA-48 and TA-55 and is dominated by cattail. The wetland within TA-55 is within a branch of Mortandad Canyon between TA-55 and TA-48; it covers 1.19 acres (0.48 hectares). This wetland is also dominated by cattails (ACE 2005; DOE 2003b, 2008a). No wetlands have been identified in other technical areas of concern.

3.7.3 Aquatic Resources

The Rito de Los Frijoles in Bandelier National Monument (located to the south of LANL) and the Rio Grande are the only truly perennial streams in the LANL region; however, several of the canyon floors within LANL contain reaches of perennial surface water. Some perennial streams occur in lower Pajarito and Ancho Canyons, which flow to the Rio Grande. Surface water flow occurs in canyon bottoms seasonally or intermittently as a result of spring snowmelt and summer rain. A few short sections of riparian vegetation of cottonwood (*Populus deltoides* Bartr. ex. Marsh, ssp. *wislizeni*, [S. Wats.] Eckenwalder), willow, and other wetland plants are present in scattered locations at LANL, as well as along the Rio Grande in White Rock Canyon. The springs and streams at LANL do not support fish populations; however, many other animal species utilize these waters. For example, terrestrial wildlife use onsite streams for drinking and associated riparian habitat for nesting and feeding (DOE 2003b).

No ponds or permanent streams are identified in any of the technical areas of concern; therefore, aquatic habitat is minimal and associated with ponding within wetland areas (LANL 2011a:Data Call Tables, 001). As explained in Section 3.7.2, wetlands are present at TA-3 within Sandia Canyon, TA-36 within Pajarito Canyon, and TA-48 and TA-55 within Mortandad Canyon.

3.7.4 Threatened and Endangered Species

The presence of, and use of LANL by, protected and sensitive species is influenced not only by the actual presence and operation of the facility, but by management of contiguous lands and resources, and by years of human use. A number of federally and state-listed species have been documented in the LANL region. **Table 3–11** provides a list of Federal and state threatened and endangered (and other special status) species occurring or possibly occurring on LANL. LANL contains potential habitat for two federally endangered species (Southwestern willow flycatcher [*Empidonax traillii extimus*] and black-footed ferret [*Mustela nigripes*]), one federally threatened species (Mexican spotted owl [*Strix occidentalis lucida*]), and three candidate species (Jemez Mountains salamander [*Plethodon neomexicanus*], yellow-billed cuckoo [*Coccyzus americanus*], and New Mexico meadow jumping mouse [*Zapus hudsonius luteus*]).

To provide for the protection of non-federally listed threatened or endangered species at LANL, the *Sensitive Species Best Management Practices Source Document, Version 1* (LANL 2010j) was developed as a site-wide mitigation plan to reduce risks to special status species protected at the state or local level.

The categories of special status species addressed in this plan include Federal candidate species and species of concern, as well as New Mexico endangered, threatened, sensitive, and critically imperiled species. The best management practices assist in making recommendations for project activities at LANL and provide mitigation measures for the reduction of risks to sensitive species. When LANL contractor personnel perform surveys, they look for and record the occurrence of these special status species.

There is no evidence that the Cerro Grande Fire caused a long-term change in the overall number of federally listed threatened or endangered species inhabiting the region within LANL. The species of greatest concern at LANL is the Mexican spotted owl. Individual Mexican spotted owls were seen within weeks of the fire and in all subsequent breeding seasons at LANL; however, there was no recorded Mexican spotted owl breeding after the 2000 Cerro Grande Fire until 2005 when a nested pair was again observed within the LANL boundaries (DOE 2008a). As stated in Section 3.7.1, the Las Conchas Fire affected 118 acres (47.8 hectares), most of which was an intentional back-burn (LANL 2011a:LANL Site, 029; USDA 2011). Although this caused loss of wildlife habitat, the wildfire did not impact habitat identified for protection of threatened and endangered species at LANL, including the Mexican spotted owl.

Table 3–11 Threatened and Endangered and Other Sensitive Species of Los Alamos National Laboratory

Common Name	***Scientific Name***	***Federal Status*** [a]	***State Status*** [b]	***Potential to Occur*** [c]
Mammals				
Big Free-tailed Bat	*Nyctinomops macrotis*	SOC	S	High
Black-footed Ferret	*Mustela nigripes*	FE	–	Low
Fringed Bat	*Myotis thysanodes*	–	S	High
Goat Peak Pika	*Ochotona princeps nigrescens*	SOC	S	Low
Long-eared Bat	*Myotis evotis*	–	S	High
Long-legged Bat	*Myotis volans interior*	–	S	High
New Mexico Meadow Jumping Mouse	*Zapus hudsonius luteus*	C	SE	Moderate
Red Fox	*Vulpes vulpes*	–	S	Moderate
Ringtail	*Bassariscus astutus*	–	S	High
Spotted Bat	*Euderma maculatum*	SOC	ST	High
Townsend's Pale Big-eared Bat	*Corynorhinus townsendii pallescens*	SOC	S	High
Western Small-footed Myotis Bat	*Myotis ciliolabrum melanorhinus*	SOC	S	High
Yuma Bat	*Myotis yumanensis*	SOC	S	High
Birds				
American Peregrine Falcon	*Falco peregrinus anatum*	D	ST	High
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	D	ST	Moderate
Bald Eagle	*Haliaeetus leucocephalus*	D	ST	High
Broad-billed Hummingbird	*Cyanthus latirostris magicus*	–	ST	Low
Gray Vireo	*Vireo vicinior*	SOC	ST	Moderate
Loggerhead Shrike	*Lanius ludovicianus*	SOC	S	High
Mexican Spotted Owl	*Strix occidentalis lucida*	FT	ST	High
Northern Goshawk	*Accipiter gentilis*	–	S	High
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	FE	SE	High
White-faced Ibis	*Plegadis chihi*	SOC	–	Moderate
Yellow-billed Cuckoo	*Coccyzus americanus*	C	S	Moderate
Fish				
Rio Grande Chub	*Gila Pandora*	–	S	Moderate

Common Name	***Scientific Name***	***Federal Status*** [a]	***State Status*** [b]	***Potential to Occur*** [c]
Amphibians				
Jemez Mountains Salamander	*Plethodon neomexicanus*	C	SE	High
Insects				
New Mexico Silverspot Butterfly	*Speyeria nokomis nitocris*	SOC	–	Moderate
Plants				
Greater Yellow Lady's Slipper	*Cypripedium calceolus var. pubescens*	–	SE	Moderate
Wood Lily	*Lilium philadelphicum var. anadinum*	–	SE	High

[a] *Federal Status*

FE = Federally Endangered; in danger of extinction throughout all or a significant portion of its range.

FT = Federally Threatened; likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

C = Candidate; substantial information exists in the U.S. Fish and Wildlife Service files on biological vulnerability to support proposals to list as endangered or threatened.

SOC = Species of Concern; conservation standing is of concern, but status information is still needed and the species does not receive recognition under the Endangered Species Act.

D = Federally delisted due to recovery, currently monitored.

[b] *State Status*

SE = State Endangered

Animal: any species or subspecies whose prospects of survival or recruitment in New Mexico are in jeopardy.

Plant: a taxon listed as threatened or endangered under provision of the Federal Endangered Species Act, or is considered proposed under the tenets of the act, or is a rare plant across its range within the state, and of such limited distribution and population size that unregulated taking could adversely impact it and jeopardize its survival in Mexico.

ST = State Threatened

Animal: any species or subspecies that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range in New Mexico.

Plant: New Mexico does not list plants as threatened.

S = Sensitive; those taxa that, in the opinion of a qualified New Mexico Department of Game and Fish biologist, deserve special consideration in management and planning, and are not listed as threatened or endangered by the State of New Mexico.

[c] *Potential Occurrence*

Low = No known habitat exists on Los Alamos National Laboratory.

Moderate = Habitat exists, though the species has not been recorded recently.

High = Habitat exists and the species is recorded to occur at Los Alamos National Laboratory.

Source: DOE 2008a; LANL 2011a:Ecological Resources, 018, 2011c; USFWS 2010.

Habitat that is either occupied by federally protected species or potentially suitable for use by these species in the future has been delineated within LANL and is protected by the *Threatened and Endangered Species Habitat Management Plan* (LANL 2011c). Site plans and monitoring plans for federally listed threatened and endangered species that occur or may occur within LANL are defined in the Habitat Management Plan and designed to provide a balance of current operations and future development needs of LANL with the habitat requirements of the threatened and endangered species. The Habitat Management Plan also facilitates DOE compliance with the Endangered Species Act and related Federal regulations. Each site plan within the Habitat Management Plan identifies areas of environmental interest (AEIs) for various federally listed threatened or endangered species. In general, an AEI consists of a core area that contains potential important breeding or wintering habitat for a specific species and a buffer area around the core area. The buffer protects the core area from disturbances that would degrade its value. The Habitat Management Plan defines the types and levels of activities that may be conducted within these areas. AEIs have been established for the Mexican spotted owl and southwestern willow flycatcher. AEIs have not been established for any other federally protected animal species at LANL, as suitable habitat for these species either does not occur at LANL or the species have never been recorded to be present in the LANL area (LANL 2011c).

Annual surveys of the Mexican spotted owl have been conducted on LANL since 1993. In 1995, a pair of Mexican spotted owls and their nest was observed on LANL property. Since then, the nesting territory has been occupied and young have fledged in multiple years. In 2007, a second pair of Mexican spotted owls and their nest was observed and has also produced young. Annual surveys are done for the Mexican spotted owl, the southwestern willow flycatcher, and the black-footed ferret. Only the Mexican spotted owl has been observed during those surveys. Although willow flycatchers have been observed at one location on LANL during migratory season surveys, it has not been possible to confirm the presence of the southwestern subspecies. Management of AEIs and mitigation measures for proposed projects result in part from these surveys (LANL 2011a:Ecological Resources, 019).

The Sandia–Mortandad Canyon Mexican Spotted Owl AEI, located in Sandia and Mortandad Canyons, encompasses a number of the technical areas of concern. This AEI overlaps with both the Pajarito Canyon and Los Alamos Canyon Mexican Spotted Owl AEIs. Specifically, parts of TA-3, -5, -36, -46, -48, -50, -52, -55, -63, and -64 are within the core and/or buffer zones of the Sandia–Mortandad Canyon, Pajarito Canyon, and/or Los Alamos Canyon Mexican Spotted Owl AEIs. The Three-Mile Canyon Mexican Spotted Owl AEI affects a small section of TA-51 within the buffer zone and a northern part of TA-36 within the core and buffer zones. A southern portion of TA-36 is also within the core and buffer zones of the Cañon de Valle Mexican Spotted Owl AEI. Other technical areas of concern, such as TA-54 and TA-72, do not fall within any Mexican Spotted Owl AEIs. Also, the southwestern willow flycatcher AEI falls completely within TA-36.

3.8 Cultural and Paleontological Resources

Cultural resources are human imprints on the landscape that are defined and protected by a series of Federal laws, regulations, and guidelines and include archaeological resources, historic buildings and structures, and traditional cultural properties. To fully meet the requirements of these laws, regulations, and guidelines, DOE is implementing *A Plan for the Management of the Cultural Heritage at Los Alamos National Laboratory, New Mexico* (LANL 2006a). Implementation of this plan involves a Programmatic Agreement between DOE, the Advisory Council on Historic Preservation, and the New Mexico State Historic Preservation Office (DOE 2006b). By carrying out the terms of the agreement, DOE will fulfill its responsibilities under Section 106 of the National Historic Preservation Act. Paleontological resources, the physical remains, impressions, or traces of plants or animals from a former geologic age, are also addressed in this section.

3.8.1 Archaeological Resources

As of 2010, archaeological surveys have been conducted on over 88 percent of the land within LANL boundaries. A total of 1,890 archaeological resource sites currently exist on the site; of these, most are prehistoric sites related to the Archaic and Ancestral Pueblo Cultures (DOE 2008a).

Following the Cerro Grande Fire, surveys identified 333 archaeological resource sites that were affected by that fire. Of these sites, 269 were damaged by the fire, 35 by suppression activities, and 29 by rehabilitation activities. Damage included direct loss, soot staining, spalling, and cracking of stone masonry walls of Ancestral Pueblo field houses and room blocks, and exposure of artifacts from erosion. Additionally, the fire, as well as prior and subsequent tree thinning measures taken to reduce wildfire hazard, resulted in the discovery of 447 new archaeological sites at LANL (DOE 2008a).

The conveyance and transfer of land has resulted in the removal of some archaeological sites from DOE protection. However, in some cases, archaeological protection easements have been used to provide continued protection for many of these sites (DOE 2008a). Sites located on lands to be conveyed to

Los Alamos County for economic development were excavated and therefore mitigated under the Programmatic Agreement (DOE 1999c; LANL 2008b).

Table 3–12 provides a summary of the number of prehistoric and historic sites present within the technical areas of concern that are eligible or potentially eligible for listing on the National Register of Historic Places (NRHP) and the types of archaeological sites present.

Table 3–12 Archaeological Sites Present within the Technical Areas of Concern

Technical Area	*Eligible and Potentially Archaeological Sites* [a]	*Archaeological Site Types*
3	6	Cultural management unit, historic other, lithic scatter, trail and/or stair
5	60	Lithic and ceramic scatter, game pit, complex pueblo, cavate, 1- to 3-room structure, historic structure, lithic scatter, rock art, wagon road, pueblo roomblock, trail and/or stair, water control
36	402	Lithic and ceramic scatter, game pit, complex pueblo, cavate, 1- to 3-room structure, Garden plot, lithic scatter, prehistoric other, rock art, wagon road, rock/wood enclosure, rock feature, rock ring, rock shelter, pueblo roomblock, trail and/or stair, water control
46	12	Lithic and ceramic scatter, cavate, 1- to 3-room structure, lithic scatter, pueblo roomblock
48	2	1- to 3-room structure, historic structure
50	0	
51	26	Lithic and ceramic scatter, cavate, 1- to 3-room structure, lithic scatter, wagon road, rock feature, rock shelter, pueblo roomblock
52	6	Cavate, rock shelter
54	97	Lithic and ceramic scatter, complex pueblo, cavate, 1- to 3-room structure, garden plot, historic artifact scatter, lithic scatter, prehistoric other, rock art, wagon road, rock feature, rock shelter, pueblo roomblock
55	2	Historic structure, rock shelter
63	0	
64	0	
72	93	Lithic and ceramic scatter, game pit, cultural management unit, complex pueblo, cavate, 1- to 3-room structure, garden plot, historic other, historic structure, lithic scatter, prehistoric other, pit structure, rock art, rock/wood enclosure, rock feature, rock ring, rock shelter, pueblo roomblock, trail and/or stair

[a] Includes sites that have been determined eligible and potentially eligible and those proposed as eligible and potentially eligible.

3.8.2 Historic Buildings and Structures

In terms of the historic built environment, there are 440 buildings and structures that date to the Manhattan Project and early Cold War, of which 21 date back to the Manhattan Project. A total of 335 of these 440 buildings and structures have been evaluated for eligibility for inclusion in the NRHP, of which 160 have been determined eligible and 165 ineligible. Among those buildings deemed eligible is the CMR Building in TA-3, which is important due to its association with important events during the Cold War years and its architectural and engineering significance (Garcia, McGehee, and Masse 2009). These figures include a small number of structures younger than 50 years in age that are likely to be deemed of exceptional national significance and are thus eligible for inclusion in the NRHP despite not yet having achieved the 50-year age limit normally required for inclusion (DOE 2008a).

A number of factors have served to greatly reduce the number of Manhattan Project buildings still extant. These include (1) the expedient initial construction of the original buildings and structures; (2) post-

Manhattan Project infrastructure development, particularly during the late 1950s and early 1960s, and again beginning in the late 1990s through the first decade of the twenty-first century; (3) the development of the Los Alamos townsite during the 1950s and 1960s; (4) the Cerro Grande Fire; and (5) contamination of some buildings by asbestos and radioactive isotopes. As of 2003, only 28 Manhattan Project buildings retained sufficient historical and physical integrity for listing on the NRHP, and only a handful are deemed suitable for long-term preservation and interpretation (LANL 2006a).

3.8.3 Traditional Cultural Properties

Within the boundaries of LANL there are ancestral villages, shrines, petroglyphs (carvings or line drawings on rocks), sacred springs, trails, and traditional use areas that could be identified by Pueblo and Hispanic communities as traditional cultural properties. In addition to physical cultural entities, concern has been expressed that "spiritual," "unseen," "undocumentable," or "beingness" aspects may be present at LANL that are an important part of Native American culture. According to the DOE compliance procedure, Native American tribes may request permission for visits to sacred sites within LANL boundaries for ceremonies or other purposes to insure visitor safety and site security (DOE 1999a, 2008a).

When a project is proposed, NNSA arranges site visits with tribal representatives from the San Ildefonso, Santa Clara, Jemez, and Cochiti Pueblos, as appropriate, to solicit their concerns and to comply with applicable requirements and agreements. Provisions for coordination among these four pueblos and DOE are contained in Accords agreements that were entered into beginning in 1992 for the purpose of improving communication and cooperation among Federal and tribal governments (DOE 1999a, 2008a). In accordance with the Accords and as part of NNSA's Government-to-Government interactions, twice yearly executive meetings are held among the Los Alamos Site Office Manager, the LANL Director, and the respective Pueblo Governors (or their representatives) of the four Accord Pueblos (Cochiti, San Ildefonso, Jemez, and Santa Clara). In addition, the Los Alamos Site Office Manager meets monthly with each governor of the two pueblos closest to LANL (San Ildefonso and Santa Clara) and with the other Accord Pueblo Governors on a less frequent basis. In both the executive meetings and the monthly meetings, the Los Alamos Site Office Manager discusses current and planned activities taking place at LANL and seeks comment on these activities from the governors. Additional information on consultation is presented in Chapter 5, Section 5.7.

A "Comprehensive Plan for the Consideration of Traditional Cultural Properties and Sacred Sites at Los Alamos National Laboratory, New Mexico" was sent by DOE in 2000 to 24 tribes to help complete the traditional cultural properties identification and evaluation process begun during the 1999 *LANL SWEIS* preparation process. Only the Pueblo of San Ildefonso responded with site information; however, DOE continues to consult with various Pueblos to maintain an open dialog. LANL missions are aware of the needs of the Pueblos and are respectful of times when the Pueblos participate in ceremonies and rituals. Various agreements, Memoranda of Agreement, Memoranda of Understanding, and Programmatic Agreements are in place with San Ildefonso, Santa Clara, and other Pueblos to allow individuals access to areas across LANL (DOE 2008a).

3.8.4 Paleontological Resources

A single paleontological artifact has been discovered at a site formerly within LANL boundaries that has since been conveyed to Los Alamos County; however, in general, the near-surface stratigraphy is not conducive to preserving plant and animal remains. The near-surface materials at LANL are volcanic ash and pumice that were extremely hot when deposited; most carbon-based materials (such as bones or plant remains) would likely have been vaporized or burned if present (DOE 2008a). No paleontological resources have been identified within any of the technical areas of concern for the impact analyses across the three alternatives analyzed in this SEIS.

3.9 Socioeconomics

Statistics for the local economy, population, and housing are presented for the ROI, a four-county area in New Mexico made up of Los Alamos, Santa Fe, Sandoval, and Rio Arriba Counties (see Figure 3–1). In 2010, there were 13,474 people employed at LANL. The majority of all LANL employees reside in this four-county area. It is estimated that approximately half of the LANL workforce resides in Los Alamos County (LANL 2011a:Data Call Tables, 001).

3.9.1 Regional Economic Characteristics

Between 2000 and 2010, the civilian labor force in the four-county area increased 14.7 percent, to about 165,000 persons. In 2010, the annual unemployment average in the ROI was 7.8 percent, which was less than the annual unemployment average of 8.4 percent for New Mexico (NMDWS 2010, 2011a). By May 2011, the unemployment rates in the ROI and the State of New Mexico decreased to 6.0 percent and 6.5 percent, respectively (NMDWS 2011b).

In 2010, the total government employment sector (Federal, state, and local) represented the largest employment sector in the four-county area (26.3 percent). This was followed by professional and business services (16.5 percent) and trade, transportation, and utilities (14.6 percent). For comparison, the totals for these employment sectors in New Mexico represented 24.2 percent, 12.8 percent, and 16.9 percent of employment, respectively (BLS 2011).

3.9.2 Population and Housing

From 2000 to 2010, the total population in the ROI increased approximately 19.8 percent, to 333,927 persons. All of the increased population can be attributed to Sandoval and Santa Fe Counties, which experienced increases of 46.3 and 11.5 percent, to 131,561 and 144,170, respectively. Over this time, the total populations of Los Alamos and Rio Arriba Counties decreased to 17,950 (-2.1 percent) and 40,246 (-2.3 percent), respectively (DOC 2010a, 2011a).

Table 3–13 displays the number of housing units, vacancy rates, and median value for homes in the ROI. From 2000 to 2010, the total number of housing units in the ROI increased by 27.9 percent, to 151,546. Sandoval County accounted for the largest portion of growth, increasing by approximately 17,400 units (50.0 percent). Santa Fe County accounted for the second largest portion of growth, increasing by approximately 13,600 units (23.5 percent). The total number of housing units in Los Alamos and Rio Arriba Counties increased by approximately 420 units (5.3 percent) and 1,600 units (9.0 percent), respectively (DOC 2010b, 2011a).

In 2010, the four-county ROI had a homeowner vacancy rate of 2.2 percent and a renter vacancy rate of 8.5 percent. Homeowner vacancy rates within the ROI are higher in Sandoval (2.3 percent) and Santa Fe (2.6 percent) Counties than in Los Alamos (1.3 percent) and Rio Arriba (1.4 percent) Counties. The opposite is true for renter vacancy rates within the ROI. Renter vacancy rates are higher in Los Alamos (9.7 percent) and Rio Arriba (10.3 percent) Counties than in Sandoval (6.2 percent) and Santa Fe (9.2 percent) Counties (DOC 2011a). Los Alamos County is currently working on updating the County Comprehensive Plan and the Downtown Los Alamos Comprehensive Plan, as well as implementing the White Rock Master Plan, all of which include additional residential development.

Table 3–13 Housing Units and Vacancy Rates in the Region of Influence

	Los Alamos County	*Rio Arriba County*	*Sandoval County*	*Santa Fe County*	*Region of Influence*
2000 Housing Units [a]	7,937	18,016	34,866	57,701	118,520
2010 Housing Units [e]	8,354	19,638	52,287	71,267	151,546
Percent Change	5.3	9.0	50.0	23.5	27.9
Vacant Units for Sale	74	179	894	1,150	2,297
Owner-Occupied Units	5,828	12,528	38,558	42,878	99,792
Homeowner Vacancy Rate (percent)	1.3	1.4	2.3	2.6	2.2
Vacant Units for Rent	198	373	594	1,925	3,090
Renter-Occupied Units	1,835	3,240	9,044	19,085	33,204
Renter Vacancy Rate (percent)	9.7	10.3	6.2	9.2	8.5
Median Value	$287,900 [b]	$151,200 [c]	$ 188,700 [d]	$295,000 [d]	Not Available

[a] DOC 2010b.
[b] DOC 2010c.
[c] DOC 2010d.
[d] DOC 2010e.
[e] DOC 2011a.

Data on home values for the counties within the ROI are taken from the Census Bureau’s American Community Survey (ACS). Availability of data for each county is dependent upon the total population thresholds required for inclusion in the ACS 1-year estimates, 3-year estimates, and 5-year estimates. The latest available data is presented for each county to provide the most up-to-date representation of conditions in the ROI. According to the Census Bureau’s 2005-2009 ACS 5-Year Estimates, the median value of housing units in Los Alamos County was $287,900 (DOC 2010c). According to the Census Bureau’s 2007–2009 ACS 3-Year Estimates, the median value of owner occupied housing units in Rio Arriba County was $151,200 (DOC 2010d).

In 2009, the median value of owner-occupied housing units in Sandoval and Santa Fe Counties was $188,700 and $295,000, respectively (DOC 2010e).

3.10 Environmental Justice

Under Executive Order 12898, DOE is responsible for identifying and addressing disproportionately high and adverse impacts on minority or low-income populations. As discussed in Appendix B, minority persons are those who identify themselves as Hispanic or Latino, Asian, Black or African American, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, or multi-racial (with at least one race designated as a minority race under CEQ Guidelines (CEQ 1997). Persons whose income is below the Federal poverty threshold are designated as low income. In 2009, the poverty threshold for a family of four with two related children was $21,756 (DOC 2010f).

There are two locations at LANL being considered for operation of CMR activities. These are TA-3, and TA-55 (see Chapter 1, Figure 1–2). The location for the proposed new CMRR-NF at TA-55 is approximately 1.2 miles (1.9 kilometers) southeast of the existing CMR Building.

Populations in the ROI include persons who live within 50 miles (80 kilometers) of the existing CMR Building or the proposed location for the CMRR-NF at TA-55. There are eight counties included or partially included in the potentially affected areas surrounding these locations: Bernalillo, Los Alamos, Mora, Rio Arriba, Sandoval, San Miguel, Santa Fe, and Taos. Portions or all of 16 Pueblo or tribal lands have been identified within the potentially affected area. **Figure 3–9** displays the proximity of Pueblo and tribal lands within the 50-mile (80-mile) potentially affected area relative to LANL.

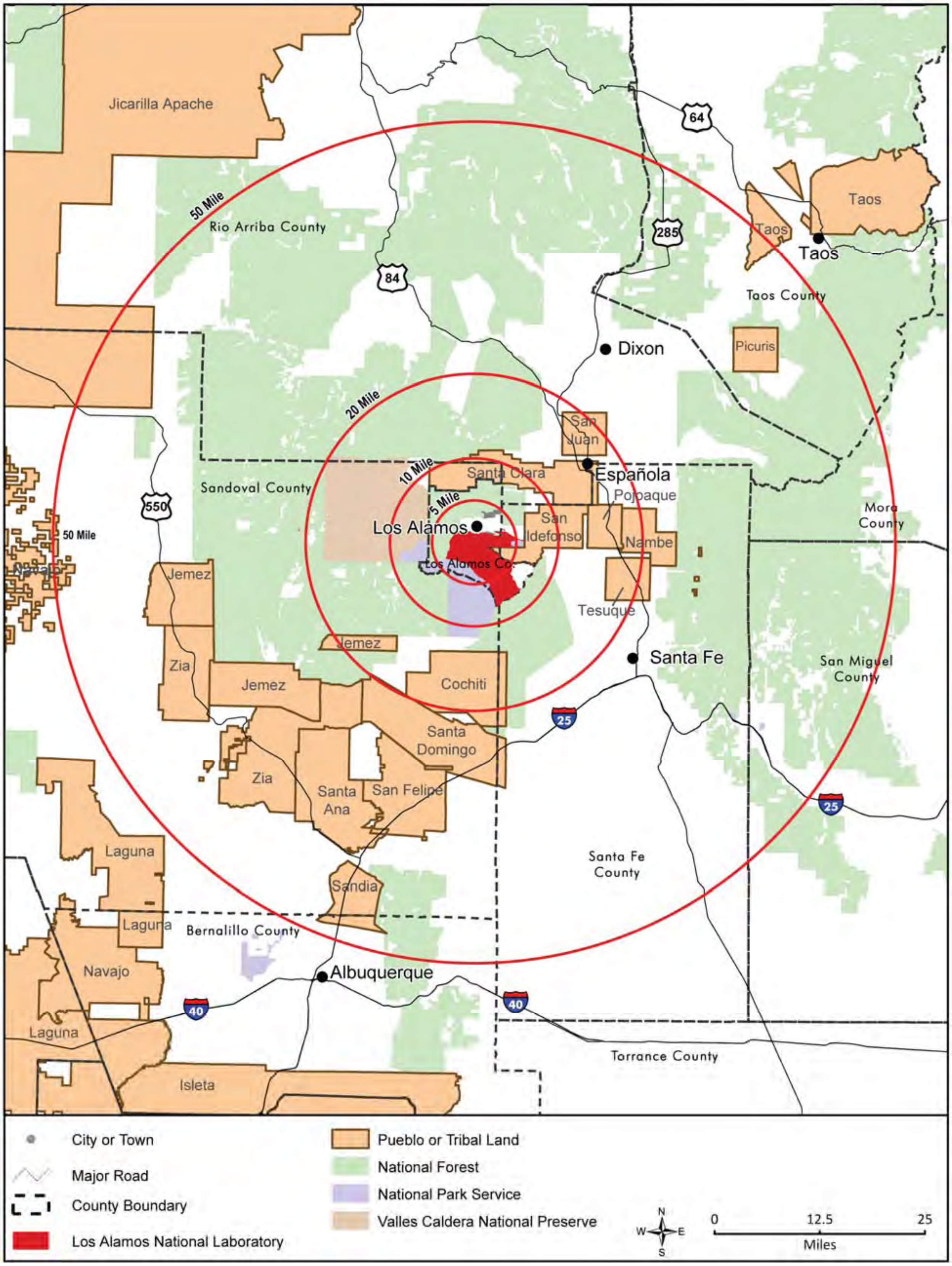

Figure 3–9 Pueblo and Tribal Lands within 50 Miles (80 kilometers) of Los Alamos National Laboratory

Consistent with the human health analysis, populations in the surrounding areas have been projected to the year 2030. To evaluate the potential impacts on populations in closer proximity to the proposed sites, additional radial distances of 5 miles (8 kilometers), 10 miles (16 kilometers), and 20 miles (32 kilometers) are also analyzed. **Tables 3–14** and **3–15** show the composition of the ROI surrounding TA-3 and TA-55 at each of these distances projected to 2030 using census data. The areas within 5 miles (8 kilometers) of each proposed site contain the lowest concentration of minority populations. The overall composition of the ROI is predominantly nonminority within the first 10 miles (16 kilometers). The areas between 10 and 20 miles (16 to 32 kilometers) contain the highest concentration of minority populations within the ROI. The percent of minority populations decreases slightly in the areas from 20 to 50 miles (32 to 80 kilometers); however, the overall composition of minority populations remains high. Similar to the minority populations, the concentration of low-income populations is lowest within the first 5 miles (8 kilometers).

Table 3–14 Projected Populations in 2030 Surrounding Technical Area 3

Population Group	*5-Mile Radius*		*10-Mile Radius*		*20-Mile Radius*		*50-Mile Radius*	
	Number	***Percent***	***Number***	***Percent***	***Number***	***Percent***	***Number***	***Percent***
Non-Minority	8,029	65	12,575	63	20,609	33	214,975	43
American Indian	96	1	866	4	4,392	7	26,009	5
Total Hispanic	2,275	18	3,909	20	33,385	54	230,434	46
Total Minority	4,319	35	7,330	37	41,791	67	287,478	57
Total Population	12,348	100	19,905	100	62,400	100	502,453	100
Low-Income	388	3	844	4	7,407	12	64,288	13

Note: To convert miles to kilometers, multiply by 1.6093.
Source: DOC 2011b.

Table 3–15 Projected Populations in 2030 Surrounding Technical Area 55

Population Group	*5-Mile Radius*		*10-Mile Radius*		*20-Mile Radius*		*50-Mile Radius*	
	Number	***Percent***	***Number***	***Percent***	***Number***	***Percent***	***Number***	***Percent***
Non-Minority	8,030	65	12,681	63	21,999	33	220,122	43
American Indian	142	1	939	5	4,828	7	25,944	5
Total Hispanic	2,303	19	4,026	20	35,175	53	233,555	46
Total Minority	4,401	35	7,538	37	44,157	67	291,353	57
Total Population	12,431	100	20,219	100	66,156	100	511,475	100
Low-Income	398	3	881	4	7,914	12	65,777	13

Note: To convert miles to kilometers, multiply by 1.6093.
Source: DOC 2011b.

Using data from the 1990 census, 2000 census, and the 2010 census for each of the affected counties within a 50-mile (80-kilometer) radius of LANL, projections of the affected populations were calculated for 2030. **Figure 3–10** shows the minority and nonminority populations by county projected to live within the potentially affected area surrounding the existing CMR Building in 2030. Because the CMRR-NF and CMR Building locations are relatively close to one another, the minority and nonminority populations living in the potentially affected area surrounding the TA-55 site differ from those surrounding the existing CMR Building at TA-3 by approximately 2 percent. Minority populations projected to live within the 50-mile (80-kilometer) radius constitute approximately 57 percent of the total population in the ROI. This is slightly lower than the projected total minority population for the State of New Mexico of approximately 65 percent. Approximately 73 percent of the total population and 72 percent of the total minority populations in the ROI reside in Sandoval and Santa Fe Counties.

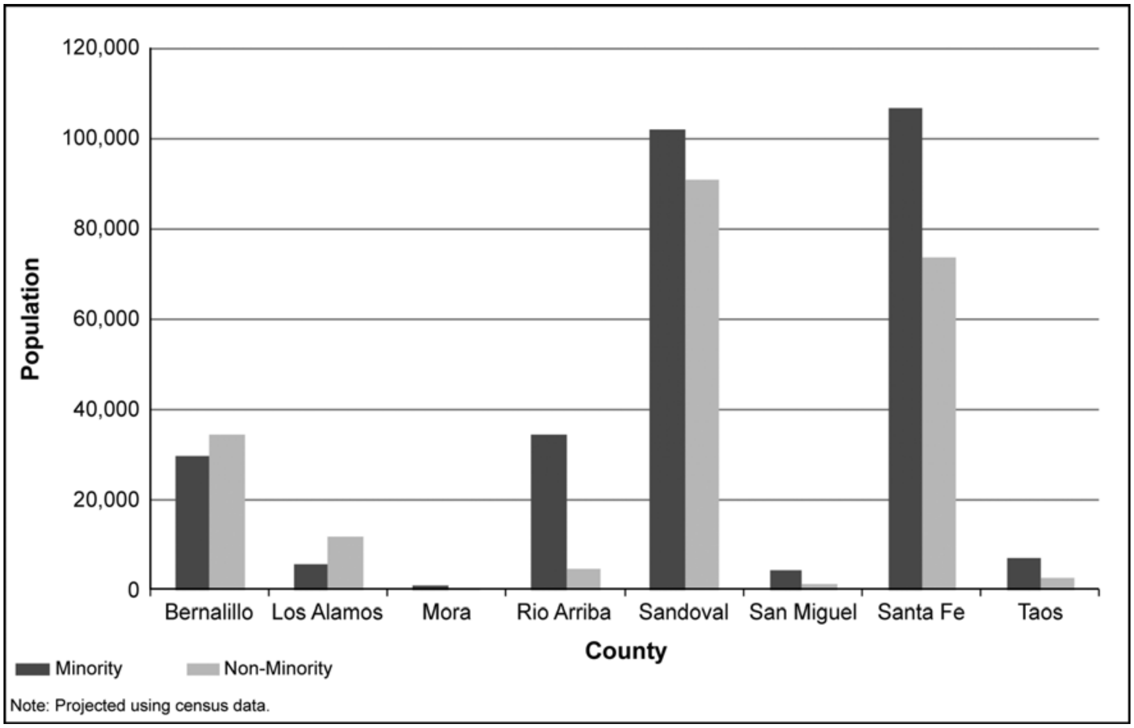

Figure 3–10 Minority and Nonminority Populations by County Projected to Live in the Potentially Affected Area in 2030

Figures 3–11 and **3–12** show cumulative total and minority populations projected to live within the potentially affected area in 2030 as a function of distance from TA-3 and TA-55. Values along the vertical axis show populations residing within a given distance from these technical areas. Moving outward from locations, the cumulative populations increase sharply in the Española, Santa Fe, and Albuquerque areas. Approximately 37 percent of the potentially affected minority population resides in the Santa Fe area.

Approximately 80 percent of the potentially affected minority population is projected to be Hispanic or Latino. Similarly, the Hispanic population is projected to account for approximately 82 percent of the total minority population of the state of New Mexico. The American Indian population is projected to account for approximately 9 percent of the total minority population of the potentially affected area in 2030, much lower than the projected American Indian population for the state of New Mexico of approximately 16 percent. Cumulative minority populations surrounding TA-3 and TA-55 are almost identical as a function of distance from the site.

Figure 3–13 shows the low-income and non-low-income population by county projected to live within the potentially affected area surrounding the existing CMR Building in 2030. As indicated in the figure, the largest potentially affected low-income populations reside in Sandoval and Santa Fe Counties. Approximately 67 percent of the total potentially affected low-income populations reside in these two counties. Low-income persons constituted approximately 12.9 percent of the total potentially affected population.

Figure 3–14 shows the cumulative low-income populations projected to live within the potentially affected area in 2030 as a function of distance from TA-3 and TA-55. The overall shape of these curves is similar to those shown in Figures 3–10 and 3–11, indicating that increases in the cumulative populations occur at the same distances and same rates. Low-income populations surrounding TA-3 and TA-55 are concentrated in the Española, Santa Fe, and Albuquerque areas. Approximately 35 percent of the potentially affected low-income population reside in Santa Fe County.

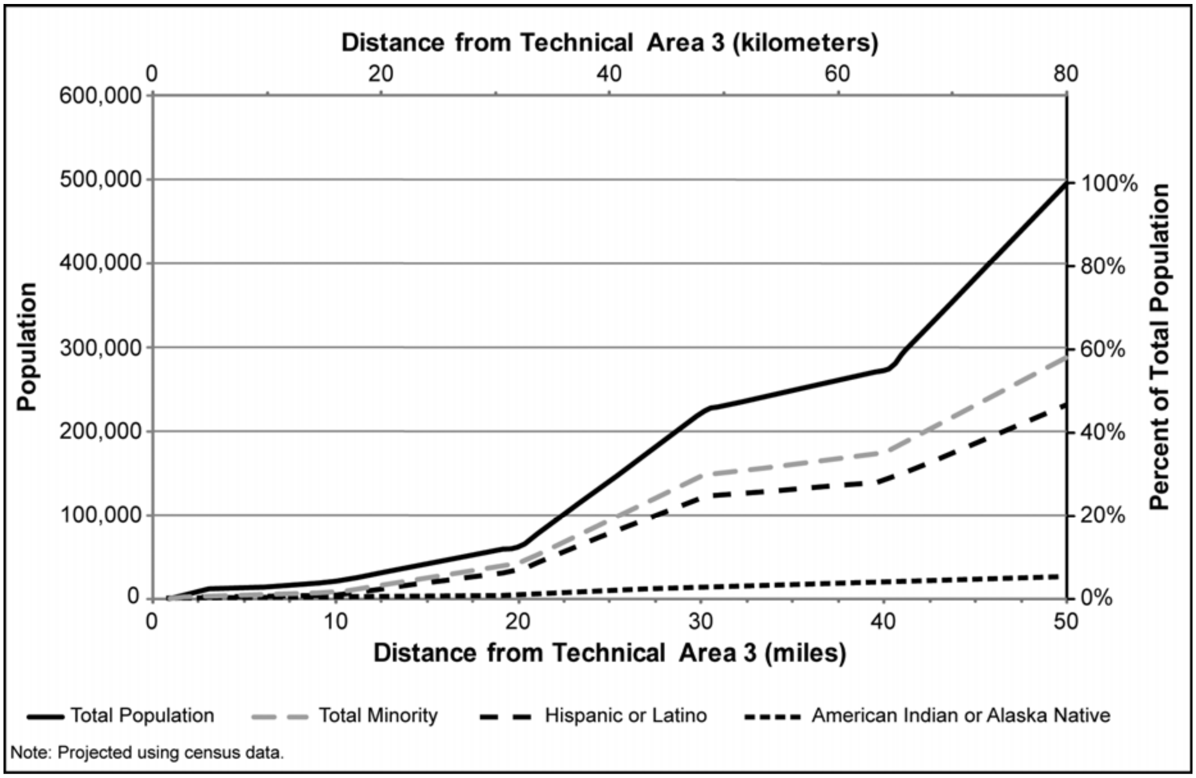

Figure 3–11 Total and Minority Populations as a Function of Distance from Technical Area 3 in 2030

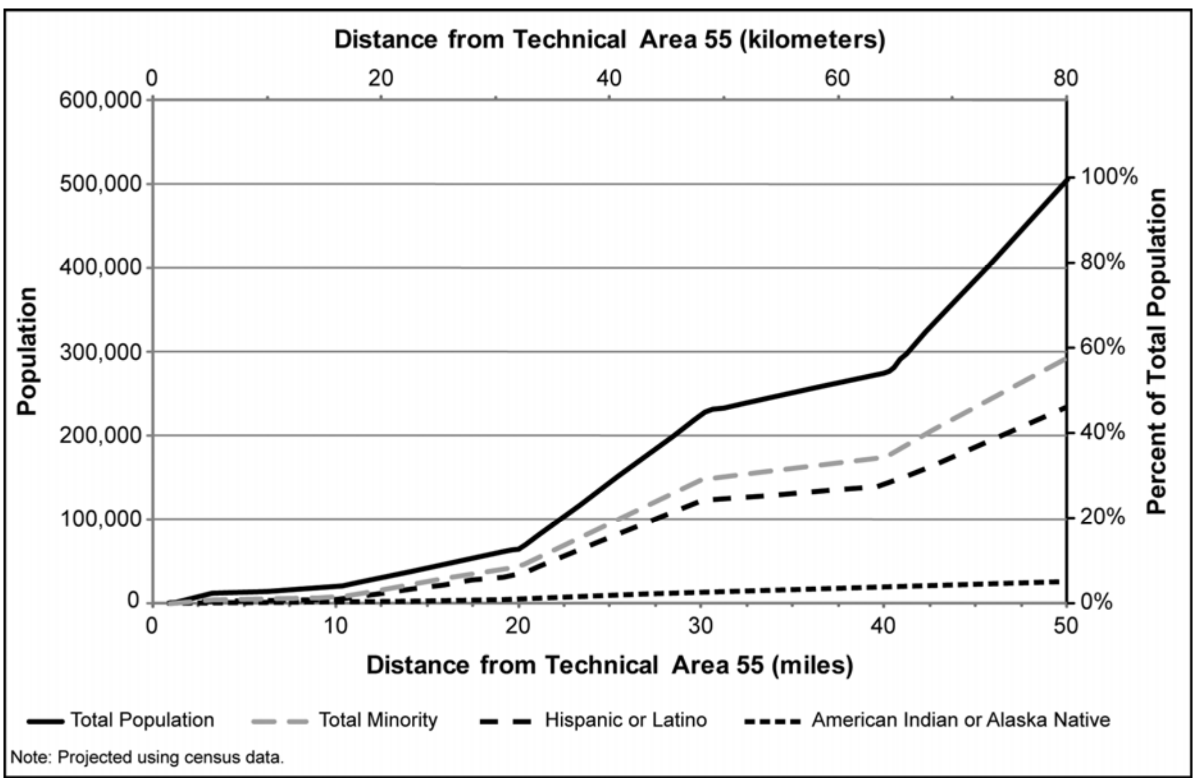

Figure 3–12 Total and Minority Populations as a Function of Distance from Technical Area 55 in 2030

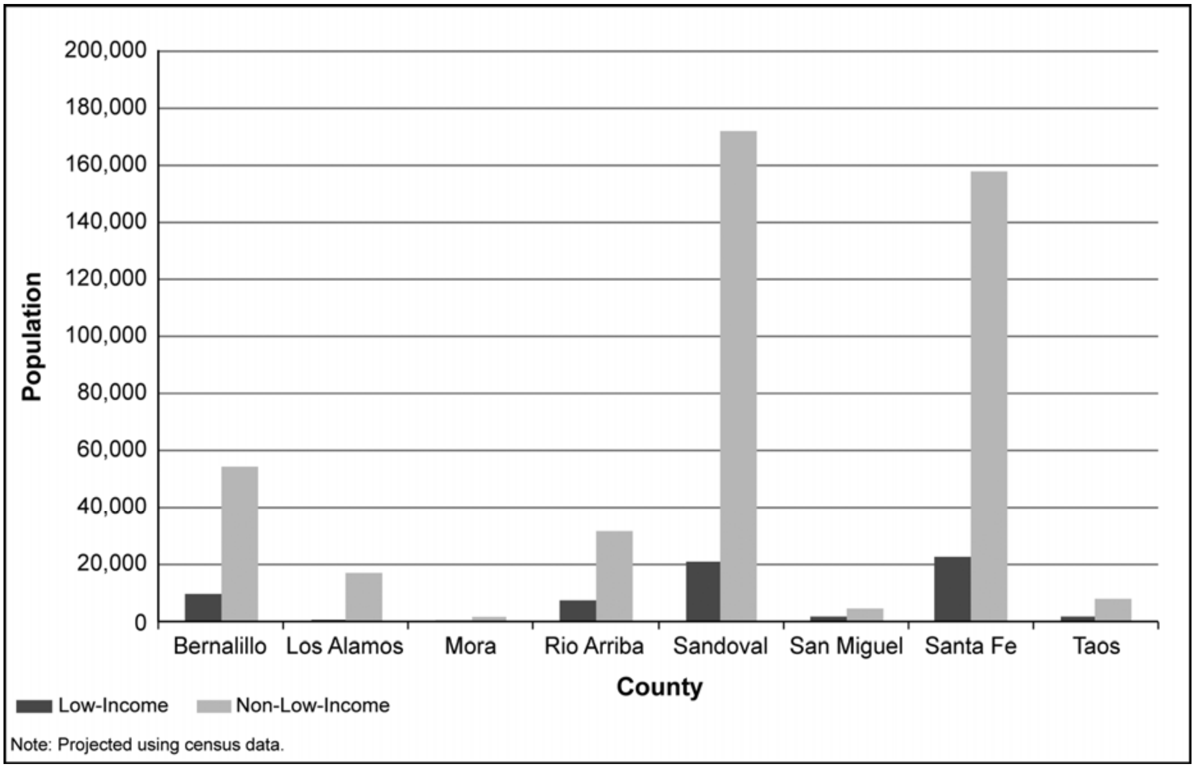

Figure 3–13 Low-Income and Non-Low-Income Populations by County Projected to Live in the Potentially Affected Area in 2030

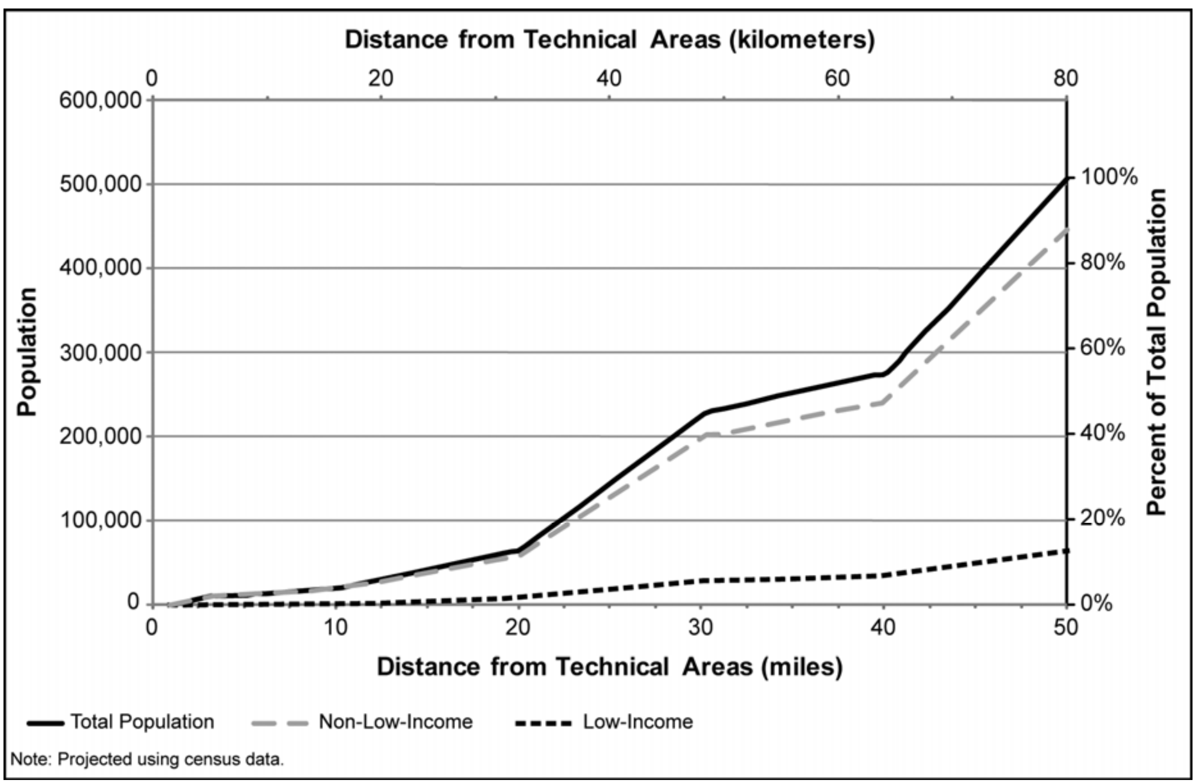

Figure 3–14 Total and Low-Income Populations as a Function of Distance from Technical Areas in 2030

3.11 Human Health

Public and occupational health and safety issues for LANL operations include the determination of potential adverse effects on human health that could result from acute and chronic exposure to ionizing radiation and hazardous chemicals. The following subsections include a discussion of radiation exposure and chemical exposure and the associated human health risks of each.

3.11.1 Radiation Exposure and Risk

Major sources and levels of background radiation exposure to individuals in the vicinity of LANL are shown in **Table 3–16**. Annual background radiation doses to individuals are expected to remain constant over time. Background radiation doses are unrelated to LANL operations.

Normal operational releases of radionuclides to the environment from LANL operations provide another source of radiation exposure to individuals in the vicinity of LANL. Types and quantities of radionuclides released from LANL operations in 2009 are listed in *Environmental Surveillance at Los Alamos During 2009* (LANL 2010b) and are presented in Section 3.4.3.

The annual population dose to the public resulting from these releases is about 0.6 person-rem (LANL 2010b), which corresponds to an average annual individual dose of 0.002 millirem for individuals residing within 50 miles (80 kilometers) of LANL.[7] This dose to the offsite public is primarily the result of airborne releases from LANSCE operations. Collective annual population doses over the last 16 years from releases at LANL have declined from a high of 4 person-rem in 1999 to less than 1 person-rem in 2009. Future collective annual doses are expected to be less than 1 person-rem. No observable health effects are expected from this dose.

Table 3–16 Sources of Radiation Exposure That Affect Individuals in the Vicinity of Los Alamos National Laboratory But Are Unrelated to Site Operations

Source	*Effective Dose Equivalent (millirem per year) [Los Alamos National Laboratory]*
Natural Background Radiation	
External cosmic [a]	50 to 90 [70]
External terrestrial [b]	50 to 150 [100]
Internal terrestrial and global cosmogenic	40
Radon (in homes)	200-300 [270]
Other Background Radiation	
Diagnostic x-rays and nuclear medicine	300
Weapons test fallout	< 1
Consumer and industrial products	10
Total	650 to 890 [790]

< = less than.
[a] Cosmic radiation doses are lower in the lower elevations and higher in the mountains.
[b] Variation in the external terrestrial dose is a function of the variability in the amount of naturally occurring uranium, thorium, and potassium in the soil.
Source: LANL 2010b.

[7] *The population dose reported in the annual site environmental report (LANL 2010b) was based on an estimated population of 280,000 people living within 50 miles (80 kilometers) of LANL. Based on the 2010 census, the population is estimated to be about 383,000. Assuming that the distribution of the population remained the same, the dose to 2010 population would be about 0.8 person-rem.*

The annual dose from airborne releases to the maximally exposed offsite individual (at East Gate[8]) was calculated to be about 0.6 millirem (LANL 2010b). This dose falls within the radiological limits (individual dose limit of 10 millirem per year from airborne emissions [40 CFR Part 61, Subpart H] and 100 millirem per year from all sources [DOE Order 458.1]) and is much lower than those from background radiation.

Using a risk estimator of 1 latent cancer fatality (LCF) per 1,667 person-rem or rem of dose (or 6×10^{-4} LCFs per person-rem or rem) (DOE 2003a), the estimated probability of this maximally exposed person developing a latent fatal cancer from radiation exposure associated with 1 year of LANL operations is about 1 chance in 3 million (3.6×10^{-7}). According to the same risk estimator, 0.00034 excess LCFs are projected in the population living within 50 miles (80 kilometers) of LANL from 1 year of normal LANL operations. To place this number in perspective, it may be compared with the number of fatal cancers expected in the same population from all causes. The mortality rate associated with cancer for the entire U.S. population is 0.2 percent per year. Based on this mortality rate, the number of fatal cancers to be expected during 2009 from *all causes* in the population of about 280,000 living within 50 miles (80 kilometers) of LANL would be 560, much higher than the 0.00034 LCFs resulting from total LANL operations that was estimated in 2009 (LANL 2010b).[9]

LANL workers receive the same dose as the general public from background radiation, but they also receive an additional dose from working in facilities with nuclear materials. The average dose to the individual worker and the cumulative dose to all workers at LANL from operations in 2009 are presented in **Table 3–17**. These doses fall within the radiological limits established by 10 CFR Part 835. Using a risk estimator of 1 LCF per 1,667 person-rem among workers (6×10^{-4} LCF per person-rem) and a total dose to workers of 115.7 person-rem, the number of estimated LCFs among LANL workers from normal operations in 2009 is 0.070.

In 2009, the average onsite concentrations in air of plutonium-239, gross alpha, and gross beta radiation on the LANL site were measured to be 1×10^{-18} curies per cubic meter, 7×10^{-16} curies per cubic meter, and 1.7×10^{-14} curies per cubic meter, respectively. The concentrations of plutonium-239, gross alpha, and gross beta radiation were about the same as those measured regionally (see Table 3–8). No specific measurements were reported for the technical areas, but the concentrations are expected to be similar to the average site values.

Table 3–17 Radiation Doses to Workers from Normal Los Alamos National Laboratory Operations in 2009 (total effective dose equivalent)

Occupational Personnel	*Onsite Releases and Direct Radiation*	
	Standard	*Actual*
Average radiation worker (millirem)	(a)	83
Total workers (person-rem) [b]	None	115.7

[a] The radiological limit for an individual worker is 5,000 millirem per year (10 CFR Part 835). However, DOE's goal is to maintain radiological exposure as low as reasonably achievable. Therefore, DOE has recommended an administrative control level of 500 millirem per year (DOE 1999b); the site must make reasonable attempts to maintain individual worker doses below this level.

[b] There were 1,392 workers with measurable doses in 2009.

Source: DOE 2010a.

[8] *The individual at this location would receive the maximum dose from all releases at LANL.*

[9] *For the 2010 population of about 383,000 people, the number of fatal cancers from all causes would be about 770 compared to the increased risk of a latent cancer fatality from LANL operations of 0.00048.*

3.11.2 Chemical Environment

The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (such as soil through direct contact or via the food pathway).

Adverse health impacts on the public are minimized through administrative and design controls to decrease hazardous chemical releases to the environment and to achieve compliance with permit requirements. The effectiveness of these controls is verified through the use of monitoring information and inspection of mitigation measures. Health impacts on the public could occur during normal operations at LANL via inhalation of air containing hazardous chemicals released to the atmosphere by LANL operations. Other potential pathways that pose risks to public health include ingestion of contaminated drinking water or direct exposure.

Baseline air emission concentrations for air pollutants and their applicable standards are presented in Section 3.4.2. These concentrations are estimates of the highest existing offsite concentrations and represent the highest concentrations to which members of the public could be exposed. These concentrations are compared with applicable guidelines and regulations.

Chemical exposure pathways to LANL workers during normal operations could include inhaling the workplace atmosphere, drinking LANL potable water, and possible other contact with hazardous materials associated with work assignments. Workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. LANL workers are also protected by adherence to the Occupational Safety and Health Administration and EPA occupational standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals. Appropriate monitoring, which reflects the frequency and amounts of chemicals used in the operation processes, ensures that these standards are not exceeded. Additionally, DOE requirements ensure that conditions in the workplace are as free as possible from recognized hazards that cause or are likely to cause illness or physical harm. Therefore, worker health conditions at LANL are substantially better than required by standards.

3.11.3 Industrial Safety

Work-related accidents in terms of total recordable cases, injuries, and deaths from normal activities (facility operation, construction, disposition) are evaluated using historical accidents databases for LANL. Two categories of industrial safety impacts are represented: (1) total recordable cases and (2) days away, restricted, and transfer cases. Total recordable cases include work-related death, illness, or injury that results in loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment beyond first aid. A fatal occurrence is a work-related injury or illness that causes the death of the employee.

Table 3–18 summarizes occupational injury and illness rates at LANL over the last 4 years and the average rates evaluated in 2008 *LANL SWEIS* for the years 1999 through 2005. These rates correlate to reportable injuries and illnesses during the year for 200,000 hours worked or roughly 100 worker-years. Analysis of NNSA's injury and illness performance at LANL shows significant improvement over the last 3 years. This has been influenced by a decrease in some types of injuries that have been historically high, such as repetitive trauma and push/pull/lift injuries. The LANL contractor continues to strengthen the interface between the LANL worker organizations with respect to timely reporting of injuries and the completion and analysis of injury investigation reports. To derive learning from injury/illness events, the LANL contractor requires that facility managers engage in a systematic in-depth analysis of the event causes and consider the efficiency of the remaining lines of defense associated with the events they evaluate.

Accident information for activities at facilities across DOE result in rates of 1.6 total recordable cases and 0.7 days away, restricted, or transferred cases, based on occupational injuries or illnesses from 2004 through 2008 (DOE 2011a). These rates are well below industry averages, which in 2006 through 2009 were 4.0 recordable cases and 2.0 days away, restricted, or transferred cases as a result of an occupational injury or illness (BLS 2010a).

There were no work-related fatalities at LANL. The DOE and contractor work-related fatality rate from 2002 to 2009 is about 0.0008 for 100 worker-years or 200,000 labor hours (DOE 2011a).

Table 3–18 Occupational Injury and Illness Rates at Los Alamos National Laboratory

Calendar Year	*2006*	*2007*	*2008*	*2009*	*LANL SWEIS*
Total recordable cases [a]	2.56	2.0	1.83	1.90	2.40
Days away, restricted, transfer [b]	1.15	0.80	0.65	0.73	1.18

[a] Total recordable cases, number per 200,000 hours worked.
[b] Days away, restricted, or transfer, number of cases per 200,000 hours worked.
Source: LANL 2007d, 2009a, 2010a, 2011b.

3.11.4 Health Effects Studies

Numerous epidemiological studies have been conducted in the LANL area. For example, a 1993 study found that the incidence of some cancers was greater than that observed in reference populations, while the incidence of other cancers was lower (Athas and Key 1993). The most notable increase was for thyroid cancer incidence observed in the mid-1980s, with increased incidence rates also observed for melanoma of the skin, prostate cancer, non-Hodgkin's lymphoma, ovarian cancer, and female breast cancer. The related epidemiologic investigation did not identify a specific cause for the high number of thyroid cancers observed in Los Alamos County, but indicated that it was likely the result of several causes (Athas 1996).

Using cancer incidence data for the years 1973 to 1997, a study identified a statistically significant cluster of childhood cancers in Los Alamos County and six counties to the south and west of Los Alamos County (Bernalillo, Cibola, McKinley, Sandoval, San Juan, and Valencia Counties), when all cancers were considered (Zhan 2001). The same study identified a statistically significant cluster of childhood acute lymphoblastic leukemia in a nine-county area south and southwest of Los Alamos County (Bernalillo, Catron, Cibola, Dona Ana, Lincoln, Sierra, Socorro, Torrance, and Valencia Counties). Over the same years, another study identified a statistically significant cluster of female breast cancer within the four-county area of Los Alamos, Sandoval, Santa Fe, and Bernalillo Counties (Zhan 2002).

In 2003, a study compared annual age-adjusted cancer incidence and mortality rates for the years 1970 to 1996 for 24 types of cancer in Los Alamos County, with rates calculated for a New Mexico state reference population (Richards 2003). Cancer incidence rates considered elevated or significantly elevated compared with the New Mexico state reference population included those for the brain, breast, colon/rectum, esophagus, Hodgkin's lymphoma, leukemia, melanoma of the skin, non-Hodgkin's lymphoma, ovary, prostate, testis, and thyroid. Cancer mortality rates considered elevated or significantly elevated compared with the New Mexico state reference population included those for breast, colon/rectum, kidney, liver, melanoma of the skin, non-Hodgkin's lymphoma, ovary, and pancreas. Incidence and/or mortality rates for other analyzed cancers were not considered elevated in Los Alamos County.

The 2008 *LANL SWEIS* presented a summary of cancer incidence and mortality figures for the Los Alamos region as derived from data made available by the National Cancer Institute (through 2003) (DOE 2008a). **Table 3–19** presents a summary of total cancer mortality, incidence of all cancers, and incidence of selected cancer types for the state of New Mexico, as well as Los Alamos, Santa Fe, Sandoval, and Rio Arriba Counties, for the period 2003 through 2007. During that period, the overall cancer incidence (403.6) and death rates (162.2) for the state of New Mexico were somewhat below the national average (464.5 and 183.8, respectively). Total cancer incidence in Los Alamos (433.4), Santa Fe (417.2), and Sandoval (444.7) Counties exceeded the state average, although the rates in all four counties were below the national averages. As reported in the State Cancer Profiles in the National Cancer Institute web site (see Table 3–19), the cancer incidence rates of melanoma of the skin, prostate cancer, and female breast cancer are elevated in Los Alamos County with respect to the state averages. The rate of thyroid cancer also exceeded the state average for the period. Cancers of the colon and rectum occurred at rates below the state averages. Due to the small number of reported cases (3 or fewer) and resulting statistical unreliability of the data, the rates of lung and bronchus cancer, non-Hodgkin's lymphoma, ovarian cancer, brain cancer, leukemia, and stomach cancer in Los Alamos County were not reported by the National Cancer Institute (NCI 2011).

Table 3–19 Five-Year Profile of Cancer Mortality and Incidence in the United States, New Mexico, and Los Alamos Region, 2003 through 2007 [a]

Statistic	*United States* [b]	*New Mexico*	*Los Alamos County*	*Santa Fe County*	*Sandoval County*	*Rio Arriba County*
Average Deaths Per Year	558,564	3,132	24	213	166	66
Annual Death Rate (per 100,000)	183.8 (183.6 - 184.0)	162.2 (159.6 - 164.8)	127.4 (105.1 - 153.2)	148.3 (139.4 - 157.6)	165.3 (154.2 - 177.1)	163.1 (145.8 - 181.8)
Annual Cancer Incidence Rate (per 100,000)						
All sites [c]	464.5 (464.1 - 464.8)	403.6 (399.6 - 407.6)	433.4 (393.5 - 476.4)	417.2 (402.5 - 432.3)	444.7 (426.4 - 463.5)	336.9 (312.2 - 363.1)
Brain and Other Nervous System	5.7 (5.7 - 5.8)	4.3 (3.8 - 5.0)	N/A [d]	7.2 (4.8 - 10.5)	N/A [d]	N/A [d]
Lung and Bronchus	84.9 (84.7 - 85.1)	55.5 (53.3 - 57.8)	N/A [d]	40.3 (33.4 - 48.1)	49.7 (40.7 - 60.0)	28.6 (18.5 - 42.0)
Colon and Rectum	57.0 (56.9 - 57.2)	48.0 (45.9 - 50.1)	37.8 (22.8 - 59.8)	44.9 (37.8 - 53.0)	49.5 (40.6 - 59.6)	61.5 (46.5 - 79.7)
Stomach	4.8 (4.7 - 4.8)	5.2 (4.6 - 5.9)	N/A [d]	4.8 (2.9 - 7.6)	N/A [d]	N/A [d]
Breast Cancer	120.6 (120.4 - 120.9)	108.5 (105.7 - 111.4)	133.5 (104.3 - 169.0)	131.7 (120.8 - 143.4)	131.1 (118.1 - 145.2)	79.6 (63.8 - 98.3)
Leukemia	9.6 (9.6 - 9.7)	10.1 (9.3 - 11.0)	N/A [d]	12.1 (8.8 - 16.2)	10.4 (7.0 - 15.0)	N/A [d]
Melanoma of Skin	23.1 (23.0 - 23.2)	21.1 (19.7 - 22.5)	38.2 (22.5 - 61.0)	23.0 (18.2 - 28.7)	24.9 (18.9 - 32.2)	N/A [d]
Non-Hodgkin's Lymphoma	23.1 (23.0 - 23.3)	18.1 (16.9 - 19.4)	N/A [d]	24.0 (19.0 - 30.0)	14.8 (10.1 - 20.8)	N/A [d]
Ovary	12.8 (12.8 - 12.9)	12.2 (11.3 - 13.2)	N/A [d]	15.5 (11.9 - 19.8)	17.1 (12.5 - 22.8)	N/A [d]
Prostate	153.5 (153.2 - 153.8)	143.3 (139.8 - 146.8)	219.3 (181.0 - 264.0)	169.8 (156.2 - 184.2)	158.4 (142.3 - 175.8)	145.2 (121.8 - 171.8)
Thyroid	10.2 (10.2 - 10.3)	12.2 (11.5 - 12.9)	33.6 (22.1 - 48.7)	13.6 (11.1 - 16.6)	14.0 (11.0 - 17.5)	13.5 (8.9 - 19.6)

N/A = not available.
[a] Age-adjusted incidence rates; the 95 percent confidence intervals are in parentheses.
[b] The U.S. average number of deaths and annual death rate reported by the National Cancer Institute are for the entire 2003 through 2007 rate period. The U.S. annual incidence rates reported by the National Cancer Institute are for the year 2010.
[c] All cancers, all races, both sexes.
[d] Data not available. When the number of reported cases is small (3 or fewer), some data are suppressed in National Cancer Institute reports to ensure confidentiality and stability of rate estimates.
Source: NCI 2011.

In a study entitled *Public Health Assessment, Final, Los Alamos National Laboratory*, the Agency for Toxic Substances and Disease Registry of the U.S. Department of Health and Human Services reported on its review of possible public exposures to radioactive materials and other toxic substances in the environment near LANL (ATSDR 2006). The study also examined the results of the Athas and Key (1993) and Athas (1996) studies and determined that there were no data to link environmental factors, other than naturally occurring ultraviolet light from the sun, with the observed incidence of any cancer in Los Alamos County. The Agency for Toxic Substances and Disease Registry concluded that, "[o]verall, cancer rates in the Los Alamos area are similar to cancer rates found in other communities. In some time periods, some cancers will occur more frequently and others less frequently than seen in reference populations. Often, the elevated rates are not statistically significant."

In 1999, the Centers for Disease Control and Prevention began a dose reconstruction project to estimate the possible exposures of populations from releases of radioactive and chemical materials from LANL since 1943. A final report addressing the first phase of the project – the Los Alamos Historical Document Retrieval and Assessment project – has been published (ChemRisk et al. 2010).

3.11.5 Accident History

Unanticipated incidents have occurred at the CMR Building during the course of its 50-plus years of operation that had the potential for impacts on workers and the public. To provide a perspective on facility hazards, a compendium of major accidents or hazardous situations that have occurred through 2008 was reviewed using historical analyses and CMR Building occurrence reports.

Radiological occurrences categories and the number of incidences are: skin contamination – 107; internal dose received – 12; clothing contamination (personal or personal protective equipment) – 79; area contamination – 73; loss of source or radiological control – 20; high airborne activity in operational area – 11; effluent stack release – 2; radiation exposure – 4; other – 9. The consequences of most of the incidents were minor, and none resulted in fatal worker injuries. Following are examples of the types of incidents that have occurred:

- An incident in Wing 9 involved an uptake of plutonium-238 during work on a heat source in an argon-purged atmosphere. The airborne radioactive material was released through a puncture in a boot around a manipulator in the operating area. Several personnel in the area received intake exposures. Intensive decontamination efforts were required to clean up the wing.

- A radiological incident occurred in Wing 3 in which plutonium-238 heat source material was accidently spilled. As a result, there was widespread building contamination and 15 laboratory employees were contaminated. Radioactive contamination on workers was transferred to two residential houses in Santa Fe that required decontamination.

- Several incidents occurred that resulted in contamination outside of the CMR Building. One incident was the result of contaminated material being sent to the Los Alamos landfill. Other incidents were the result of stack releases in excess of DOE guidelines. There were two releases at the CMR Building involving 116 microcuries of uranium-235 from Wing 4 and 1.24 microcuries of plutonium-239 from Wing 3. In addition, a hot-cell manipulator seal leak and glove tear in Wing 9 resulted in both a stack release of 55 curies of plutonium-238 to the environment and an individual worker exposure of 15 rem in the lungs.

- There have also been incidents of small fires. One fire was a result of the ignition of a container of isopropyl alcohol and potassium hydroxide. The incident occurred either by spontaneous ignition of the bath or the evolution of vapors that were ignited by an external source. A second fire occurred in Wing 5 involving an unattended electric oven that was being used to dry a potentially contaminated mop head. A third fire occurred in Wing 9 as a result of an explosion.

- Over the history of the CMR Building, there have been a number of spills of radioactive materials during operations within ventilated hoods and operations outside of containment boxes. As an example, a spill occurred when a worker working in a ventilated hood was splashed with a radioactive solution spilled inside the hood. Another spill occurred when a worker dropped a glass vial containing 140 micrograms of dried plutonium-238 residue.

In recent years, the frequency of accidents is lower than in earlier years of CMR Building operations. Investigations of these and other occurrences were conducted to determine root causes, implement corrective actions, evaluate trends, and communicate lessons learned. A review of incidents at the CMR Building verifies that accidents occur both during laboratory processes and during activities to operate and maintain the facility.

On June 13, 2007, two workers were exposed above the Occupational Safety and Health Administration permissible time-weighted average limit for silica. Sampling during this period indicated that an overexposure occurred when the two workers were using a jackhammer on concrete. Although the Occupational Safety and Health Administration permissible exposure limit was exceeded, a single overexposure should not result in measurable harm to the workers.

3.11.6 Emergency Preparedness and Security

Each DOE site has established an emergency management program that is activated in the event of an accident. This program has been developed and maintained to ensure adequate response to most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program includes emergency planning, training, preparedness, and response.

NNSA maintains equipment and procedures to respond to situations where human health or the environment is threatened. These include specialized training and equipment for the local fire department, local hospitals, state public safety organizations, and other government entities that may participate in response actions, as well as specialized assistance teams (DOE Order 151.1C). These programs also provide for notification of local governments whose constituencies may be threatened. Broad ranges of exercises are run to ensure the systems are working properly, from facility-specific exercises to regional responses. In addition, DOE has specified actions to be taken at all DOE sites to implement lessons learned from the emergency response to an accidental explosion at the Hanford Site in Richland, Washington, in May 1997.

Emergency response facilities and equipment, trained staff, and effective interface and integration with offsite emergency response authorities and organizations support NNSA's emergency management system at LANL. LANL personnel maintain the necessary apparatus, equipment, and a state-of-the-art Emergency Operations Center to respond effectively to virtually any type of emergency, not only at LANL, but throughout the local community as well.

The Emergency Operations Center serves as the command center for emergency responders in the event of an emergency and has space and resources to house up to 120 personnel, including representatives from neighboring pueblos, the Federal Bureau of Investigation, the Federal Emergency Management Agency, DOE, U.S. Forest Service, National Park Service, National Guard, New Mexico State Police, Los Alamos County police and firefighters, Emergency Managers, the Red Cross, and others.

NNSA's Emergency Response and Management Program at LANL effectively combines Federal and local emergency response capabilities. A coordinated effort to share emergency information with Los Alamos County is a cornerstone of the Emergency Response and Management Program. LANL emergency response and management staff and Los Alamos County police, fire, emergency medical, and 911 dispatch personnel operate out of the LANL Emergency Operations Center. It is the United States' first Emergency Operating Center that combines Federal and local operations. A computer-aided dispatch system provides a centralized dispatch capability for the Los Alamos police and fire departments. First responders from different agencies can share real-time information in the same Emergency Operations Center, resulting in a more coordinated emergency response. Additional information on the Emergency Response and Management Program is provided in the 2008 *LANL SWEIS* (DOE 2008a).

3.11.7 Los Alamos National Laboratory Security Program

LANL workers maintain special nuclear material inventories, classified matter, and facilities that are essential to nuclear weapons production. These security interests are protected against a range of threats that include adversarial groups, theft or diversion of special nuclear material, sabotage, espionage, and loss or theft of classified matter or government property.

NNSA's physical security protection strategy at LANL is based on a graded and layered approach supported by an armed guard force trained to detect, deter, and neutralize adversary activities and backed up by local, state, and Federal law enforcement agencies. This strategy employs the concept of defensible concentric layers where each layer provides additional controls and protections. The defense-in-depth approach begins in the airspace above LANL, which is restricted to approximately 5,000 feet (1,500 meters) above the ground surface. On-the-ground protection begins at the site perimeter and facility access control points and builds inwardly to facility exteriors and designated interior zones and control points.

Physical security protection also includes barriers, electronic surveillance systems, and intrusion detection systems that form a comprehensive site-wide network of monitored alarms. Various types of barriers are used to delay or channel personnel, or to deny access to classified matter, special nuclear material, and vital areas. Barriers are used to direct the flow of vehicles through designated entry control portals and to deter and prevent penetration by motorized vehicles where vehicular access could significantly enhance the likelihood of a successful malevolent act.

Barriers may be passive, active, or a combination of the two. Barriers may also have an active component designed to dispense an obscuration agent, viscous barrier, or sensory irritant. Tamper-protected surveillance, intrusion detection, and alarm systems designed to detect an adversary action or anomalous behavior inside and outside LANL facilities are paired with assessment systems to evaluate the nature of the adversary action. Random patrols and visual observation are also used to deter and detect intrusions. Penetration-resistant alarmed vaults and vault-type rooms are used to protect classified materials.

Guards are stationed in mobile and fixed posts around LANL 24 hours a day, 365 days a year. They are trained and equipped to respond to alarms and adversary action, in accordance with well-designed and thoroughly tested plans, using specialized equipment and weapons.

3.12 Waste Management and Pollution Prevention

A wide range of waste types are generated through activities at the CMR Building and LANL that are related to research, production, maintenance, construction, decontamination, decommissioning, demolition, and environmental restoration. These waste types include wastewaters (sanitary liquid waste, high-explosives-contaminated liquid waste, and industrial effluent); solid waste, including routine office-type (sanitary solid) waste and construction and demolition debris; and radioactive and chemical wastes. Management of these wastes is addressed in detail in the *CMRR EIS* (DOE 2003b) and the 2008 *LANL SWEIS* (DOE 2008a). Sections 3.12.1 through 3.12.4 of this *CMRR-NF SEIS* summarize information and updates information from these and other sources.

Wastes managed at the CMR Building and LANL are regulated in accordance with a variety of Federal and state regulations, applicable to specific waste types and their radiological and nonradiological content. Requirements for waste management activities are determined and documented by Institutional Requirements. These Institutional Requirements provide details on proper management of all process wastes and contaminated environmental media. The waste management operation tracks waste-generating processes; waste quantities; chemical and physical characteristics; regulatory status; compliance with applicable treatment and disposal standards; and final disposition (DOE 2008a).

Several capabilities have been established at the CMR Building for managing waste within overall LANL capabilities, including analyzing, packaging, storing, and transporting all wastes generated from CMR Building operations. All liquid wastes generated at the CMR Building are determined to meet appropriate waste acceptance criteria before the wastes are sent to designated LANL waste management facilities. Liquid wastes are treated at LANL at the SWWS Plant and RLWTF. Liquid radioactive and inorganic chemical wastes from the CMR Building are piped to RLWTF for processing, while liquid organic chemical wastes (which are low in volume) are collected in small containers in temporary holding areas, packaged, and trucked to TA-50 for disposition. Wastes from processing operations are solidified and transported to TA-54, Area G, or off site for disposal. Solid low-level radioactive waste, mixed low-level radioactive waste, transuranic waste, and chemical waste generated at the CMR Building are packaged there and shipped to on- and offsite facilities for disposition (DOE 2003b, 2008a).

The CMR Building conducts operations in accordance with the LANL waste minimization and pollution prevention program. The preferred method for minimizing waste is source reduction, including materials substitution and process improvement. Recycling and reuse practices are also implemented, along with volume reduction and treatment options. Progress in pollution prevention initiatives at LANL is measured annually against metrics approved by DOE.

In 2004, LANL began development and implementation of an environmental management system to comply with the then-current DOE Order 450.1. DOE Order 450.1 defined an environmental management system as a continuous cycle of planning, implementing, evaluating, and improving processes and actions undertaken to achieve environmental missions and goals. The environmental management system at LANL was third-party-certified to the ISO 14001:2004 standard in April 2006, and recertified in April 2009, by the National Science Foundation's International Strategic Registrations (LANL 2011b).

Research, production, maintenance, and construction activities at LANL, as well as the environmental restoration activities, generate radioactive, chemical, and other wastes. The volumes of all types of waste produced at LANL are projected to be large over the next several years because of the need for site remediation pursuant to the 2005 Consent Order and from decontamination, decommissioning, and demolition (DD&D) of facilities, in addition to routine operations. Actual waste volumes from remediation may be smaller than projected, depending on regulatory decisions and because of the employment of possible waste volume reduction and sorting techniques.

Table 3–20 compares 2009 waste generation rates by waste type for the CMR Building and site-wide LANL (LANL 2010b). Note that routine and nonroutine solid wastes from operations are not tracked on a facility-specific basis, but only on a LANL site-wide basis.

Table 3–20 Annual Waste Generation Rates for the Chemistry and Metallurgy Research Building and Los Alamos National Laboratory for 2009 [a]

Waste Type	*Chemistry and Metallurgy Research Building*	*Los Alamos National Laboratory Site-Wide*
Liquid NPDES discharge (millions of gallons)	0	133.3
Routine solid waste (tons) [b]	(d)	2,630
Nonroutine solid waste (tons) [c]	(d)	3,013
Chemical waste (tons) [e]	0.5057	1,899.2
Low-level radioactive waste (cubic yards)	138.8	4,933.5
Mixed low-level radioactive waste (cubic yards)	0.9	17.59
Transuranic waste (cubic yards)	5.1	48.72
Mixed transuranic waste (cubic yards)	0	98.5

NPDES = National Pollutant Detection and Elimination System.
[a] Waste generation rates reflect the current reduced capacity and limited capabilities of the CMR Building.
[b] Routine solid waste consists mostly of food and food-contaminated waste and cardboard, plastic, glass, Styrofoam® packing material, and similar items.
[c] Nonroutine solid waste is typically derived from construction and demolition projects and consists of materials such as asphalt, concrete, dirt, or brush.
[d] Generation of routine and nonroutine solid waste is not reported on a facility-specific basis.
[e] Chemical waste is not a formal LANL waste category, but per the *LANL SWEIS* (DOE 2008a), is used in this table to denote a broad category of materials, including hazardous wastes, toxic wastes, and special wastes so designated under the New Mexico Solid Waste Regulations.
Note: Values have been converted from original units in the source document using the same number of significant figures. To convert gallons to liters, multiply by 3.7854; tons to metric tons, multiply by 0.90718; cubic yards to cubic meters, multiply by 0.76456.
Source: LANL 2011b.

3.12.1 Wastewater Treatment and Effluent Reduction

LANL has three primary sources of nonradioactive wastewater: sanitary liquid wastes, high-explosives-contaminated liquid wastes, and industrial effluent. Radioactive liquid waste is addressed in Section 3.12.4.2.

3.12.1.1 Sanitary Liquid Waste

The SWWS Plant in TA-46 treats liquid sanitary wastes. In 2009, the plant processed about 85.3 million gallons (323 million liters) of wastewater, all of which was pumped to TA-3 to be either recycled at the TA-3 power plant (as makeup water for the cooling towers), or discharged into Sandia Canyon via permitted Outfall Number 001 (LANL 2011b). The Sanitary Effluent Reclamation Facility treats some liquid effluent for reuse in the cooling towers at the Metropolis Center for Modeling and Simulation (DOE 2008a).

3.12.1.2 Sanitary Sludge

Sanitary sludge from the SWWS Plant is dried for a minimum of 90 days to reduce pathogens and then disposed of as special waste (as determined by the State of New Mexico) at an authorized, permitted landfill. The volume of sanitary sludge generated and disposed of by DOE is reported in the annual site environmental surveillance report (DOE 2008a).

3.12.1.3 High-Explosives-Contaminated Liquid Wastes

The High Explosives Wastewater Treatment Facility, located in TA-16, treats process waters containing high-explosives compounds using three treatment technologies. Sand filtration is used to remove particulate high explosives; activated carbon is used to remove organic compounds and dissolved high explosives; and ion exchange units are used to remove perchlorate and barium. The High Explosives Wastewater Treatment Facility receives some wastewaters by truck from processing facilities located outside TA-16 (DOE 2008a). The CMR Building does not generate high-explosives-contaminated liquid wastes.

Equipment upgrades have significantly reduced the quantities of high-explosives wastewater treated and effluent discharged to NPDES-permitted outfalls. In 2009, high-explosives processing and high-explosives laboratory operations generated approximately 16,000 gallons (61,000 liters) of high-explosives-contaminated water, which were treated at the High Explosive Wastewater Treatment Facility (HEWTF) using an evaporator system that resulted in no liquid discharge during that year (LANL 2011b).

3.12.1.4 Industrial Effluent

Industrial effluent is discharged through NPDES-permitted outfalls across LANL. The number of outfalls has been reduced in recent years with an eventual goal of achieving zero liquid discharge from LANL operations. As of December 31, 2009, LANL had 15 permitted wastewater outfalls (14 industrial and 1 sanitary) regulated under NPDES Permit Number NM0028355. In 2009, however, flow was recorded at only 12 outfalls. In 2009, combined discharges totaled 133.3 million gallons (505 million liters), approximately 25.1 million gallons (95 million liters) less than the 2008 total of 158.4 million gallons (599.4 million liters) (LANL 2011b), and well below the maximum flow of 279.5 million gallons (1,058 million liters) projected for the No Action Alternative in the 2008 *LANL SWEIS* (DOE 2008a). The outfall from the CMR Building (03A-21) recorded no discharge in 2009 (LANL 2011b). The CMR outfall was discontinued as of September 30, 2010, and effluent is now piped to the SWWS Plant in TA-46.

3.12.2 Sanitary Solid Waste

Sanitary solid waste is excess material that is not radioactive or hazardous and can be disposed of in a permitted solid waste landfill. LANL sanitary solid waste was historically disposed of at the Los Alamos County Landfill, which is located within LANL boundaries, but operated by Los Alamos County. Waste volumes delivered to the landfill varied considerably over the last decade, with a peak of more than 14,000 tons (12,700 metric tons) transferred to the landfill in 2000 due to removal of Cerro Grande fire debris. The Los Alamos County Landfill has been replaced by a solid waste transfer station, the Los Alamos County Eco Station, which is located at the landfill site. A landfill closure plan was submitted to NMED in September 2005 (LANL 2011b). Solid waste from the Los Alamos County Eco Station is transported off site for recycle or disposal, typically to the Rio Rancho and Valencia County solid waste facilities for disposal.

Sanitary solid waste can be classified as routine or nonroutine. Routine sanitary waste consists mostly of food and food-contaminated waste and cardboard, plastic, glass, Styrofoam® packing material, and similar items. Nonroutine sanitary waste is typically derived from construction and demolition projects and includes materials such as concrete, asphalt, dirt, or brush that may be separated and sorted by material for recycle or beneficial reuse. Routine and nonroutine sanitary solid wastes may be recycled or disposed of as summarized in **Table 3–21** for 2009 (LANL 2011b). These wastes may be sent to the Los Alamos Eco Station or directly to an offsite facility for recycle or disposal.

Table 3–21 Los Alamos National Laboratory Sanitary Solid Waste Generation for 2009

Disposition	*Routine Waste (tons)*	*Nonroutine Waste (tons)*	*Total (tons)*
Recycled	564	2,255 [a]	2,820
Landfill disposal	2,066	757 [b]	2,824
Total	2,630	3,013	5,644

[a] Brush, dirt, concrete, and asphalt.
[b] Construction and demolition debris, nonhazardous solid waste from TA-54.
Total may not equal the sum of the contributions due to rounding.
Note: Values have been converted from original units in the source document using the same number of significant figures.
To convert tons to metric tons, multiply by 0.9072.
Source: LANL 2011b.

DOE/NNSA has instituted a waste minimization and recycling program at LANL that has reduced the amount of waste disposed of in sanitary landfills. Per capita generation of routine sanitary waste at LANL fell from 584 pounds (265 kilograms) per person per year in 1993 to 359 pounds (163 kilograms) per person per year in 2001 to 344 pounds (156 kilograms) per person per year in 2008, equivalent to a 41 percent decrease in routine waste generation over 16 years. This reduction is the result of waste minimization programs that includes recycle of mixed office paper, cardboard, plastic, and metal and source reduction efforts (LANL 2010a). As shown in Table 3–21, of the routine solid waste that was generated in 2009, about 21 percent was recycled rather than being disposed of.

Nonroutine waste from construction and demolition projects is regulated as a separate category of solid waste under the New Mexico Solid Waste Regulations. This waste may be disposed of in a municipal or construction and demolition debris landfill (NMAC 20.9.1), but is frequently separated by material and recycled or beneficially reused. Recycling programs for concrete, asphalt, dirt, and brush were established at LANL in FY 2001 and, as a result, LANL is recycling more construction waste and decreasing landfill disposal (LANL 2011b). As shown in Table 3–21, of the nonroutine solid waste that was generated at LANL in 2009, about 75 percent was recycled. During construction of RLUOB, over 81 percent of construction-generated waste materials was recycled (LANL 2011a:Data Call Tables, 001; Waste Management, 022).

Construction of new facilities and demolition of old facilities are expected to continue to generate substantial quantities of this type of waste. The annual average generation of 310,000 cubic yards (240,000 cubic meters) of construction and demolition debris has been projected for LANL activities (LANL 2010a). In 2009, construction and demolition projects included those at TA-8, TA-16, TA-21, TA-43, and TA-54 (LANL 2011b). Additional wastes could be generated from environmental restoration activities, depending on regulatory decisions regarding the restoration of several material disposal areas at LANL (DOE 2008a).

3.12.3 Chemical Waste

"Chemical waste" is not a formal LANL waste category, but per the *2008 LANL SWEIS* (DOE 2008a), is used in this *CMRR-NF SEIS* to denote a broad category of materials, including hazardous wastes, toxic wastes, and special wastes. Hazardous and toxic wastes are those wastes defined as such pursuant to the Resource Conservation and Recovery Act (RCRA) and Toxic Substances Control Act, respectively. Typical hazardous waste streams include solvents, unused chemicals, acids and bases, solids such as barium-containing explosive materials, laboratory trash, and cleanup materials such as rags. Toxic wastes principally include waste materials containing asbestos or polychlorinated biphenyls. Special wastes are designated under the New Mexico Solid Waste Regulations and include industrial waste, infectious waste, and petroleum-contaminated soil (DOE 2008a).

Construction and demolition debris is tracked in *LANL SWEIS* yearbooks as a component of chemical wastes that, in most cases, are sent directly to offsite disposal facilities. Construction and demolition debris consists primarily of asbestos and construction debris from DD&D projects, and may be disposed of in permitted solid waste landfills pursuant to Subtitle D of RCRA (DOE 2008a). This waste typically consists of a mixture of materials that would be difficult to separate and sort for recycle or beneficial reuse.

The 2008 *LANL SWEIS* projected that chemical waste volumes would decline for normal LANL operations but potentially increase for environmental restoration activities. In 2009, chemical waste generation at the CMR Building was 0.5057 tons (0.4588 metric tons) (LANL 2011b), which represents about 4.2 percent of the 12 tons (11 metric tons) of annual chemical waste projected for the continued operation of the CMR Building over the next several years (DOE 2008a).

3.12.4 Radioactive Waste

3.12.4.1 Solid Radioactive Waste Management

Solid radioactive waste consists of low-level radioactive waste, mixed low-level radioactive waste, transuranic waste, and mixed transuranic waste. Waste minimization efforts have reduced waste generation rates for specific waste types as facility processes have been improved and nonhazardous product substitutions implemented (DOE 2008a). In some cases, facility workloads have been less than those projected in the 2008 *LANL SWEIS*, and environmental restoration activities have generated less waste than the estimated bounding levels.

Low-Level Radioactive Waste – Low-level radioactive waste is defined as waste that is radioactive and does not fall within any of the following classifications: high-level radioactive waste, transuranic waste, spent nuclear fuel, or byproduct materials (uranium and thorium mill tailings). These wastes are generated at LANL when materials, equipment, and water are used in radiological control areas as part of work activities; when these contaminated items are no longer useable, they are removed from the area as low-level radioactive waste. Typical waste streams include laboratory equipment, service and utility equipment, plastic bottles, disposable wipes, plastic sheeting and bags, paper, and electronic equipment (DOE 2008a). Environmental restoration and DD&D activities also generate low-level radioactive waste, primarily contaminated soil and debris.

Low-level radioactive waste generated at LANL may be disposed of on site at Area G in TA-54 (a small amount of certain types of low-level radioactive waste) or shipped off site for disposal at the Nevada National Security Site or a commercial disposal facility (beginning about 2008, most low-level radioactive waste generated by LANL operations has been disposed of off site). In 2009, the CMR Building operating at reduced capacity and with limited capabilities generated 138.8 cubic yards (106.1 cubic meters) of low-level radioactive waste (LANL 2011b), representing about 6 percent of the 2,400 cubic yards (1,800 cubic meters) annually projected for the CMR Building for the next several years of continued operations (DOE 2008a).

Mixed Low-Level Radioactive Waste – Mixed low-level radioactive waste is waste that contains both low-level radioactive waste and hazardous waste as defined by RCRA. Most operational mixed low-level radioactive waste is generated by stockpile stewardship and research and development programs. Typical waste streams include contaminated lead bricks and debris, spent chemical solutions, fluorescent light bulbs, copper solder joints, and used oil. Environmental restoration and DD&D activities also produce some mixed low-level radioactive waste. In 2009, the CMR Building generated 0.9 cubic yards (0.7 cubic meters) of mixed low-level radioactive waste (LANL 2011b), representing about 4 percent of the 25 cubic yards (19 cubic meters) projected for the continued operation of the CMR Building over the next several years (DOE 2008a). Mixed low-level radioactive waste may be sent for treatment to a variety of permitted commercial facilities (located, for example, in Florida, Tennessee, Texas, Washington, and Utah) with subsequent disposal at a commercial facility such as the Energy*Solutions* facility in Utah or at the Nevada National Security Site in Nevada.

Transuranic and Mixed Transuranic Waste – Transuranic waste is waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes having half-lives greater than 20 years per gram of waste. This type of waste contains radioactive isotopes such as plutonium, neptunium, americium, and curium. Specific categories are excluded from the definition of transuranic waste: (1) high-level radioactive waste; (2) waste that DOE has determined, and EPA has concurred, does not need the same degree of isolation as most transuranic waste; and (3) waste that the U.S. Nuclear Regulatory Commission has approved, on a case-by-case basis, for disposal at a low-level radioactive waste facility (DOE 2008a). Mixed transuranic waste is transuranic waste that also contains hazardous constituents regulated under RCRA.

Transuranic and mixed transuranic wastes may be generated during research, development, and stockpile manufacturing and management activities. Waste forms include contaminated scrap and residues, plastics, lead gloves, glass, and personnel protective equipment. Transuranic and mixed transuranic wastes may also be generated through environmental restoration, legacy waste retrieval, offsite source recovery, and DD&D activities. Transuranic and mixed transuranic wastes are characterized and certified prior to shipment to the Waste Isolation Pilot Plant (DOE 2008a).

In 2009, the CMR Building operating at reduced capacity and with limited capabilities generated 5.1 cubic yards (3.9 cubic meters) of combined transuranic and mixed transuranic waste (LANL 2011b), representing about 9 percent of the 55 cubic yards (42 cubic meters) of combined transuranic waste annually projected for the continued operation of the CMR Building in the 2008 *LANL SWEIS* (DOE 2008a).

3.12.4.2 Liquid Radioactive Waste

The principal facility for treating radioactive liquid waste at LANL is RLWTF, located in TA-50. RLWTF consists of the treatment facility, support buildings, and liquid and chemical storage tanks and receives liquid waste from various sites across LANL. Several upgrades to RLWTF have been implemented in recent years to upgrade the tank farm, install new ultrafiltration and reverse osmosis equipment, and install new nitrate reduction equipment. RLWTF Outfall Number 051 discharges into Mortandad Canyon. In 2009, discharge volumes were 1.1 million gallons (4.2 million liters) (LANL 2011b), which is about a quarter of the annual discharge volume of 4 million gallons (15 million liters) projected for RLWTF for the next several years of LANL operations (DOE 2008a). Source reduction and process improvements both contributed to these reduced volumes. For example, process waters are now used instead of tap water for the dissolution of chemicals needed in the treatment process and for filter backwash operations (LANL 2011b). RLWTF is slated for replacement with a new facility in accordance with the 2008 *LANL SWEIS* ROD; this new facility is being planned with an evaporation unit to eliminate liquid discharge into the environment.

3.13 Transportation

Transportation infrastructure includes the public roadway network, public transportation systems, airports, railroads, and pedestrian/bicycle facilities on and in the immediate vicinity of LANL. Motor vehicles are the primary means of transportation in Los Alamos County and to LANL.

Regional transportation routes to LANL include: from Albuquerque and Santa Fe, Interstate 25 to U.S. Routes 84/285 to SR-502; from Española, SR-30 to SR-502; and from Jemez Springs and communities to the west of LANL, SR-4. Only two major roads (SR-502 and SR-4) access Los Alamos County. To the west of LANL, SR-501 (also known as West Jemez Road) connects SR-502 and SR-4 via Diamond Drive. SR-501 and SR-502 generally bound the site to the west and north. To the south, LANL is bounded by SR-4, which is a two-lane roadway. SR-501 is also a two-lane roadway that is a DOE-owned roadway internal to LANL, although it has a State Road numerical designation. SR-4 connects to SR-502 to the north and east of LANL. SR-502 is a two- to six-lane roadway to the north of the site that becomes a multi-lane divided freeway to the east of the intersection with SR-4. Los Alamos County traffic volume on these two segments of highway is primarily associated with LANL activities. The location of arterial public roadways and LANL Vehicle Access Portals (VAPs) are shown in Figure 3–1.

The public road system feeds into an internal LANL road system. The main townsite access is from Diamond Drive. The major roadways of the internal LANL road system are Pajarito Road, East Jemez Road, and West Jemez Road. Pajarito Road is a two-lane, access-controlled roadway, while East Jemez Road and West Jemez Road are two-lane roadways that are not access-controlled, although the infrastructure to facilitate access control is present. About 80 miles (129 kilometers) of paved roads exist at LANL. There is no railroad service connection to the site or Los Alamos County.

A public bus service (Atomic City Transit) operates within Los Alamos County 5 days a week. The nearest commercial bus terminal is located in Española. The nearest commercial rail connection is at Santa Fe, 35 miles (56 kilometers) southwest of LANL. The primary commercial international airport in New Mexico is located in Albuquerque. The Santa Fe Municipal Airport currently has four daily commercial flights, three to Dallas/Fort Worth and one to Los Angeles (Santa Fe 2010). The small Los Alamos County Airport is owned by the Federal Government and is operated and maintained by the county.

Workers access LANL using both public transportation and privately owned vehicles. The New Mexico Park and Ride regional bus service delivers 300 riders per day to the site, and Atomic City Transit also serves LANL. Additionally, car/vanpool programs are operated by the State of New Mexico, private companies, and by individuals. The number of workers using privately owned vehicles and car/van pools is 11,750 (LANL 2011a:Data Call Tables, 001).

TA-55 is located along Pajarito Road, a two-lane roadway connecting to Diamond Drive on the west end and SR-4 on the east end. Pajarito Road has a VAP approximately 0.75 miles (1.2 kilometers) to the west of TA-55 off of Diamond Drive (West VAP). The West VAP has five lanes for incoming traffic and one lane for outgoing traffic. Pajarito Road also has a VAP approximately 5 miles (8 kilometers) east of TA-55 off of SR-4 near the community of White Rock (East VAP). The East VAP has four lanes for incoming traffic and one lane for outgoing traffic. Approximately 70 percent of existing Pajarito Road traffic uses the West VAP. The capacity of a VAP is directly related to the type of identification processing being used and the number of lanes available. The existing capacity of the current gates is provided in **Table 3–22**.

Table 3–22 Vehicle Access Portal Capacity for Vehicles Entering Los Alamos National Laboratory

Identification Processing	*West Vehicle Control Point (vehicles per hour)*	*East Vehicle Control Point (vehicles per hour)*
Identification check	2,100	1,400
Identification check tandem processing	3,000	2,000

Source: SDDCTEA 2006.

LANL has approximately 13,500 site workers, of whom 11,752 use personally owned vehicles and car/van pools to commute to work (LANL 2011a:Data Call Tables, 001). Using the methodology developed by the Institute of Transportation Engineers, traffic generated by 11,750 employees has been estimated to be approximately 20,000 trips per day. A trip is defined as a one-way vehicle movement. T**able 3–23** provides the estimated peak hour traffic at LANL (ITE 2003).

Table 3–23 Expected Peak Hour Traffic at Los Alamos National Laboratory

Time Period	*Peak Hour Trips*	
	Entering	*Exiting*
Weekday A.M.	2,600	400
Weekday P.M.	300	2,700
Saturday	440	50
Sunday	430	40

Approximately 4,600 LANL employees (34 percent) work along Pajarito Road (LANL 2010b). Thus, 34 percent of the trips listed in Table 3–22 are expected to take place along this roadway (see **Table 3–24**). For both LANL as a whole and the Pajarito Road corridor, the expected peak hour traffic would occur during the weekday morning and evening rush hours. Actual traffic counts conducted in 2008 at Diamond Drive and Pajarito Road confirmed a peak hour traffic volume of approximately 1,000 vehicles per hour in the morning peak hour (the 60-minute period with the highest traffic volume between 7 and 9 A.M.) and 950 vehicles per hour in the afternoon peak hour (the 60-minute period with the highest traffic volume between 3:30 and 7 P.M.) (Wilson 2010).

The existing VAPs have adequate capacity for the existing traffic.

Table 3–24 Expected Peak Hour Traffic on Pajarito Road

Time Period	*Peak Hour Trips*	
	Entering	*Exiting*
Weekday A.M.	880	140
Weekday P.M.	100	920
Saturday	150	17
Sunday	150	14

The ability of roadways to function is measured in terms of level of service (LOS), which is determined based on the peak hour traffic. LOS is a measure of the operational characteristics of a roadway. In general, it reflects the amount of congestion and ease of use of a roadway segment by individual drivers. Significant impacts on traffic LOS are generally considered to occur when the LOS on the studied roadway segment falls below the acceptable LOS for that roadway.

Arterial roadways primarily serve through-traffic and secondarily provide access to adjoining properties. Collector roadways primarily serve to provide access to adjoining properties and are not intended to serve through-traffic. Rural areas are areas with widely scattered development and a low density of housing and employment. Urban areas are typified by high-density development or large concentrations of population. Rural arterials are roadways primarily serving through-traffic in rural areas. Urban arterials are roadways primarily serving through-traffic in urban areas. All roadways primarily serving through-traffic in an incorporated area are considered urban arterials.

The desired LOS for roadways depends on the classification of the roadway.

- For rural arterial roadways, LOS C or better is desired.
- For urban arterial roadways, LOS D or better is desired.
- For collector roadways, LOS D or better is desired.

Pajarito Road is a collector roadway within LANL. Diamond Drive and SR-502 are urban arterials within the Los Alamos townsite and rural arterials outside of the developed areas. SR-4 is an urban arterial within the community of White Rock and a rural arterial outside of the developed areas.

Representative existing average annual daily traffic and LOS classifications of the public roadways in the vicinity of LANL are provided in **Table 3–25**.

Table 3–25 Existing Annual Average Daily Traffic and Levels of Service of Roadways in the Vicinity of Los Alamos National Laboratory

Location	*Road Type and Number of Lanes*	*AADT per Year (2009)*	*Percent Trucks*	*Existing LOS*
SR-4 at Los Alamos County Line to SR-501	Minor Arterial/Two Lanes	734	9	A
SR-4 at Bandelier Park Entrance	Minor Arterial/Two Lanes	681	7	A
SR-4 at Junction of Pajarito Road – White Rock	Minor Arterial/Two Lanes	9,302	9	D
SR-4 at Jemez Road	Minor Arterial/Two Lanes	9,358	12	D
SR-501 at Junction of SR-4 and Diamond Drive	Minor Arterial/Two Lanes	11,848	11	D
SR-501 at Junction of Diamond Drive	Primary Arterial/Four Lanes	21,211	8	C
SR-501 at SR-502	Primary Arterial/Four Lanes – Divided	17,807	8	C
SR-502 at Oppenheimer Street	Primary Arterial/Four Lanes – Divided	12,817	6	C
SR-502 at Los Alamos/Santa Fe County Line	Primary Arterial/Four Lanes	12,256	9	A

AADT = annual average daily traffic; LOS = Level of Service; SR = New Mexico State Route.
Source: Valencia 2010.

Traffic on arterial roadway segments is generally described by assigning LOS categories, as defined below:

- **LOS A** describes the highest quality of traffic service, with motorists able to travel at their desired speed. Most drivers find operating a vehicle on a LOS A roadway to be stress free.
- **LOS B** describes a condition where the drivers have some restrictions on their speed of travel. Most drivers find operating a vehicle on a LOS B roadway slightly stressful.
- **LOS C** describes a condition of stable traffic flow that has significant restrictions on the ability of motorists to travel at their desired speed. Most drivers find operating a vehicle on a LOS C roadway somewhat stressful.
- **LOS D** describes unstable traffic flow. Drivers are restricted in slow-moving platoons and disruptions in the traffic flow can cause significant congestion. There is little or no opportunity to pass slower-moving traffic. Most drivers find operating a vehicle on a LOS D roadway stressful.

- **LOS E** represents the highest volume of traffic that can move on the roadway without a complete shutdown. Most drivers find operating a vehicle on a LOS E roadway very stressful.

- **LOS F** represents heavily congested flow, with traffic demand exceeding capacity. Traffic flows are slow and discontinuous. Most drivers find operating a vehicle on a LOS F roadway extremely stressful.

A review of information contained in the *Pajarito Road Closure Study* indicates that the LOS of Pajarito Road is LOS C or better for all intersection legs except for Pajarito Road and Diamond Drive in the A.M. peak hour, which has an unacceptable LOS of E (Wilson 2010). Traffic count information provided for each intersection in the *Pajarito Road Closure Study* has been used to estimate the current LOS for road segments between each intersection (**Table 3–26**). All segments were found to be LOS C or D for both the A.M. and P.M. peak hours.

Table 3–26 Estimated 2011 Existing Conditions Los Pajarito Road

Pajarito Road Segment	*2008 A.M. Peak Hour Vehicles per Hour per Year*	*2008 A.M. Peak Hour Vehicles per Hour per Year*	*2011 A.M. Level of Service*	*2011 P.M. Level of Service*
Diamond Drive to TA-48/64	770	694	C	C
TA-48/64 to Pecos Drive	699	692	C	C
Pecos Drive to Lubbock	807	807	D	D
Lubbock to SR-4	794	770	D	C

SR = New Mexico State Route; TA = technical area.

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

4 ENVIRONMENTAL CONSEQUENCES

Chapter 4 describes the environmental consequences of the alternatives to replace the Chemistry and Metallurgy Research (CMR) Building at Los Alamos National Laboratory. The impact on each resource area is evaluated for the three proposed alternatives: the No Action Alternative (2004 Chemistry and Metallurgy Research Building Replacement Nuclear Facility [CMRR-NF]); the Modified CMRR-NF Alternative; and the Continued Use of CMR Building Alternative. In addition, the analysis evaluates the impacts of two options under the Modified CMRR-NF Alternative: the Deep Excavation Option and the Shallow Excavation Option. Chapter 4 also describes the cumulative impacts of these alternatives when combined with other past, present, and future actions that could affect the region; mitigation measures; and resource commitments.

4.1 Introduction

The environmental impacts analysis evaluates potentially affected resource areas in a manner commensurate with the importance of the potential effects on each area. The methodologies used to prepare the assessments for the following resource areas are discussed in Appendix B of this supplemental environmental impact statement (SEIS): land use and visual resources; site infrastructure; air quality and noise, including greenhouse gas emissions; geology and soils; surface-water and groundwater quality; ecological resources; cultural and paleontological resources; socioeconomics; human health; environmental justice; waste management and pollution prevention; and transportation and traffic. With the exception of the Continued Use of Chemistry and Metallurgy Research (CMR) Building Alternative, all alternatives would involve a significant amount of construction activity. All construction would take place on land already owned by the Federal Government and administered by the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) and, for the most part, on land that has already been disturbed by other DOE activities. This *Final 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 (CMRR-NF SEIS)* addresses the potential effects associated with land disturbance that construction and operation activities would have on air and water resources, as well as the effects on ecological, cultural, and paleontological resources and on socioeconomic conditions within the environment influenced by DOE's potential actions at Los Alamos National Laboratory (LANL). The potential effects on the health and safety of workers, the public, and the environment from postulated accident conditions are analyzed. In addition, this SEIS addresses the impacts of transportation of materials both on site and off site, as well as the impacts of construction-related traffic on the roads in and around LANL.

Activities expected to occur during normal operations under the alternatives would not be characterized by any significant release of effluent, radiological or nonradiological, hazardous or nonhazardous. Therefore, the effects on the health and safety of workers, the public, and the environment from normal facility operations are presented in detail in deference to public interest rather than as an indication of their significance. This is also true of the assessments presented for environmental justice and waste generation.

Chapter 4 is organized by environmental resource areas under each alternative. These sections include discussions of potential impacts on all environmental resources due to construction (except for the Continued Use of CMR Building Alternative) and operations for the proposed alternatives at LANL. Section 4.2 discusses the environmental consequences of the No Action Alternative, building and operating the 2004 Chemistry and Metallurgy Research Building Replacement Nuclear Facility (CMRR-NF) at Technical Area 55 (TA-55), in accordance with the preferred alternative described in the 2003 *Final Environmental Impact Statement for the Chemistry and Metallurgy Research Building*

Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico (CMRR EIS) and selected in the 2004 Record of Decision (ROD).

Section 4.3 discusses the environmental consequences of the Modified CMRR-NF Alternative under both the Deep Excavation and Shallow Excavation Options. Section 4.4 discusses the environmental consequences of the Continued Use of CMR Building Alternative.

Other sections of this chapter present additional information as follows:

- *Section 4.5, Facility Disposition:* This section discusses disposition of the existing CMR Building and the CMRR-NF.
- *Section 4.6, Cumulative Impacts:* This section discusses cumulative impacts at LANL and the surrounding region, as appropriate.
- *Section 4.7, Mitigation:* This section discusses mitigation measures that could reduce, minimize, or eliminate unavoidable environmental impacts.
- *Section 4.8, Resource Commitments:* This section discusses the resource commitments required for the proposed action, including unavoidable, adverse impacts; the relationship between short-term uses of the environment and maintenance and enhancement of long-term productivity; and irreversible or irretrievable commitments of resources.

4.2 Environmental Impacts of the No Action Alternative

4.2.1 No Action Alternative

This section discusses the potential environmental impacts associated with the No Action Alternative. Under the No Action Alternative, NNSA would have constructed and operated a new CMRR-NF at TA-55, adjacent to the Radiological Laboratory/Utility/Office Building (RLUOB), as analyzed in the 2003 *CMRR EIS* and selected in the associated 2004 ROD. The 2004 CMRR-NF would have been linked to RLUOB by a tunnel and to the TA-55 Plutonium Facility by another tunnel. Based on information learned since 2004, the 2004 CMRR-NF would not meet the standards for a Performance Category 3[1] (PC-3) structure as required to safely conduct the full suite of NNSA analytical chemistry and materials characterization mission work. Therefore, the 2004 CMRR-NF would not be constructed. Chapter 2, Section 2.6.1, provides a description of the No Action Alternative.

Because the 2004 CMRR-NF would not be constructed, the potential impacts of constructing and operating the 2004 CMRR-NF have not been fully re-evaluated in this *CMRR-NF SEIS*. Instead, with the exceptions discussed below, the potential impacts as presented in the 2003 *CMRR EIS* for the alternative selected in the 2004 ROD are presented for comparison to the impacts of the action alternatives. Many of the analyses in the 2003 *CMRR EIS* did not distinguish between the potential impacts of the CMRR-NF and RLUOB; therefore, the impacts of constructing and operating both buildings are included in this section.

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[1] *Each structure, system, and component in a DOE facility is assigned to one of five performance categories depending upon its safety importance. Performance Category 3 (PC-3) structures, systems, and components are those for which failure to perform their safety function could pose a potential hazard to public health, safety, and the environment from release of radioactive or toxic materials. Design considerations for this category are to limit facility damage as a result of design-basis natural phenomena events (for example, an earthquake) so that hazardous materials can be controlled and confined, occupants are protected, and the functioning of the facility is not interrupted.*

Analyses have been updated in three areas. A comprehensive update to the LANL seismic hazard analysis was completed in June 2007 (LANL 2007a), after completion of the 2003 *CMRR EIS*. The updated report used more-recent field study data, most notably from the proposed CMRR-NF site, to update the seismic characterization of LANL, including the probabilistic seismic hazard and horizontal and vertical ground accelerations that would constitute what is considered a design-basis earthquake for the proposed CMRR-NF site. The seismic hazard analysis was updated again in 2009 (LANL 2009b). Based on the updated probabilistic seismic hazard analysis, it was concluded that a design-basis earthquake with a return interval of about 2,500 years would have an estimated peak horizontal ground acceleration of 0.47 *g* [gravitational acceleration] and a peak vertical ground acceleration of 0.51 *g*. At the time the *CMRR EIS* was prepared, the peak horizontal ground acceleration was about 0.31 *g* and the peak vertical ground acceleration was about 0.27 *g* for a design-basis earthquake.[2] As a result of this updated understanding of the seismic hazard, it was concluded that the 2004 CMRR-NF design, as originally conceived, would not survive the updated design-basis earthquake. Therefore, the accident analysis of the 2004 CMRR-NF was updated in this *CMRR-NF SEIS* to reflect the potential consequences and risks associated with such an earthquake. Additionally, analyses of greenhouse gas emissions and the potential impacts of construction transportation on traffic, both of which were not included in the 2003 *CMRR EIS*, have been added to the No Action Alternative analysis.

4.2.2 Land Use and Visual Resources

4.2.2.1 Land Use

Construction and Operations Impacts—Under the No Action Alternative, a total of 26.75 acres (10.8 hectares) in TA-48, TA-50, and TA-55 would be disturbed during construction of the Chemistry and Metallurgy Research Building Replacement (CMRR) Facility (that is, the CMRR-NF and RLUOB). A total of 13.75 acres (5.6 hectares), consisting of land used for buildings (2004 CMRR-NF and RLUOB) and parking lots, would be permanently disturbed. The remaining 13 acres (5.26 hectares) would consist of a construction laydown area (2 acres [0.8 hectares]), an area for a concrete batch plant (5 acres [2 hectares]), and land affected by a road realignment (6 acres [2.4 hectares]). Potential development sites at TA-48 and TA-55 include some areas that have already been disturbed, as well as others that are currently covered with native vegetation, including some mature trees that would have to be cleared prior to construction. Construction and operation of the CMRR Facility at TA-55 would be consistent with the designation of the area for Research and Development and Nuclear Materials Research and Development.

4.2.2.2 Visual Resources

Construction and Operations Impacts—Impacts on visual resources resulting from the construction of the 2004 CMRR-NF at TA-55 under the No Action Alternative would be temporary in nature and could include increased levels of dust and human activity. Once completed, the 2004 CMRR-NF would be one story above ground, and its general appearance would be consistent with current development at LANL. The facility would be readily visible from Pajarito Road and from the upper reaches of the Pajarito Plateau rim. Although the 2004 CMRR-NF would add to the overall development at TA-55, it would not alter the industrial nature of the area. Thus, the current Visual Resource Contrast Class IV rating for TA-55 would not change.

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[2] *There are many input parameters used in determining the seismic hazard for a site. However, when designing a structure, it is the ground motion, defined in terms of peak horizontal and vertical ground acceleration, that is key to determining the loads that the structure must resist. The return period for the obsolete peak horizontal and vertical ground accelerations of 0.31 and 0.27, respectively, was 2,000 years; the return interval for the current design-basis earthquake with peak horizontal and vertical ground accelerations of 0.47 g and 0.51 g, respectively, is 2,500 years.*

4.2.3 Site Infrastructure

Construction Impacts—Projected annual demands on key site infrastructure resources associated with construction under the No Action Alternative are presented in **Table 4–1**. Existing LANL infrastructure would easily be capable of supporting the construction requirements for the CMRR Facility proposed under this alternative without exceeding site capacities. Although gasoline and diesel fuel would be required to operate construction vehicles, generators, and other construction equipment, fuel would be procured from offsite sources and, therefore, would not be a limited resource. Construction impacts on the local transportation network would be minimal.

Table 4–1 No Action Alternative — Annual Site Infrastructure Requirements for 2004 CMRR-NF and RLUOB Construction

Resource	*Available Site Capacity* [a]	*Total Requirement* [b]	*Percentage of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	513,000	63	0.01
Peak load demand (megawatts)	16	0.3	1.9
Fuel			
Natural gas (million cubic feet per year)	5,860	0	0
Water (million gallons per year)	130	0.75	0.6

CMRR-NF= Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Capacity minus the current site requirements, a calculation based on the data provided in Chapter 3, Table 3–3, of this *CMRR-NF SEIS*.

[b] Total estimated infrastructure requirements for the CMRR-NF and RLUOB are presented annually, assuming a 5-year construction period for both facilities.

Note: To convert gallons to liters, multiply by 3.78533; cubic feet to cubic meters by 0.028317.

Source: Table 3–3; DOE 2003b.

Operations Impacts—Resources needed annually to support operations under the No Action Alternative are presented in **Table 4–2**. All of the requirements associated with CMRR Facility operations would be well within the available site capacity.

Table 4–2 No Action Alternative — Annual Site Infrastructure Requirements for 2004 CMRR-NF and RLUOB Operations

Resource	*Available Site Capacity* [a]	*Total Requirement*	*Percentage of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	513,000	19,300	3.8
Peak load demand (megawatts)	16	2.6	16
Fuel			
Natural gas (million cubic feet per year)	5,860	Not available	Not available
Water (million gallons per year)	130	10.4	8.0

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Capacity minus the current site requirements, a calculation based on the data provided in Chapter 3, Table 3–3, of this *CMRR-NF SEIS*.

Note: To convert gallons to liters, multiply by 3.78533; cubic feet to cubic meters by 0.028317.

Source: Table 3–3; DOE 2003b.

4.2.4 Air Quality and Noise

NNSA determined that the Clean Air Act "General Conformity Rule" would not apply, and no conformity analysis would be required because LANL is located in an attainment area for all criteria pollutants and ambient air quality standards would not be exceeded (DOE 2003b).

4.2.4.1 Air Quality

Construction Impacts—Construction of a CMRR Facility (2004 CMRR-NF and RLUOB) at TA-55 would result in temporary emissions from construction equipment, trucks, and employee vehicles. Criteria pollutant concentrations were modeled for the construction of the CMRR Facility at TA-55 and compared to the most stringent standards (see **Table 4–3** and Chapter 3, Section 3.4.2). The maximum ground-level concentrations off site or along the perimeter road to which the public has regular access would be below the ambient air quality standards. Concentrations along Pajarito Road adjacent to the construction site would be higher and could exceed the 24-hour ambient standards for nitrogen dioxide, particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM_{10}), and total suspended particulates. However, the public would not be allowed access to this section of road. Actual criteria pollutant concentrations are expected to be less because conservative emission factors and other assumptions, which tend to overestimate the impacts, were used in the modeling of construction activities. The maximum short-term concentrations during construction would occur at the eastern site boundary at points accessible to the public on a regular basis. The maximum annual criteria pollutant concentrations would occur at a receptor located to the north at the Royal Crest Trailer Park.

Table 4–3 No Action Alternative — Nonradiological Air Quality Concentrations at Technical Area 55 Site Boundary – Construction

Criteria Pollutant	*Averaging Time*	*NMAAQS (parts per million)* [a]	*Calculated Concentration (parts per million)* [b]
Carbon monoxide	1 hour	13	0.20
	8 hours	8.7	0.026
Nitrogen dioxide	Annual	0.05	0.00059
Sulfur dioxide	3 hours	0.5 [c]	0.0089
	24 hours	0.1	0.0011
	Annual	0.02	0.000039
PM_{10}	24 hours	150 µg/m³	34 µg/m³
Total suspended particulates	24 hours	150 µg/m³	67 µg/m³
	Annual	60 µg/m³	4.0 µg/m³

µg/m³ = micrograms per cubic meter; NMAAQS = New Mexico Ambient Air Quality Standards; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers.

[a] NMAAQS are more stringent than the Federal standards; thus, emissions are compared to the latest NMAAQS consistent with other air quality analyses in this *CMRR-NF SEIS*. All emissions were converted from micrograms per cubic meter, as shown in Table 4–9 of the *CMRR EIS*, to parts per million using the appropriate corrections for temperature (70 degrees Fahrenheit) and a site elevation of 7,229 feet (2,200 meters), in accordance with New Mexico dispersion modeling guidelines (NMAQB 2010).

[b] The annual concentrations were analyzed at locations to which the public has access: the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

[c] NMAAQS does not have a 3-hour standard; thus, the current Federal standard (from the National Ambient Air Quality Standards [NAAQS]) is used here.

Source: DOE 2003a.

Radiological releases from construction activities are not expected. As described in Chapter 2, Section 2.5, the RLUOB has been constructed and the CMRR-NF site has been excavated down to about 30 feet (9.1 meters) already and no contamination was encountered. Any suspected or known contaminated areas from prior LANL activities would be evaluated to identify procedures for working within those areas and to determine the need to remove site contamination. Contaminated soils would be removed as necessary to protect worker health or the environment before construction was initiated. Any contaminated soil removed would characterized and disposed of appropriately at LANL or an offsite waste management facility.

Operations Impacts—Under the No Action Alternative, criteria and toxic air pollutants would be generated from operation and testing of an emergency generator at TA-55. **Table 4–4** summarizes the concentrations of criteria pollutants from CMRR Facility operations at TA-55. The concentrations are compared to their corresponding ambient air quality standards (see Chapter 3, Section 3.4.2). The maximum ground-level concentrations that would result from CMRR Facility operations at TA-55 would be below the ambient air quality standards. Actual criteria pollutant concentrations are expected to be less because conservative stack parameters were assumed in the modeling of the diesel emergency generator. The maximum annual criteria pollutant concentrations would occur at the Royal Crest Trailer Park. The maximum short-term concentrations would also occur at the Royal Crest Trailer Park north of TA-55 at the LANL site boundary. No major changes in emissions or air pollutant concentrations at LANL would be expected under this alternative.

Approximately 0.00076 curies per year of actinides and 2,645 curies of fission products and hydrogen-3 (tritium) would be released to the environment from relocated CMR Building operations at TA-55 (DOE 2003b). Impacts of radiological air pollutants are discussed in Section 4.2.10.

Table 4–4 No Action Alternative — Nonradiological Air Quality Concentrations at Technical Area 55 Site Boundary – Operations

Criteria Pollutant	*Averaging Time*	*NMAAQS (parts per million)* [a]	*Calculated Concentration (parts per million)* [b]
Carbon monoxide	1 hour	13	0.027
	8 hours	8.7	0.060
Nitrogen dioxide	Annual	0.05	0.000012
Sulfur dioxide	3 hours	0.5 [c]	0.10
	24 hours	0.1	0.014
	Annual	0.02	0.0000055
PM_{10}	24 hours	150 μg/m³	1.4 μg/m³
Total suspended particulates	24 hours	150 μg/m³	2.4 μg/m³
	Annual	60 μg/m³	0.001 μg/m³

μg/m³ = micrograms per cubic meter; NMAAQS = New Mexico Ambient Air Quality Standards; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers.

[a] NMAAQS are more stringent than the Federal standards; thus, emissions are compared to the latest NMAAQS consistent with other air quality analyses in this *CMRR-NF SEIS*. All emissions were converted from micrograms per cubic meter, as shown in Table 4–10 of the *CMRR EIS*, to parts per million using the appropriate corrections for temperature (70 degrees Fahrenheit) and a site elevation of 7,229 feet (2,200 meters), in accordance with New Mexico dispersion modeling guidelines (NMAQB 2010).

[b] The annual concentrations were analyzed at locations to which the public has access: the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

[c] NMAAQS does not have a 3-hour standard; thus, the Federal standard (from the NAAQS) is used here.

Source: DOE 2003a.

4.2.4.2 Greenhouse Gas Emissions

Greenhouse gas emissions were not analyzed in the 2003 *CMRR EIS*. The impacts on greenhouse gas emissions due to construction and operation of the 2004 CMRR-NF under the No Action Alternative are discussed below.

Construction Impacts—Under the No Action Alternative, construction of the 2004 CMRR-NF at TA-55 would result in temporary greenhouse gas emissions from construction equipment, material transport trucks, personnel commutes, and electricity consumption.

Emissions of greenhouse gases from these construction activities, excluding electricity consumption, were estimated to be more than 4,000 tons (3,700 metric tons) carbon-dioxide equivalent per year (see **Table 4–5**). Compared to the 2008 site-wide greenhouse gas baseline emissions, 440,000 tons (400,000 metric tons) of carbon-dioxide equivalent per year (LANL 2011a:Greenhouse Gases, 015)[3], there would be a minimal and temporary increase (about 1 percent) in greenhouse gases from the construction of the 2004 CMRR-NF under the No Action Alternative.

Table 4–5 No Action Alternative — 2004 CMRR-NF Construction Emissions of Greenhouse Gases

Emissions Scope	*Activity*	*Emissions (tons per year)*			
		CO_2	*CH_4 CO_2e*	*N_2O CO_2e*	*Total CO_2e*
Scope 3 [a]	Sitework/grading	1,300	1	10	1,310
	Construction	1,900	3	40	1,940
	Materials transport	100	0	0	100
	Personnel Commutes	850	1	20	871
Subtotal		4,150	5	70	4,220
Scope 2 [b]	Electricity Use	66	0	0	66
Total		4,220	5	71	4,290

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; CO_2 = carbon dioxide; CH_4 CO_2e = methane in carbon-dioxide equivalent; N_2O CO_2e = nitrous oxide in carbon-dioxide equivalent; CO_2e = carbon-dioxide equivalent.

[a] Scope 3 sources include indirect emissions of construction equipment not owned or controlled by LANL.

[b] Scope 2 sources include indirect emissions from the generation of purchased electricity, where the emissions actually occur at sources off site and not at sources owned or controlled by LANL.

[c] The electrical requirement estimated in the 2003 *CMRR EIS* was based on preconceptual design information and is now known to be greatly underestimated.

Note: Totals may not equal the sum of the contributions due to rounding. To convert tons to metric tons, multiply by 0.90718.

Direct greenhouse gas emissions at LANL are those described as Scope 1. There are no established thresholds for greenhouse gases, but in draft guidance issued February 18, 2010, the Council on Environmental Quality (CEQ) suggested that proposed actions that are reasonably anticipated to cause direct emissions of 27,600 tons (25,000 metric tons) or more of carbon-dioxide equivalent should be evaluated by quantitative and qualitative assessments. This is not a threshold of significance, but an indicator that a quantitative and qualitative assessment may be meaningful to decisionmakers and the public and would require consideration in National Environmental Policy Act (NEPA) documentation

[3] *The projected LANL site-wide greenhouse gas emissions associated with the electrical usage corresponding to the operations selected in the 2008* Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico *(LANL SWEIS) RODs would be 543,000 tons (493,000 metric tons) per year.*

(see Chapter 3, Section 3.4.4, and Chapter 5, Section 5.4). There would be no direct or Scope 1 greenhouse gas emissions during construction under the No Action Alternative.

Operations Impacts—Operations of the 2004 CMRR-NF and RLUOB would release greenhouse gases into the atmosphere annually as a result of emissions associated with personnel commutes, refrigerants used to cool the building, three emergency backup diesel generators at RLUOB, and electricity consumption (see **Table 4–6**). Since no new hires would be needed, emissions from personnel commutes are already included in the baseline inventory and are not included here. Total greenhouse gases emitted during normal operations of the 2004 CMRR-NF and RLUOB under the No Action Alternative, excluding the offsite emissions from electricity consumption, would be approximately 1,200 tons (1,090 metric tons) of carbon-dioxide equivalent per year. Compared to site-wide greenhouse gas emissions, 440,000 tons (400,000 metric tons) of carbon-dioxide equivalent per year (LANL 2011a:Greenhouse Gases, 015), there would be a minimal increase in greenhouse gases from normal operations of the 2004 CMRR-NF and RLUOB under the No Action Alternative.

Emissions from the generation of purchased electricity occur at offsite power plants that are not owned or controlled by LANL. Greenhouse gas emissions associated with electricity use during the operation of the 2004 CMRR-NF are approximately 12,700 tons (11,500 metric tons) of carbon-dioxide equivalent per year; however, the electrical requirement estimated in the 2003 *CMRR EIS* was based on preconceptual design information and is now known to be greatly underestimated. The total greenhouse gas emissions from the operation of the 2004 CMRR-NF and RLUOB, including electricity use, would be approximately 13,900 tons (12,600 metric tons) of carbon-dioxide equivalent per year.

Table 4–6 No Action Alternative — 2004 CMRR-NF and RLUOB Operations Emissions of Greenhouse Gases

Emissions Scope	*Activity*	*Emissions (tons per year)*				
		CO_2	*CH_4 CO_2e*	*N_2O CO_2e*	*HFC CO_2e*	*Total CO_2e*
Scope 1 [a]	Refrigerants Used	N/A	N/A	N/A	1,100	1,100
	Backup Generator	95	0	0	N/A	95
	Subtotal	95	0	0	1,100	1,200
Scope 2 [b]	Electricity Use [c]	12,600	5	55	N/A	12,700
	Total	12,700	5	55	1,100	13,900

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; CO_2 = carbon dioxide; CH_4 CO_2e = methane in carbon-dioxide equivalent; N_2O CO_2e = nitrous oxide in carbon-dioxide equivalent; CO_2e = carbon-dioxide equivalent; HFC CO_2e = hydrofluorocarbons in carbon-dioxide equivalent; N/A = not applicable; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Scope 1 sources include emissions of direct stationary sources owned or controlled by LANL.

[b] Scope 2 sources include indirect emissions from the generation of purchased electricity, where the emissions actually occur at sources off site and not owned or controlled by LANL.

[c] The electrical requirement estimated in the 2003 *Final Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico* was based on preconceptual design information and is now known to be greatly underestimated.

Note: Totals may not equal the sum of the contributions due to rounding. To convert tons to metric tons, multiply by 0.09718.

Direct greenhouse gas emissions at LANL are those described as Scope 1. There are no established thresholds for greenhouse gases, but in draft guidance issued February 18, 2010, the CEQ suggested that proposed actions that are reasonably anticipated to cause direct emissions of 27,600 tons (25,000 metric tons) or more of carbon-dioxide equivalent should be evaluated by quantitative and qualitative assessments. This is not a threshold of significance, but an indicator that a quantitative and qualitative assessment may be meaningful to decisionmakers and the public and would require consideration in NEPA documentation. The direct (Scope 1) greenhouse gas emissions during operations of the 2004 CMRR-NF under the No Action Alternative are from the occasional use of three emergency backup generators and the refrigerants used for cooling. Together, the Scope 1 emissions during operation of the 2004 CMRR-NF and RLUOB under the No Action Alternative (1,200 tons or 1,100 metric tons of carbon-dioxide equivalent per year) would be below the CEQ suggested level of 27,600 tons (25,000 metric tons) per year set for quantitative and qualitative assessments.

4.2.4.3 Noise

Construction Impacts—Construction of the 2004 CMRR-NF at TA-55 would result in some temporary increase in noise levels near the area from construction equipment and activities. Some disturbance to wildlife near the area could occur as a result of the operation of construction equipment. There would be no change in noise impacts on the public outside of LANL as a result of construction activities, except for a small increase in traffic noise levels from construction employees' vehicles and materials shipment. Noise sources associated with construction at TA-55 are not expected to include loud, impulsive sources such as from blasting.

Operations Impacts—Noise impacts resulting from CMRR Facility operations at TA-55 would be similar to those resulting from existing operations at TA-55. Although there would be a small increase in traffic and equipment noise (such as heating and cooling systems) near the area, there would be little change in noise impacts on wildlife and no change in noise impacts on the public outside of LANL as a result of moving CMR Building activities to TA-55.

4.2.5 Geology and Soils

Construction Impacts—Construction of the CMRR Facility under this alternative would require aggregate and other geologic resources to support construction activities at TA-55, but these resources are abundant within a 500-mile (800-kilometer) radius. Relatively deep subsurface excavation would be required to construct belowground portions of the CMRR Facility. A site survey and foundation study would be conducted as necessary to confirm site geologic characteristics for facility engineering purposes.

Operations Impacts— CMRR Facility operations under this alternative would not impact geologic or soil resources at LANL. The potential impacts on the 2004 CMRR-NF, with few exceptions, were not re-evaluated in this *CMRR-NF SEIS.* The increased seismic hazard has been evaluated and is addressed in Section 4.2.10.2, Facility Accidents, and Appendix C, Section C.4.1. Volcanic hazards identified for the LANL vicinity would apply to the 2004 CMRR-NF. These include ash and pumice falls, mudflows and flooding, seismic activity, lava flows, atmospheric effects, and acid rains (see Appendix C, Section C.4.1).

4.2.6 Surface-Water and Groundwater Quality

4.2.6.1 Surface Water

Construction Impacts—There are no natural surface-water drainages in the vicinity of the proposed 2004 CMRR-NF site in TA-55 or Mesita del Buey, and no surface water would be used to support facility construction. It is expected that portable toilets would be used for construction personnel, resulting in no onsite direct discharge of sanitary wastewater and no impact on surface waters. Waste generation and management activities are detailed in Section 4.2.12.

Stormwater runoff from construction areas could potentially 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 during construction to minimize suspended sediment and material transport and potential water quality impacts. TA-55 activities are not expected to affect floodplains; TA-55 is not in an area that is prone to flooding, and the nearest 100-year floodplains are located at a distance of approximately 650 feet (200 meters) in Twomile Canyon, 1,900 feet (580 meters) in Mortandad Canyon, and 3,000 feet (910 meters) in Pajarito Canyon, all at much lower elevations.

Operations Impacts—No impacts on surface-water quality are expected as a result of CMR operations at TA-55 under this alternative. No surface water would be used to support facility activities, and there would be no direct discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated by facility staff use of lavatory, shower, and break room facilities and from miscellaneous potable and sanitary uses. As planned, this wastewater would be collected by an expanded TA-55 sanitary sewer system and conveyed to appropriate wastewater treatment facilities for ultimate disposal. Radioactive liquid waste would be transported via a radioactive liquid waste pipeline to the existing Radioactive Liquid Waste Treatment Facility (RLWTF). The design and operation of new buildings would incorporate appropriate stormwater management controls to safely collect and convey stormwater from facilities while minimizing washout and soil erosion. Overall, operational impacts on site surface waters and downstream water quality would be expected to be minimal.

4.2.6.2 Groundwater

Construction Impacts—Groundwater would be required to support construction activities at TA-55. The volume of groundwater required for construction would be small compared to site availability and historic usage, and there would be no onsite discharge of wastewater to the surface or subsurface. No impact on groundwater availability or quality is anticipated from construction activities in TA-55.

Operations Impacts—Relocated CMR operations and activities at TA-55 under the No Action Alternative would use groundwater primarily to meet the potable and sanitary needs of facility support personnel, as well as for miscellaneous building mechanical uses. It is estimated that new building operations under this alternative would require about 10.4 million gallons (39.4 million liters) per year of groundwater. This demand is a small fraction of total LANL usage and would not exceed site availability. Therefore, no additional impact on regional groundwater availability is anticipated.

Waste generation and management activities are detailed in Section 4.2.12. No sanitary or industrial effluent would be discharged directly to the surface or subsurface. Thus, no operational impacts on groundwater quality are expected.

4.2.7 Ecological Resources

4.2.7.1 Terrestrial Resources

Construction Impacts—Although TA-55 is located within the ponderosa pine forest vegetation zone, few trees exist in developed portions of the area. Where construction would occur on previously disturbed land, there would be little or no impact on terrestrial resources. However, construction would remove some previously undisturbed ponderosa pine forest, resulting in the loss of less-mobile wildlife, such as reptiles and small mammals, and causing more-mobile species, such as birds or large mammals, to be displaced. The success of displaced animals would depend on the carrying capacity[4] of the area into which they move. If the area were at or near its carrying capacity, displaced animals would not likely survive. (Since the issuance of the 2004 ROD associated with the *CMRR EIS*, activities at the proposed TA-55 site

[4] Carrying capacity in the ecological context is defined as the threshold of stress above which populations and ecosystem functions cannot be sustained. Biological carrying capacity is an equilibrium between the availability of habitat and the number of a given species the habitat can support over time.

related to RLUOB construction and geological studies have resulted in the elimination of this forestland.) Indirect impacts of construction, such as noise or human disturbance, could also impact wildlife living adjacent to the construction zone. Although temporary, such disturbance would span the construction period and the time required for the habitat to naturally regenerate. The work area would be clearly marked to prevent construction equipment and workers from disturbing adjacent natural habitat.

Operations Impacts—CMRR Facility operations would have a minimal impact on terrestrial resources within or adjacent to TA-55. As wildlife residing in the area has already adjusted to current levels of noise and human activity associated with current TA-55 operations, it is unlikely to be adversely affected by similar activities associated with CMRR Facility operations. Areas not permanently disturbed by the new CMRR Facility (for example, construction laydown areas) would be landscaped. While these areas would provide some habitat for wildlife, it is likely that species composition and density would differ from preconstruction conditions.

4.2.7.2 Wetlands

Construction and Operations Impacts—Although there are three areas of wetlands located within TA-55, none is present in the proposed 2004 CMRR-NF construction area. Thus, there would be no direct impacts on wetlands. Further, indirect impacts on these wetlands due to erosion should not occur because water from the site drains into the Pajarito watershed and not the Mortandad watershed, in which these wetlands are located. In addition, a sediment and erosion control plan would be implemented to control stormwater runoff during construction and operation, thus preventing impacts on wetlands located further down Pajarito Canyon.

4.2.7.3 Aquatic Resources

Construction and Operations Impacts—The only aquatic resources present at TA-55 are small pools associated with wetlands. There would be no impact on these resources from the construction of the 2004 CMRR-NF or operation of the CMRR Facility.

4.2.7.4 Threatened and Endangered Species

Construction Impacts—Areas of environmental interest have been established for the Mexican spotted owl and southwestern willow flycatcher. (Since the issuance of the 2004 ROD associated with the *CMRR EIS*, the bald eagle has been federally delisted due to recovery.) Portions of TA-55 include both core and buffer zones for the Mexican spotted owl, federally classified as a threatened species; however, annual surveys have not identified the spotted owl within these zones. Construction of the 2004 CMRR-NF is not expected to directly affect individuals of this species, but could remove a small portion of the Mexican spotted owl's habitat buffer area; this potential effect on Mexican spotted owl habitat would not likely be adverse. In 2003, the U.S. Fish and Wildlife Service concurred with NNSA's determination that the construction and operation of the CMRR Facility at TA-55 would not be likely to adversely affect either individuals of threatened or endangered species currently listed or their critical habitat at LANL. Core and buffer zones for the southwestern willow flycatcher do not overlap TA-55. No impacts that violate the provisions of the Bald and Golden Eagle Protection Act or the Migratory Bird Treaty Act have been identified.

Operations Impacts—CMRR Facility operations at TA-55 would not directly affect any endangered, threatened, or special status species. Noise levels associated with the CMRR Facility would be low, and human disturbance would be similar to that already occurring within TA-55; however, parking activities at the CMRR Facility could be in close proximity to the Mexican spotted owl's potential habitat area and may indirectly affect that potential habitat. In addition, nighttime lighting at the parking lot could indirectly affect prey species activities; therefore it would not be directed toward canyon areas to reduce such impacts. These are not likely to be adverse effects on the Mexican spotted owl's potential habitat areas.

4.2.8 Cultural and Paleontological Resources

Construction and Operations Impacts—Adverse impacts on historic resources at TA-55 resulting from construction and operation of the CMRR Facility are not expected. There are no prehistoric sites located within TA-55. There is one prehistoric site located near the boundary of TA-55 within TA-48 that is eligible for listing in the National Register of Historic Places (NRHP). This site would be avoided during construction of the 2004 CMRR-NF and operation of the CMRR Facility. Some of the 10 historic sites located within TA-55 could be disturbed by the construction of the 2004 CMRR-NF. As appropriate, NNSA would consult with the State Historic Preservation Officer and, if necessary, data and artifact recovery would be conducted. There are no known paleontological resources present at TA-55 at LANL.

The area at TA-55 proposed to house the 2004 CMRR-NF has not been surveyed for traditional cultural properties. If any traditional cultural properties are found during construction, work would stop while appropriate actions are undertaken. Thus, it is expected that there would be no impacts on these resources.

4.2.9 Socioeconomics

Construction Impacts—Construction of new buildings at TA-55 to house CMR activities would require a peak construction employment level of 300 workers. This level of employment would generate about 852 indirect jobs in the region around LANL. The potential total employment increase of 1,152 direct and indirect jobs represents an approximate 1.3 percent increase in the workforce and would occur over the proposed construction period. This small increase would have little or no noticeable impact on the socioeconomic conditions of the region of influence (ROI).

Operations Impacts—CMRR Facility operations would require a workforce of approximately 550 workers. As evaluated in the *CMRR EIS*, this would be an increase of about 340 workers over currently restricted CMR Building operational requirements. Nevertheless, the increase in the number of workers in support of expanded CMRR Facility operations would have little or no noticeable impact on socioeconomic conditions in the LANL ROI. New LANL employees hired to support the CMRR Facility would compose a small fraction of the LANL workforce and an even smaller fraction of the regional workforce.

4.2.10 Human Health

4.2.10.1 Normal Operations

Radiological Impacts

Construction Impacts—No radiological risks would be incurred by members of the public from construction activities. Construction workers would be at a small risk for construction-related accidents and radiological exposures. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, these workers would be protected through appropriate training, monitoring, and management controls. Their exposure would be limited to ensure that doses are kept as low as is reasonably achievable.

Operations Impacts—Normal operations of the CMRR Facility at TA-55, as evaluated in the 2003 *CMRR EIS*, are not expected to result in an increase in latent cancer fatalities (LCFs) in the general public. Under this alternative, the radiological releases to the atmosphere from the 2004 CMRR-NF and RLUOB at TA-55 would be those shown in **Table 4–7**. The actinide emissions listed in this table are in the form of plutonium, uranium, thorium, and americium isotopes. In estimating the human health impacts, all emissions were considered to be plutonium-239. This is conservative because the human health impacts on a per-curie basis are greater for plutonium-239 than for the other actinides associated with CMR activities.

Table 4–7 No Action Alternative — 2004 CMRR-NF and RLUOB Radiological Emissions During Normal Operations

Nuclide	*Emissions (curies per year)*
Actinides	0.00076
Krypton-85	100
Xenon-131m	45
Xenon-133	1,500
Hydrogen-3 (tritium) [a]	1,000

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] The tritium release is in the form of both tritium oxide (750 curies) and elemental tritium (250 curies). Tritium oxide is more readily absorbed by the body; therefore, the health impact of tritium oxide on a receptor is greater than that for elemental tritium. For this reason, all of the tritium release has been conservatively modeled as if it were tritium oxide.

Source: DOE 2003b.

Doses from radiological emissions under the No Action Alternative are presented as they were reported in the 2003 *CMRR EIS*. They were based on internal dose conversion factors from Federal Guidance Report No. 11 (EPA 1988). For the same exposure, doses would be slightly lower using the more recent Federal Guidance Report No. 13 (EPA 1993b) factors. **Table 4–8** shows the annual collective dose to the population living within a 50-mile (80-kilometer) radius of the CMRR Facility at TA-55 was estimated to be 1.9 person-rem under the No Action Alternative. This population dose increases the annual risk of a single latent fatal cancer in the population by 1×10^{-3}. Another way of stating this is that the likelihood that one fatal cancer would occur in the population as a result of radiological releases associated with this alternative is about 1 chance in 1,000 per year. Statistically, LCFs are not expected to occur in the population as a result of CMRR Facility operations at TA-55.

Table 4–8 No Action Alternative — Annual Radiological Impacts of CMRR-NF and RLUOB Operations on the Public

	Maximally Exposed Individual	*Population Within 50 Miles [a] (80 kilometers)*	*Average Individual Within 50 Miles (80 kilometers)*
Dose	0.33 millirem	1.9 person-rem	0.0063 millirem
Cancer fatality risk [b]	2×10^{-7}	1×10^{-3}	4×10^{-9}
Regulatory dose limit [c]	10 millirem	Not applicable	10 millirem
Dose as a percentage of the regulatory limit	3.3	Not applicable	0.06
Dose from background radiation [d]	450 millirem	139,000 person-rem	450 millirem
Dose as a percentage of background dose	0.07	0.0014	0.0014

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] The population dose for this table was based on the 2000 population estimate of about 309,000 surrounding TA-55, as shown in Table 4–12 of the 2003 *Final Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico (CMRR EIS)*.

[b] Based on a risk estimate of 0.0006 latent cancer fatalities per person-rem (DOE 2003a).

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

[d] The listed annual individual dose from background radiation is as presented in the 2003 *CMRR EIS*, Table 4–12.

Source: DOE 2003b.

The average annual dose to an individual in the population would be 0.0063 millirem. The corresponding increased risk of an individual developing a fatal cancer from receiving the average dose would be 4×10^{-9}, or about 1 chance in 250 million per year. The maximally exposed individual (MEI) member of the public would receive an estimated annual dose of 0.33 millirem. This dose corresponds to an increased annual risk of developing a fatal cancer of 2×10^{-7}. In other words, the likelihood that the MEI would develop a fatal cancer is about 1 chance in 5 million for each year of operation.

Estimated annual doses to workers involved with CMRR Facility operations (involved workers) under the No Action Alternative are provided in **Table 4–9**. The estimated worker doses are based on historical exposure data for LANL workers (DOE 2003b). Based on the reported data, the average annual dose to a LANL worker who received a measurable dose was 104 millirem. A value of 110 millirem has been used as the estimate of the average annual worker dose per year of operations at the 2004 CMRR-NF and RLUOB at TA-55.

Table 4–9 No Action Alternative — Annual Radiological Impacts of 2004 CMRR-NF and RLUOB Operations on Workers

	Individual Worker	***Worker Population*** [a]
Dose	110 millirem	61 person-rem
Fatal cancer risk [b]	7×10^{-5}	4×10^{-2}
Dose limit [c]	5,000 millirem	Not available
Administrative control level [d]	500 millirem	Not available

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Based on a worker population of 550 for the 2004 CMRR-NF at Technical Area 55. Dose limits and administrative control levels do not exist for worker populations.

[b] Based on a worker risk estimate of 0.0006 latent cancer fatalities per person-rem (DOE 2003a).

[c] 10 CFR 835.202.

[d] DOE 1999b (DOE Standard 1098-99).

Source: DOE 2003b.

This 110-millirem dose is well below the DOE worker dose limit of 5 rem (5,000 millirem) (10 *Code of Federal Regulations* [CFR] Part 835) and is significantly less than the recommended Administrative Control Level of 500 millirem (DOE 1999b). This average annual dose corresponds to an increased risk of a fatal cancer of 6.7×10^{-5} for each year of operations. In other words, the likelihood that a worker would develop a fatal cancer from annual work-related exposure is about 1 chance in 14,000.

Based on a worker population of 550, the estimated annual worker population dose would be 61 person-rem. This would increase the likelihood of a fatal cancer within the worker population by 4×10^{-2} per year. In other words, on an annual basis, there is less than 1 chance in 25 of one fatal cancer developing in the entire worker population (550 workers) as a result of exposures associated with activities under this alternative.

Hazardous Chemical Impacts

No chemical-related health impacts on the public would be associated with this alternative. The laboratory quantities of chemicals that could be released to the atmosphere during normal operations are minor quantities and would be below the screening levels used to determine the need for additional analysis. Workers would be protected from adverse effects from the use of hazardous chemicals by adherence to Occupational Safety and Health Administration (OSHA) and U.S. Environmental Protection Agency (EPA) occupational standards that limit concentrations of potentially hazardous chemicals.

4.2.10.2 Facility Accidents

Radiological Impacts

Radiological impacts of facility accidents, including hazards from volcanic eruptions, at the 2004 CMRR-NF were evaluated in the *CMRR EIS*. Appendix C of the *CMRR EIS* provides the methodology and assumptions used to develop facility accident scenarios and estimate doses to the general public within 50 miles (80 kilometers), to an MEI, and to an onsite worker near the facility.

The safety documents for the CMR Building, the proposed CMRR-NF, and the other plutonium facilities at LANL start with hazard evaluations that systematically consider a wide range of potential hazards and identify the controls needed either to prevent the incident from occurring or to mitigate the potential consequences should an incident occur. Incidents that could result in high consequences or risks are further evaluated to identify controls to reduce the likelihood of the accident occurring and to reduce the potential radiological consequences to the extent practicable.

For facilities like the CMR Building, the proposed CMRR-NF, and the other plutonium facilities at LANL, the general safety strategy requires the following:

- Plutonium materials be contained at all times with multiple layers of confinement that prevent the materials from reaching the environment.
- Energy sources that are large enough to disperse the plutonium and threaten confinement be minimized.

This basic strategy means that operational accidents, including spills, impacts, fires, and operator errors, never have sufficient energy available to threaten the multiple levels of confinement that are always present within a plutonium facility. For plutonium facilities, such as the proposed CMRR-NF, the final layer of confinement is the reinforced concrete structure and the system of barriers and multiple stages of high-efficiency particulate air (HEPA) filters that limit the amount of material that could be released to the environment even in the worst realistic internal events.

The operational events that present the greatest threats to confinement in facilities like the proposed CMRR-NF are large-scale internal fires, which, if they occurred, could present heat and smoke loads that threaten the building's HEPA filter systems. For modern plutonium facilities, the safety strategy is to (1) prevent large internal fires by limiting the energy sources, such as flammable gases and other combustible materials, to the point that a wide-scale, propagating fire is not physically possible, and (2) to defeat smaller internal fires with fire-suppression systems.

Modern plutonium operations, such as the proposed CMRR-NF, are designed and operated such that the estimated frequency of any large fire within the facility would fall into the "extremely unlikely" category and would require multiple violations of safety procedures to introduce sufficient flammable materials into the facility to support such a fire. Any postulated large-scale fire in a modern plutonium facility would be categorized as a "beyond-design-basis" event and is not expected to occur during the life of the facility.

Other events that might threaten the integrity of the building and the ability to confine the materials were also considered, including external events such as aircraft crashes and wildfires and rare natural phenomena-initiated events such as volcanic eruptions. Each of these types of events is considered in the safety analyses that support existing or proposed plutonium facilities and are discussed briefly below (see Appendix C for additional information on these accident scenarios).

Airplane Crash—The potential release of radioactive materials from an unintentional airplane crash into a building was considered in this *CMRR-NF SEIS*. In accordance with DOE Standard 3014, an aircraft impact analysis was performed for the CMRR-NF (LANL 2011h). This analysis concluded that the largest aircraft that would exceed the DOE Standard 3014 evaluation guideline of 10^{-6} (1 chance in 1 million) per year for an aircraft crash into the CMRR-NF was a general aviation aircraft (DOE 2006a, LANL 2011h). Accident impacts from larger aircraft (air carrier and large military) were determined to have a probability of less than 10^{-7} (1 chance in 10 million) per year of crashing into the CMRR-NF and were not considered further in this *CMRR-NF SEIS*. The impacts of a general aviation aircraft crash into the facility have been evaluated and accounted for in the design of the Modified CMRR-NF and are bounded by other accidents addressed in this *CMRR-NF SEIS*.

Wildfires—The potential impacts of wildfires on LANL were evaluated in Appendix D of the 2008 *Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico (*2008 *LANL SWEIS)* (DOE 2008b). Wildfires are a reasonably expected event in the region; in the 2008 *LANL SWEIS*, the annual frequency of occurrence was estimated to be 0.05 (once every 20 years). The evaluation included in the 2008 *LANL SWEIS* identified the facilities most at risk of radiological release in the event of a wildfire and did not include the CMR Building or any buildings in TA-55. Wildfires such as the Las Conchas fire of June 2011 and Cerro Grande fire of May 2000 are not expected to threaten these facilities or the proposed Modified CMRR-NF because the shells of these facilities are constructed of noncombustible materials and a buffer area free of combustible materials is maintained around them. In the unlikely event that a wildfire would directly affect one of the facilities, the impacts are not expected to exceed those of other fire scenarios evaluated in this *CMRR-NF SEIS*.

Volcanism—A preliminary evaluation of volcanic hazards at LANL was reported in the *Preliminary Volcanic Hazards Evaluation for Los Alamos National Laboratory Facilities and Operations* (LANL 2010i) (see Chapter 3, Section 3.5.5). Based on an evaluation of information on the volcanic history of the region surrounding LANL, the report described the potential volcanic hazards to LANL from future eruptions in the region. The preliminary calculation of the recurrence rate for silicic eruptions is about 1×10^{-5} per year in the Valles Caldera study region. Similarly, the preliminary calculation of the recurrence rate for basaltic eruptions along the Rio Grande rift 4 is 2×10^{-5} per year. These recurrence rates were calculated by dividing the number of eruptive events by the active eruption period. The estimates of past recurrences rates are not the same as the probability of future eruptions that might affect a given facility. Although it cannot be ruled out, volcanism in the vicinity of TA-55 within the lifetime of the CMRR-NF (50 to 100 years) is unlikely (LANL 2011a:LANL Site, 030). Ash fall may be sufficient to exceed roof design load limits for the CMR Building or the proposed CMRR-NF. In that event, structural failure could occur. Since the release associated with structural failure resulting from ash fall loads is driven by the same physical phenomena, the material at risk and the release mechanisms should be similar to those for the analyzed seismic events. Thus, conservative damage ratios and respirable release fractions applied to the material released as a result of impact or thermal stress for seismic events are applicable to the volcanic ash fall event. The building leak path factor conservatively assumed for the seismic analysis is expected to be the same as or higher than the leak path factor associated with volcanic ash fall events because the ash would contribute to the tortuousness of the leak path. The frequency of an earthquake that results in wide-scale damage and loss of confinement for the building (on the order of once in 100,000 years), coupled with a widespread seismically initiated fire, is conservatively assumed to be 0.00001 per year for risk calculation purposes. This is expected to be the same order of magnitude as the upper limit for the volcanic events described above.

Based on the review discussed above, four accidents are included in this *CMRR-NF SEIS*, representing a wide range of possible accidents and risks that are expected to envelope the consequences and risks associated with all of the accidents discussed above. The four accident scenarios are common to all three alternatives analyzed in this *CMRR-NF SEIS* and include a facility-wide fire, a seismically induced spill, a seismically induced spill followed by a fire, and a loading dock spill/fire. The seismically induced spill followed by a fire scenario has been changed from that included in the *Draft CMRR-NF SEIS* for the CMRR-NF. In this *Final CMRR-NF SEIS*, this accident assumes that the earthquake initiates a radioactive material spill that is followed shortly thereafter by a fire, instead of both accidents occurring simultaneously. This change in assumptions results in a larger dose to the MEI and noninvolved worker because the radioactive materials associated with the assumed spill are not immediately lofted by the fire, which would lessen doses to persons close to the accident site.

The doses included in the *CMRR EIS* were calculated using MACCS2 [MELCOR Accident Consequence Code Systems], Version 1.12. The accident scenarios in the *CMRR EIS* were reviewed and compared with accidents from more-recent safety analyses for the CMR Building and preliminary analyses for the 2004 CMRR-NF (LANL 2011d).

In this *CMRR-NF SEIS*, doses were estimated using MACCS2, Version 1.13.1. Using the scenarios discussed above, the only other changes in parameters used from those presented in Appendix C of the *CMRR EIS* are a new 2030 projected population distribution within 50 miles (80 kilometers) of the 2004 CMRR-NF (projected to be about 511,000 persons surrounding TA-55) and a revised distance to the nearest offsite individual (0.75 miles [1.2 kilometers]) from the 2004 CMRR-NF. All other assumptions are consistent with those presented in Appendix C of the 2003 *CMRR EIS*. Because of these changes, the calculated consequences and risks presented in this SEIS are different from those estimated in the 2003 *CMRR EIS*.

As indicated in Appendix C of this *CMRR-NF SEIS*, two sets of accident source terms are presented. First, the conservative source terms developed in the safety-basis process at LANL are presented. In general, these conservative source term estimates take little or no credit for the integrity of containers or building confinement under severe accidents and assume a damage ratio of 1, meaning that all material at risk would be subjected to the similar, near worst-case conditions. Furthermore, these safety evaluations assume that all of the material at risk that is made airborne and respirable is released to the environment (leak path factor of 1).

For purposes of this *CMRR-NF SEIS*, a second set of source terms was developed that presents reasonable, but still conservative, estimates of source terms. These source terms take into account a range of responses of facility features and materials containers and typical operating practices at plutonium facilities at LANL and elsewhere. Therefore, for design-basis-type accidents, a damage ratio of 1 normally would not be realistic if the containers, process enclosures, limits on combustibles, and similar types of safety systems functioned during the accident. Similarly, the building containment, including HEPA filters, would be expected to remain functioning, although at perhaps a degraded level, during and after the accident.

Tables 4–10 and **4–11** provide the revised accident consequences and risks, respectively. These tables provide accident consequences and risks to the offsite MEI, a member of the public at the nearest public location (0.75 miles [1.2 kilometers] north-northeast from TA-55); the offsite population living within 50 miles (80 kilometers) of the CMRR-NF at TA-55; and a noninvolved worker assumed to be at the TA-55 boundary, about 240 yards (220 meters) from the CMRR-NF.

Table 4–10 No Action Alternative — Accident Frequency and Consequences

Accident	Frequency (per year)	Maximally Exposed Individual: Dose (rem)	Maximally Exposed Individual: Latent Cancer Fatality [b]	Offsite Population [a]: Dose (person-rem)	Offsite Population [a]: Latent Cancer Fatalities [c]	Noninvolved Worker at TA Boundary: Dose (rem)	Noninvolved Worker at TA Boundary: Latent Cancer Fatality [b]
Safety-Basis Scenarios							
Facility-wide fire	0.0001	1.1	0.0007	700	0 (0.4)	5.9	0.004
Seismically induced spill	0.01	600	0.7	140,000	80	20,000	1
Seismically induced spill and fire [d]	0.0001	5,600	1	3,900,000	2,000	47,000	1
Loading dock spill/fire	0.01	0.028	0.00002	6.6	0 (0.004)	1.0	0.0006
SEIS Scenarios							
Facility-wide fire	0.000001	0.011	0.000007	7.2	0 (0.004)	0.059	0.00004
Seismically induced spill	0.001	6.0	0.004	1,400	1 (0.8)	200	0.2
Seismically induced spill and fire [d]	0.0001	6.2	0.004	1,500	1 (0.9)	200	0.2
Loading dock spill/fire	0.0001	0.028	0.00002	6.6	0 (0.004)	1.0	0.0006

SEIS = supplemental environmental impact statement, TA = technical area.

[a] Based on a projected 2030 population estimate of 511,000 persons residing within 50 miles (80 kilometers) of TA-55.

[b] Increased likelihood of an LCF for an individual if the accident occurs.

[c] Increased number of LCFs in the offsite population if the accident occurs (results rounded to one significant figure). When the reported value is zero, the result calculated by multiplying the collective dose to the population by the risk factor (0.0006 LCFs per person-rem) is shown in parentheses.

[d] In the seismically induced spill and fire accident, two sequential events are considered; first, the seismic spill occurs, then releases of material outside the building occur due to the fire.

Table 4–11 No Action Alternative — Annual Accident Risks

Accident	Risk of Latent Cancer Fatality: Maximally Exposed Individual [a]	Risk of Latent Cancer Fatality: Offsite Population [b, c]	Risk of Latent Cancer Fatality: Noninvolved Worker at TA Boundary [a]
Safety-Basis Scenarios			
Facility-wide fire	7×10^{-8}	4×10^{-5}	4×10^{-7}
Seismically induced spill	7×10^{-3}	8×10^{-1}	1×10^{-2}
Seismically induced spill and fire [d]	1×10^{-4}	2×10^{-1}	1×10^{-4}
Loading dock spill/fire	2×10^{-7}	4×10^{-5}	6×10^{-6}
SEIS Scenarios			
Facility-wide fire	7×10^{-12}	4×10^{-9}	4×10^{-11}
Seismically induced spill	4×10^{-6}	8×10^{-4}	2×10^{-4}
Seismically induced spill and fire [d]	4×10^{-7}	9×10^{-5}	2×10^{-5}
Loading dock spill/fire	2×10^{-9}	4×10^{-7}	6×10^{-8}

SEIS = supplemental environmental impact statement, TA = technical area.

[a] Increased risk of an LCF to the individual.

[b] Increased risk of an LCF in the offsite population.

[c] Based on a projected 2030 population estimate of 511,000 persons residing within 50 miles (80 kilometers) of TA-55.

[d] In the seismically induced spill and fire accident, two sequential events are considered; first, the seismic spill occurs, then releases of material outside the building occur due to the fire.

Table 4–10 presents the frequencies and consequences of the postulated set of accidents for these three receptors, and Table 4–11 presents the accident risks obtained by multiplying each accident's consequences by the likelihood (frequency per year) that the accident would occur.

As shown in Table 4–11, the accident with the highest potential risk would be a seismically induced spill (safety-basis scenario) that would severely damage the 2004 CMRR-NF. The annual risk of an LCF for the MEI would be 7×10^{-3}. In other words, the MEI's likelihood of developing a fatal cancer from this event would be about 1 chance in 143 per year. The dose to the offsite population would increase the risk of fatal cancers in the entire population. The risk of developing one fatal cancer in the entire population from this event would be 8×10^{-1} per year. Therefore, LCFs are expected to occur in the population if this accident occurs in the 2004 CMRR-NF. The risk of an LCF to a noninvolved worker would be 1×10^{-2}, or about 1 chance in 100 per year.

The risks associated with seismically induced accidents at the 2004 CMRR-NF, if they were to occur, would exceed DOE guidelines (see Appendix C) and would present unacceptable risks to the public and the LANL workforce. This is because the building is predicted to fail in the event of a design-basis earthquake (see Appendix C). The results presented in Tables 4–10 and 4–11 indicate that the 2004 CMRR-NF presents a very high risk to the offsite population. To reduce the doses to the offsite MEI and offsite population from these accidents to acceptable levels, the material at risk in the 2004 CMRR-NF would have to be reduced from 6.6 tons (6.0 metric tons) to about 11 pounds (5 kilograms) or less, severely limiting the usefulness of the building and rendering it unable to fulfill its mission.

Land contamination—A severe seismic event that results in the failure of building containment also has the potential to release sufficient quantities of plutonium that could lead to land contamination near the facility. Even for severe earthquakes that result in major damage to the building structure and failure of confinement systems, there should not be large energy sources to drive the materials that would typically be used in the proposed CMRR-NF, such as plutonium metal and oxides, out of the damaged building and rubble. Seismic collapse scenarios that result primarily in spills could release plutonium materials through the rubble, but that material would not generally go far from the building site. Seismic collapse scenarios that involve large fires have the potential to loft materials such that transport of radioactive materials downwind might result in land contamination at levels that could require monitoring or additional actions.

The No Action Alternative SEIS scenarios involving a seismically induced spill or a seismically induced spill and fire were modeled to evaluate the potential extent of land that might be contaminated above a screening level of 0.2 microcuries per square meter.[5] Estimates of land area that might be contaminated are highly dependent on specific accident source terms and metrological modeling assumptions. This is because the amount of radioactive material that may accumulate on the ground is highly dependent on the size of the particles that get through the building rubble and are released to the environment (which determines how fast they settle back to the ground), specific accident conditions (for example, presence of a fire), and specific meteorological conditions at the time of the earthquake (for example, high winds). In general, unless there is a fire that can effectively loft the plutonium particles into the air, most of the particles would return to the ground within a few hundred meters of the building location. In the event of a seismically induced spill followed by a large fire at the proposed 2004 CMRR-NF, the heat energy could effectively raise the release height such that ground contamination at the screening level could extend out to approximately 10 miles (16 kilometers) from TA-55, depending in large part on the meteorological conditions at the time of the accident.

[5] *This* CMRR-NF SEIS *uses a plutonium areal concentration of 0.2 microcuries per square meter as a screening level for determining the lateral extent of contamination that might require cleanup actions (Chanin 1996). This screening level was first proposed by EPA in the late 1970s, but never formally adopted. It has been used in many environmental impact statements as a screening level to indicate land areas that would or would not likely require remedial actions.*

Areas contaminated above a specified screening level (for example, 0.2 microcuries per square meter) would require further action, such as radiation surveys or cleanup. Costs associated with radiation surveys, cleanup, and continued monitoring could vary widely depending upon the characteristics of the contaminated area and could range in the hundreds of million dollars per square kilometer for land decontamination (NASA 2006). In addition to the potential direct costs, there are potential secondary societal costs associated with the mitigation from such high-consequence accidents. Those costs could include, but may not be limited to, the following:

- Temporary or longer-term relocation of residents
- Temporary or longer-term loss of employment
- Destruction or quarantine of agricultural products
- Land-use restrictions (which could affect real estate values, businesses, and recreational activities)
- Public health effects and medical care

Dose Impacts from Common Failure Mode Seismic Event—If a severe earthquake were to occur in the Los Alamos area, individuals close to and downwind from TA-55 might receive exposure from radioactive material releases at the existing TA-55 Plutonium Facility, as well as from the 2004 CMRR-NF, if it were built. As noted earlier, NNSA would not construct the 2004 CMRR-NF because it would not meet the standards for a PC-3 facility as required to safely conduct the full suite of CMR mission work. The TA-55 Plutonium Facility was originally designed to a lower seismic standard, but is in the process of being upgraded to withstand higher seismic loadings. In the *LANL SWEIS*, a site-wide seismic event that corresponded to approximately a PC-3 earthquake[6] resulted in estimated doses from the Plutonium Facility (TA-55-4), the Storage Facility (TA-55-185), and the Safe, Secure Transport Facility (TA-55-355) of 160 rem to the MEI and 14,880 person-rem to the population residing within 50 miles (80 kilometers) of TA-55. About 150 rem of the dose to the MEI was estimated to be from the TA-55 Plutonium Facility, the remaining 10 rem was from the other two facilities.

DOE has committed to seismic upgrades to the TA-55 Plutonium Facility that will result in an updated safety-basis estimate (NNSA 2010c, 2011) of mitigated consequences of less than 25 rem to the MEI (the DOE Evaluation Guideline described in DOE Standard 3009) for a seismically induced fire. Proposed future improvements that will be incorporated into the TA-55 Plutonium Facility include fire-rated containers, seismically qualified fire-suppression systems, and seismically qualified portions of the confinement ventilation system. The 2011 safety basis analysis prepared in support of NNSA's response to the DNFSB concluded that seismically upgrading the fire-suppression system would further reduce calculated offsite consequences to the MEI to the level estimated for the seismically induced spill without fire, which is about 9 rem (NNSA 2010c, 2011).

Under the No Action Alternative (the 2004 CMRR-NF), the MEI doses from the seismically induced spill or the seismically induced spill plus fire under the SEIS scenarios are estimated to be about 6 rem. For the MEI closest to the TA-55 area and for the surrounding population, doses from the 2004 CMRR-NF would add directly to those from the other TA-55 facilities in the event of such accidents. As discussed above,

[6] *The estimated dose consequences included in the* LANL SWEIS *(DOE 2008b) were based on a PC-3 seismic event with a return period of 2,000 years and a peak horizontal ground acceleration of approximately 0.31 g (the current PC-3 seismic event return period is 2,500 years). The* 2007 Update of the Probabilistic Seismic Hazard Analysis and Development of Seismic Design Ground Motions at the Los Alamos National Laboratory *(LANL 2007a) had been recently issued and an evaluation of the effects of the new data on LANL facilities was just getting underway. The consequences of a current PC-3 seismic event could be higher than estimated in the* LANL SWEIS.

upgrades to the TA-55 Plutonium Facility are ongoing and will be completed a few years after the projected completion of the 2004 CMRR-NF. Prior to completion of the upgrades, the combined doses for the 2004 CMRR-NF and the TA-55 facilities would be those included in the *LANL SWEIS*, plus the dose from the 2004 CMRR-NF – approximately 166 rem to the MEI and 16,400 person-rem to the population for a seismically induced spill plus fire. Once the TA-55 Plutonium Facility upgrades are complete, the dose to the MEI would be about 25 rem, and the estimated dose to the population within 50 miles (80 kilometers) of LANL would be about 6,000 person-rem. For the MEI, this analysis takes into account the revised MEI dose of 19 rem (9 rem from the revised 2011 safety basis for the TA-55 Plutonium Facility and 10 rem for releases from other facilities at TA-55 per the 2008 *LANL SWEIS*). Given a severe seismic event accompanied by a fire, these doses represent a probability of the MEI developing a fatal cancer from this dose of 0.03, or approximately 1 chance in 33, and it is expected to result in up to 4 LCFs in the exposed population surrounding the site.

Involved Worker Impacts

Approximately 550 workers would be at the 2004 CMRR-NF and RLUOB during operations. The impacts on involved workers are very dependent on the type of accident, the severity of the accident, the location of workers, and protective action taken. An additional approximately 900 workers would be in close proximity in the Plutonium Facility. Any workers near an accident could be at risk of serious injury or death. Following initiation of accident and site emergency alarms, workers in adjacent areas of the facility would evacuate the area or shelter in place in accordance with the technical area and facility emergency operating procedures and training in place.

Hazardous Chemicals and Explosives Impacts

Some of the chemicals used in CMRR Facility operations are toxic and carcinogenic. The quantities of the regulated hazardous chemicals and explosive materials stored and used in the 2004 CMRR-NF would be well below the threshold quantities set by EPA (40 CFR Part 68) and would pose minimal potential hazards to the public health and the environment in an accident condition. These chemicals would be stored and handled in laboratory quantities and would only be a hazard to involved workers under accident conditions.

4.2.10.3 Intentional Destructive Acts

NNSA has prepared a classified appendix to this *CMRR-NF SEIS* that evaluates the potential impacts of malevolent, terrorist, or intentional destructive acts. Substantive details of terrorist attack scenarios, security countermeasures, and potential impacts are not released to the public because disclosure of this information could be exploited by terrorists to plan attacks. NNSA's strategy for mitigation of environmental impacts resulting from extreme events, including intentional destructive acts, has three distinct components: (1) prevention or deterrence of successful attacks; (2) planning and timely and adequate response to emergency situations; and (3) progressive recovery through long-term response in the form of monitoring, remediation, and support for affected communities and the environment.

Depending on the intentional destructive acts, the impacts could be similar to the impacts of the accidents analyzed in this *CMRR-NF SEIS*. However, there may be intentional destructive act scenarios for which the impacts exceed those of the accidents analyzed. Analysis of these intentional destructive act impacts provides NNSA with information upon which to base, in part, decisions regarding the construction and operation of the 2004 CMRR-NF. The classified appendix evaluates the similarity of scenarios involving intentional destructive acts with those evaluated in the *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico (LANL SWEIS)* and *Complex Transformation Supplemental Programmatic Environmental Impact Statement* and presents the potential consequences to a noninvolved worker, an MEI, and the population in terms of physical injuries, radiation doses, and LCFs. Although the results of the analyses cannot be disclosed, the following general conclusion can be drawn: the potential consequences of intentional destructive acts are highly dependent on the distance to the site boundary and the size and proximity of the surrounding population; the closer and denser the surrounding population, the higher the consequences. In addition, it is generally easier and more cost-effective to protect new facilities because new security features can be incorporated into their design. In other words, the protective forces needed to defend new facilities may be smaller due to the inherent security features of a new facility. New facilities can, as a result of design features, better prevent security attacks and reduce the impacts of such attacks.

4.2.11 Environmental Justice

Construction Impacts—As discussed throughout the other subsections of Section 4.2, environmental impacts due to construction would be temporary and would not extend beyond the boundary of LANL. For these reasons, under the No Action Alternative, construction at TA-55 would not result in disproportionately high and adverse environmental impacts on the public living within the potentially affected area surrounding TA-55, including low-income and minority populations.

Operations Impacts—Radiological and hazardous chemical risks to the public resulting from normal operations would be small. Table 4–8 shows the health risks associated with these releases also would be small. Normal operations at the CMRR Facility at TA-55 are not expected to cause fatalities or illness among the general population surrounding TA-55, including minority and low-income populations living within the potentially affected area.

Residents of the Pueblo of San Ildefonso have expressed concern that pollution from CMRR Facility operations could contaminate Mortandad Canyon, which drains onto pueblo land and sacred areas. CMRR Facility operations under this alternative are not expected to adversely affect air quality. There would be no direct liquid discharges and stormwater management controls would be in place to collect stormwater and prevent washout and soil erosion. Thus, there would be no contamination of tribal lands adjacent to the LANL boundary (DOE 2003b). In summary, implementation of the No Action Alternative would not pose disproportionately high and adverse environmental risks to low-income or minority populations living in the potentially affected area around the CMRR Facility at TA-55.

4.2.12 Waste Management and Pollution Prevention

Construction Impacts—Only nonhazardous waste would be generated from construction activities to relocate CMR Building operations and materials to the 2004 CMRR-NF at TA-55. No radioactive or hazardous waste would be generated during construction activities.

Solid, nonhazardous waste generated from construction activities associated with the 2004 CMRR-NF at TA-55 would be processed at the Los Alamos County Eco Station, where it would be separated into materials suitable for recycle or disposal, then disposed of at an offsite solid waste facility permitted to accept the waste. Approximately 578 tons (524 metric tons) of solid, nonhazardous waste, consisting primarily of gypsum board, wood scraps, nonrecyclable scrap metals, concrete, steel, and other construction waste, would be generated from the construction activities. Management of this additional waste at LANL would be within the capabilities of the LANL waste management program, but additional waste management personnel may be required.

Construction debris would be collected in appropriate waste containers and transported to the receiving landfill on a regular basis. Sanitary wastewater generated as a result of construction activities would be managed using portable toilet systems. No other nonhazardous liquid wastes are expected.

Operations Impacts—The impacts on the LANL waste management systems, in terms of managing the waste, are discussed in this section. Waste generation rates, by waste type, are summarized in **Table 4–12** for CMRR Facility operations and overall LANL activities. Radioactive solid and liquid wastes from CMRR Facility operations would constitute only a portion of the total amounts of these wastes generated, treated, and/or disposed of at LANL. The radiological and chemical impacts of managing CMRR Facility radioactive waste on workers and the public have been evaluated along with the other LANL site wastes in other environmental documentation (at the time of the 2003 *CMRR EIS*, the 1999 *LANL SWEIS* (DOE 1999a) included evaluation of these wastes).

Table 4–12 No Action Alternative — Operational Waste Generation Rates Projected for CMRR Facility and Los Alamos National Laboratory Activities

Waste Type	*Units*	*CMRR Facility Generation Rate* [a]	*Site-Wide LANL Projections* [b]
Transuranic and mixed transuranic	Cubic yards per year	88 [c]	440 to 870
Low-level radioactive	Cubic yards per year	2,640 [d]	21,000 to 115,000
Liquid low-level radioactive	Gallons per year	2,700,000	4,000,000
Mixed low-level radioactive	Cubic yards per year	26	320 to 18,100
Chemical [e]	Tons per year	12.4	3,200 to 5,750
Sanitary	Gallons per year	7,200,000 [f]	156,000,000 [g]

CMRR = Chemistry and Metallurgy Research Replacement; LANL = Los Alamos National Laboratory; SEIS = supplemental environmental impact statement.

[a] DOE 2003b.

[b] Estimated site-wide LANL projections based on estimates included in the 2008 *LANL SWEIS* (DOE 2008a).

[c] Includes both transuranic and mixed transuranic waste.

[d] Volumes of low-level radioactive waste include solid wastes generated by the treatment of low-level radioactive liquid wastes generated by CMRR Facility operations.

[e] Chemical waste is not a formal LANL waste category; however, as was done in the 2008 *LANL SWEIS* (DOE 2008a), the term is used in this SEIS to denote a variety of materials including hazardous waste regulated under the Resource Conservation and Recovery Act; toxic waste regulated under the Toxic Substances Control Act; and special waste designated under the New Mexico Solid Waste Regulations, including industrial waste, infectious waste, and petroleum-contaminated soil.

[f] Calculated assuming 550 CMRR Facility workers, each generating 50 gallons per day for 260 workdays per year.

[g] The value shown is the annual volume of wastewater processed at the Sanitary Wastewater Systems Plant in TA-46, assuming operation at its 600,000-gallon-per-day (2.27-million-liter-per-day) design capacity for 260 working days per year (DOE 2003b). Sanitary wastewater and nonradioactive liquid waste are both projected to be routed to the Sanitary Wastewater Systems Plant for treatment.

Note: The generation rates are attributed to facility operations and do not include the waste generated from environmental restoration actions. To convert cubic yards to cubic meters, multiply by 0.76456; gallons to liters, by 3.78533; tons to metric tons, by 0.90718.

Transuranic and Mixed Transuranic Wastes

Analytical, processing, fabrication, and research and development activities at the CMRR Facility would generate transuranic waste. Approximately 88 cubic yards (67 cubic meters) of transuranic and mixed transuranic waste would be generated each year. Any transuranic waste generated by CMRR Facility operations would be transported to the Waste Isolation Pilot Plant (WIPP) or a similar facility for disposition. Transuranic waste volumes generated through CMRR Facility operations over the life of the facility are estimated to be less than 2 percent of the WIPP capacity. Offsite disposal capacities for transuranic waste are expected to be adequate for the disposal needs of LANL, including CMRR Facility operations.

Low-Level Radioactive Waste

About 2,640 cubic yards (2,020 cubic meters) of solid low-level radioactive waste would be generated each year from CMRR Facility operations. Volumes of low-level radioactive waste from CMRR Facility operations include the solid low-level radioactive component of liquid wastes treated through RLWTF or a similar facility. The impacts of managing this waste at LANL would be minimal.

CMRR Facility operations would also generate liquid low-level radioactive waste. Because the exact amount of liquid low-level radioactive waste that would be generated by the CMRR Facility at TA-55 is not known, the 10,400 gallons (39,400 liters) per day (2.7 million gallons [10 million liters] per year) associated with operations in the CMR Building were estimated to be generated by operations at the CMRR Facility as well. Therefore, the amount of solid low-level radioactive waste that would result from RLWTF treatment of liquid low-level radioactive waste generated by CMRR Facility operations was estimated to be 200 cubic yards (150 cubic meters) annually and is included as low-level radioactive waste in Table 4–12. RLWTF capacity is expected to be sufficient to manage the liquid low-level radioactive waste generated by CMRR Facility operations.

Mixed Low-Level Radioactive Waste

Mixed low-level radioactive waste generated from CMRR Facility operations at TA-55 would be surveyed and decontaminated on site, if possible. Those remaining wastes would be treated on site or stored and processed at TA-54, Area G, or Area L and transported to a commercial or DOE offsite treatment and disposal facility. About 26 cubic yards (20 cubic meters) of mixed low-level radioactive waste would be generated each year. The impacts of managing this waste at LANL would be minimal.

Sanitary Wastewater

Sanitary wastewater generated from CMRR Facility operations at TA-55 would be sent to the Sanitary Wastewater Systems Plant. Approximately 27,500 gallons per day (104,000 liters per day) of sanitary wastewater would be generated for 260 working days per year. This would represent about 4.6 percent of the 600,000-gallon-per-day (2.27-million-liter-per-day) design capacity of the Sanitary Wastewater Systems Plant.

Chemical Waste

Chemical waste generated from CMRR Facility operations at TA-55 would be decontaminated or recycled, if possible. Typically, chemical waste is not held in long-term storage at LANL. Approximately 12.4 tons (11.2 metric tons) of chemical waste would be generated each year. The impacts of managing this waste at LANL would be minimal.

4.2.13 Transportation and Traffic

4.2.13.1 Transportation

A transportation impact assessment was conducted for (1) the one-time movement of special nuclear material (SNM), equipment, and other materials during the transition from the existing CMR Building to the 2004 CMRR-NF and (2) the routine onsite shipment of analytical chemistry and materials characterization samples between the Plutonium Facility at TA-55 and the CMRR Facility at TA-55. The results of this impact assessment are presented below for incident-free and transportation accident impacts to the public and workers.

Routine (Incident-Free) Transportation

One-Time Movement of SNM, Equipment, and Other Materials—Transport of SNM, equipment, and other materials currently located at the CMR Building to the 2004 CMRR-NF at TA-55 would occur on open or closed roads. The public is not expected to receive any measurable exposure from the one-time movement of radiological materials associated with this action.

CMR Building workers could receive a minimal dose from shipping and handling of SNM during the transition from the existing CMR Building to the 2004 CMRR-NF. Based on a review of radiological exposure information, the average dose to CMR Building workers (including material handlers) is about 110 millirem per year. The material handler worker dose from shipping and handling of SNM would be similar to those for normal operations currently performed at the CMR Building.

Routine Onsite Shipment of Analytical Chemistry and Materials Characterization Samples—The public is not expected to receive any additional measurable exposure from the movement of small quantities of radioactive materials and SNM samples between the Plutonium Facility at TA-55 and the CMRR Facility at TA-55. These include metal, liquid, or powder samples of weapons-grade plutonium, plutonium-238, uranium-235, uranium-233, and other actinide isotopes.

Transportation Accidents

One-Time Movement of SNM, Equipment, and Other Materials—Potential handling and transport accidents during the one-time movement of SNM, equipment, and other materials during the transition from the existing CMR Building to the 2004 CMRR-NF at TA-55 would be bounded in frequency and consequence by other facility accidents under each of the alternatives presented in this chapter. Once a shipment is prepared for low-speed movement, the likelihood and consequences of any foreseeable accident are considered to be very small.

4.2.13.2 Traffic

Construction Impacts – Truck Traffic—Under the No Action Alternative, construction of the 2004 CMRR-NF would take approximately 3 years. Construction impacts would occur in the time period from 2012 to 2015. This alternative would require excavation of a 68,000-square-foot (6,300-square-meter) area to a depth of 50 feet (15 meters), of which approximately 30 feet (9.1 meters) have already been excavated as part of the geologic analysis of the site, leaving approximately 20 feet (6.1 meters) to be excavated. The excavated soil and rock material would be stored in temporary storage piles assumed to be located approximately 3 miles (4.8 kilometers) from the 2004 CMRR-NF construction site in appropriate storage areas. Excavation of the additional 20 feet and the tunnels to be constructed between RLUOB and the TA-55 Plutonium Facility to the 2004 CMRR-NF would require the removal of approximately 77,000 cubic yards (59,000 cubic meters) of material. This would take approximately 5,000 20-ton truck round trips or 3,300 30-ton truck round trips to move. This material would be staged at a LANL materials staging area for future reuse in other LANL projects.

The number of truck trips per hour would depend on the method used for excavation of the 2004 CMRR-NF. Assuming a 20-minute round trip to the LANL materials staging area, it would take approximately 54 days with one loader and 20-ton trucks or approximately 36 days with one loader and 30-ton trucks to remove the excavated soils and rock. This time period could be shortened by using two loaders, which would be preferable because it would keep trucks operating more efficiently. On a per-hour basis, these trips would be insignificant to the level of service on Pajarito Road. The acceleration of the loaded earthwork trucks would be slow and would result in lower speeds and some reduction in the level of service in the road segment where the trucks accelerate. Pajarito Road is not accessible by the public.

Bulk materials would be delivered to the 2004 CMRR-NF by either standard three-axle dump trucks (20-ton trucks) or five-axle bottom dump trucks (30-ton trucks). This material would be required over the period when the foundation and shell of the 2004 CMRR-NF are being constructed. Approximately 3,200 cubic yards (2,400 cubic meters) of structural concrete and 5,000 cubic yards (3,800 cubic meters) of other concrete would be required (DOE 2003b). To support the concrete batch plant operation for all concrete operations, the following materials would be required (DOE 2003b):

- Approximately 3,700 tons (3,400 metric tons) of coarse aggregate (180 20-ton trucks or 120 30-ton trucks)
- Approximately 3,700 tons (3,400 metric tons) of fine aggregate (sand) (180 20-ton trucks or 120 30-ton trucks)
- Approximately 1,500 tons (1,400 metric tons) of cement (75 20-ton trucks or 50 30-ton trucks)
- Approximately 800 tons (730 metric tons) of fly ash (40 20-ton trucks or 27 30-ton trucks)
- The No Action Alternative would also require approximately 270 tons (240 metric tons) of structural steel (14 20-ton trucks or 9 30-ton trucks) (DOE 2003b).

Most of the length of Pajarito Road from TA-63 to White Rock was repaved in October 2010 (LANL 2011a:Data Call Tables, 001). It now consists of an average of 4 inches (10.2 centimeters) of asphaltic concrete over 8 inches (20.3 centimeters) of aggregate base course. Consideration of the methods contained in the *AASHTO Guide for Design of Pavement Structures* (AASHTO 1993) indicates that this pavement would withstand the expected truck traffic only if the relative quality of the roadbed soil is "very good" according to American Association of State Highway and Transportation Officials standards. If the relative quality of the roadbed soil is less strong, it is possible that the pavement would fail structurally. A second method of failure would be at the edge of the pavement if that edge is not adequately supported laterally. Pajarito Road has 8-foot, paved shoulders, which would provide the necessary lateral support. The roadway shoulders and especially the edges of the shoulders might be subject to damage if trucks were to use the shoulders on a regular basis.

Construction Impacts – Worker Traffic—Under all alternatives, the workers going to the 2004 CMRR-NF are expected to use the public roadways. A peak of 300 workers is anticipated to commute to parking areas. For this analysis, the peak commuting time of these workers would align with the peak-hour traffic on the adjoining public roadways. Three hundred construction workers are anticipated to add an estimated 200 peak-hour trips. These 200 additional commuter vehicles (300 workers) were added to the existing traffic to determine the anticipated level of service. As shown in **Table 4–13**, the impacts on traffic were compared for the year 2012, the year that construction would start, and 2015, the year that construction would be completed. No change in the level of service of roadways in the vicinity of LANL is anticipated during the construction period.

Operations Impacts—The employees currently working at the existing CMR Building and other facilities at LANL are expected to relocate to the CMRR Facility. There would be no impact from traffic or transportation on the internal LANL road system, the vehicle access portals, or the public roadways external to LANL over the existing conditions.

Table 4–13 No Action Alternative — Expected Levels of Service of Roadways in the Vicinity of Los Alamos National Laboratory

Location / *Year*	*Road Type and Number of Lanes*	*AADT/Year/ Percentage Trucks*	*Existing Traffic* AADT/ Peak Hour/ LOS 2012	*Existing Traffic* AADT/ Peak Hour/ LOS 2015	*No Action Alternative* Peak Hour/ LOS 2012	*No Action Alternative* Peak Hour/ LOS 2015	*Comments (assumed percentage of construction traffic assigned to road segment) (200 VPH)*
SR 4 at Los Alamos County Line to SR 501	Minor arterial/ two lanes	734/ 2009/9	760/ 80/A	780/80/A	100/A	100/A	(10) No change in level of service
SR 4 at Junction Bandelier Park Entrance	Minor arterial/ two lanes	681/ 2009/7	700/ 70/A	710/70/A	90/A	90/A	(10) No change in level of service
SR 4 at Junction of Pajarito Road – White Rock	Minor arterial/ two lanes	9,302/ 2009/9	9,580/ 960/D	9,770/ 980/D	1,140/D	1,160/D	(90) No change in level of service
SR 4 at Junction of Jemez Road	Minor arterial/ two lanes	9,358/ 2009/12	9,640/ 960/D	9,830/ 980/D	1,140/D	1,160/D	(90) No change in level of service
SR 501 at Junction of SR 4 to Diamond Drive	Minor arterial/ two lanes	11,848/ 2009/11	12,210/ 1,220/D	12,460/ 1,250/D	1,260/D	1,290/D	(90) No change in level of service
SR 501 at Junction of Diamond Drive and Onward	Primary arterial/ four lanes	21,211/ 2009/8	21,850/ 2,190/C	22,290/ 2,230/C	2,230/C	2,270/C	(90) No change in level of service
SR 501 at Junction 502	Primary arterial/ four lanes – divided	17,807/ 2009/8	18,350/ 1,840/C	18,720/ 1,870/ C	1,940/C	1,970/C	(20) No change in level of service
SR 502 at Junction Openheimer Street	Primary arterial/ four lanes – divided	12,817/ 2009/6	13,210/ 1,320/C	13,480/ 1,350/C	1,420/C	1,450/C	(20) No change in level of service
SR 502 East of Junction with SR 4	Primary arterial/ four-lane freeway	6,341/ 2009/12	6,530/ 650/A	6,660/ 670/A	670/A	690/A	(10) No change in level of service

AADT = average annual daily traffic; LOS = level of service; SR = State Road; VPH = vehicles per hour.

4.3 Environmental Impacts of the Modified CMRR-NF Alternative

4.3.1 Modified CMRR-NF Alternative

This section presents the environmental impacts associated with the Modified CMRR-NF Alternative. This alternative addresses seismic safety and security concerns associated with the No Action Alternative. Among the concerns identified in the seismic and geologic studies is the presence of a subsurface layer of poorly welded volcanic tuff. The layer would need to be removed or modified to provide a stable medium on which to build the Modified CMRR-NF or the facility would be constructed at a sufficient height above this layer. As a result, two construction options are being considered under the Modified CMRR-NF Alternative.

The Deep Excavation Option would involve excavating the identified footprint another 100 feet (30 meters) to a nominal depth of 130 feet (40 meters), thus removing the poorly welded tuff layer. The excavation would then be backfilled with concrete up to 60 feet (18 meters) to provide a stable surface on which to build. The Shallow Excavation Option would involve constructing the Modified CMRR-NF in the stable geologic layer overlying the poorly welded tuff layer, 17 feet (5.2 meters) above the interface between the two layers.

Additional CMRR Project activities analyzed under this alternative include the following (see Chapter 2, Section 2.6):

- TA-50 electrical substation
- TA-48/55 bus parking lot and TA-72 parking lot
- Pajarito Road realignment and buried utilities relocation activities
- Construction laydown areas and warehouse (TA-46/63 and TA-48/55)
- Construction laydown and support areas (including spoils storage areas) (TA-5/52)
- Concrete batch plants (TA-46/63 and TA-48/55)
- Power upgrades (TA-5 to TA-55)
- Spoils storage areas (TA-36, TA-51, TA-54)
- Stormwater detention ponds (TA-48, TA-50, TA-63, TA-64, TA-72)

As under the No Action Alternative, the Modified CMRR-NF would be linked to the newly constructed RLUOB via an underground tunnel, and another underground tunnel would be constructed to connect the TA-55 Plutonium Facility with the Modified CMRR-NF. The vault for long-term storage of SNM would be within the footprint of the Modified CMRR-NF. Chapter 2, Section 2.6.2, provides a complete description of the Modified CMRR-NF Alternative. The impacts of construction and operation of this proposed facility are described in the following sections for both the Deep Excavation Option and the Shallow Excavation Option. Regardless of the construction option, the impacts from operations would not affect the performance of the building once it was constructed. Under either construction option, the resulting building would meet the current standards required for a PC-3 facility so it would perform the same in the event of a seismic accident. The operations impacts discussed below include those from the operation of RLUOB. The impacts of operating the existing CMR Building would continue during the construction of the Modified CMRR-NF at TA-55. In addition, under the Modified CMRR-NF Alternative, there would be a transition period of 3 years, during which operations impacts could exist in whole or in part from both the existing CMR Building and the Modified CMRR-NF. Disposition of this Modified CMRR-NF is discussed in Section 4.5.

4.3.2 Land Use and Visual Resources

4.3.2.1 Land Use

Construction Impacts – Deep Excavation Option—Construction of the Modified CMRR-NF under the Deep Excavation Option of the Modified CMRR-NF Alternative encompasses numerous project elements that would involve both temporary and permanent facilities. These project elements would have the potential to impact land use within TA-5, TA-36, TA-46, TA-48, TA-50, TA-51, TA-52, TA-54, TA-55, TA-63, TA-64, and TA-72. **Table 4–14** lists the various project elements and the technical areas in which they would occur. Also presented in the table are the total acreages involved and the acreage of land that is presently undeveloped, whether the action would be temporary or permanent, the present land use designation of the area in which each project element would occur, and whether there would be a change in land use. Impacts on land use under the Deep Excavation Option for the various project elements are addressed below.

Table 4–14 Modified CMRR-NF Alternative, Deep Excavation Option — Land Use Impacts

Project Element	*Technical Area*	*Acreage (total/undeveloped)*	*Status*	*Present Land Use*	*Change in Land Use*
Pajarito Road realignment	55	3.4/2	P	Reserve	Yes
Electrical substation	50	1.4/1.4	P	Reserve	Yes
Stormwater detention ponds	50	0.5/0.5	P	Reserve	Yes
	64	1/1	P	Reserve	Yes
Spoils storage areas [a]	36	39.1/39.1	T	High Explosives Testing	Yes
	51	9.1/9.1	T	Reserve	Yes
	54	18.6/18.6	T	Reserve	Yes
Parking lot and associated road improvements	72	13–15/13–15	T	Reserve	Yes
Bus parking lot	48/55	3/3	T	Reserve	Yes
Power upgrades	55 through 50, 63, and 52 to 5	9.1/2	T/P	Along or adjacent to existing rights-of-way within developed areas; however, within TA-52 and -5, the right-of-way is within an area designated Reserve.	No change along portions of the route that are developed; however, land use would change along the portion of the route designated Reserve.
Construction laydown/concrete batch plant	46/63	40/33.5	T	Administrative, Service, and Support (TA-46); Reserve (TA-63)	No (TA-46); Yes (TA-63)
	48/55	20/16	T	Reserve and Experimental Science (TA-48); Theoretical and Computational Science (TA-55)	No (Experimental Science portion of TA-48 and TA-55); Yes (Reserve portion of TA-48)
Construction laydown and support area [a]	5/52	19.1/19.1	T	Reserve	Yes

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; P = permanent; T = temporary; TA = technical area.

[a] About 67 acres (27 hectares) of potential spoils storage area have been identified in TA-36, TA-51, and TA-54; also additional acreage in TA-5/52 could be used for spoils storage. However, only 30 acres (12.1 hectares) are expected to be needed to support this project under the Deep Excavation Option.

Note: To convert acres to hectares, multiply by 0.40469.

Source: LANL 2011a:Data Call Tables, 002, 003, 025, 027.

Pajarito Road Realignment—The realignment of a 0.5-mile (0.8-kilometer) section of Pajarito Road south of the Modified CMRR-NF would disturb 3.4 acres (1.4 hectares) of land on the south side of the road, 2 acres (0.8 hectares) of which have not been previously developed, in addition to requiring movement of the buried utilities. The road shift would ensure proper placement of the Modified CMRR-NF perimeter intrusion security fence in proximity to Pajarito Road (LANL 2010d). The undeveloped portion of the affected area is presently designated as Reserve, indicating that it is vacant land not otherwise included in one of the other land use categories (see Chapter 3, Figure 3–1). Thus, this area would be dedicated to transportation and would fall under the Physical and Technical Support land use category and no longer be classified as Reserve. The realignment would not impact operations at any other facilities along Pajarito Road.

Electrical Substation—If needed, the CMRR Project would install a new substation, as analyzed in the 2008 *LANL SWEIS*, on the existing 115-kilovolt power distribution loop in TA-50, just south of the existing RLUOB construction office trailers. The new substation would be a permanent installation that would provide an independent power feed (about 40 megawatts) to the existing TA-55 complex and the Modified CMRR-NF and RLUOB. The substation would require 1.4 acres (0.57 hectares) (LANL 2010d). This project would result in a permanent change in the land use designation of the area from Reserve to Physical and Technical Support. Instead of installing this substation, another action being evaluated is the installation of a new electrical feed from the TA-3 substation along an existing utilities right-of-way.

Stormwater Detention Ponds—Approximately 1.5 acres (0.6 hectares) would be required for permanent stormwater detention ponds to be located south of Pajarito Road in TA-64 and adjacent to the electrical substation in TA-50. Each of these areas is presently designated as Reserve; however, once the detention ponds are in place, the land use designation would change to Physical and Technical Support. Additional stormwater detention ponds would be located within TA-63 (one temporary and one permanent), TA-48 (temporary), and TA-72 (temporary). However, because these fall within those portions of the technical areas that would be disturbed by other activities, their acreage is not included here to avoid double counting. The existing detention pond at TA-63 that would be enlarged would not experience a change in land use designation. As the project proceeds, there may be a need for additional or larger detention ponds; however, they would be placed within areas already identified and analyzed in this *CMRR-NF SEIS*.

Spoils Storage Areas—Spoils storage would require a total of 30 acres (12.1 hectares) of land. The space needed for excavated materials storage would not have to be collocated; that is, it could be broken up across available acreage. Thus, a number of areas, not all of which would be needed, have been identified that could be used to stage excavated spoils. The determination of which areas would be used would be made at a later date once the exact construction schedule is developed (LANL 2010d). As indicated in Table 4–14, spoils storage could take place within TA-36, TA-51, and TA-54. Land use within the potential spoils areas in TA-51 and TA-54 is designated Reserve, while land use in TA-36 is designated High Explosives Testing. Thus, the use of any of these areas for spoils storage would change the present land use. Temporary spoils storage areas would be restored to a more-natural state after they are no longer needed, which could lead to a re-establishment of the current land use designation.

Parking Lot— Two temporary parking lots are planned under this alternative. A bus parking lot would be constructed straddling the boundary of TA-48 and -55, with capacity for 15 buses. Its construction would disturb 3 acres (1.2 hectares).

A second parking lot for commuters and associated road improvements would be constructed in TA-72 along the south side of East Jemez Road, east of the TA-72 firing range. This lot would have 600 to 800 parking spaces and a truck loop area and would require from 13 to 15 acres (5.3 to 6.1 hectares) (LANL 2010d). Both areas are designated Reserve; thus, their use for temporary parking lot would result in a change in land use designation to Physical and Technical Support. Both parking areas would be restored to a more-natural state after they are no longer required for Modified CMRR-NF construction. This could lead to a re-establishment of the Reserve land use designation.

Power Upgrades—It would be necessary to upgrade power services for the Modified CMRR-NF construction site and support activities. These upgrades could be either temporary or permanent, depending on future power requirements. The power upgrades project would bring in power along a route from the TA-5 eastern technical area substation along Puye Road through TA-5, TA-52, and TA-63, then through TA-50, along Pecos Drive and through a new underground duct to the Modified CMRR-NF site in TA-55. In general, the project would use existing electric utility easements and overhead power poles (LANL 2010d). However, some new overhead poles may be needed, which would disturb an estimated 2 acres (0.8 hectares) of the 9.1 acres (3.7 hectares) total for this activity. The land that would be newly disturbed is primarily in TA-52 adjacent to Puye Road and is presently designated Reserve. It is also possible that underground ducts could be used instead of new overhead poles for this segment of the route. Use of this area would change the land use designation either temporarily or permanently to Physical and Technical Support. Other alternatives for power upgrades are discussed above in the Electrical Substation section.

Construction Laydown and Concrete Batch Plants—The Modified CMRR-NF Project would utilize two areas for construction laydown and support services: one would be located in portions of TA-46 and TA-63 and a second would be located in TA-48 and TA-55. Both areas would provide space for construction office trailers, temporary parking, a concrete batch plant, and construction laydown and storage. Both would also be temporary and would include some areas that were formerly used as material storage and laydown sites. The TA-46/63 site covers 40 acres (16.2 hectares) and is designated Administrative, Service, and Support (TA-46) and Reserve (TA-63). The TA-48/55 site covers 20 acres (8.1 hectares) and is designated Reserve and Experimental Science (TA-48) and Theoretical and Computational Science (TA-55) (LANL 2010d). The use of both construction laydown sites would require some clearing of vegetation and would alter the current land use designation for the duration of the project. However, following construction, the portions of each area currently designated as Reserve would be restored and revert to that designation.

Construction Laydown and Support Area—Construction support would require an area of 19.1 acres (7.7 hectares) within TA-5/52. This area could be used for a variety of construction-related needs, including storage of equipment and spoils. The use of this area during construction of the Modified CMRR-NF would result in a change in its present Reserve land use designation. However, upon completion of construction, the area could be restored to its present condition, thus leading to the re-establishment of its current land use designation.

The duration of the temporary use of land would vary depending primarily on the land use under the project. Land used for batch plants, laydown, support areas, detention ponds, and parking would be revegetated soon after it is no longer needed for the project. Temporary use of land for spoils storage would continue until the spoils are used up (for landscaping or for other construction projects elsewhere).

Construction Impacts – Shallow Excavation Option—Construction of the Modified CMRR-NF under the Shallow Excavation Option would entail the same project elements noted above under the Deep Excavation Option. However, only 10 acres (4 hectares) would be required for spoils storage. Further, the potential spoils storage areas being considered for this option would only include the 19.1-acre (7.7-hectare) site in TA-5/52 and the 9.1-acre (3.7-hectare) site in TA-51. A determination of which areas would be used would be made at a later date after the exact construction schedule is developed (LANL 2010d).

Operations Impacts—Under both of the Modified CMRR-NF Alternative construction options, there would be a land commitment associated with facility operations of 28.1 acres (11.4 hectares), including 4.8 acres (1.9 hectares) for the Modified CMRR-NF, 4 acres (1.6 hectares) for RLUOB, 13 acres (5.3 hectares) for the TA-50 parking lot, 3.4 acres (1.4 hectares) for the Pajarito Road realignment, 1.4 acres (0.6 hectares) for the electrical substation, and 1.5 acres (0.6 hectares) for stormwater detention ponds. There would be no additional change in land use as a result of operations of the Modified CMRR-NF and RLUOB because any changes that would take place would have already occurred during construction.

4.3.2.2 Visual Resources

Construction Impacts – Deep Excavation Option—A general description of the appearance of each technical area affected by the proposed action and alternatives is presented in Chapter 3, Table 3–2. Project elements undertaken under the Deep Excavation Option of the Modified CMRR-NF Alternative would affect the appearance of the individual technical areas in which they would take place. More importantly, when taken together, they have the potential to affect the overall visual environment of LANL. Most development under this option would occur along the central portion of the Pajarito Road corridor; however, spoils storage could occur to the east in TA-36, TA-51, and TA-54. Additionally, a parking lot would be located in TA-72.

As much of the proposed development associated with the various project elements that would take place under the Deep Excavation Option for the Modified CMRR-NF Alternative would occur within or adjacent to developed areas along the central Pajarito Road corridor, there would be little overall change in the industrial appearance of the area. New construction in these areas would generally take place within or adjacent to previously developed areas; thus, it would not represent a significant change in the visual environment. Because Pajarito Road is closed to the public, near views of CMRR-related development along the roadway would be restricted to site workers. As viewed from higher elevations to the west, new development along the central portion of Pajarito Road would result in little change to the area's present appearance. Further, new required lighting would not noticeably change the present nighttime appearance of the site. Overall, there would be no change in the current U.S. Bureau of Land Management (BLM) Visual Resource Contrast Class IV rating along the central portion of Pajarito Road. Visual impacts to the east along Pajarito Road in the vicinity of TA-36, TA-51, and TA-54 could be more noticeable because this portion of the roadway has little adjacent development. Because many project elements are temporary in nature, visual impacts would decrease once the construction phase of the Modified CMRR-NF project is complete and temporarily disturbed areas are restored to a more-natural appearance.

One project element that would be located some distance from the Pajarito Road corridor under this alternative is the TA-72 parking lot, which would be built approximately 0.75 miles (1.2 kilometers) west of the intersection of East Jemez Road and New Mexico State Road 4. Construction of the 13- to 15-acre (5.3- to 6.1-hectare) parking lot would require removal of all vegetation, as well as leveling the site, which would change its natural appearance. The parking lot would be readily seen by both site workers and the general public because traffic along the road is not restricted, as it is along Pajarito Road. In addition, because it would be lit at night, it would be readily seen from East Jemez Road, and the nighttime sky glow would be visible from New Mexico State Road 4 and the Tsankawi Unit of Bandelier National Monument. It would also be readily seen from nearby higher elevations. Installed lighting would comply with the New Mexico Night Sky Protection Act to the extent that it would not compromise security. Development of this part of TA-72 would result in a change in the BLM visual resource contrast rating from Class III to a Class IV. Following completion of the Modified CMRR-NF, the parking lot would be restored to a more-natural state. However, it would take years before the area would return to its predisturbance appearance.

Construction Impacts – Shallow Excavation Option—Impacts on visual resources resulting from implementation of the Shallow Excavation Option would be similar to those described under the Deep Excavation Option. However, only 10 acres (4 hectares) within TA-5/52 and TA-51 would be needed for spoils storage. Thus, overall visual impact of the project during the period when spoils would be stored would be less than under this option compared with the Deep Excavation Option.

Operations Impacts—Once the Modified CMRR-NF becomes operational and the spoils storage area(s) is closed and restored to a more-natural state, the appearance of the involved technical areas under both options for the Modified CMRR-NF Alternative would approximate preconstruction conditions. The

Modified CMRR-NF itself, excluding the cupola roofs, would range from about 20 feet (6 meters) to 55 feet (17 meters) above ground, which would primarily be viewed by LANL employees because Pajarito Road is closed to the public. When viewed from higher elevations to the west, the Modified CMRR-NF and RLUOB would blend in with existing development along the central portion of Pajarito Road. Their presence would not change the BLM Visual Resource Contrast Class IV rating.

4.3.3 Site Infrastructure

Construction Impacts – Deep Excavation Option—Planned and proposed construction activities (see **Table 4–15**) are expected to have a temporary effect on the electrical power requirements at LANL. During the construction phase (about 9 years), the temporary increase in power would be approximately 6 percent of the available (surplus) energy capacity at LANL and would not impact the available energy supply to any current or projected uses. The temporary increase in the peak load demand would be approximately 75 percent of the available (surplus) capacity. With planned upgrades and modifications (see Chapter 2, Section 2.6.2), existing infrastructure would be capable of supporting the construction requirements for the Modified CMRR-NF proposed under this alternative without exceeding site capacities.

Table 4–15 Modified CMRR-NF Alternative, Deep Excavation Option — Site Infrastructure Requirements for Facility Construction

Resource	*Available Site/System Capacity* [a]	*CMRR-NF Project Requirement*	*Percentage of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	513,000	31,000	6
Peak load demand (megawatts)	16	12	75
Fuel			
Natural gas (million cubic feet per year)	5,860	Not applicable	Not applicable
Propane (gallons per year) [b]	Not applicable	19,200	Not applicable
Water (million gallons per year)	130	5	4

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.
[a] A calculation based on the system-wide (site-wide for water) capacity from data provided in Chapter 3, Table 3–3, of this *CMRR-NF SEIS*.
[b] Use of propane would be limited to the winter months for a period of 3 to 6 years.
Note: To convert cubic feet to cubic meters, multiply by 0.028314; gallons to liters by 3.78533.
Source: LANL 2011a:Data Call Tables, 002; Infrastructure, 026.

No natural gas would be needed for construction of the Modified CMRR-NF. Although gasoline and diesel fuel would be required to operate construction vehicles, generators, and other construction equipment, fuel would be procured from offsite sources and, therefore, would not be a limited resource for the purposes of this *CMRR-NF SEIS*. An estimated 19,200 gallons (73,000 liters) of propane would be used annually during a portion of the construction period (3 to 6 years) for heating purposes. The propane would be procured from offsite sources and, therefore, would not be a limited resource for the purposes of this SEIS (LANL 2011a:Infrastructure, 026).

Primary construction water use would be for concrete, site preparation, and earthwork (for example, grading, compaction, dust control). There would be a temporary effect on the water supply at LANL. During the construction phase, it was estimated that approximately 5 million gallons (19 million liters) of water per year (42 million gallons total [159 million liters]) would be needed. This would be approximately 4 percent of the available (surplus) capacity at LANL. The volume of groundwater that would be used is within the retained water right quantity at LANL, which is figured on an annual use ceiling of 542 million gallons (2,000 million liters). However, the site is currently at a baseline of

76 percent of the available capacity due to other site requirements. With the proposed construction included, the site would be at 76.9 percent of capacity. The ROI, which includes water used by LANL and Los Alamos County, is over 91 percent; with the proposed construction included, the total ROI would be at 91.8 percent of capacity.

Construction Impacts – Shallow Excavation Option—Planned and proposed construction activities (see **Table 4–16**) are expected to have a temporary effect on the electrical power requirements. During the construction phase (about 9 years),[7] the temporary increase in power would be approximately 6 percent of the available (surplus) energy capacity and would not impact the available energy supply to any current or projected uses. The temporary increase in the peak load demand would be approximately 75 percent of the available (surplus) capacity. With planned upgrades and modifications, existing infrastructure would be capable of supporting the construction requirements of the Modified CMRR-NF proposed under this alternative without exceeding site capacities.

No natural gas would be needed for construction of the Modified CMRR-NF. Although gasoline and diesel fuel would be required to operate construction vehicles, generators, and other construction equipment, fuel would be procured from offsite sources and, therefore, would not be a limited resource for the purposes of this SEIS. An estimated 19,200 gallons (73,000 liters) of propane would be used annually during a portion of the construction period (3 to 6 years) for heating purposes. The propane would be procured from offsite sources and, therefore, would not be a limited resource for the purposes of this SEIS (LANL 2011a:Infrastructure, 026).

Table 4–16 Modified CMRR-NF Alternative, Shallow Excavation Option — Site Infrastructure Requirements for Facility Construction

Resource	*Available Site/System Capacity* [a]	*CMRR-NF Project Requirement*	*Percentage of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	513,000	31,000	6
Peak load demand (megawatts)	16	12	75
Fuel			
Natural gas (million cubic feet per year)	5,860	Not applicable	Not applicable
Propane (gallons per year) [b]	Not applicable	19,200	Not applicable
Water (million gallons per year)	130	4	3

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; SEIS = supplemental environmental impact statement.

[a] A calculation based on the system-wide (site-wide for water) capacity from data provided in Chapter 3, Table 3–3, of this *CMRR-NF SEIS*.

[b] Use of propane would be limited to the winter months for period of 3 to 6 years.

Note: To convert cubic feet to cubic meters, multiply by 0.028314; gallons to liters by 3.78533.

Source: LANL 2011a:Data Call Tables, 003; Infrastructure, 026.

Similar to the Deep Excavation Option, there would be a temporary effect on the water supply at LANL. During the construction phase (about 9 years), it was estimated that approximately 4 million gallons (15 million liters) of water per year (35 million gallons [130 million liters] total) would be needed. This temporary increase in water use would be approximately 3 percent of the available (surplus) capacity at LANL. The volume of groundwater that would be used is within the retained water right quantity at LANL, which is figured on an annual use ceiling of 542 million gallons (2,000 million liters). However, the site is at a baseline of 76 percent of the available capacity due to other site requirements. With the

[7] *The construction period is the same regardless of the construction option; the additional excavation required for the Deep Excavation Option would occur in parallel with other activities (for example, preparing laydown areas and installing construction utilities) that would occur under both options.*

proposed construction included, the site would be at 76.7 percent of capacity. The ROI, which includes water used by LANL and Los Alamos County, is over 91 percent; with the proposed construction included, the ROI would be at 91.7 percent of capacity.

Operations Impacts—Resources needed to support the projected demands on key site infrastructure resources associated with CMRR Facility operations under the Modified CMRR-NF Alternative are presented in **Table 4–17**. CMRR-NF and RLUOB operations together would require 161,000 megawatt-hours per year, or approximately 31 percent of the available (surplus) energy capacity. The peak electrical demand estimate of 26 megawatts, when combined with the projected site-wide peak demand, would exceed the available (surplus) capacity at the site. The peak load demand assumes all electrical demands are at their peak need at the same time. Actual peak demand for LANL has been below projected levels in the past and well within site capacities (see Chapter 3, Section 3.3.2). Regardless of the decisions to be made regarding the CMRR-NF, adding a third transmission line and/or reconductoring the existing two transmission lines are being studied by LANL to increase transmission line capacities up to 240 megawatts to provide additional capacity across the site.[8] If the proposed TA-50 electrical substation is constructed, it would provide reliable additional electrical power as the independent power feed to the existing TA-55 complex and the CMRR Facility. LANL is also considering establishing an independent power feed to the existing TA-55 complex and the CMRR Facility from TA-3 along existing utility rights-of-way. If additional capacity and reliability can be added to the existing TA-3 substation, this would negate the need to build the proposed TA-50 substation.

Natural gas is used to supply boilers and emergency generators, but is restricted to the utility building attached to RLUOB. The required amount would only use about 1 percent of the available site capacity.

Table 4–17 Modified CMRR-NF Alternative — Site Infrastructure Requirements for Modified CMRR-NF and RLUOB Operations

Resource	*Available Site/System Capacity* [a]	*CMRR Facility Requirement*	*Percentage of Available Site Capacity*
Electricity			
RLUOB energy (megawatt-hours per year)		59,000	
Modified CMRR-NF energy (megawatt-hours per year)		102,000	
Modified CMRR-NF and RLUOB energy (megawatt-hours per year)	*513,000*	*161,000*	*31*
RLUOB peak load demand (megawatts)		11	
Modified CMRR-NF peak load demand (megawatts)		15	
Modified CMRR-NF and RLUOB peak load demand (megawatts)	*16*	*26*	*Exceeds available capacity* [b]
Fuel (million cubic feet per year)			
RLUOB natural gas		38	
Modified CMRR-NF natural gas		20	
Modified CMRR-NF and RLUOB natural gas	*5,860*	*58*	*1.0*
Water (million gallons per year)			
RLUOB water		*7*	
Modified CMRR-NF water		*9*	
Modified CMRR-NF and RLUOB water	*130*	*16*	*12*

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] A calculation based on the system-wide (site-wide for water) capacity from data provided in Chapter 3, Table 3–3, of this CMRR-NF SEIS.

[b] Actual peak demand for LANL has been below projected levels in the past and well within site capacities.

Note: To convert cubic feet to cubic meters, multiply by 0.028314; gallons to liters by 3.78533.

Source: LANL 2011a:Data Call Tables, 005; Infrastructure, 011, 012, 013.

[8] *Evaluated by NNSA in a 2000 environmental assessment,* Environmental Assessment for Electrical Power Systems Upgrades at Los Alamos National Laboratory *(DOE/EA-1247).*

Under this alternative, water would be needed for building mechanical uses, including a demineralization system, and to meet the potable and sanitary needs of facility support personnel. It was estimated that Modified CMRR-NF and RLUOB operations would require about 16 million gallons (61 million liters) of groundwater per year. During operations, the increase in water would be approximately 12 percent of the available (surplus) capacity at LANL. The volume of groundwater that would be used is within the retained water right quantity at LANL, which is figured on an annual use ceiling of 542 million gallons (2,000 million liters). However, the site is at a baseline of 76 percent of capacity. With the proposed operations included, the site would be at 79 percent of capacity. The ROI, which includes water used by LANL and Los Alamos County, is at over 91 percent; with the proposed Modified CMRR-NF and RLUOB operations included, the ROI would be at 92.4 percent of capacity.

4.3.4 Air Quality and Noise

4.3.4.1 Air Quality

For both of the construction options considered under the Modified CMRR-NF Alternative, air quality emissions were calculated for construction activities, transport of materials to and from the work site, transport of personnel from the proposed parking area in TA-72 to the work site, and production of concrete from the temporary batch plants that would be located on site. A detailed discussion of calculation methods is included in Appendix B. Nonradiological air emissions are discussed for both options. There would be no discernable effect on air quality from the use of propane heaters during construction under either construction option because propane burns clean, with little emissions. No radiological emissions would occur during the construction phase.

Construction permits for nonradiological air emissions would be required. Specifically, emissions from combustion sources and concrete batch plant would require construction permits from the New Mexico Environment Department. In addition, pre-construction approval from EPA would be required for radioactive air emissions, in accordance with 40 CFR Part 60, Subpart H. Due to the LANL site-wide operating permit discussed in Chapter 3, Section 3.4.2, a Prevention of Significant Deterioration permit would not be required. It is expected that the LANL site-wide Title V operating permit would require future modification to incorporate permit requirements for construction of the Modified CMRR-NF.

Construction Impacts – Deep Excavation Option—Construction of the Modified CMRR-NF under the Deep Excavation Option would result in temporary emissions from construction equipment, trucks transporting materials, and employee vehicles. Criteria pollutant concentrations at the boundary of TA-55 due to construction activities and at the LANL boundary due to the transport of people and materials were compared to the New Mexico Ambient Air Quality Standards, which are more stringent than the National Ambient Air Quality Standards (see **Table 4–18**). Construction emissions would not exceed the New Mexico Ambient Air Quality Standards or the National Ambient Air Quality Standards for any of the criteria pollutants. These levels are based on the concentrations expected at the boundary of TA-55 during active construction. Actual criteria pollutant concentrations are expected to be less because emission factors were used to complete modeling of construction and associated activities that tend to overestimate impacts. The model generates concentrations based on assumptions for a worst-case scenario. The public would not be allowed access to this area during construction. Emissions calculated to determine potential impacts on the nearest residents located at the Royal Crest Trailer Park, north of the project site, found pollutant concentrations to be well below the most stringent standards. Criteria pollutant concentrations would not exceed the most stringent standards during construction activities or transport of materials to and from the site. Mitigation actions were not considered in the analysis. Actual concentrations are expected to be less than predicted.

Table 4–18 Modified CMRR-NF Alternative, Deep Excavation Option — Criteria Pollutant Emissions Compared to New Mexico State Standards

Criteria Pollutant	Averaging Time	NMAAQS [a] (parts per million)	Calculated Concentration (parts per million)			
			Construction [b]	Concrete Batch [c]	Materials Transport [d]	Personnel Transport [d]
Carbon monoxide	1 hour	13	0.31	N/A	0.35	<<0.01
	8 hours	8.7	0.22	N/A	0.24	<<0.01
Nitrogen dioxide	Annual	0.05	0.02	N/A	<<0.01	<<0.01
Sulfur dioxide	3 hours	0.5 [e]	0.06	N/A	<<0.01	<<0.01
	24 hours	0.1	0.01	N/A	<<0.01	<<0.01
	Annual	0.02	<<0.01	N/A	<<0.01	<<0.01
PM_{10}	24 hours	150 μg/m³ [e]	15 μg/m³	0.26 μg/m³	20 μg/m³	0.06 μg/m³
Total suspended particulates	24 hours	150 μg/m³	15 μg/m³	0.26 μg/m³	20 μg/m³	0.06 μg/m³
	Annual	60 μg/m³	3.0 μg/m³	0.05 μg/m³	4.0 μg/m³	0.01 μg/m³

<< = much less than; μg/m³ = micrograms per cubic meter; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; N/A = not applicable; NMAAQS = New Mexico Ambient Air Quality Standards; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers.

[a] NMAQB 2010.

[b] Construction emissions were modeled using TA-55 as the total area in which pollutants are distributed.

[c] Concrete batch plant emissions were modeled using the area of TA-63 in which pollutants are distributed.

[d] Emissions from mobile sources were modeled using an area that would encompass the length of road used.

[e] EPA 2010c. There are no NMAAQS for PM_{10}; therefore, NAAQS are used here.

The following corrective actions may be used to decrease construction-related emissions. In addition to standard construction emissions controls, emissions from construction equipment may be mitigated by maintaining the equipment to ensure that the emissions control systems and other components are functioning at peak efficiency. Exposed soil during construction activities is a source of particulate matter (fugitive dust) and may be controlled with routine watering. Application of chemical stabilizers to exposed areas and administrative controls such as planning, scheduling, and the use of special equipment could further reduce emissions.

Radiological releases from construction activities are not expected. As described in Chapter 2, Section 2.5, RLUOB has been constructed and the CMRR-NF site has been excavated down to about 30 feet (9.1 meters) already and no contamination was encountered. Any suspected or known contaminated areas from prior LANL activities would be evaluated to identify procedures for working within those areas and to determine the need to remove site contamination. Contaminated soils would be removed as necessary to protect worker health or the environment before construction was initiated. Any contaminated soil removed would be characterized and disposed of appropriately at LANL or an offsite waste management facility.

Construction Impacts – Shallow Excavation Option—The Shallow Excavation Option for the Modified CMRR-NF would also include construction, production of concrete via temporary batch plants, and the transport of personnel and materials to and from the site. Criteria pollutant emissions under the Shallow Excavation Option are summarized in **Table 4–19**. Annual construction and personnel transport emissions are predicted to be comparable to those under the Deep Excavation Option. Less concrete is needed for this option; thus, less particulate matter emissions from the batch plants are expected. Similar to the Deep

Excavation Option, criteria pollutant concentrations would not exceed the most stringent standards during construction activities and transport of materials to and from the site. Emissions calculated to determine potential impacts on the nearest residents located at the Royal Crest Trailer Park, north of the project site, found pollutant concentrations to be well below the most stringent standards.

Table 4–19 Modified CMRR-NF Alternative, Shallow Excavation Option — Criteria Pollutant Emissions Compared to New Mexico State Standards

Criteria Pollutant	*Averaging Time*	*NMAAQS [a] (parts per million)*	*Calculated Concentration (parts per million)*			
			Construction [b]	*Concrete Batch [c]*	*Materials Transport [d]*	*Personnel Transport [d]*
Carbon monoxide	1 hour	13	0.31	N/A	0.27	<<0.01
	8 hours	8.7	0.22	N/A	0.19	<<0.01
Nitrogen dioxide	Annual	0.05	0.02	N/A	<<0.01	<<0.01
Sulfur dioxide	3 hours	0.5 [e]	0.06	N/A	<<0.01	<<0.01
	24 hours	0.1	0.01	N/A	<<0.01	<<0.01
	Annual	0.02	<<0.01	N/A	<<0.01	<<0.01
PM_{10}	24 hours	150 μg/m[e]	15 μg/m³	0.19 μg/m³	15 μg/m³	0.06 μg/m³
Total suspended particulates	24 hours	150 μg/m³	15 μg/m³	0.19 μg/m³	15 μg/m³	0.06 μg/m³
	Annual	60 μg/m³	3.0 μg/m³	0.04 μg/m³	3.0 μg/m³	0.01 μg/m³

<< = much less than; μg/m³ = micrograms per cubic meter; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; N/A = not applicable; NMAAQS = New Mexico Ambient Air Quality Standards; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers.

[a] NMAQB 2010.

[b] Construction emissions were modeled using TA-55 as the total area in which pollutants are distributed.

[c] Concrete batch plant emissions were modeled using the area of TA-63 in which pollutants are distributed.

[d] Emissions from mobile sources were modeled using an area that would encompass the length of road used.

[e] EPA 2010b. There are no NMAAQS for PM_{10}; therefore, National Ambient Air Quality Standards are used here.

Operations Impacts—Operations impacts from nonradiological emissions under the Modified CMRR-NF Alternative would be from the routine testing of seven emergency backup generators. Radiological emissions would be the same as those estimated under the No Action Alternative (see Section 4.2.4.1). **Table 4–20** summarizes the concentrations of criteria pollutants from operations at the Modified CMRR-NF and RLUOB. The maximum ground-level concentrations that would result from Modified CMRR-NF and RLUOB operations at TA-55 would be below ambient air quality standards.

The proximity of the site to the Bandelier National Monument, a Class I Prevention of Significant Deterioration area, requires more-stringent thresholds to maintain a high level of air quality and visibility. The pollutants of interest are: nitrogen dioxide, sulfur dioxide, and particulate matter in two classes, with an aerodynamic diameter less than or equal to 10 and 2.5 microns. The proposed action would not exceed the allowable Prevention of Significant Deterioration increments for a Class I area established in NMAC 20.2.74.504.

Table 4–20 Modified CMRR-NF Alternative — Nonradiological Air Quality Concentrations at Technical Area 55 Site Boundary – Operations

Criteria Pollutant	*Averaging Time*	*NMAAQS (parts per million)* [a]	*Calculated Concentration (parts per million)* [b]
Carbon monoxide	1 hour	13	0.002
	8 hours	8.7	0.001
Nitrogen dioxide	Annual	0.05	0.000079
Sulfur dioxide	3 hours	0.5 [c]	0.001
	24 hours	0.1	0.00018
	Annual	0.02	0.000035
PM_{10}	24 hours	150 µg/m³	0.031 µg/m³
Total suspended particulates	24 hours	150 µg/m³	0.031 µg/m³
	Annual	60 µg/m³	0.006 µg/m³

µg/m³ = micrograms per cubic meter; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; NMAAQS = New Mexico Ambient Air Quality Standards; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers.

[a] NMAAQS are more stringent than the Federal standards; thus, emissions are compared to the latest NMAAQS consistent with other air quality analyses in this *CMRR-NF SEIS*. All emissions were converted from micrograms per cubic meter, as shown in Table 4–10 of the 2003 *CMRR EIS*, to parts per million using the appropriate corrections for temperature (70 degrees Fahrenheit) and a site elevation of 7,229 feet (2,200 meters), in accordance with New Mexico dispersion modeling guidelines (NMAQB 2010).

[b] The annual concentrations were analyzed at locations to which the public has access: the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

[c] NMAAQS does not have a 3-hour standard; thus, the National Ambient Air Quality Standards are used here.

Source: DOE 2003a.

4.3.4.2 Greenhouse Gas Emissions

Construction Impacts – Deep Excavation Option—Under the Deep Excavation Option, construction of the Modified CMRR-NF at TA-55 would result in temporary greenhouse gas emissions from construction equipment, material transport trucks, personnel commutes, propane heaters used during the winter months, and electricity consumption. Operation of the concrete batch plants would not require natural gas, but would require electricity, which is accounted for in the total electricity use presented in **Table 4–21**.

Emissions of greenhouse gases (see Table 4–21) from these construction activities, excluding electricity use, were estimated to be approximately 12,500 tons (11,300 metric tons) of carbon-dioxide equivalent per year. Compared to the 2008 site-wide greenhouse gas baseline emissions, about 440,000 tons (400,000 metric tons) of carbon-dioxide equivalent per year (LANL 2011a:Greenhouse Gases, 015),[9] there would be a minimal and temporary increase (about 2.8 percent) in greenhouse gases from the construction of the Modified CMRR-NF under the Deep Excavation Option.

[9] *The projected LANL site-wide greenhouse gas emissions associated with the electrical usage corresponding to the operations selected in the 2008* LANL SWEIS *RODs would be 543,000 tons per year.*

Table 4–21 Modified CMRR-NF Alternative, Deep Excavation Option — Construction Emissions of Greenhouse Gases

Emissions Scope	Activity	Emissions (tons per year)			
		CO_2	CH_4 CO_2e	N_2O CO_2e	Total CO_2e
Scope 1	Propane Use	123	0	0	123
Scope 3 [a]	Sitework/grading	2,500	0	5	2,500
	Construction	2,500	3	40	2,540
	Materials transport	6,000	1	10	6,010
	Personnel commutes	1,250	2	27	1,280
	Subtotal	12,400	6	82	12,500
Scope 2 [b]	Electricity Use	20,000	6	86	20,100
	Total	32,400	12	168	32,600

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; CO_2 = carbon dioxide; CH_4 CO_2e = methane in carbon-dioxide equivalent; N_2O CO_2e = nitrous oxide in carbon-dioxide equivalent; CO_2e = carbon-dioxide equivalent.

[a] Scope 3 sources include indirect emissions of construction equipment not owned or controlled by LANL.

[b] Scope 2 sources include indirect emissions from the generation of purchased electricity, where the emissions actually occur at sources off site and not at sources owned or controlled by LANL.

Note: Totals may not equal the sum of the contributions due to rounding. To convert tons to metric tons, multiply by 0.90718.

Total greenhouse gases from construction activities, including electricity consumption, would be approximately 32,600 tons (29,600 metric tons) of carbon-dioxide equivalent per year. Greenhouse gas emissions from electricity use during construction of the Modified CMRR-NF Alternative, Deep Excavation Option, would be approximately 4.6 percent of the total site-wide carbon-dioxide-equivalent emissions.

Direct greenhouse gas emissions at LANL are those described as Scope 1. There are no established thresholds for greenhouse gases, but in draft guidance issued February 18, 2010, the CEQ suggested that proposed actions that are reasonably anticipated to cause direct emissions of 27,600 tons (25,000 metric tons) or more of carbon-dioxide equivalent should be evaluated by quantitative and qualitative assessments. This is not a threshold of significance, but an indicator that a quantitative and qualitative assessment may be meaningful to decisionmakers and the public and would require consideration in NEPA documentation. The only direct, or Scope 1, greenhouse gas emissions during construction under the Modified CMRR-NF Alternative, Deep Excavation Option, would be from the use of propane heaters in the winter months. The use of propane would result in emissions of approximately 123 tons (112 metric tons) per year of carbon-dioxide equivalent, which is well below the CEQ suggested level of 27,600 tons (25,000 metric tons) per year set for quantitative and qualitative assessments.

Construction Impacts – Shallow Excavation Option—Under the Shallow Excavation Option, construction at TA-55 would result in temporary greenhouse gas emissions from construction equipment, material transport trucks, personnel commutes, propane heaters used during the winter months, and electricity consumption. Operation of the concrete batch plants would not require natural gas, but would require electricity. Construction and personnel transport emissions annually are similar to the Deep Excavation Option, but with lower emissions from fewer truck trips. Emissions of greenhouse gases (see **Table 4–22**) from these construction activities, excluding electricity consumption, were estimated to be approximately 11,000 tons (10,000 metric tons) of carbon-dioxide equivalent per year.

Total greenhouse gases from construction activities, including electricity consumption, would be approximately 31,100 tons (28,200 metric tons) of carbon-dioxide equivalent per year. The greenhouse gas emissions from electricity use during construction of the Modified CMRR-NF Alternative, Shallow

Excavation Option, are approximately 4.6 percent of the total site-wide carbon-dioxide-equivalent emissions. As with the Deep Excavation Option, the only direct, or Scope 1, greenhouse gas emissions during construction under the Modified CMRR-NF Alternative, Shallow Excavation Option, would be from the use of propane heaters in the winter months. This use of propane would result in approximately 123 tons (112 metric tons) per year of carbon-dioxide equivalent, which is well below the draft CEQ guidance suggested level of 27,600 tons (25,000 metric tons) per year set for quantitative and qualitative assessments.

Table 4–22 Modified CMRR-NF Alternative, Shallow Excavation Option — Construction Emissions of Greenhouse Gases

Emissions Scope	*Activity*	*Emissions (tons per year)*			
		CO_2	*CH_4 CO_2e*	*N_2O CO_2e*	*Total CO_2e*
Scope 1	Propane Use	123	0	0	123
Scope 3 [a]	Sitework/grading	2,500	0	5	2,500
	Construction	2,500	3	40	2,540
	Materials transport	4,600	0	10	4,610
	Personnel commutes	1,200	2	26	1,250
Subtotal		10,900	5	81	11,000
Scope 2 [b]	Electricity use	20,000	6	86	20,100
Total		30,900	11	167	31,100

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; CO_2= carbon dioxide; CH_4 CO_2e = methane in carbon-dioxide equivalent; N_2O CO_2e = nitrous oxide in carbon-dioxide equivalent; CO_2e = carbon-dioxide equivalent.

[a] Scope 3 sources include indirect emissions of construction equipment not owned or controlled by LANL.

[b] Scope 2 sources include indirect emissions from the generation of purchased electricity, where the emissions actually occur at sources off site and not at sources owned or controlled by LANL.

Note: Totals may not equal the sum of the contributions due to rounding. To convert tons to metric tons, multiply by 0.90718.

Operations Impacts—Greenhouse gas emissions during operations of both the CMRR-NF and RLUOB from refrigerants used to cool the building and backup generators are approximately 2,100 tons (1,900 metric tons) per year of carbon-dioxide equivalent. Since there would be no new hires under this alternative, emissions from personnel commutes (Scope 3) already included in the baseline are not included here. Compared to the site-wide greenhouse gas emissions, about 440,000 tons (400,000 metric tons) of carbon-dioxide equivalent per year (LANL 2011a:Greenhouse Gases, 015), there would be a minimal increase (less than 1 percent) in greenhouse gases on site from normal operations of the Modified CMRR-NF and RLUOB.

Direct greenhouse gas emissions at LANL are those described as Scope 1. There are no established thresholds for greenhouse gases, but in draft guidance issued February 18, 2010, the CEQ suggested that proposed actions that are reasonably anticipated to cause direct emissions of 27,600 tons (25,000 metric tons) or more of carbon-dioxide equivalent should be evaluated by quantitative and qualitative assessments. This is not a threshold of significance, but an indicator that a quantitative and qualitative assessment may be meaningful to decisionmakers and the public and would require consideration in NEPA documentation. The only direct (Scope 1) greenhouse gas emissions during operations of the CMRR-NF and RLUOB under the Modified CMRR-NF Alternative would be from backup generators and refrigerants used to cool the building. Together, the Scope 1 emissions during operation of the CMRR-NF and RLUOB under the Modified CMRR-NF Alternative, approximately 2,100 tons (1,900 metric tons), would be below the CEQ suggested level of 27,600 tons (25,000 metric tons) per year set for quantitative and qualitative assessments.

Total greenhouse gases, including both indirect (Scope 2 and 3) and direct (Scope 1) emissions, during operation of the CMRR-NF and RLUOB would be approximately 107,000 tons (97,000 metric tons) of carbon-dioxide equivalent per year (see **Table 4–23**). This is an increase of approximately 25 percent of the total site-wide carbon-dioxide-equivalent emissions per year based on the 2008 baseline inventory for LANL. These greenhouse gases emitted by operations under the Modified CMRR-NF Alternative would add a relatively small increment to emissions of these gases in the United States and the world (see Section 4.6).

Table 4–23 Modified CMRR-NF Alternative — Modified CMRR-NF and RLUOB Operations Emissions of Greenhouse Gases

Emissions Scope	*Activity*	*Emissions (tons per year)*				
		CO_2	*CH_4 CO_2e*	*N_2O CO_2e*	*HFC CO_2e*	*Total CO_2e*
Scope 1 [a]	Refrigerants used	N/A	N/A	N/A	1,860	1,860
	Backup generator	210	2	30	N/A	242
	Subtotal	210	2	30	1,860	2,100
Scope 2 [b]	Electricity use	105,000	30	450	N/A	105,000
	Total	105,000	32	480	1,860	107,000

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; CO_2 = carbon dioxide; CH_4 CO_2e = methane in carbon-dioxide equivalent; N/A = not applicable; N_2O CO_2e = nitrous oxide in carbon-dioxide equivalent; HFC CO_2e = hydrofluorocarbons in carbon-dioxide equivalent; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Scope 1 sources include direct emissions by stationary sources owned or controlled by LANL.

[b] Scope 2 sources include indirect emissions from the generators of purchased electricity, where the emissions actually occur at sources off site and not owned or controlled by LANL.

Note: Totals may not equal the sum of the contributions due to rounding. To convert tons to metric tons, multiply by 0.90718.

4.3.4.3 Noise

Construction noise was evaluated using RCNM [Roadway Construction Noise Model], Version 1.1, the Federal Highway Administration's standard model for the prediction of construction noise (DOT 2006). RCNM has the capability to model types of construction equipment that are expected to be the dominant construction-related noise sources associated with this action. All construction noise analyses were assumed to make use of a standard set of construction equipment. Construction noise impacts are quantified using the 8-hour noise level equivalent ($L_{eq[8]}$) noise metric, as calculated on an average busy working day during construction. The maximum sound level (L_{max}) shows the sound level of the loudest piece of equipment, which is generally the driver of the $L_{eq(8)}$ sound level.

Construction noise was evaluated for one construction site; this evaluation may be applied to each of the sites individually as an assessment of the potential negative effects on sensitive receptors in the vicinity of the construction site. Construction noise was evaluated at 100-foot (30.5-meter) increments from the construction equipment. Noise abatement measures were not considered in this analysis, which provides for a more-conservative analysis. The same types of equipment were assumed to be used on each construction site. At noise levels greater than 65 decibels A-weighted (dBA), the potential for annoyance increases, and at levels above 75 dBA, possible harm to health may occur; thus, noise levels above 65 dBA were used as the significance threshold. **Table 4–24** shows the noise levels expected at receptor distances at 100-foot (30.5-meter) increments and the residential area 0.6 miles (1.0 kilometer) north of TA-55.

Construction Impacts – Deep Excavation Option—On site, all workers potentially exposed to elevated noise associated with their activities would comply with all hearing-protective requirements specified by OSHA. Any other personnel visiting on site also would adhere to the OSHA standards for hearing protection.

Off site, noise experienced on a day-to-day basis depends on the specific activity under way and its proximity to the site edge, where a receptor may be present. Nevertheless, the relatively low time-averaged noise levels calculated indicate that project-related construction activities would not be excessively intrusive.

Table 4–24 Modified CMRR-NF Alternative — Noise Levels During Modified CMRR-NF Construction

Distance from Equipment (feet)	***Maximum Sound Level (L_{max}) [a] dBA***	***Equivalent Sound Level (L_{eq}) [b] dBA***
100	79	81
200	73	75
300	69	72
400	67	69
500	65	67
1000	59	61
Residential area [c]	49	51

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; dBA = decibels A-weighted.
[a] Calculated maximum sound level is the loudest equipment value.
[b] Equivalent sound level is the sound averaged over an 8-hour period.
[c] Residential area located approximately 0.6 miles (1 kilometer) north of TA-55.
Note: To convert feet to meters, multiply by 0.3048.

The areas involving construction are situated within areas already exposed to some form of noise from vehicular highway traffic. Construction noise emanating off site would probably be noticeable in the immediate site vicinity, but is not expected to create adverse impacts. Construction-related noise is intermittent and transitory and would cease at the completion of the project. Construction noise would have no adverse effects on residents with construction noise levels of 51 dBA. No adverse effects of construction noise are expected.

Construction Impacts – Shallow Excavation Option—Noise under the Shallow Excavation Option would be the same as shown under the Deep Excavation Option. This option would be completed in the same amount of time as the Deep Excavation Option; because of the distance to the exposed public, no differences in effects from construction noise are expected.

Operations Impacts—Operations of the Modified CMRR-NF and RLUOB would have noise levels similar to those of existing operations at TA-55. A slight increase in traffic and equipment (such as heating and cooling systems) noise near the area is expected. These noise levels would not cause adverse impacts on wildlife or the public located outside of LANL.

4.3.5 Geology and Soils

Construction Impacts – Deep Excavation Option

Ground Disturbance. Under the Deep Excavation Option, minimal additional land would be disturbed at TA-55. RLUOB has already been constructed adjacent to the proposed Modified CMRR-NF site, and up to 30 feet (9 meters) of the 130-foot (40-meter) excavation required for the Deep Excavation Option of the Modified CMRR-NF has already been completed as part of the geologic evaluation of the site. Additional land disturbance at TA-55 would primarily be associated with installation and construction of infrastructure associated with the Modified CMRR-NF, such as buried utilities and security fence relocation. However, other aspects of the project would result in additional land disturbance (see Section 4.3.2.1).

This construction option requires the excavation of an additional 100 feet (30 meters) of bedrock for construction of the Modified CMRR-NF, as approximately 30 feet (9 meters) of the Modified CMRR-NF excavation has already been completed. Some of the material excavated from TA-55 would be reused as fill for other Modified CMRR-NF infrastructure and construction support-related projects, such as fill for the TA-46/63 and TA-48/55 laydown areas. The remaining amount would be staged at a LANL materials staging area for future reuse on other LANL projects. Reuse of this material at LANL would directly offset the future need to transport purchased fill material from offsite locations, as is currently the case because of the limited amount of suitable fill material available within existing LANL borrow pits.

Although many of the areas to be developed are previously disturbed, the following actions would expose soils to wind and water erosion: removal of vegetation, grading for new laydown areas, and temporary stockpiling of soils adjacent to utility trenches and other infrastructure excavations and in staging areas. See Section 4.3.6 for more information related to erosion impacts. The 2008 *LANL SWEIS* analyzed impacts associated with management of 150,000 cubic yards (115,000 cubic meters) per year of spoils from the Modified CMRR-NF site and other construction projects at LANL (DOE 2008a).

Aggregate Supply. Large tonnages of aggregate would be required to support construction activities at TA-55. Approximately 313,000 tons (284,000 metric tons) of coarse aggregate and 320,000 tons (290,000 metric tons) of fine aggregate (sand) would be required to support all concrete operations, including placement of up to 250,000 cubic yards (227,000 cubic meters) of low-slump concrete fill material in the lower 60 feet (18 meters) of the Modified CMRR-NF excavation.

Additional excavation under the Deep Excavation Option would require the removal of approximately 545,000 cubic yards (417,000 cubic meters) of material. Such material would be suitable for some construction backfill for this project, as well as for construction projects located throughout LANL, but it is unlikely that the characteristics of this material would make it suitable as aggregate for concrete. Similarly, the East Jemez Road Borrow Pit, located in TA-61, which represents good source material for certain construction purposes, is not anticipated to be used as a source for Modified CMRR-NF construction purposes. For purposes of analysis, aggregate for concrete was assumed to come from sources within 100 miles (160 kilometers) of LANL. Aggregate would be procured from existing commercial vendors operating in accordance with all necessary permits. As practical, nearer sources of materials would be used. There are numerous commercial offsite borrow pits and quarries in the vicinity of LANL, including 11 pits or quarries located within 30 miles (48 kilometers) of LANL.

Seismicity. All proposed new facilities would be designed, constructed, and operated in compliance with applicable DOE orders, requirements, and governing standards established to protect public and worker health and the environment. DOE Order 420.1B requires that nuclear or nonnuclear facilities be designed, constructed, and operated so that the public, the workers, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes. The order stipulates the natural phenomena hazards mitigation requirements for DOE facilities. DOE Standard 1020-2002 (DOE 2002a) implements DOE Order 420.1B and provides criteria for the design of new structures, systems, and components to ensure that DOE facilities can safely withstand the effects of natural phenomena hazards, such as earthquakes. See Section 4.3.10.2 for an evaluation of the potential radiological impacts of an earthquake.

As discussed in Chapter 3, Section 3.5.4, in 2007, the *Final Report, Update of the Probabilistic Seismic Hazard Analysis and Development of Seismic Design Ground Motions at the Los Alamos National Laboratory (Probabilistic Seismic Hazard Analysis)* (LANL 2007a), was issued, which provided a better assessment of the seismic behavior during a design-basis earthquake. The seismic hazard analysis was updated again in 2009 (LANL 2009b). As a result, the hazard assessment for the site of the proposed Modified CMRR-NF has been updated so that these data could be used during facility design to meet DOE orders, requirements, and governing standards.

Based on the updated seismic hazard analysis, the geotechnical properties of the bedrock (the structural stability of the rock) at the proposed Modified CMRR-NF location have been further evaluated with respect to the proposed Modified CMRR-NF structure and associated depth of excavation (Kleinfelder 2010a, 2010b). As discussed in Chapter 3, Section 3.5.2, approximately 700 feet (210 meters) of Bandelier Tuff is present beneath the site. The Modified CMRR-NF excavation would be affected by the uppermost units of this geologic formation, consisting of Units 3 (Qbt3) and 4 (Qbt4) of the Tshirege Member of the Bandelier Tuff (see Chapter 2, Figure 2–7). In comparison to the units above and below, the lower part of Unit 3 ($Qbt3_L$) has lower bearing capacity, is more compressible, has higher porosity, and has less cohesion. These rock properties, coupled with the vertical proximity of Unit 3 to the Modified CMRR-NF foundation grade and its lateral proximity to the slope of Twomile Canyon, have led to potentially significant structural design issues, including the following (Kleinfelder 2010a):

- Potential for static deflection (compression)
- Potential for hydro-collapse, due to wetting
- Potential for excessive movement of buttress, due to dynamic slope instability
- Inadequate resistance to dynamic sliding forces
- Seismic shaking and building response

The geotechnical contractor prepared a draft slope stability analysis that indicated that global slope stability is not an issue for the Deep Excavation Option (LANL 2011a:LANL site, 028). If this construction option were selected, as part of the ongoing design and evaluation process, studies would be completed to verify that all geotechnical stability issues had been addressed.

As previously discussed, a 130-foot (40-meter) excavation would be required for the Modified CMRR-NF construction under the Deep Excavation Option. $Qbt3_L$, the poorly welded to nonwelded tuff, occurs from a depth of approximately 75 feet (23 meters) to approximately 125 to 130 feet (38 to 40 meters) below ground surface (Kleinfelder 2010b) (see Chapter 2, Figure 2–7). Therefore, under the Deep Excavation Option, $Qbt3_L$ would be excavated and replaced with concrete fill, as evaluated in the *Phase I Ground Modification Alternatives Feasibility Study, Chemistry and Metallurgy Research Replacement (CMRR) Nuclear Facility, Los Alamos National Laboratory* (Kleinfelder 2010a), and as detailed in the *Work Plan, Excavation Support Design, Chemistry and Metallurgy Research Facility Replacement (CMRR) Project, Los Alamos National Laboratory* (Kleinfelder 2010b). A 10-foot-thick (3-meter-thick) basemat and the Modified CMRR-NF foundation would be constructed directly upon this concrete fill material.

The new structure would be designed and constructed in accordance with the geotechnical analyses and design recommendations provided in the geotechnical reports (Kleinfelder 2007a:46-108, 2010a:23, and 2010b:2-10). These reports have concluded that the substrate is sufficiently strong to withstand the weight of the proposed structure, such that intolerable amounts of seismically and non-seismically induced settlement and lateral shifting of the foundation would not occur. Final geotechnical and structural design calculations would be completed in conjunction with final building design.

To meet the seismic protection design requirements resulting from the *Probabilistic Seismic Hazard Analysis* and other seismic studies (LANL 2005, 2007a, 2008a; Kleinfelder 2010a, 2010b), the Modified CMRR-NF would require large amounts of structural concrete and reinforcing steel for construction of the walls, floors, and roof of the building. These portions of the Modified CMRR-NF would, accordingly, be thicker and heavier than was previously estimated. In addition, most of the worker access areas inside the building would be constructed with solid floors rather than steel grating floors; fire suppression water storage tanks would be located inside the Modified CMRR-NF rather than using existing exterior water storage tanks (the large size and weight of these tanks require additional building structural considerations); various utilities would be installed with added protection measures; and other seismic protection and safety measures would be incorporated into the building design and the installation of equipment.

Volcanism: As discussed in Chapter 3, Section 3.5.1, limited evaluation of volcanic hazards to LANL was undertaken in 2010. The report, *Preliminary LANL Volcanic Hazards Evaluation*, integrated available information on the volcanic history of the region surrounding LANL, and described potential volcanic hazards to LANL from future eruptions in the region (LANL 2010i).

Potential volcanic hazards affecting facilities at TA-55 include ash and pumice falls, mudflows and flooding, seismic activity, lava flows, atmospheric effects (volcanogenic thunderstorms with lightning), and acid rains. The primary hazard to the Modified CMRR-NF would be roof loads of ash and pumice from a silicic eruption and ash and scoria from a basaltic eruption. A related hazard would be mudflows formed by rain containing ashfall and resulting flooding. This possible hazard would be naturally mitigated by the relatively low slopes at TA-55 and the presence of deep canyons that would channel flows from the Jemez Mountains west of Los Alamos. Earthquakes associated with a silicic eruption of this kind could lie in the magnitude 3 to 5 range, based on past eruptions.

Construction Impacts – Shallow Excavation Option

Ground Disturbance. Under the Shallow Excavation Option, additional land would be disturbed at TA-55 beyond that disturbed under the No Action Alternative. RLUOB has already been constructed adjacent to the Modified CMRR-NF site, and up to 30 feet (9 meters) of the 58-foot (18-meter) excavation required for the Shallow Excavation Option of the Modified CMRR-NF has already been completed as part of the geologic evaluation of the site. Excavation of the additional 28 feet (8.5 meters) would require the removal of approximately 236,000 cubic yards (180,000 cubic meters) of material. This material would be managed the same way as discussed under the Deep Excavation Option.

Aggregate Supply. Approximately 120,000 tons (110,000 metric tons) of coarse aggregate and 120,000 tons (110,000 metric tons) of fine aggregate (sand) would be required to support construction under this construction option. Offsite sources of aggregate for concrete would be the same as discussed under the Deep Excavation Option.

Seismicity. As discussed under the Deep Excavation Option, a comprehensive update to the LANL seismic hazard analysis was completed in June 2007 and again in 2009 (LANL 2007a, 2009b). Based on this updated seismic hazard analysis, the geotechnical properties of the bedrock at the proposed Modified CMRR-NF location have been further evaluated with respect to the proposed Modified CMRR-NF structure and associated depth of excavation (Kleinfelder 2007a). Similar to the Deep Excavation Option, the Modified CMRR-NF excavation under the Shallow Excavation Option would be affected by the uppermost units of this geologic formation, consisting of Units 3 (Qbt3) and 4 (Qbt4) of the Tshirege Member of the Bandelier Tuff (see Chapter 2, Figure 2–8). In comparison to the units above and below, the lower part of Unit 3 ($Qbt3_L$) has lower bearing capacity, is more compressible, has higher porosity, and has less cohesion. These rock properties, coupled with its vertical proximity to the Modified CMRR-NF basemat and foundation grade (about 15 feet [4.6 meters] separate $Qbt3_L$ from the proposed foundation) and its lateral proximity to the slope of Twomile Canyon, have led to potentially significant basemat and structural design issues (Kleinfelder 2010a).

Under the Shallow Excavation Option, a 58-foot (18-meter) excavation would be required for the Modified CMRR-NF construction. $Qbt3_L$, the poorly welded to nonwelded tuff, occurs from a depth of approximately 75 feet (23 meters) to approximately 125 to 130 feet (38 to 40 meters) below ground surface (Kleinfelder 2010b) (see Chapter 2, Figure 2–8). Therefore, $Qbt3_L$ would remain in place under this construction option, with about 17 feet (5.2 meters) of vertical separation between $Qbt3_L$ and the 10-foot-thick (3-meter-thick) basemat and foundation. The new structures would be designed and constructed in accordance with geotechnical recommendations provided in the geotechnical report prepared specifically for the Shallow Excavation Option (Kleinfelder 2007a). In addition, the geotechnical report concluded that the 17-foot-thick (5.2-meter-thick) layer of competent material, located below the proposed structure and above $Qbt3_L$, is sufficiently strong to withstand the weight of the proposed structure, such that intolerable amounts of seismically and non-seismically induced settlement and lateral shifting of the foundation would not occur.

The hazards from volcanic eruptions would be the same as those discussed under the Deep Excavation Option.

Operations Impacts—Modified CMRR-NF and RLUOB operations would not impact geologic and soil resources at LANL, as no ground disturbance would occur and no additional geologic resources would be required.

4.3.6 Surface-Water and Groundwater Quality

Water quality impacts are not expected to occur as a result of constructing and operating the Modified CMRR-NF at TA-55. Construction activities could lead to a short-term increase in stormwater runoff, erosion, and/or sedimentation, but potential impacts on surface-water quality would be mitigated through implementation of Stormwater Pollution Prevention Plans (SWPPPs) and their designated controls (best management practices). Groundwater quality impacts are not expected during construction or operations under this alternative.

4.3.6.1 Surface Water

There are no natural surface-water drainages in the vicinity of the proposed Modified CMRR-NF at TA-55, and no surface water would be used to support facility construction. All project areas were reviewed, and it was determined that none would require a New Mexico Section 401 Water Quality Certification or U.S. Army Corps of Engineers 404 Dredge and Fill Permit. During construction, it is expected that portable toilets would be used for construction personnel, resulting in no onsite discharge of sanitary wastewater and no impact on surface waters (DOE 2003b). However, plumbed restrooms made available to construction workers would generate sanitary effluent during the construction period; this effluent would be discharged to sanitary sewer lines for treatment at the Sanitary Wastewater Systems Plant in TA-46, and then piped to TA-3 and discharged to Sandia Canyon via a National Pollutant Discharge Elimination System (NPDES)-permitted outfall (DOE 2008a).

Construction Impacts – Deep Excavation Option—Stormwater runoff from construction activities under the Deep Excavation Option could potentially impact downstream surface-water resources, but would be minimized through stormwater control, implemented as part of an SWPPP, and therefore is not expected to adversely impact downstream surface-water resources. The SWPPP would be prepared, prior to commencement of construction, to implement requirements and guidance from Federal and state regulations under the Clean Water Act, including the NPDES Construction General Permit and Clean Water Act Section 401 and 404 permits. Stormwater management controls, including best management practices for increased stormwater flows and sediment loads, would be included in the construction design specifications (DOE 2008a). To monitor the effectiveness of erosion and sediment control measures, the SWPPP would include a mitigation monitoring program, such as consistent and continual inspection and maintenance, to ensure that an adequate schedule and procedures are in place and implemented.

TA-55 activities are not expected to affect floodplains; TA-55 is not in an area that is prone to flooding, and the nearest 100-year floodplains are located at a distance of approximately 650 feet (200 meters) in Twomile Canyon, 1,900 feet (580 meters) in Mortandad Canyon, and 3,000 feet (910 meters) in Pajarito Canyon, all at much lower elevations.

Construction activities associated with the Modified CMRR-NF and the Pajarito Road right-of-way realignment at TA-50 and TA-55 would not require a New Mexico Section 401 Water Quality Certification or U.S. Army Corps of Engineers 404 Dredge and Fill Permit. However, these construction activities would require an NPDES General Permit for Storm Water Discharge from Construction Activities and an associated SWPPP. If oil, gasoline, diesel fuel, or other petroleum products spill onto the ground, they must be cleaned up, containerized, characterized, and disposed of. Excess materials, such as product debris, equipment, chemicals, waste, concrete, asphalt, and stockpiled soil, are considered wastes and would not be abandoned at the end of the project (NNSA 2010a) (see Section 4.3.12 for discussion of construction waste generation and management). The shifted road segment would be closer to the edge of Twomile Canyon, but would remain on the mesa top and not enter the canyon (LANL 2010d). Potential impacts on surface-water quality due to construction for the Pajarito Road realignment would be minimized through implementation of the SWPPP to control soil erosion in accordance with the NPDES Construction General Permit.

Soil and rock material excavated from the Modified CMRR-NF location would be transported by truck to storage areas within LANL in accordance with routine material reuse practices at the site. Best management practices to control stormwater runoff and minimize erosion and/or sedimentation would be employed to protect surface waters. Management of construction fill is expected to have no effect on surface-water quality. An existing stormwater detention pond would be enlarged at TA-63, and an additional detention pond would be constructed to collect and control runout from the TA-46/63 construction laydown area spanning land across the shared boundary of both technical areas. Another detention pond would be constructed to collect and control runout from the TA-48/55 construction laydown area in TA-64, and two more would be constructed in TA-48 and TA-72 to collect runoff from the parking areas. A smaller detention pond would be constructed in TA-50 to collect and control runoff from the Modified CMRR-NF construction site in TA-55 (LANL 2010d).

An SWPPP would be prepared and implemented for construction of a new, permanent 115-kilovolt electrical substation in TA-50. The new substation, located on approximately 1.4 acres (0.6 hectares), would include construction of a short, unpaved service access road from Pajarito Road to the substation (LANL 2010d). Construction of the 115-kilovolt electrical substation in TA-50 is not expected to negatively impact surface-water quality.

Construction Impacts – Shallow Excavation Option—Implementation of the Shallow Excavation Option is expected to result either in impacts similar to those under the Deep Excavation Option for surface-water quality during construction or reduced impacts because there would be less excavated soil under the Shallow Excavation Option that would need to be controlled for erosion and sedimentation. All of the same stormwater management controls identified under the Deep Excavation Option during construction would be utilized if the Shallow Excavation Option is implemented.

Operations Impacts—No impacts on surface-water quality are expected as a result of Modified CMRR-NF and RLUOB operations under this alternative, including operations at RLUOB. No surface water would be used to support the facility, and there would be no direct discharge of effluent to surface waters during facility operations (LANL 2010d).

The Modified CMRR-NF and RLUOB stormwater control system would be sized to collect and manage flow from both buildings and the surrounding area for up to a 25-year design storm. The system includes design features and best management practices that comply with sustainable design principles, as well as LANL and EPA standards. It would include roof drains, ditches, curbs and gutters, catch basins, manholes, storm sewer pipes, and a stormwater sediment basin or detention pond. The stormwater detention pond (located south of Pajarito Road in TA-50) would control erosion from stormwater runoff by detaining and releasing the storm flow in a controlled manner (LANL 2010d).

4.3.6.2 Groundwater

No impacts on groundwater are anticipated to result from construction and operation of the Modified CMRR-NF and RLUOB.

Construction Impacts – Deep Excavation Option—No onsite discharges that would affect groundwater are planned for construction of the Modified CMRR-NF. Appropriate spill prevention, countermeasures, and control procedures (for example, proper management of hazardous and nonhazardous wastes and materials such as diesel fuel or petroleum, oils, and lubricants from construction equipment) would be utilized to minimize potential releases that could affect groundwater.

Construction Impacts – Shallow Excavation Option—Implementation of the Shallow Excavation Option is expected to result in impacts similar to those under the Deep Excavation Option for groundwater quality during construction.

Operations Impacts—No impacts on groundwater resources (that is, groundwater quality or availability) are anticipated during operations of the Modified CMRR-NF or RLUOB under this alternative. No discharges to the surface or subsurface are planned, and spill prevention, countermeasures, and control procedures would be employed to minimize the probability of, and the potential for, an unplanned release that could infiltrate and affect groundwater (LANL 2010a). (The volume of groundwater required during construction and operations is discussed in Section 4.3.3.)

4.3.7 Ecological Resources

4.3.7.1 Terrestrial Resources

Construction Impacts – Deep Excavation Option—Under the Deep Excavation Option, the affected areas within TA-5, TA-46, TA-48, TA-50, TA-52, TA-55, TA-63, and TA-64 are located on the mesa top and mostly within the ponderosa pine forest vegetation zone; however, areas within TA-36, TA-51, TA-54, and TA-72 are located on mesa tops or canyons at lower elevations to the east and fall within the pinyon-juniper woodland vegetation zone. About 5 acres (2.02 hectares) of undeveloped land, consisting mostly of ponderosa pine forest, would be permanently disturbed by vegetation removal and grading. About 110 – 119 acres (40 – 48 hectares) of undeveloped land, consisting of grasslands, ponderosa pine forest, and pinyon-juniper woodland, would be temporarily disturbed by vegetation removal and grading (see Table 4–14). Pajarito Road realignment, electrical substation, stormwater detention ponds, construction laydown areas, and concrete batch plants are within or adjacent to developed land or have been previously used for material storage and laydown activities (LANL 2010d). Vegetation and habitat would be most impacted by the parking lot located within TA-72; potential spoils storage areas within

TA-51, TA-54, and TA-36; and a construction laydown and support area in TA-5/52. These areas are largely undeveloped and would remove mostly pinyon-juniper woodland. There are several areas of undeveloped land being considered for spoils storage, 30 acres (12.1 hectares) of which would be used on a long-term temporary basis under this construction option. Areas of temporary disturbance would be revegetated using native species following the construction period or, in the case of spoils storage areas, once they are no longer needed (LANL 2010c, 2011a:Data Call Tables, 002).

Where construction would occur on previously developed land, there would be little or no impact on terrestrial resources. Within areas of undeveloped ponderosa pine forest and pinyon-juniper woodland, construction would result in the loss of less-mobile wildlife, such as reptiles and small mammals, and displacement of more-mobile species, such as birds and large mammals. Construction is not expected to impact the movement of wildlife across LANL because the main construction site is located within an area that has been disturbed for many years, adjacent to developed and fenced areas. Other areas needed to support construction are either in built-up areas or are relatively small and would not present a barrier to the movement of animals. No impacts that would violate provisions of the Bald and Golden Eagle Protection Act or the Migratory Bird Treaty Act have been identified. The *Migratory Bird Best Management Practices Source Document for Los Alamos National Laboratory* provides site-wide mitigation measures, including timing of forest clearing to avoid the breeding season of migratory birds (June 1 through July 31), which would reduce risks to birds protected under the Migratory Bird Treaty Act at LANL (LANL 2010h). Indirect impacts of construction, such as noise or human disturbance, could also temporarily impact wildlife living adjacent to the construction zone. All work areas would be clearly marked to prevent construction equipment and workers from disturbing adjacent natural habitat.

Construction Impacts – Shallow Excavation Option—Potential impacts under the Shallow Excavation Option on terrestrial resources at LANL are similar to those expected under the Deep Excavation Option, with the exception that less land is required for spoils storage. Only about 10 acres (4 hectares) would be needed for spoils storage compared to 30 acres (12 hectares) under the Deep Excavation Option. The two potentially impacted areas would be 9.1 acres (3.7 hectares) of mostly undeveloped pinyon-juniper woodland within TA-51 and 19.1 acres (7.7 hectares) of mostly ponderosa pine forest within TA-5/52 along both sides of Puye Road. Spoils storage sites would potentially be established in either one or both of these areas. Potential impacts on terrestrial resources would be the same as discussed above under the Deep Excavation Option.

Operations Impacts—Operations at the Modified CMRR-NF and RLUOB would have a minimal impact on terrestrial resources within or adjacent to TA-55. Because wildlife residing in the area has already adjusted to levels of noise and human activity associated with current TA-55 operations, it is unlikely to be adversely affected by similar types of activity associated with Modified CMRR-NF and RLUOB operations (DOE 2003b).

4.3.7.2 Wetlands

Construction and Operations Impacts – Deep Excavation and Shallow Excavation Options—As noted in Chapter 3, Section 3.7.2, there is one wetland located within TA-55, four within TA-48, and nine within TA-36. Under the Modified CMRR-NF Alternative, no wetlands would be present in the areas where Modified CMRR-NF construction would occur, meaning there would be no direct impacts on wetlands. The wetlands within TA-48 and TA-55 are located in Mortandad Canyon, north of the project area, and would not be affected by construction. However, under the Deep Excavation Option, wetlands located in TA-36 could be indirectly affected by possible spoils storage there, with the potential for stormwater runoff and erosion into the Pajarito watershed if TA-36 is selected for spoils storage. A sediment and erosion control plan would be implemented to control stormwater runoff during construction, preventing impacts on the wetlands located farther down Pajarito Canyon. Under the Shallow Excavation Option, there would be no direct or indirect impacts on any LANL wetlands because TA-36 would not be a potential spoils storage area. No impacts on wetlands are expected as a result of Modified CMRR-NF and RLUOB operations under this alternative.

4.3.7.3 Aquatic Resources

Construction and Operations Impacts – Deep Excavation and Shallow Excavation Options—The only aquatic resources present within the potentially impacted areas under the Modified CMRR-NF Alternative are small pools associated with the wetlands. There would be no direct impacts on these resources from the construction of most project elements associated with the Modified CMRR-NF. There could be indirect impacts on aquatic habitat within wetland areas located in TA-36 under the Deep Excavation Option, although, as stated above, a sediment and erosion control plan would be implemented to control stormwater runoff. No impacts on aquatic resources are expected as a result of Modified CMRR-NF and RLUOB operations under this alternative.

4.3.7.4 Threatened and Endangered Species

Construction Impacts – Deep Excavation Option—As noted in Chapter 3, Section 3.7.4, areas of environmental interest for the Mexican spotted owl and the southwestern willow flycatcher have been established at LANL to protect their potential habitat. Portions of TA-55 and other technical areas affected by construction under the Deep Excavation Option include both core and buffer zones for the federally threatened Mexican spotted owl (see **Table 4–25**). Project elements, including Pajarito Road realignment, electrical substation, stormwater detention ponds, construction laydown areas, and concrete batch plants, are within or adjacent to developed land or land that has been previously used for material storage and laydown activities. Therefore, potential habitat that would be removed for these project elements may affect, but is not likely to adversely affect, the Mexican spotted owl. Other areas of concern that would impact undisturbed land include all potential spoils storage areas within TA-36, TA-51, and TA-54; a construction laydown and support area in TA-5/52; and a parking lot in TA-72 (see Section 4.3.2.1). Of these areas, the construction laydown and support area in TA-5/52 would fall within core and buffer zones of a Mexican spotted owl area of environmental interest and could impact up to 9.7 acres (3.9 hectares) of core zone potential habitat and 12.9 acres (5.2 hectares) of buffer zone potential habitat. Although a small portion of potential Mexican spotted owl habitat would be removed, no owls have been observed in any potentially impacted area, according to annual surveys. A spoils storage area within TA-36 would be adjacent to the southwestern willow flycatcher area of environmental interest and would not remove any potential habitat for this species. However, due to possible erosion concerns affecting wetlands in that area, the potential habitat may be affected. No willow flycatchers of the southwestern subspecies have been confirmed on LANL. As stated earlier, a sediment and erosion control plan would be implemented to control stormwater runoff. After biological evaluation, NNSA determined and U.S. Fish and Wildlife Service concurred, that construction may affect, but is not likely to adversely affect, the Mexican spotted owl or the southwestern willow flycatcher (LANL 2011a:Ecological Resources, 019, 020, 021). NNSA maintains an active process of consultation with the U.S. Fish and Wildlife Service in accordance with requirements of the Endangered Species Act. Consultations resulted in concurrence by

USFWS Concurrence Letters in Response to Biological Assessments for the CMRR Facility

- (May 14, 2003) CMR replacement buildings
- (March 9, 2005) Additional buildings and associated parking lots north and south of Pajarito Road
- (February 7, 2006) An electrical substation
- (September 26, 2007) Additional laydown area for spoils storage and staged equipment and construction and operation of a concrete batch plant
- (August 6, 2009) Moving underground utilities to the south side of Pajarito Road
- (May 2, 2011) Additional spoils storage and staging area and new parking and vehicle turnaround area

U.S. Fish and Wildlife Service with NNSA's determination that construction and operation of the CMRR Facility in TA-55, including use of other areas for construction support activities, may affect, but are not likely to adversely affect, either individuals of threatened or endangered species currently listed by the U.S. Fish and Wildlife Service, or their critical habitat at LANL (see Chapter 5, Section 5.7). All project activities have been reviewed for compliance with the *Threatened and Endangered Species Habitat Management Plan for Los Alamos National Laboratory* (LANL 2011c). In accordance with the plan, annual surveys are performed to determine the location of any special status species and to determine whether any additional consultation with U.S. Fish and Wildlife Service is necessary. Additionally, in accordance with the *Sensitive Species Best Management Practices Source Document, Version 1* (LANL 2010j), best management practices would be implemented for project activities to reduce risks to sensitive state-listed species. Any lighting would be directed away from canyons and comply with the New Mexico Night Sky Protection Act, and disturbance and noise would be kept to a minimum (LANL 2010c).

Table 4–25 Modified CMRR-NF Alternative — Deep Excavation Option, Impacted Areas of Environmental Interest for the Mexican Spotted Owl

Project Element	*Technical Area*	*Mexican Spotted Owl Areas of Environmental Interest Impacted*	*Potential Impacts*
Pajarito Road realignment	55	Core and buffer	Some habitat would be developed. The National Nuclear Security Administration determined that construction may affect, but is not likely to adversely affect, the Mexican spotted owl due to removal of a small portion of potential habitat. No owls have been observed in the areas where project activity would occur under this alternative.
Electrical substation, stormwater detention ponds	50	Core and buffer	
	64	Slightly within buffer	
Spoils storage areas	36	Buffer	
	51	Slightly within buffer	
	54	None	
Parking lot and associated road improvements	72	None	
Bus parking lot	48/55	Buffer	
Power upgrades	55 through 50, 63, and 52 to 5	Core and buffer	
Construction laydown/concrete batch plant	46/63	Buffer and slightly within core	
	48/55	Buffer	
Construction laydown and support area	5/52	Core and buffer	

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.
Source: LANL 2011a:Data Call Tables, 002.

Construction Impacts – Shallow Excavation Option—Potential impacts on threatened and endangered species at LANL under the Shallow Excavation Option are similar to those under the Deep Excavation Option, with the exception that only about 10 acres (4 hectares) of spoils storage would be needed from two areas proposed for spoils storage (TA-51 and TA-5/52).

Operations Impacts— Modified CMRR-NF and RLUOB operations would not directly affect any endangered, threatened, or special status species within or adjacent to TA-55. Noise levels associated with the new facility would be low, and human disturbance would be similar to that which already occurs within TA-55. Nighttime lighting could indirectly affect prey species activities; however, any lighting would meet requirements under the New Mexico Night Sky Protection Act. These effects are not likely to adversely affect the Mexican spotted owl potential habitat areas.

4.3.8 Cultural and Paleontological Resources

Construction Impacts – Deep Excavation Option—Construction of the Modified CMRR-NF under the Deep Excavation Option encompasses numerous project elements that would involve both temporary and permanent facilities. These new facilities would have the potential to impact cultural resources within a number of the affected technical areas. **Table 4–26** lists the various project elements and the technical areas in which they would occur. Also presented are the total acreage involved, whether the action would be temporary or permanent, the number of NRHP-listed and -eligible sites within each technical area that could potentially be affected, and whether any eligible sites would be impacted.

Table 4–26 Modified CMRR-NF Alternative — Cultural Resources Impacts

Project Element	*Technical Area*	*Acreage*	*Status*	*NRHP-Listed and -Eligible Sites in Project Element Vicinity*	*Potential Conflict Between Project Element and NRHP-Listed and -Eligible Sites*
Pajarito Road realignment	55	3.4	P	One rock shelter	No effect through avoidance.
Electrical substation	50	1.4	P	None	
Stormwater detention ponds	50	0.5	P	None	
	64	1	P	None	
Spoils storage areas	36	24.7	T	Three 1- to 3-room structures; two pueblo roomblocks; five complex pueblos; one lithic scatter; and one artifact scatter	No effect through avoidance.
	36	14.4	T	None	
	51	9.1	T	One cavate; two 1- to 3-room structures; and one lithic scatter	No effect through avoidance.
	54	18.6	T	Two 1- to 3-room structures; and two pueblo roomblocks	No effect through avoidance.
Parking lot and associated road improvements	72	13-15	T	Two lithic scatters and rock ring	No effect through avoidance. Northern third of Mortandad Trail would be impacted.
Bus parking lot	48/55	3	T	None	
Power upgrades	55 through 59 to 63	25.2	T/P	None	
	5/52	2	T/P	One 1- to 3-room structure in TA-5	No effect through avoidance.
Construction laydown/concrete batch plant	46/63	40	T	One 1- to 3-room structure and one pueblo roomblock in TA-46	No effect through avoidance.
	48/55	20	T	One 1- to 3-room structure in TA-48	No effect through avoidance.
Construction laydown and support area [a]	5/52	19.1	T	One 1- to 3-room structure in TA-5; two cavates and one rock shelter in TA-52	No effect through avoidance.

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; NRHP = National Register of Historic Places; P = permanent; T = temporary; TA = technical area.

[a] Construction support could include potential use of a portion of the area for spoils storage.

Note: To convert acres to hectares, multiply by 0.40469.

Nine affected technical areas contain NRHP-listed or -eligible sites in the vicinity of project activities (see Table 4–26). In all cases, there would be no effect through avoidance. Under the procedures for compliance with *A Plan for the Management of the Cultural Heritage at Los Alamos National Laboratory, New Mexico* (*Cultural Resources Management Plan*) (LANL 2006a), sites would be clearly marked and fenced, as appropriate, to avoid direct or indirect disturbance by construction equipment and workers. Further, construction activities would be monitored to ensure that the sites remain undisturbed. If buried cultural deposits are encountered during construction, activities would cease until their significance is determined and procedures are implemented in accordance with the *Cultural Resources Management Plan*. In addition, if project plans should change such that impacts become unavoidable, LANL would consult with the New Mexico State Historic Preservation Office in accordance with Section 106 of the National Historic Preservation Act of 1966 prior to any ground disturbance taking place.

In the case of TA-72, the northern third of the Mortandad Trail leading to the Mortandad Cave Kiva would be directly impacted or cut by construction of the parking lot. Access to this trail, and hence Mortandad Cave Kiva, is limited to organized tours. The project would work with LANL cultural resources personnel to re-establish the affected portion of the trail and thus maintain continued limited access to the Mortandad Cave Kiva. However, to help control unauthorized visitation, the parking lot design would incorporate fencing around its perimeter to prevent direct access to the trail.

With respect to traditional cultural properties, it is anticipated that there would be no effect through avoidance. As is the case with other cultural resources, DOE would comply with Section 106 of the National Historic Preservation Act of 1966 should project plans change. Further, DOE would respect the needs of the pueblos during the construction period with regard to times when members might want to participate in ceremonies and rituals (see Chapter 3, Section 3.8.3). There are no known paleontological resources present at TA-55 at LANL. Thus, there would be no impacts on these resources.

Construction Impacts – Shallow Excavation Option—Construction of the Modified CMRR-NF under the Shallow Excavation Option would entail the same project elements noted above for the Deep Excavation Option. However, as only 10 acres (4 hectares) would be required for spoils storage, only TA-5/52 and TA-51 would be considered for this purpose. While NRHP-listed or -eligible sites are found in the vicinity of both spoils storage areas, none are located within either of the areas proposed for spoils storage. Thus, there would be no impact on cultural resources from this element of the project.

Operations Impacts—Operation of the Modified CMRR-NF and RLUOB would not directly impact cultural or paleontological resources. Nevertheless, cultural resources would continue to be periodically monitored, and the fencing would be maintained, as appropriate, to ensure that they remain undisturbed. Impacts on the Mortandad Trail are described above.

4.3.9 Socioeconomics

Construction Impacts – Deep Excavation Option—Construction of the Modified CMRR-NF under the Deep Excavation Option would require a peak construction employment level of about 790 workers (LANL 2011a:Data Call Tables, 002). This level of employment would generate about 450 indirect jobs in the region around LANL. The potential total peak employment of 1,240 direct and indirect jobs represents an increase in the ROI workforce of approximately 0.8 percent. Direct construction employment would average 420 workers annually over this time, approximately half of the estimated peak employment. The average direct construction employment would result in about 240 indirect jobs in the region around LANL. This total of 660 direct and indirect jobs represents an approximate 0.4 percent increase in the ROI workforce. These small increases would have little or no noticeable impact on the socioeconomic conditions of the ROI.

Construction Impacts – Shallow Excavation Option—The impacts under the Shallow Excavation Option from construction of the Modified CMRR-NF would be similar to the Deep Excavation Option. The peak employment number of about 790 construction workers would be the same as under the Deep Excavation Option, and the annual average would be 410 workers over the life of the project. The average direct construction employment would result in about 240 indirect jobs in the region around LANL. This total of 650 direct and indirect jobs represents an approximate 0.4 percent increase in the ROI workforce. Therefore, there would be little or no noticeable impact on the socioeconomic conditions of the ROI.

Operations Impacts—Operations at the Modified CMRR-NF and RLUOB would require a workforce of approximately 550 workers, including workers that would come from other locations at LANL to use the Modified CMRR-NF laboratory capabilities. The number of workers in support of Modified CMRR-NF operations would cause no change to socioeconomic conditions in the LANL four-county ROI. Workers assigned to the Modified CMRR-NF and RLUOB would be drawn from existing LANL facilities, including the CMR Building. The number of LANL employees supporting the Modified CMRR-NF and RLUOB operations would represent only a small fraction of the LANL workforce (approximately 13,500 in 2010) and an even smaller fraction of the regional workforce (approximately 165,000 in 2010).

4.3.10 Human Health Impacts

4.3.10.1 Normal Operations

No radiological risks would be incurred by members of the public from construction activities associated with the Modified CMRR-NF. Construction workers would be at a small risk for construction-related accidents and radiological exposures. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, these workers would be protected through appropriate training, monitoring, and management controls. Their exposure would be limited to ensure that doses are kept as low as is reasonably achievable.

As stated in Chapter 3, Section 3.11.3, there have been no work-related accident fatalities at LANL for over 10 years. Review of the statistics on injury and illness data for DOE construction contractors from 2003 through March of 2010 identified no injuries resulting in death in over 160 million worker hours. Therefore, to estimate the potential for any fatalities during construction, the DOE-contractor average fatality rate of 0.0008 per 200,000 hours worked was used (DOE 2011a).

Construction Impacts – Deep Excavation Option—Under the Deep Excavation Option, construction of the Modified CMRR-NF would require a peak employment level of 790 workers and an average of 420 workers over the approximate 9-year construction period. Using this level of employment and the TRC and DART rates from LANL and DOE, there would be about 95 TRCs of occupational injury and illness and about 47 DART cases. During the same period, an estimated 0 (0.03) work-related fatalities would occur under the Deep Excavation Option from construction activities.

Construction Impacts – Shallow Excavation Option—Consistent with the Deep Excavation Option, construction of the Modified CMRR-NF under the Shallow Excavation Option would require a peak employment level of 790 workers, but an average of 410 workers over an approximate 9-year construction period. Using this level of employment and using the TRC and DART rates from LANL and DOE, there would be about 92 TRCs of occupational injury and illness and about 45 DART cases. During the same period, an estimated 0 (0.03) work-related fatalities would occur under the Shallow Excavation Option from construction activities.

Operations Impacts—Normal operations of the Modified CMRR-NF and RLUOB at TA-55 are not expected to result in an increase in LCFs among the general public. Under this alternative, the radiological releases to the atmosphere from the Modified CMRR-NF and RLUOB at TA-55 would be similar to those estimated in the *CMRR EIS* and provided in **Table 4–27**. The actinide emissions listed in this table are in the form of plutonium, uranium, thorium, and americium isotopes. In estimating the human health impacts, all actinide emissions were considered to be plutonium-239. This is conservative because the human health impacts on a per-curie basis are greater for plutonium-239 than for the other actinides associated with activities at the Modified CMRR-NF. Liquid radiological effluents would be routed through an existing pipeline to the TA-50 RLWTF, where they would be treated along with other LANL radioactive liquid wastes. The treatment residues would be solidified and disposed of as radioactive waste.

Table 4–27 Modified CMRR-NF Alternative — Modified CMRR-NF and RLUOB Radiological Emissions During Normal Operations

Nuclide	*Emissions (curies per year)*
Actinides	0.00076
Krypton-85	100
Xenon-131m	45
Xenon-133	1,500
Hydrogen-3 (tritium) [a]	1,000

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] The tritium release is in the form of both tritium oxide (750 curies) and elemental tritium (250 curies). Tritium oxide is more readily absorbed by the body and, therefore, the health impact of tritium oxide on a receptor is greater than that for elemental tritium. Therefore, all of the tritium release has been conservatively modeled as if it were tritium oxide.

Source: DOE 2003b.

Table 4–28 shows the annual collective dose to the population projected to be living within a 50-mile (80-kilometer) radius of TA-55 in 2030. The *CMRR EIS* provided estimates of annual collective doses to the general population and an MEI from radioactive releases during normal operations. Appendix B of the *CMRR EIS* documented the methodology and assumptions used in estimating the population and MEI doses. These doses were calculated using the Generalized Environmental Radiation Dosimetry Software System – Hanford Dosimetry System (GENII) Version 1.485 computer program (Napier et al. 1988), which used dose conversion factors from Federal Guidance Report No. 11 and No. 12 (EPA 1988 and 1993a). The population dose in the *CMRR EIS* was based on the estimated population surrounding TA-55 in 2000. In this *CMRR-NF SEIS*, the estimated population dose centered at TA-55 is based on the 2030 projected population estimate of about 511,000. In addition, in this SEIS, a revised version of the computer program, GENII Version 2 (PNNL 2007), was used, along with updated dose conversion factors. GENII Version 1.485 overestimated the projected dose by not depleting the radioactive cloud as particles settled during its travel downwind. GENII Version 2 does account for depletion, so even though a larger population was used in the current analysis, the new dose estimates are smaller than those provided in the *CMRR EIS* for the same released quantities of radioactive emissions. In addition, the use of revised dose conversion factors for inhalation from Federal Guidance Report No. 13, which are derived from models based on current understanding of the biological behavior of radionuclides in the body and models representing the U.S. population, resulted in lower estimated doses.

Doses were estimated for the general public living within 50 miles (80 kilometers) of the Modified CMRR-NF at TA-55, an average member of the public, and an offsite MEI (a hypothetical member of the public residing at the LANL site boundary who receives the maximum dose). The dose pathways for these receptors include inhalation, ingestion, and direct exposure from immersion in the passing plume and from materials deposited on the ground. To put the doses into perspective, they are compared to doses from natural background radiation[10] levels.

Table 4–28 Modified CMRR-NF Alternative — Annual Radiological Impacts of Modified CMRR-NF and RLUOB Operations on the Public

	Maximally Exposed Individual	***Population Within 50 Miles (80 kilometers)***	***Average Individual Within 50 Miles (80 kilometers)***
Dose	0.31 millirem	1.8 person-rem	0.0035 millirem
Cancer fatality risk [a]	2×10^{-7}	1×10^{-3}	2×10^{-9}
Regulatory dose limit [b]	10 millirem	Not applicable	10 millirem
Dose as a percentage of the regulatory limit	3.1	Not applicable	0.03
Dose from natural background radiation [c]	480 millirem	250,000 person-rem	480 millirem
Dose as a percentage of background dose	0.041	0.0007	0.0007

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Based on a risk estimate of 0.0006 latent cancer fatalities per person-rem (DOE 2003a).

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

[c] The annual individual dose from background radiation at LANL is 480 millirem (see source of natural background radiation in Chapter 3, Section 3.11.1). The 2030 population living within 50 miles (80 kilometers) of TA-55 was estimated to be about 511,000.

Table 4–28 shows the estimated population dose associated with Modified CMRR-NF operations to be 1.8 person-rem. This population dose would increase the annual risk of a latent fatal cancer in the population by 1×10^{-3}. Another way of stating this is that the likelihood that one fatal cancer would occur in the population as a result of radiological releases associated with this alternative is about 1 chance in 1,000 per year. Statistically, LCFs are not expected to occur in the population from Modified CMRR-NF operations at TA-55.

The average annual dose to an individual in the population would be 0.0035 millirem under this alternative. The corresponding increased risk of an individual developing a latent fatal cancer from receiving the average dose would be 2×10^{-9}, or about 1 chance in 500 million per year.

The MEI would receive an estimated annual dose of 0.31 millirem. This dose corresponds to an increased annual risk of developing a latent fatal cancer of about 2×10^{-7}. In other words, the likelihood that the MEI would develop a fatal cancer is about 1 chance in 5 million for each year of operations.

Estimated annual doses to workers involved with Modified CMRR-NF and RLUOB operations under this alternative are provided in **Table 4–29**. The average annual worker dose for workers involved in Modified CMRR-NF and RLUOB activities was estimated to be about 140 millirem per radiation worker for Modified CMRR-NF activities and 20 millirem per radiation worker for RLUOB activities (LANL 2011a:Data Call Tables, 004, 005). Therefore, a weighted average of about 109 millirem has been used as the estimate of the average annual worker dose per year of operations at the Modified CMRR-NF and RLUOB at TA-55.

[10] The term natural background radiation is used to mean the natural radiation in the environment that the population cannot avoid. It includes a small component of manmade radiation from past nuclear weapons testing.

The average annual worker dose of about 109 millirem is well below the DOE worker dose limit of 5 rem (5,000 millirem) (10 CFR Part 835) and is significantly less than the recommended Administrative Control Level of 500 millirem (DOE 1999b). This average annual dose corresponds to an increased risk of a fatal cancer of 7×10^{-5} for each year of operations. In other words, the likelihood that a worker at the Modified CMRR-NF would develop a fatal cancer from annual work-related exposure is about 1 chance in 14,000.

Table 4–29 Modified CMRR-NF Alternative — Annual Radiological Impacts of Modified CMRR-NF and RLUOB Operations on Workers

	Individual Worker	***Worker Population*** [a]
RLUOB dose/fatal cancer risk [b, c]	20 millirem/1×10^{-5}	2.8 person-rem/2×10^{-3}
Modified CMRR-NF dose/fatal cancer risk [b, c]	140 millirem/8×10^{-5}	57.4 person-rem/3×10^{-2}
Total	Not applicable	60 person-rem/4×10^{-2}
Dose limit [d]	5,000 millirem	Not available
Administrative control level [e]	500 millirem	Not available

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; LANL – Los Alamos National Laboratory; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Based on a radiation worker population of 140 for RLUOB and 410 for the Modified CMRR-NF at TA-55. Dose limits and administrative control levels do not exist for worker populations.

[b] Based on the average dose to LANL workers who received a measurable dose in the period from 2007 to 2009 and specific activities associated with the Modified CMRR-NF (LANL 2011a:Data Call Tables, 004, 005). A program to reduce doses to as low as is reasonably achievable would be employed to reduce doses to the extent practicable.

[c] Based on a worker risk estimate of 0.0006 latent cancer fatalities per person-rem (DOE 2003a).

[d] 10 CFR 835.202.

[e] DOE 1999b.

Based on a worker population of 550 combined in the Modified CMRR-NF and RLUOB, the estimated annual worker population dose would be 60 person-rem. This would increase the likelihood of a fatal cancer within the worker population by about 4×10^{-2} per year. In other words, on an annual basis, there is less than 1 chance in 25 of one fatal cancer developing in the entire worker population as a result of exposures associated with activities under this alternative.

Occupational injury and illness rates under the Modified CMRR-NF Alternative are projected to follow mostly the patterns observed at LANL sites from 1999 through 2008, as discussed in Chapter 3, Section 3.11, and documented in the *LANL SWEIS* (DOE 2008a). The average injury and illness rates at LANL during this period were 2.40 total recordable cases (TRCs) and 1.18 days away, restricted, or transferred (DART) cases (when workers missed days, their activities were restricted, or they were transferred due to an occupational injury or illness) for every 200,000 hours worked (see Chapter 3, Section 3.11). Using these average TRC and DART case rates, it is expected that the workers would experience about 14 TRCs and about 7 DART cases, annually. Comparably, the average rates at DOE facilities are projected to result in 1.6 TRCs and 0.7 DART cases, based on the accident cases from 2004 through 2008 (DOE 2011a). Both of these sets of rates are well below industry averages, which in 2009 were 3.6 TRCs and 1.8 DART cases (BLS 2010a).

Hazardous Chemicals Impacts

No chemical-related health impacts on the public would be associated with the Modified CMRR-NF and RLUOB operations. As stated in the 2008 *LANL SWEIS*, the laboratory quantities of chemicals that could be released to the atmosphere during normal operations are minor quantities and would be below the screening levels used to determine the need for additional analysis. Workers would be protected from adverse effects from the use of hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals.

4.3.10.2 Facility Accidents

The Modified CMRR-NF would include safety features that would reduce the risks of accidents described under the No Action Alternative (2004 CMRR-NF). From an accident perspective, the proposed Modified CMRR-NF built under either construction option would be designed to meet the Performance Category 3 seismic requirements and would have a full confinement system that includes tiered pressure zone ventilation and HEPA filters.

Radiological Impacts

Appendix C of this *CMRR-NF SEIS* provides the methodology and assumptions used in developing facility accident scenarios and estimating doses to the general public within 50 miles (80 kilometers), the offsite MEI, and an onsite worker near the facility. Hazards from volcanic eruptions were reviewed in addition to other possible accidents. Two of the four accidents analyzed for the 2004 CMRR-NF, as described in Section 4.2.10.2, were modified to account for the design changes needed to ensure the Modified CMRR-NF would survive a design-basis earthquake (see Appendix C). The revised seismic accidents would result in lower released quantities of radioactive material because the Modified CMRR-NF would be designed to survive a design-basis earthquake accident; thus, releases from the Modified CMRR-NF due to such an earthquake would be mitigated, whereas the 2004 CMRR-NF would likely fail in the event of such an earthquake. The Modified CMRR-NF would be a much stronger and more seismically resistant structure compared to the 2004 CMRR-NF.

Tables 4–30 and **4–31** provide the accident consequences and risks for the Modified CMRR-NF. Table 4–30 presents the frequencies and consequences of the postulated set of accidents for a noninvolved worker at the technical area boundary (TA-55), a distance of 240 yards (220 meters), the offsite MEI at the nearest public location (0.75 miles [1.2 kilometers] north-northeast of TA-55), and the general population living within 50 miles (80 kilometers) of the facility. Table 4–31 presents the accident risks, obtained by multiplying each accident's consequences by the likelihood (frequency per year) that the accident would occur.

The accident with the highest potential risk to the MEI (see Table 4–31) would be a loading-dock spill/fire caused by mishandling material or an equipment failure (safety-basis scenario). This accident would present an annual risk of an LCF to the offsite MEI of 2×10^{-7}. In other words, the offsite MEI's likelihood of developing a latent fatal cancer from this event is about 1 chance in 5,000,000 per year. The accident with the highest potential risk to the offsite population would be a seismically induced spill of radioactive materials followed by a fire (safety-basis scenario). The seismically induced spill followed by a fire scenario has been changed from that included in the *Draft CMRR-NF SEIS* for the CMRR-NF. In this *Final CMRR-NF SEIS*, this accident assumes that the earthquake initiates a radioactive material spill that is followed shortly thereafter by a fire, instead of both accidents occurring simultaneously. This accident would present an increased risk of a single LCF in the entire population by 5×10^{-5} per year; in other words, the likelihood of one fatal cancer in the entire population from this event would be about 1 chance in 20,000 per year. Statistically, LCFs are not expected to occur in the population. The maximum risk of an LCF to a noninvolved worker would also be from a seismically induced spill and fire (safety-basis scenario); the risk would be 7×10^{-6}, or about 1 chance in 143,000 per year.

Table 4–30 Modified CMRR-NF Alternative — Accident Frequency and Consequences

Accident	*Frequency (per year)*	*Maximally Exposed Individual*		*Offsite Population* [a]		*Noninvolved Worker at TA Boundary*	
		Dose (rem)	*Latent Cancer Fatality* [b]	*Dose (person-rem)*	*Latent Cancer Fatalities* [c]	*Dose (rem)*	*Latent Cancer Fatality* [b]
Safety-Basis Scenarios							
Facility-wide fire	0.0001	1.1	0.0007	700	0 (0.4)	5.9	0.004
Seismically induced spill with mitigation	0.0001	1.5	0.0009	350	0 (0.2)	51	0.06
Seismically induced spill and fire with mitigation [d]	0.0001	2.1	0.001	820	0 (0.5)	54	0.07
Loading-dock spill/fire	0.01	0.028	0.00002	6.6	0 (0.004)	1.0	0.0006
SEIS Scenarios							
Facility-wide fire	0.000001	0.011	0.000007	7.1	0 (0.004)	0.059	0.00004
Seismically induced spill with mitigation	0.0001	0.3	0.0002	71	0 (0.04)	10	0.006
Seismically induced spill and fire with mitigation [d]	0.00001	0.32	0.0002	83	0 (0.05)	10	0.006
Loading-dock spill/fire	0.0001	0.028	0.00002	6.6	0 (0.004)	1.0	0.0006

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; SEIS = supplemental environmental impact statement; TA = technical area.

[a] Based on a projected 2030 population estimate of about 511,000 persons residing within 50 miles (80 kilometers) of TA-55.

[b] Increased likelihood of an LCF for an individual if the accident occurs.

[c] Increased number of LCFs for the offsite population if the accident occurs (results rounded to 1 significant figure). When the reported value is zero, the result calculated by multiplying the collective dose to the population by the risk factor (0.0006 LCFs per person-rem) is shown in parentheses.

[d] In the seismically induced spill and fire accident, two sequential events are considered; first, the seismic spill occurs, then releases of material outside the building occur due to the fire.

Table 4–31 Modified CMRR-NF Alternative — Annual Accident Risks

Accident	*Risk of Latent Cancer Fatality*		
	Maximally Exposed Individual [a]	*Offsite Population* [b, c]	*Noninvolved Worker at TA Boundary* [a]
Safety-Basis Scenarios			
Facility-wide fire	7×10^{-8}	4×10^{-5}	4×10^{-7}
Seismically induced spill with mitigation	9×10^{-8}	2×10^{-5}	6×10^{-6}
Seismically induced spill and fire with mitigation [d]	1×10^{-7}	5×10^{-5}	7×10^{-6}
Loading-dock spill/fire	2×10^{-7}	4×10^{-5}	6×10^{-6}
SEIS Scenarios			
Facility-wide fire	7×10^{-12}	4×10^{-9}	4×10^{-11}
Seismically induced spill with mitigation	2×10^{-8}	4×10^{-6}	6×10^{-7}
Seismically induced spill and fire with mitigation [d]	2×10^{-9}	5×10^{-7}	6×10^{-8}
Loading-dock spill/fire	2×10^{-9}	4×10^{-7}	6×10^{-8}

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; SEIS = supplemental environmental impact statement; TA = technical area.

[a] Increased risk of an LCF to the individual.

[b] Increased risk of an LCF in the offsite population.

[c] Based on a projected 2030 population estimate of about 511,000 persons residing within 50 miles (80 kilometers) of TA-55.

[d] In the seismically induced spill and fire accident, two sequential events are considered; first, the seismic spill occurs, then releases of material outside the building occur due to the fire.

Land contamination—A severe seismic event that results in the failure of building containment also has the potential to release sufficient quantities of plutonium that could lead to land contamination near the facility. Even for the severe earthquakes that result in major damage to the building structure and failure of confinement systems, there should not be large energy sources to drive the materials that would typically be used in the proposed CMRR-NF, such as plutonium metal and oxides, out of the damaged building and rubble. Seismic collapse scenarios that result primarily in spills could release plutonium materials through the rubble, but that material would not generally go far from the building site. Seismic collapse scenarios that involve large fires have the potential to loft materials such that transport of radioactive materials downwind might result in land contamination at levels that could require monitoring or additional actions.

The Modified CMRR-NF Alternative SEIS scenarios involving a seismically induced spill or a seismically induced spill and fire were modeled to evaluate the potential extent of land that might be contaminated above a screening level of 0.2 microcuries per square meter.[11] Estimates of land area that might be contaminated are highly dependent on specific accident source terms and metrological modeling assumptions. This is because the amount of radioactive material that may accumulate on the ground is highly dependent on the size of the particles that get through the building rubble and are released to the environment (which determines how fast they settle back to the ground), specific accident conditions (for example, presence of a fire), and specific meteorological conditions at the time of the earthquake (for example, high winds). In general, unless there is a fire that can effectively loft the plutonium particles into the air, most of the particles would return to the ground within a few hundred meters of the building location. In the event of a seismically induced spill followed by a large fire at the Modified CMRR-NF, no land outside of TA-55 is projected to be contaminated above the screening level.

Areas contaminated above a specified screening level (for example, 0.2 microcuries per square meter) would require further action, such as radiation surveys or cleanup. Costs associated with radiation surveys, cleanup, and continued monitoring could vary widely depending upon the characteristics of the contaminated area and could range in the hundreds of million dollars per square kilometer for land decontamination (NASA 2006). In addition to the potential direct costs, there are potential secondary societal costs associated with the mitigation from such high-consequence accidents. Those costs could include, but may not be limited to, the following:

- Temporary or longer-term relocation of residents
- Temporary or longer-term loss of employment
- Destruction or quarantine of agricultural products
- Land-use restrictions (which could affect real estate values, businesses, and recreational activities)
- Public health effects and medical care

Dose Impacts from Common Failure Mode Seismic Event—If a severe earthquake were to occur in the Los Alamos area, individuals close to and downwind from TA-55 might receive exposure from radioactive material releases at the existing TA-55 Plutonium Facility, as well as from the proposed Modified CMRR-NF, if it were built. The TA-55 Plutonium Facility was originally designed to a lower seismic standard, but is in the process of being upgraded to withstand higher seismic loadings. In the *LANL*

[11] *This* CMRR-NF SEIS *uses a plutonium areal concentration of 0.2 microcuries per square meter as a screening level for determining the lateral extent of contamination that might require cleanup actions (Chanin 1996). This screening level was first proposed by EPA in the late 1970s but never formally adopted. It has been used in many environmental impact statements as a screening level to indicate land areas that would or would not likely require remedial actions.*

SWEIS, a site-wide seismic event that corresponded to approximately a PC-3 earthquake[12] resulted in estimated doses from the Plutonium Facility (TA-55-4), the Storage Facility (TA-55-185), and the Safe, Secure Transport Facility (TA-55-355) of 160 rem to the MEI and 14,880 person-rem to the population residing within 50 miles (80 kilometers) of TA-55. About 150 rem of the dose to the MEI was estimated to be from the TA-55 Plutonium Facility, the remaining 10 rem was from the other two facilities.

By the time the proposed Modified CMRR-NF would be operational, seismic upgrades to the TA-55 Plutonium Facility should be complete, and the facility is expected to be able to survive the current design-basis earthquake with limited releases. Both the Modified CMRR-NF and the upgraded TA-55 Plutonium Facility would have multi-layered defenses to limit releases from storage containers, gloveboxes, equipment, vaults, and the building. The release mechanisms for either the Modified CMRR-NF or the TA-55 Plutonium Facility would be similar, and the total amount of radioactive material that could be released would be more or less proportional to the amounts and forms of materials that might be at risk in either facility. As proposed, the Modified CMRR-NF would likely have much less material at risk in a severe seismic event than the TA-55 Plutonium Facility.

DOE has committed to seismic upgrades to the TA-55 Plutonium Facility such that it would result in an updated safety-basis estimate (NNSA 2011) of mitigated consequences of less than 25 rem to the MEI (the DOE Evaluation Guideline described in DOE Standard 3009) for a seismically induced fire. The 2011 safety basis analysis prepared in support of NNSA's response to the DNFSB concluded that seismically upgrading the fire-suppression system would further reduce calculated offsite consequences to the MEI to the level estimated for the seismically induced spill without fire, which is about 9 rem (NNSA 2011).

Under the Modified CMRR-NF Alternative, the MEI doses for the seismically induced spill or seismically induced spill plus fire from the Modified CMRR-NF are estimated to be about 0.3 rem. For the MEI closest to TA-55, the doses from the Modified CMRR-NF would add directly to those from the other TA-55 facilities. The dose from the TA-55 Plutonium Facility, with its larger inventory, and other TA-55 facilities is still expected to be the major contributor to the MEI dose. When the updated TA-55 facility doses are combined with the projected doses from the Modified CMRR-NF in the event of a very severe earthquake, the dose to the MEI would be about 19 rem (19 rem from the TA-55 Plutonium Facility and other facilities at TA-55 and 0.3 rem from the Modified CMRR-NF), and the 2030 estimated population dose within 50 miles (80 kilometers) of LANL would be about 4,500 person-rem for a seismically induced spill plus fire. Given a severe seismic event accompanied by a fire, these doses represent a probability of the MEI developing a fatal cancer from this dose of 0.023, or approximately 1 chance in 44, and are expected to result in up to 3 LCFs in the population surrounding the site.

Involved Worker Impacts

Approximately 550 workers would be at the Modified CMRR-NF and RLUOB during operations. The impacts on involved workers are very dependent on the type of accident, the severity of the accident, the location of workers, and protective action taken. An additional approximately 900 workers would be in close proximity in the Plutonium Facility. Any workers near an accident could be at risk of serious injury or death. Following initiation of accident and site emergency alarms, workers in adjacent areas of the

[12] *The estimated dose consequences included in the* LANL SWEIS *(DOE 2008b) were based on a PC-3 seismic event with a return period of 2,000 years and a peak horizontal ground acceleration of approximately 0.31 g (the current PC-3 seismic event return period is 2,500 years). The* 2007 Update of the Probabilistic Seismic Hazard Analysis and Development of Seismic Design Ground Motions at the Los Alamos National Laboratory *(LANL 2007a) had been recently issued and an evaluation of the effects of the new data on LANL facilities was just getting underway. The consequences of a current PC-3 seismic event could be higher than estimated in the* LANL SWEIS.

facility would evacuate the area in accordance with technical area and facility emergency operating procedures and training.

Hazardous Chemicals and Explosives Impacts

Some of the chemicals that would be used in the Modified CMRR-NF and RLUOB operations are toxic and carcinogenic. The quantities of the regulated hazardous chemicals and explosive materials stored and used would be well below threshold quantities set by EPA (40 CFR Part 68) and would pose minimal potential hazards to the public health and the environment in an accident condition. These chemicals would be stored and handled in small quantities (10 to a few hundred milliliters) and would only be a hazard to the involved worker under accident conditions.

4.3.10.3 Intentional Destructive Acts

Analysis of the impacts of terrorist incidents on the construction and operation of the Modified CMRR-NF is presented in a classified appendix to this *CMRR-NF SEIS*. The impacts of some terrorist incidents would be similar to the accident impacts described earlier in this section, while some terrorist incidents may have more-severe impacts. A description of how NNSA assesses the vulnerability of its sites to terrorist threats and then designs its response systems is in Section 4.2.10.3.

4.3.11 Environmental Justice

Construction Impacts – Deep Excavation and Shallow Excavation Options—There would be no disproportionately high and adverse environmental impacts on minority or low-income populations due to construction activities at TA-55 under either construction option of the Modified CMRR-NF Alternative. This conclusion is a result of analyses in this *CMRR-NF SEIS* that determined there would be no significant impacts on human health, ecological resources, cultural and paleontological resources, socioeconomics, or other resource areas described in other subsections of this chapter.

Operations Impacts—Population estimates of the entire population and minority and low-income subsets of the population have been projected to the year 2030 (see Section 4.3.10.1 and Chapter 3, Section 3.10). Consistent with the human health analysis, impacts were analyzed on the potentially affected populations within 50 miles (80 kilometers) of TA-55. In addition, impacts on populations in close proximity were analyzed at radial distances of 5, 10, and 20 miles (8, 16, and 32 kilometers).

Table 4–32 shows the impacts on the total and subset populations within 5, 10, and 20 miles (8, 16, and 32 kilometers) of TA-55, the location of the proposed CMRR-NF. The total population within 5 miles (8 kilometers) of TA-55 is projected to receive an annual dose of approximately 0.5 person-rem; the average individual dose is projected to be 0.040 millirem, annually. Within 5 miles (8 kilometers) of TA-55, the average dose to a minority individual would be 0.042 millirem, annually. This dose is very small and represents an increased risk to the exposed individual of developing a latent fatal cancer of 2.5×10^{-8}, or 1 chance in about 40 million, annually. There is no appreciable difference between the estimated dose to the average minority individual (0.042 millirem per year) and the average nonminority individual (0.039 millirem per year). Average annual doses estimated for individuals of other minority population subsets shown in the table would be very small and less than the dose to an average individual of the total population (0.040 millirem per year).

Table 4–32 Modified CMRR-NF Alternative — Comparison of Annual Doses to Total Minority, Hispanic, Native American, and Low-Income Populations Within 5, 10, and 20 Miles (8, 16, and 32 kilometers) and to Average Individuals (in 2030)

	5 Miles (8 kilometers)		*10 Miles (16 kilometers)*		*20 Miles (32 kilometers)*	
	Population (person-rem)	*Average Individual (millirem)*	*Population (person-rem)*	*Average Individual (millirem)*	*Population (person-rem)*	*Average Individual (millirem)*
Total population	0.50	0.040	0.61	0.030	0.84	0.013
Nonminority population	0.31	0.039	0.38	0.030	0.43	0.019
Total minority population	0.18	0.042	0.23	0.030	0.41	0.0094
Hispanic population [a]	0.079	0.034	0.11	0.027	0.27	0.0078
Native American population	0.006	0.039	0.015	0.016	0.034	0.0070
Non-low-income population	0.48	0.040	0.59	0.030	0.79	0.013
Low-income population	0.016	0.040	0.022	0.025	0.058	0.0073

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.
[a] The Hispanic population includes all Hispanic persons, regardless of race.

Doses to persons living below the poverty level are also presented in Table 4–32. The average annual dose to an individual, whether below or above the poverty level, would be 0.040 millirem; this dose represents an increased risk of developing a latent fatal cancer of 2.4×10^{-8}, or about 1 chance in 42 million, annually.

The total population within 10 miles (16 kilometers) of TA-55 is projected to receive an annual dose of approximately 0.61 person-rem; the average individual dose is projected to be 0.030 millirem, annually. The average individual in any minority subset of the population within 10 miles (16 kilometers) would receive an annual dose less than or equal to the average individual (0.030 millirem). This dose is very small and represents an increased risk to the exposed individual of developing a latent fatal cancer of 1.8×10^{-8}, or 1 chance in about 55 million, annually. An individual member of the low-income population would receive an average annual dose of about 0.025 millirem. This dose is less than the average dose that would be received by a member of the total population and represents an increased risk to the exposed individual of developing a latent fatal cancer of 1.5×10^{-8}, or about 1 chance in 68 million, annually.

The total population within 20 miles (32 kilometers) of TA-55 is projected to receive an annual dose of approximately 0.84 person-rem; the average individual dose is projected to be 0.013 millirem, annually. The average annual dose to a member of the nonminority population (0.019 millirem) would be higher than the average annual dose to an individual of the total population (0.013 millirem). The average dose to a member of any of the minority population subsets would be less than the average dose to a member of the total population or nonminority population. The dose to the nonminority average individual is very small and represents an increased risk to the exposed individual of developing a latent fatal cancer of 1.2×10^{-8}, or 1 chance in about 85 million, annually. The average dose to a member of the low-income population would be much lower than the average doses to a member of the non-low-income population and the total population.

As shown in **Table 4–33**, the total population (approximately 511,000) within 50 miles (80 kilometers) of TA-55 under the Modified CMRR-NF Alternative is projected to receive a dose of approximately 1.8 person-rem and an average individual dose of 0.0035 millirem, annually.

Table 4–33 Modified CMRR-NF Alternative — Comparison of Annual Doses to Total Minority, Hispanic, Native American, and Low-Income Populations Within 50 Miles (80 kilometers) and to Average Individuals (in 2030)

	Population (person-rem)	*Average Individual (millirem)*
Total population	1.8	0.0035
Nonminority population	0.82	0.0037
Total minority population	0.95	0.0033
Hispanic population [a]	0.73	0.0031
Native American population	0.071	0.0027
Non-low-income population	1.6	0.0036
Low-income population	0.18	0.0027

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.
[a] The Hispanic population includes all Hispanic persons, regardless of race.

The population subset of nonminority individuals would receive the highest average dose, 0.0037 millirem, annually. This dose is very small and represents an increased risk to the exposed individual of developing a latent fatal cancer of 2.1×10^{-9}, or 1 chance in about 480 million, annually. Doses estimated for the average individual of the following population subsets would all be less than the dose to the average individual of the total population: all (total) minorities, Native Americans, and Hispanics of any race. The total minority population is expected to receive the largest annual collective dose (0.95 person-rem) of the population subsets, because the majority of the population surrounding LANL is considered part of a minority group; the annual average dose to a member of the minority population would be 0.0033 millirem. This dose represents an increased risk to the exposed individual of developing a latent fatal cancer of 2.0×10^{-9}, or about 1 chance in 500 million, annually. Native Americans living within 50 miles (80 kilometers) of TA-55 would receive a collective dose of 0.071 person-rem annually and an average individual dose of 0.0027 millirem, annually. This dose represents an increased risk to the exposed individual of developing a latent fatal cancer of 1.6×10^{-9}, or about 1 chance in 610 million, annually. The Hispanic population would receive a collective dose of 0.73 person-rem annually; the average individual dose to a member of the Hispanic population would be 0.0031 millirem, annually. This dose represents an increased risk to the exposed individual of developing a latent fatal cancer of 1.9×10^{-9}, or about 1 chance in 530 million, annually.

Population doses to persons living below the poverty level are also presented in Table 4–33. The low-income population surrounding TA-55 would receive an annual dose of 0.18 person-rem; the average dose to an individual would be 0.0027 millirem, annually. This dose represents an increased risk to the exposed individual of developing a latent fatal cancer of 1.6×10^{-9}, or about 1 chance in 610 million, annually. Persons living above the poverty level would receive an annual collective dose of 1.6 person-rem; the average dose to an individual would be 0.0036 millirem, annually. This dose represents an increased risk to the exposed individual of developing a latent fatal cancer of 2.1×10^{-9}, or about 1 chance in 480 million, annually.

These data show that the dose to all population subsets surrounding TA-55 at radial distances of 5, 10, 20, and 50 miles (8, 16, 32, and 80 kilometers) would be small and would not result in adverse impacts on human health. Within the 5-, 10-, and 20-mile (8-, 16-, and 32-kilometer) radial distances, the highest population dose projected is to the nonminority population. The average annual individual dose to the minority population slightly exceeds that to the nonminority population within the 5- and 10-mile (8- and 16-kilometer) radial distances; however, there is no appreciable difference between projected doses. Although the annual population dose to the total minority population is projected to be slightly higher than that to the nonminority population within 50 miles (80 kilometers) of TA-55, the difference between doses is also not appreciable. Furthermore, within 50 miles (80 kilometers) of TA-55, the dose to the average individual of the nonminority population is projected to be slightly higher than the projected dose to the average individual of the minority population.

A special pathways receptor analysis was performed in support of the 2008 *LANL SWEIS*. In this analysis, it was determined that a special pathways receptor who consumed increased amounts of fish, deer, and elk from the areas surrounding LANL and drank surface water and Indian tea (Cota) along with other potentially contaminated foodstuffs could receive an additional dose of up to 4.5 millirem per year from these special pathways (see Appendix C, Section C.1.4 of the 2008 *LANL SWEIS* [DOE 2008a]). Doses associated with normal operation of the proposed CMRR-NF would not be expected to increase the doses from these special pathways. Therefore, if the MEI associated with this *CMRR-NF SEIS* were also assumed to be a special pathways receptor, the maximum dose would be up to 4.8 millirem per year (4.5 millirem associated with special pathways and about 0.3 millirem associated with normal operations of the Modified CMRR-NF). This dose is low; it would represent an increase of 1 percent above the approximately 480 millirem that a person residing near LANL would normally receive annually from natural background radiation. In terms of increased risk of a fatal cancer from the special pathways dose plus the dose from normal operations of the CMRR-NF, it would represent an annual estimated risk of 3×10^{-6} or about 1 chance in 333,000.

For nonradiological air quality impacts, as shown in Table 4–20, the concentrations of criteria pollutants as a result of Modified CMRR-NF and RLUOB operations under the Modified CMRR-NF Alternative would remain well below the ambient standards established to protect human health. Therefore, the impact of potential nonradiological air pollutant releases on minority or low-income individuals under this alternative would not be considered significant.

Nonradiological air quality impacts are discussed in Section 4.3.4.1. Nonradiological releases due to CMRR-NF or RLUOB operations under the Modified CMRR-NF Alternative would be the same as those discussed under the No Action Alternative. The maximum concentration of criteria pollutants from Modified CMRR-NF and RLUOB operations would be below ambient standards established to protect human health. Therefore, the impact of potential nonradiological air pollutant releases on minority or low-income individuals under this alternative would be considered minor.

Potential impacts on cultural resources at LANL are discussed in Section 4.3.8. There are several sites of cultural significance in the vicinity of project activities. There would be no impacts on these resources through avoidance. Therefore, no adverse impacts on cultural resources at LANL or surrounding communities are expected from implementing this alternative.

Residents of the Pueblo of San Ildefonso have expressed concern that pollution from CMRR Facility operations could contaminate Mortandad Canyon, which drains onto pueblo land and sacred areas. CMRR Facility operations under this alternative are not expected to adversely affect air. There would be no direct liquid discharges, and stormwater management controls would be in place to collect stormwater and prevent washout and soil erosion. Thus, there would be no contamination of tribal lands adjacent to the LANL boundary. Impacts on surface-water and groundwater quality are discussed in Section 4.3.6.

As discussed in Section 4.3.13, there are not expected to be any significant impacts on transportation routes or traffic in the area surrounding LANL during construction or operations as a result of implementing this alternative. A separate analysis has been included in Section 4.3.13 on the specific impacts of transporting radioactive materials from LANL to Pojoaque and from Pojoaque to Santa Fe, transportation routes that include sections through tribal lands. The results of this analysis show that the incident-free population risks are small, at most 2×10^{-5} or 1 chance in 50,000 that the radiological dose to the public from this transportation would result in a latent cancer fatality in the affected population. Similarly, accident risks associated with this transportation on these routes are small, at most 4×10^{-4} or

1 chance in 2,500 that a traffic accident involving one of the trucks would result in a fatality in the affected population.

These data show that the total minority, Native American, Hispanic, and low-income populations would not be subjected to disproportionately high and adverse impacts from normal operations of the Modified CMRR-NF and RLUOB at TA-55.

4.3.12 Waste Management and Pollution Prevention

Construction Impacts – Deep Excavation and Shallow Excavation Options—Under either construction option, acreage would be disturbed in several technical areas in addition to TA-55. Surveys have been conducted to identify potential release sites (PRSs), and no unidentified or unexpected soil contamination or buried media have been encountered (LANL 2010d). There are, however, known PRSs located within the affected technical areas (for example, Material Disposal Area [MDA] C in TA-50), and the potential for contact with contaminated soil or other media would be appropriately considered throughout the construction process. For example, PRS-48-001 is being evaluated for potential impacts resulting from actions in the TA-48/55 laydown and concrete batch plant area. Proper precautions would be taken as needed to minimize the potential disturbance of this or other PRSs. As needed, actions such as appropriate documentation and contaminant removal would be taken by the LANL Environmental Restoration Program in accordance with the 2005 Consent Order[13] and other applicable requirements. Wastes that might be generated from these actions have not been specifically analyzed because the types and quantities of waste are unknown. Possible waste volumes that could result from site-wide remediation activities were, however, projected in the 2008 *LANL SWEIS* (see Chapter 3, Section 3.12).

Modified CMRR-NF construction would principally generate nonhazardous solid waste under either the Deep or Shallow Excavation Option. If small quantities of other radioactive or nonradioactive wastes are generated, as experienced during RLUOB construction, the wastes would be managed in accordance with standard LANL procedures (see Chapter 3, Section 3.12). Sanitary wastewater generated as a result of construction activities would be managed using some plumbed restrooms and portable toilet systems, with sanitary wastewater from the restrooms transferred to the Sanitary Wastewater Systems Plant in TA-46 for treatment. No other nonhazardous liquid wastes are expected.

Total and peak annual quantities of construction waste (construction debris and sanitary solid waste generated by construction workers) were estimated for both construction options and are summarized in **Table 4–34**. Under the Modified CMRR-NF Alternative, regardless of the excavation option, the same peak annual waste quantities would be generated and the same total quantity of construction waste (2,600 tons [2,400 metric tons]) would be generated since the difference is due to excavation and other activities during which little construction waste would be generated. Using an average waste density of 0.5 tons per cubic yard, 340 tons (308 metric tons) of peak annual waste would represent about 1 percent of the 59,000 to 62,000 cubic yards (45,000 to 47,000 cubic meters) of construction and demolition waste annually projected in the 2008 *LANL SWEIS* (see Table 4–57).

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[13] In March 2005, the New Mexico Environment Department, DOE, and the LANL management and operating contractor entered into a Compliance Order on Consent (Consent Order) (NMED 2005). The purposes of the Consent Order are (1) to define the nature and extent of releases of contaminants at, or from, LANL; (2) to identify and evaluate, where needed, alternatives for corrective measures to clean up contaminants in the environment and prevent or mitigate the migration of contaminants at, or from, LANL; and (3) to implement such corrective measures.

Table 4–34 Modified CMRR-NF Alternative — Construction Debris and Sanitary Solid Waste Generation for Construction of the Modified CMRR-NF

Construction Option	*Construction Waste (tons)* [a]	
	Total	***Peak Annual***
Deep Excavation	2,600	340
Shallow Excavation	2,600	340

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.
[a] Construction waste includes construction debris and sanitary solid waste generated by construction workers.
Note: Estimates have been rounded. To convert tons to metric tons, multiply by 0.90718.

The waste would be collected in appropriate waste containers such as dumpsters or rolloffs and regularly disposed of or recycled by transfer to the Los Alamos County Eco Station located at the Los Alamos County Landfill site within the LANL boundary or by transfer to an offsite solid waste facility permitted to accept the waste. Waste transferred to the Los Alamos County Eco Station would be separated into materials suitable for recycle or disposal, and both types of materials would be shipped for offsite disposition. Because the Los Alamos County Eco Station is permitted to accept construction and demolition waste, as well as municipal solid waste, it is expected that the Los Alamos County Eco Station would be able to accept the bulk of the projected waste from the Modified CMRR-NF construction. If waste is generated that is not acceptable at the Los Alamos County Eco Station (for example, petroleum-contaminated soil or other special waste), or for other reasons such as convenience to the government, then the waste would be transferred to an appropriate, permitted offsite facility for disposition.

No impacts on available solid waste management capacity are expected because of the small quantity of waste to be managed annually (340 tons [308 metric tons] of combined construction debris and sanitary solid waste) compared to the total quantities of solid waste addressed on a county and state basis and the large number of available waste disposition facilities within New Mexico. Including the Los Alamos County Eco Stations, 239 landfills, recycling facilities, composting facilities, or transfer stations of convenience were permitted in New Mexico as of July 2009, including 19 facilities permitted to accept special waste, such as petroleum-contaminated soil (NMED 2009). The projected annual quantity of Modified CMRR-NF construction debris and sanitary solid waste represents only about 1 percent of the waste processed in 2009 at the Los Alamos County Eco Station (Nagawiecki 2010).

Operations Impacts—Projected annual waste generation rates for operations at the Modified CMRR-NF and RLUOB are summarized in **Table 4–35** (LANL 2010c), along with projected overall LANL activities based on information from the 2008 *LANL SWEIS* (DOE 2008a; LANL 2010a). In the following discussion, waste generation rates projected in this *CMRR-NF SEIS* from operation of the Modified CMRR-NF and RLUOB are compared to waste generation rates projected in the 2008 *LANL SWEIS* from operation of the CMR Building and site-wide LANL operations. Radioactive solid and liquid wastes generated from Modified CMRR-NF and RLUOB operations would constitute only fractions of the total quantities of each of these generated wastes (see Table 4–35).

Note that a transition period would initially occur, during which operations at the CMR Building would be transferred to the Modified CMRR-NF. During this transition period, wastes would be generated at both the CMR Building (see Section 4.4.12) and the Modified CMRR-NF and RLUOB, although the annual rates may be less at either facility than the rates estimated in Table 4–35 and in Section 4.4.12.[14] Both on- and offsite waste management capacity are sufficient for this transition period.

[14] *Operations at the Modified CMRR-NF and RLUOB would be limited initially and then increase at the same time that CMR Building operational activities would decrease.*

Table 4–35 Modified CMRR-NF Alternative — Operational Waste Generation Rates Projected for Modified CMRR-NF, RLUOB, and Los Alamos National Laboratory Activities

Waste Type	*Projected Modified CMRR-NF Generation Rate* [a]	*Projected RLUOB Generation Rate* [a]	*Projected Modified CMRR-NF and RLUOB Generation Rate*	*Site-wide LANL Projections*
Transuranic and mixed transuranic (cubic yards per year)	88	0	88	440 to 870 [b]
Low-level radioactive (cubic yards per year)	2,510	130	2,640	21,000 to 115,000 [b]
Mixed low-level radioactive (cubic yards per year)	23.7	2.3	26	320 to 18,100 [b]
Chemical (tons per year) [c]	11.9	0.5	12.4	3,200 to 5,750 [b]
Sanitary solid (tons per year) [d]	71	24	95	– [e]
Sanitary wastewater (gallons per year)	8,315,000	2,485,000	10,800,000	156,000,000 [f]
Radioactive liquid (gallons per year)	248,000 [g]	95,800	344,000	4,000,000 [h]

CMRR-NF = Chemistry and Metallurgy Research Replacement Project Nuclear Facility; LANL = Los Alamos National Laboratory; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] From *CMRR-NF Project and Environmental Description Document* (LANL 2010d) and other sources (LANL 2011a:Data Call Tables, 004, 005).

[b] Projected waste quantities from LANL operations are given as a range in the *LANL SWEIS* (DOE 2008a). The listed value reflects the assumption of the Expanded Operations Alternative in the *LANL SWEIS*, less the waste projected from some activities that were not implemented (see Table 4–57).

[c] Chemical waste is not a formal LANL waste category; however, as was done in the 2008 *LANL SWEIS* (DOE 2008a), the term is used in this *CMRR-NF SEIS* to denote a variety of materials, including hazardous waste regulated under the Resource Conservation and Recovery Act; toxic waste regulated under the Toxic Substances Control Act; and special waste designated under the New Mexico Solid Waste Regulations, including industrial waste, infectious waste, and petroleum-contaminated soil.

[d] The projected quantity of Modified CMRR-NF and RLUOB sanitary solid waste (municipal trash) was estimated by multiplying the projected annual number of full-time equivalent radiation workers (140 for RLUOB and 410 for the Modified CMRR-NF) by an assumed annual 344 pounds of waste generated per person per year (see Chapter 3, Section 3.12.2).

[e] Annual sanitary solid waste quantities were not projected in the 2008 *LANL SWEIS*.

[f] The value shown is the annual volume of wastewater processed at the Sanitary Wastewater Systems Plant in TA-46, assuming operation at its 600,000-gallon-per-day design capacity for 260 working days per year (DOE 2003b). Sanitary wastewater and nonradioactive liquid waste are both projected to be routed to the Sanitary Wastewater Systems Plant for treatment.

[g] Includes 247,000 gallons per year of liquid low-level radioactive waste and 950 gallons per year of liquid transuranic waste at the Modified CMRR-NF (Balkey 2011).

[h] The value shown is the projected annual liquid low-level radioactive waste treatment rate at RLWTF assuming implementation of the No Action Alternative in the 2008 *LANL SWEIS*; annual treatment of 30,000 gallons of liquid transuranic waste was also projected (DOE 2008a).

Note: To convert cubic yards to cubic meters, multiply by 0.76456; tons to metric tons, by 0.90718; gallons to liters, by 3.78533.

Transuranic and Mixed Transuranic Wastes

Activities at the Modified CMRR-NF would generate transuranic and mixed transuranic wastes that would be packaged in containers in accordance with the WIPP waste acceptance criteria and shipped to WIPP for disposal. The combined annual volume of transuranic and mixed transuranic wastes (88 cubic yards [67 cubic meters]) is about 60 percent larger than that projected for the CMR Building operations in the 2008 *LANL SWEIS* (DOE 2008a). It would represent only about 10 to 20 percent of the annual 440 to 870 cubic yards (340 to 670 cubic meters) of combined transuranic and mixed transuranic waste projected for site-wide LANL operations in the 2008 *LANL SWEIS*. The Modified CMRR-NF would be designed and operated to accommodate the projected waste volumes, and no difficulty in managing the waste for shipment to WIPP is expected on either a facility or a site-wide LANL basis.

Over 50 years of Modified CMRR-NF and RLUOB operations (DOE 2003b), about 4,400 cubic yards (3,400 cubic meters) of transuranic and mixed transuranic wastes would be generated. The total WIPP capacity for transuranic waste disposal is set at about 219,000 cubic yards (168,000 cubic meters) of contact-handled transuranic waste pursuant to the Waste Isolation Pilot Plant Land Withdrawal Act (DOE 2002b). Estimates in the *Annual Transuranic Waste Inventory Report – 2010* (DOE 2010b) indicate that about 185,000 cubic yards (141,000 cubic meters) of contact-handled transuranic waste would be disposed of at WIPP, about 36,000 cubic yards (27,500 cubic meters) less than the contact-handled transuranic waste permitted capacity. The projected 50-year total of 4,400 cubic yards (3,400 cubic meters) of transuranic and mixed transuranic waste from Modified CMRR-NF and RLUOB operations would require about 12 percent of the unsubscribed WIPP disposal capacity.

Because the total quantity of transuranic waste that may be disposed of at WIPP is statutorily established, and the operating period for WIPP will depend on the volumes of transuranic waste that may be disposed of at WIPP, WIPP may meet its statutory disposal limit before the end of the operational period of the Modified CMRR-NF. If necessary, transuranic or mixed transuranic waste generated without a disposal pathway would be safely stored pending development of additional disposal capacity.

Low-Level Radioactive Waste

Solid low-level radioactive waste generated from Modified CMRR-NF and RLUOB operations would be characterized and packaged for disposal. Disposal would occur off site at the Nevada National Security Site (NNSS) (formerly known as the Nevada Test Site) or at a commercial disposal facility or could occur on site while Area G continues to accept waste. Typical disposal containers would include B-25 boxes and 55-gallon (208-liter) drums. About 2,640 cubic yards (2,020 cubic meters) of solid low-level radioactive waste would be generated annually, including the solid low-level radioactive component of liquid wastes treated through RLWTF or a similar facility. This projected volume would represent a 10 percent increase in the low-level radioactive waste annually projected for the CMR Building in the 2008 *LANL SWEIS* (DOE 2008a). The projected waste from Modified CMRR-NF and RLUOB operations would represent about 2 to 13 percent of the projected annual site-wide LANL volume (21,000 to 115,000 cubic yards [16,000 to 88,000 cubic meters]).

Because the Modified CMRR-NF and RLUOB would be designed, constructed, and operated to accommodate the projected waste volumes for the facilities, no difficulties are expected in packaging and staging this waste pending transfer to LANL Area G or shipment to offsite disposal facilities. Disposal capacity is also expected to be available. Annual generation of 2,640 cubic yards (2,020 cubic meters) of low-level radioactive waste from the Modified CMRR-NF and RLUOB operations would represent about 4 percent of the average low-level radioactive waste disposal rate at the NNSS[15] and about 2 percent of the current low-level radioactive waste disposal rate at the commercial facility in Clive, Utah.[16]

[15] For the 5 years from 2004 through 2008, an annual average of 62,900 cubic yards (48,000 cubic meters) of low-level radioactive waste and 1,540 cubic yards (1,180 cubic meters) of mixed low-level radioactive waste was disposed of at NNSS (Gordon 2009).
[16] Based on estimates for three-quarters of calendar year 2010, extrapolated to 1 year (Hultquist 2010).

Mixed Low-Level Radioactive Waste

Mixed low-level radioactive waste generated from Modified CMRR-NF and RLUOB operations would be packaged and temporarily stored pending transport off site to a commercial treatment, storage, and disposal facility and/or to the NNSS in Nevada. Typical shipment packages would include B-25 boxes and 55-gallon (208-liter) drums. The projected 26 cubic yards (20 cubic meters) of mixed low-level radioactive waste from Modified CMRR-NF operations would be only slightly larger than the annual rate projected from the CMR Building in the 2008 *LANL SWEIS* (DOE 2008a). The projected Modified CMRR-NF and RLUOB volume would represent about 0.1 to 8 percent of the 320 to 18,100 cubic yards (240 to 14,000 cubic meters) of mixed low-level radioactive waste projected for LANL in the 2008 *LANL SWEIS*.

Sufficient offsite treatment, storage, and disposal capacity is expected for the mixed low-level radioactive waste projected from Modified CMRR-NF and RLUOB operations. Several permitted commercial treatment, storage, and disposal facilities exist in the United States (for example, in Florida, Tennessee, Texas, Washington, and Utah), in addition to the mixed low-level radioactive waste disposal capacity available at the NNSS in Nevada, and additional facilities may be used as they are available and appropriate for the waste contents or characteristics. The projected mixed low-level radioactive waste from the Modified CMRR-NF and RLUOB would represent about 2 percent of the average mixed low-level radioactive waste disposal rate at the NNSS[17] and less than 1 percent of the current mixed low-level radioactive waste disposal rate at the commercial facility in Clive, Utah.[18]

Chemical Waste

Chemical waste is not a formal LANL waste category; however, as was done in the 2008 *LANL SWEIS* (DOE 2008a), the term is used in this *CMRR-NF SEIS* to denote a broad category of materials, including hazardous wastes, toxic wastes, and special waste designated under the New Mexico Solid Waste Regulations. Chemical waste generated from Modified CMRR-NF and RLUOB operations would be packaged and shipped to offsite permitted recycle or treatment, storage, and disposal facilities, typically in 55-gallon (208-liter) drums. Temporary storage before offsite shipment may occur at the Modified CMRR-NF and RLUOB or at a permitted LANL storage area. About 12.4 tons (11.2 metric tons) of chemical waste would be generated annually from Modified CMRR-NF and RLUOB operations. This projected rate is only slightly larger than the chemical waste projected for the CMR Building in the 2008 *LANL SWEIS* (DOE 2008a). The projected Modified CMRR-NF and RLUOB operations chemical waste quantity would represent from 0.2 to 0.4 percent of the annual chemical waste projection for LANL in the 2008 *LANL SWEIS*. The Modified CMRR-NF and RLUOB would be designed and operated to accommodate this waste, and no difficulty in managing this waste for shipment for offsite disposition is expected on either a facility or a site-wide LANL basis. Adequate offsite waste disposition capacity is expected for the chemical waste projected from Modified CMRR-NF and RLUOB operations because of the large number of permitted facilities that exist within New Mexico and neighboring states.

Sanitary Solid Waste

Based on the projected number of full-time equivalent workers at the Modified CMRR-NF and RLUOB (550) and the assumption that each worker generates 344 pounds (156 kilograms) of sanitary solid waste (municipal trash) annually (see Chapter 3, Section 3.12.2), about 95 tons (86 metric tons) of sanitary solid

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[17] For the 5 years from 2004 through 2008, an annual average of 62,900 cubic yards (48,000 cubic meters) of low-level radioactive waste and 1,540 cubic yards (1,180 cubic meters) of mixed low-level radioactive waste was disposed of at NNSS (Gordon 2009).
[18] Based on estimates for three-quarters of calendar year 2010, extrapolated to 1 year (Hultquist 2010).

waste would be generated annually. This waste would be collected in appropriate waste containers, such as dumpsters, and regularly disposed of or recycled by transfer to the Los Alamos County Eco Station located at the Los Alamos County Landfill site within the LANL boundary or by transfer to an offsite solid waste facility permitted to accept the waste. No impacts on available solid waste management capacity are expected because of the small quantity of sanitary solid waste that would be generated at the Modified CMRR-NF and RLUOB compared to the total quantities of solid waste addressed annually on a county and state basis and the large number of available waste disposition facilities within New Mexico. Ninety-five tons (86 metric tons) of sanitary solid waste generation would represent only about 0.3 percent of the waste processed in 2009 at the Los Alamos County Eco Station (see the *Construction Impacts* discussion within this section).

Sanitary Wastewater

Approximately 10,800,000 gallons (40,900,000 liters) of sanitary wastewater would be generated annually from Modified CMRR-NF and RLUOB operations; this wastewater would to be sent to the Sanitary Wastewater Systems Plant in TA-46 (see Chapter 3, Section 3.12.1). The projected wastewater volume from the Modified CMRR-NF and RLUOB would include 7,300,000 gallons (27,600,000 liters) for sanitary flow and 3,500,000 gallons (13,200,000 liters) for reject water from the facility demineralization water treatment system.[19] This wastewater flow would represent only about 7 percent of the 600,000-gallon-per-day (2.27-million-liter-per-day) design capacity of the Sanitary Wastewater Systems Plant in TA-46, assuming 260 working days per year (DOE 2003b). Therefore, no impacts on available sanitary wastewater treatment capacity are expected from Modified CMRR-NF and RLUOB operations.

Radioactive Liquid Waste

Modified CMRR-NF and RLUOB operations are projected to generate about 344,000 gallons (1.3 million liters) of liquid low-level radioactive waste annually, including about 950 gallons (3,600 liters) of liquid transuranic waste. This liquid waste would be transferred for treatment to RLWTF in TA-50 (Balkey 2011). The treatment process would generate solid low-level radioactive waste (for example, solidified liquids) that would be managed as discussed above. The annual volume of radioactive liquid waste from the Modified CMRR-NF and RLUOB would represent only about 8.5 percent of the annual volume of 4 million gallons (15 million liters) of liquid low-level radioactive waste and 3 percent of the 30,000 gallons (110,000 liters) of liquid transuranic waste projected for RLWTF in the 2008 *LANL SWEIS* (see Table 4–35). The projected liquid waste generation rates from Modified CMRR-NF and RLUOB have been considered in LANL forecasts for annual receipt of liquid waste at RLWTF (Balkey 2011), and no impacts on radioactive liquid waste treatment and discharge capacity are expected from its operation.

4.3.13 Transportation and Traffic

4.3.13.1 Transportation

The risk of transporting radioactive materials can be affected by a number of factors. These factors are predominantly categorized as either radiological or nonradiological impacts. Radiological impacts are those associated with the accidental release of radioactive materials and the effects of low levels of radiation emitted during normal, or incident-free, transportation. Nonradiological impacts are those

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[19] *All water supplied to the CMRR-NF would be treated in a demineralization unit to remove silica. This treatment process would reduce maintenance of boilers and other major equipment and increase equipment durability and operating life. The demineralization unit produces treated water that would be supplied to the CMRR-NF and reject water that would be discharged through the CMRR-NF sanitary wastewater system (LANL 2010d).*

associated with the transportation itself, regardless of the nature of the cargo, such as accidents resulting in death or injury when there is no release of radioactive material.

In addition to calculating the radiological risks that would result from all reasonable accidents during transportation of radioactive wastes, NNSA assessed the highest consequences of a maximum reasonably foreseeable accident with a radioactive release frequency greater than 1×10^{-7} (1 chance in 10 million) per year along the route. The consequences were determined for average atmospheric conditions. For additional information on the assumptions and methods used in the transportation analysis, see Appendix B.

At LANL, radioactive materials (for example, SNM, low-level radioactive waste, transuranic waste) are transported both on site (between the technical areas) and off site to multiple locations. Onsite transportation constitutes the majority of activities that are part of routine operations in support of various programs. The impacts of these activities are part of the impacts of routine operations at these areas. For example, worker dose from handling and transporting radioactive materials is included as part of the worker dose from operational activities. Specific analyses performed in the 2008 *LANL SWEIS* (DOE 2008a) indicate that the projected collective radiation dose for LANL drivers from the projected onsite shipments was, on average, less than 1 millirem per transport. A review of onsite radioactive materials transportation under all alternatives in this *CMRR-NF SEIS* indicates that the 2008 *LANL SWEIS* projection of impacts would envelop the impacts for routine onsite transportation.

Transport of SNM, equipment, and other materials currently located at the CMR Building to a Modified CMRR-NF at TA-55 would occur over a period of 3 years on open or closed roads. The public is not expected to receive any measurable exposure from the one-time movement of radiological materials associated with this action. CMR Building workers could receive a minimal dose from shipping and handling of SNM during the transition from the existing CMR Building to the Modified CMRR-NF at TA-55. Based on a review of radiological exposure information in calendar year 2009, the average dose to LANL workers (including CMR Building workers and material handlers) is about 100 millirem per year. Because the transition to operations at the Modified CMRR-NF at TA-55 would occur over multiple years, the material handler worker dose would be similar to those for normal operations currently performed at the CMR Building.

Offsite transportation of radioactive materials would occur using trucks. The radioactive materials that would be transported include low-level radioactive waste and transuranic waste. For analysis purposes in this *CMRR-NF SEIS*, the destinations for disposal of radioactive wastes were limited to DOE disposal sites such as the NNSS in Nevada and a commercial waste disposal site such as the Energy*Solutions* disposal site in Clive, Utah; disposal of transuranic waste was assumed to occur at WIPP in New Mexico. The analyzed routes for these shipments are shown in Appendix B, Figure B–1.

Table 4–36 provides the estimated number of annual offsite shipments of operational wastes under each action alternative. This table also provides the estimated number of offsite shipments resulting from activities associated with construction of the Modified CMRR-NF at TA-55.

Table 4–36 Estimated Annual Offsite Shipments Under the Action Alternatives

Alternative	*Annual Number of Shipments*					
	Operational Wastes				*Construction Shipments* [a]	
	Low-Level Radioactive Waste	*Mixed Low-Level Radioactive Waste*	*Transuranic Waste*	*Hazardous Waste*	*Nonhazardous Waste*	*Materials* [b]
Modified CMRR-NF Alternative, Deep Excavation Option	176	2	13	2	20	4,300
Modified CMRR-NF Alternative, Shallow Excavation Option	176	2	13	2	20	3,300
Continued Use of CMR Building Alternative	21	1	2	1	0	0

CMR = Chemistry and Metallurgy Research; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.
[a] Construction values are annualized values based on estimates on construction durations (about 9 years under the Modified CMRR-NF Alternative, Deep Excavation Option and Shallow Excavation Option).
[b] Materials include construction commodities: cements, gravel, sand, ash, structural and rebar steel, etc. These numbers are rounded to the nearest 100 shipments.

Construction Impacts

Routine (Incident-Free) Transportation – Deep Excavation Option—Under the Deep Excavation Option, about 4,300 shipments of construction-generated nonhazardous waste and construction commodities would be made annually (see Table 4–36). The nonhazardous waste would be transported to a regional disposal site in New Mexico (for example, Mountainair, about 130 miles [210 kilometers] away), and the construction commodities would be transported to TA-55 from a distance of up to 100 miles (160 kilometers) for sand, cement, and gravels and up to 500 miles (800 kilometers) for steels. Using these estimates, the total annual projected (one-way) distance traveled on public roads transporting construction materials to and from LANL would be about 470,000 miles (750,000 kilometers). The estimated total transportation is conservative because it assumes that all offsite material shipments would be from a distance of 100 to 500 miles (160 to 800 kilometers). It is likely that many of these shipments would be less than 100 miles (160 kilometers) because shipments of most of these materials should be obtained from Albuquerque or closer. Because no radioactive materials would be transported during construction, no radiological risks would be incurred by members of the transportation crew (truck drivers) from construction activities.

Routine (Incident-Free) Transportation – Shallow Excavation Option—Under the Shallow Excavation Option, about 3,300 shipments of construction-generated nonhazardous waste and construction commodities would be made annually (see Table 4–36). Based on the assumptions described above regarding materials and waste shipment distances, the total annual projected (one-way) distance traveled on public roads transporting construction materials to and from LANL would be about 380,000 miles (610,000 kilometers). As discussed above under the Deep Excavation Option, the estimated total transportation is conservative because it assumes that all offsite material shipments would be from a distance of 100 to 500 miles (160 to 800 kilometers). Because no radioactive materials would be transported during construction, no radiological risks would be incurred by members of the transportation crew (truck drivers) from construction activities.

Transportation Accidents – Deep Excavation Option—Under the Deep Excavation Option, the impacts of transporting construction materials were evaluated in terms of the distance traveled and number of expected traffic accidents and fatalities. The annual transportation impacts under this option would be 0 (0.3) traffic accidents and no (0.03) traffic fatalities. For the approximately 9 years to complete the project, these impacts would be 3 (2.5) traffic accidents and no (0.3) traffic fatalities.

Transportation Accidents – Shallow Excavation Option—Under the Shallow Excavation Option, the impacts of transporting construction materials were evaluated in terms of distance traveled and number of expected traffic accidents and fatalities. The annual transportation impacts under this option would be 0 (0.2) traffic accidents and no (0.02) traffic fatalities. For the approximately 9 years to complete the project, these impacts would be 2 (2.1) traffic accidents and no (0.2) traffic fatalities.

Operations Impacts

Routine (Incident-Free) Transportation—**Table 4–37** summarizes the total transportation impacts, as well as transportation impacts on two nearby LANL transportation routes: (1) LANL to Pojoaque, New Mexico, the route segment used by trucks from LANL, and (2) Pojoaque to Santa Fe, New Mexico, the route segment used by trucks traveling on Interstate 25 (such as trucks traveling to WIPP). For analysis purposes in this SEIS, two sites, the NNSS and a commercial facility in Utah, were selected as possible disposal sites for all low-level radioactive wastes should the decision be made to dispose of low-level radioactive waste off site rather than on site. Differences in distance to these two sites and the affected population along the transportation routes result in a range of impacts under each alternative.

Table 4–37 Modified CMRR-NF Alternative — Annual Risks of Transporting Operational Radioactive Materials

Transport Segments	Offsite Disposal Option [a]	Number of Shipments	Round Trip Kilometers Traveled (thousand)	Incident-Free: Crew: Dose (person-rem)	Incident-Free: Crew: Risk [b]	Incident-Free: Population: Dose (person-rem)	Incident-Free: Population: Risk [b]	Accident: Radiological Risk [b]	Accident: Nonradiological Risk [b]
LANL to Pojoaque	NNSS	191	11.9	0.07	4×10^{-5}	0.02	1×10^{-5}	4×10^{-9}	2×10^{-4}
Pojoaque to Santa Fe		191	19.9	0.12	7×10^{-5}	0.04	2×10^{-5}	4×10^{-9}	4×10^{-4}
Total Route		191	461	2.5	2×10^{-3}	0.8	5×10^{-4}	1×10^{-7}	7×10^{-3}
LANL to Pojoaque	Commercial	191	11.9	0.07	4×10^{-5}	0.02	1×10^{-5}	4×10^{-9}	2×10^{-4}
Pojoaque to Santa Fe [c]		13	1.4	0.03	2×10^{-5}	0.01	5×10^{-6}	2×10^{-9}	3×10^{-5}
Total Route		191	399	2.2	1×10^{-3}	0.7	4×10^{-4}	1×10^{-7}	6×10^{-3}

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; LANL = Los Alamos National Laboratory; NNSS = Nevada National Security Site.

[a] Under this option, low-level radioactive waste would be shipped to either the NNSS or a commercial site in Utah. Transuranic waste would be shipped to WIPP.

[b] Risk is expressed in terms of latent cancer fatalities, except for the nonradiological, where it refers to the number of traffic accident fatalities.

[c] Shipments of low-level radioactive waste to a commercial disposal site in Utah would not pass along the Pojoaque to Santa Fe segment of highway.

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

Under this alternative, about 191 offsite shipments of radioactive materials would be made annually to the NNSS in Nevada (or a commercial site in Clive, Utah) and WIPP in New Mexico (see Table 4–37). Maximum transportation impacts would be realized if low-level and mixed low-level radioactive waste were shipped to either the NNSS in Nevada or a commercial site in Clive, Utah, instead of being disposed of on site. Transuranic waste would be shipped to WIPP. The total projected (one-way) distance traveled on public roads transporting radioactive materials to various locations would range from about 125,000 to 144,000 miles (200,000 to 231,000 kilometers).

The annual dose to the transportation crew from all offsite transportation activities under the Modified CMRR-NF Alternative was estimated to range from about 2.2 person-rem for disposal at the commercial low-level radioactive waste disposal site in Clive, Utah, to about 2.5 person-rem for disposal at the NNSS in Nevada. The dose to the general population would range from 0.7 to 0.8 person-rem for the commercial site in Clive, Utah, and the NNSS in Nevada, respectively. Accordingly, incident-free transportation would result in a maximum of no (2×10^{-3}) excess LCFs among the transportation workers and no (5×10^{-4}) excess LCFs in the affected population. The estimated dose associated with transport of low-level and mixed low-level radioactive waste to the NNSS in Nevada is higher because of the longer distance traveled and larger affected population. The differences in estimated doses under either disposal option are very small, however, as shown above.

Note that DOE regulations limit the maximum annual dose to a transportation worker to 100 millirem per year unless the individual is a trained radiation worker. The dose to a trained radiation worker is limited to 2 rem per year (DOE 1999b). The potential for a trained radiation worker to develop a fatal latent cancer from an annual dose at the maximum annual exposure is 0.0012. Therefore, an individual transportation worker is not expected to develop a lifetime latent fatal cancer from exposure during these activities.

The doses to the general populations along the routes from LANL to Pojoaque and from Pojoaque to Santa Fe, New Mexico, were estimated to be a maximum of 0.04 person-rem. This dose would result in no (2×10^{-5}) excess LCFs among the exposed populations.

Transportation Accidents—Two sets of analyses were performed for the evaluation of transportation accident impacts involving radioactive materials transport: impacts of maximum reasonably foreseeable accidents (accidents with probabilities greater than 1 in 10 million per year [1×10^{-7}]) and impacts of all accidents (total transportation accidents).

For radioactive materials transported under the Modified CMRR-NF Alternative, the maximum reasonably foreseeable offsite truck transportation accident with the greatest consequence would involve a truck carrying contact-handled transuranic waste. The probability that such an accident would occur is about 1 in 3.6 million (2.8×10^{-7}) per year in a suburban area. If such an accident occurs, the consequences in terms of general population dose would be 8 person-rem. Such an exposure would result in no (5×10^{-3}) excess LCFs among the exposed population. This accident would result in a dose of 8.2 millirem to a hypothetical MEI located at a distance of 330 feet (100 meters) and exposed to the accident plume for 2 hours, with a corresponding risk of developing a latent fatal cancer of 5×10^{-6}, or about 1 chance in 200,000.

Under this alternative, the estimated risks for all projected accidents involving radioactive shipments, regardless of type, are a maximum radiological dose-risk[20] to the general population of about

[20] *Dose-risk includes the probability that an accident will occur. Here, these values were calculated by dividing the radiological risks in terms of LCFs given in Table 4–37 (column 9) by 0.0006, which is the risk of an LCF per person-rem of exposure.*

0.2 person millirem, resulting in no (1×10^{-7}) excess LCFs, and a maximum nonradiological (traffic) accident risk of zero (7×10^{-3}) fatalities.

The maximum radiological transportation accident dose-risk to the general populations along the routes from LANL to Pojoaque and from Pojoaque to Santa Fe, New Mexico, would be 0.0067 person-millirem. This dose would result in no (4×10^{-9}) excess LCFs among the exposed populations. The maximum expected number of traffic accident fatalities along these routes would be 0 (4×10^{-4}).

The impacts of transporting nonradiological materials were also evaluated. These impacts are presented in terms of distance traveled and numbers of expected traffic accidents and fatalities. The following assumptions were made: asbestos would be disposed of at a facility in Phoenix, Arizona; hazardous waste would be disposed of at a facility in Andrews, Texas; and solid waste would be disposed of at Mountainair, New Mexico. As indicated in Table 4–36, only two shipments of hazardous materials would be made annually. The transportation under this alternative would result in 666 miles (1,100 kilometers) traveled, no (0.0002) traffic accidents, and no (0.00002) fatalities.

4.3.13.2 Traffic

Construction Impacts – Deep Excavation Option – Truck Traffic—Under the Deep Excavation Option, an additional 100 feet (30 meters) would be excavated during construction of the Modified CMRR-NF, as approximately 30 feet (9.1 meters) of the Modified CMRR-NF excavation have already been completed. Excavation of the additional 100 feet (30 meters) and the associated tunnels would require the removal of approximately 545,000 cubic yards (420,000 cubic meters), or approximately 900,000 tons (820,000 metric tons) of material. This amount of material would require approximately 45,000 20-ton truck trips or 30,000 30-ton truck trips to move. This material would be staged at a LANL materials staging area for future reuse on other LANL projects. Reuse of this material at LANL would directly offset the future need to transport purchased fill material from offsite locations, as is currently the case because of the limited amount of suitable fill material available within existing LANL borrow pits. Excavated soil and rock material from the Modified CMRR-NF would be transported by truck to spoils storage areas within TA-5, TA-36, TA-51, TA-52, or TA-54 in accordance with routine material reuse practices at LANL, and the excavated material (spoils) would ultimately be reused in various construction and landscaping projects at LANL.

As discussed under the No Action Alternative, each round trip to the LANL materials staging area would take approximately 20 minutes. Moving the material generated by excavation under the Deep Excavation Option would take approximately 450 10-hour shifts with one loader and 20-ton trucks or approximately 300 10-hour shifts with one loader and 30-ton trucks. This time period could be shortened by using two loaders and additional trucks. On a per-hour basis, these trips would make little difference to the level of service on Pajarito Road. The acceleration of the loaded earthwork trucks would be slow and would result in lower speeds and some reduction in the level of service in the road segment where the trucks accelerate. Pajarito Road is not accessible by the public.

The use of onsite concrete batch plants under the Deep Excavation Option would be required. The largest volume of concrete would be anticipated in the early years of the project as the 60 feet (18 meters) of low-slump concrete fill and the basemat and foundation of the building are constructed. It is not expected that the plants would be operated simultaneously. Depending on the quality of the concrete specified for the low-slump fill material, it may or may not be necessary to use concrete transit trucks for a trip this short. Regardless of whether concrete transit trucks or dump trucks are used to transport the concrete, the weight limit would be approximately 20 tons (18 metric tons) for three-axle trucks. Wet concrete weighs approximately 2 tons (1.8 metric tons) per cubic yard. Structural concrete for the shell of the Modified CMRR-NF would be conveyed from the batch plant to the site using concrete transit trucks.

Peak operation of the northeast (TA-48/55) concrete plant is expected during the first year of Modified CMRR-NF construction (2012), when the plant would be used to produce an estimated 250,000 cubic yards (190,000 cubic meters) of low-slump concrete that would be placed in the lower 60 feet (18 meters) of the Modified CMRR-NF excavation for soil stabilization (LANL 2010d).

If the peak operation of this concrete plant is 150 cubic yards (115 cubic meters) per hour and 20-ton trucks are used for transport, it would take approximately 170 10-hour shifts to transport 250,000 cubic yards (190,000 cubic meters) of concrete. This timeframe could be reduced to approximately 70 days with 24-hour operations.

Bulk concrete materials would be delivered to the Modified CMRR-NF batch plant site by either standard three-axle dump trucks (20-ton trucks) or five-axle bottom dump trucks (30-ton trucks).

To support the concrete batch plant operation for all concrete operations, the following materials would be required (LANL 2011a:Data Call Tables, 002):

- Approximately 313,000 tons (284,000 metric tons) of coarse aggregate (15,700 20-ton trucks or 10,400 30-ton trucks)
- Approximately 320,000 tons (290,000 metric tons) of fine aggregate (sand) (16,000 20-ton trucks or 10,700 30-ton trucks)
- Approximately 69,000 tons (63,000 metric tons) of cement (3,500 20-ton trucks or 2,300 30-ton trucks)
- Approximately 37,000 tons (34,000 metric tons) of fly ash (1,900 20-ton trucks or 1,200 30-ton trucks)

This operation would add a maximum of approximately 66 truck trips per hour to Pajarito Road. Current peak-hour traffic volume on Pajarito Road is anticipated to be 800 vehicles per hour (Level of Service D). The capacity of a two-lane roadway is approximately 2,400 trips per hour. The acceleration of the loaded concrete trucks would be slow and, with a distance of less than one-eighth of a mile for some of the loaded concrete trucks, would result in considerably lower speeds in this road segment. The section of Pajarito Road from the floor of the valley to the top of the mesa would also be impacted by the slow speed of loaded trucks climbing this hill. The addition of the truck trips hauling materials for concrete production is not expected to change the level of service on this road segment. This issue could be mitigated by adding a truck climbing lane on this stretch of roadway. During the construction period, climbing lanes could be warranted; however, this condition would be temporary, and truck deliveries could be scheduled to avoid peak traffic hours.

Construction under the Deep Excavation Option would also require the following amounts of steel (LANL 2011a:Data Call Tables, 002):

- Approximately 560 tons (510 metric tons) of structural steel (30 20-ton trucks or 20 30-ton trucks)
- Approximately 18,000 tons of concrete reinforcing steel (900 20-ton trucks or 600 30-ton trucks)

All construction supplies reaching the site must use Pajarito Road. All movement of excavated material from the Modified CMRR-NF to the internal storage areas must use Pajarito Road. The movement of large numbers of heavy trucks can damage the structure of existing pavement, reducing its lifespan and requiring repair or replacement. If the pavement structure is not sufficiently strong, the driving pavement can rut or crumble. The edges of existing pavements are vulnerable to crumbling if sufficient lateral support is not provided. The impacts on Pajarito Road’s structural integrity would be similar to those discussed under the No Action Alternative; however, there is a greater chance of structural damage to Pajarito Road under the Modified CMRR-NF Alternative due to the greater total weight of materials that would be transported on the roadway and the longer duration of transports. Pajarito Road may be sufficiently strong to support the transports without damage if the underlying soil is strong. Should damage occur to the roadway surface, Pajarito Road may require rehabilitation or repair sooner than currently anticipated.

Construction Impacts – Deep Excavation Option – Worker Traffic—The workers going to the Modified CMRR-NF are expected to use the public roadways. A peak of 790 workers is anticipated to commute to the parking area at TA-72 (LANL 2010d). For this analysis, the peak commuting time of these workers would align with the peak-hour traffic on the adjoining public roadways. Approximately 500 peak-hour trips are anticipated from a peak of 790 construction workers. These 500 additional peak-hour (worker) commuters were added to the existing traffic to determine the anticipated level of service. As shown in **Table 4–38**, the impacts on traffic were compared for the year 2012, the year that the Deep Excavation Option would start, and 2020, the year that construction would be completed under this alternative. No change in the level of service of roadways in the vicinity of LANL is anticipated during the construction period. In addition, the impacts of construction traffic would be minimal as it is anticipated that workers for the Modified CMRR-NF would park at the parking lot in TA-72 and would be bused to the worksite.

Table 4–38 Modified CMRR-NF Alternative — Expected Levels of Service of Roadways in the Vicinity of Los Alamos National Laboratory

Location	*Road Type and Number of Lanes*	*AADT/Year/ Percentage Trucks*	*Existing Traffic*		*Deep Excavation Option*		*Comments (assumed percentage of construction traffic assigned to road segment)(790 workers, 500 VPH peak)*
			AADT/ Peak Hour/ LOS	*AADT/ Peak Hour/ LOS*	*Peak Hour/ LOS*	*Peak Hour/ LOS*	
Year			*2012*	*2020*	*2012*	*2020*	
SR 4 at Los Alamos County Line to SR 501	Minor arterial/ two lanes	734/ 2009/9	760/80/A	840/80/A	130/A	130/A	(10) No change in LOS
SR 4 at Junction Bandelier Park Entrance	Minor arterial/ two lanes	681/ 2009/7	700/70/A	770/80/A	120/A	130/A	(10) No change in LOS
SR 4 at Junction of Pajarito Road – White Rock	Minor arterial/ two lanes	9,302/ 2009/9	9,580/ 960/D	10,580/ 1,060/D	1,410/D	1,510/D	(90) No change in LOS
SR 4 at Junction of Jemez Road	Minor arterial/ two lanes	9,358/ 2009/12	9,640/ 960/D	10,650/ 1,070/D	1,410/D	1,520/D	(90) No change in LOS
SR 501 at Junction of SR 4 to Diamond Drive	Minor arterial/ two lanes	11,848/ 2009/11	12,210/ 1,220/D	13,490/ 1,350/D	1,670/D	1,800/D	(50) No change in LOS
SR 501 at Junction of Diamond Drive and Onward	Primary arterial/ four lanes	21,211/ 2009/8	21,850/ 2,190/C	24,140/ 2,410/C	2,640/C	2,860/C	(90) No change in LOS
SR 501 at Junction 502	Primary arterial/ four lanes – divided	17,807/ 2009/8	18,350/ 1,840/C	20,270/ 2,030/C	1,940/C	2,130/C	(20) No change in LOS
SR 502 at Junction Openheimer Street	Primary arterial/ four lanes – divided	12,817/ 2009/6	13,210/ 1,320/C	14,590/ 1,460/C	1,420/C	1,560/C	(20) No change in LOS
SR 502 East of Junction with SR 4	Primary arterial/ four-lane freeway	6,341/ 2009/12	6,530/ 650/A	7,210/ 720/A	700/A	770/A	(10) No change in LOS

AADT = average annual daily traffic; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; LOS = level of service; SR = State Road; VPH = vehicles per hour.

Construction Impacts – Shallow Excavation Option – Truck Traffic—The impacts of construction on peak-hour levels of service on public roadways adjoining LANL under the Shallow Excavation Option would be similar to those anticipated under the Deep Excavation Option. Construction under the Shallow Excavation Option would require the excavation and removal of 236,000 cubic yards (180,000 cubic meters), or 390,000 tons (350,000 metric tons) of material. This amount of material would require approximately 19,500 20-ton truck trips or 13,000 30-ton truck trips to move. As under the Deep Excavation Option, the material would be staged for future reuse on other LANL projects.

As discussed under the No Action Alternative, each round trip to the LANL materials staging area would take approximately 20 minutes. To move the material generated by excavation under the Shallow Excavation Option would take approximately 195 10-hour shifts with one loader and 20-ton trucks or approximately 130 10-hour shifts with one loader and 30-ton trucks. This time period could be shortened by using two loaders and additional trucks. As under the Deep Excavation Option, these trips would be make little difference to the level of service on Pajarito Road.

Compared to the Deep Excavation Option, there would be no need for a large volume of concrete for a building foundation subgrade replacement of the poorly welded tuff layer. This would reduce the number of trucks transporting concrete mix from the batch plant to the Modified CMRR-NF. While the total number of trucks would be reduced, the number of trucks in a peak hour is expected to remain the same. Thus, the impact on the roadway level of service would remain the same, although the duration of construction-related traffic would be reduced.

The same amount of steel would be required under the Shallow Excavation Option as under the Deep Excavation Option. To support the concrete batch plant operation under the Shallow Excavation Option for all concrete operations, the following materials would be required (LANL 2011a:Data Call Tables, 003):

- Approximately 120,000 tons (110,000 metric tons) of coarse aggregate (6,000 20-ton trucks or 4,000 30-ton trucks)
- Approximately 120,000 tons (110,000 metric tons) of fine aggregate (sand) (6,000 20-ton trucks or 4,000 30-ton trucks)
- Approximately 26,000 tons (24,000 metric tons) of cement (1,300 20-ton trucks or 900 30-ton trucks)
- Approximately 14,000 tons (13,000 metric tons) of fly ash (700 20-ton trucks or 500 30-ton trucks)

All supplies reaching the site must use Pajarito Road. The structural impacts on internal LANL roadways would be less under the Shallow Excavation Option than the Deep Excavation Option due to the lesser amount of concrete that would be needed to support construction.

Construction Impacts – Shallow Excavation Option – Worker Traffic—The peak number of workers going to the Modified CMRR-NF is expected to be approximately the same under the Shallow Excavation Option as under the Deep Excavation Option. The 790 additional (worker) commuters were added to the existing traffic to determine the anticipated level of service. The impacts on traffic were compared for the year 2012, the year that the Shallow Excavation Option construction would start, and 2020, the year that the Shallow Excavation Option construction would be completed. The results are the same as those shown for the Deep Option in Table 4–38. No change in the level of service of roadways in the vicinity of LANL is anticipated during the construction period. In addition, the impacts of construction traffic would be minimal because it is anticipated that workers for the Modified CMRR-NF would park at the parking lot in TA-72 and would be bused to the worksite.

Operations Impacts—Employees currently working at the existing CMR Building and other facilities at LANL are expected to occupy the Modified CMRR-NF. There would be no net increase in the number of employees at LANL as a result of operating the Modified CMRR-NF. Because no net increase in employees is anticipated to support Modified CMRR-NF operations under the Modified CMRR-NF Alternative, compared with employees supporting the existing CMR Building, there would be no significant impact on traffic or transportation on the public roadways external to LANL and the vehicle access portals. Those employees accessing the CMRR-NF from the east would have a shorter commute on the internal LANL roadway system and those employees accessing the CMRR-NF from the west would have a longer commute on the internal LANL roadway system. No change in the level of service of the internal LANL roadways impacted by these changes in commuting patterns is anticipated.

4.4 Environmental Impacts of the Continued Use of CMR Building Alternative

4.4.1 Continued Use of CMR Building Alternative

This section presents the environmental impacts associated with the Continued Use of CMR Building Alternative. Under this alternative, the existing CMR Building at TA-3 would continue operations with necessary maintenance and component replacements, as described in Chapter 2, Section 2.6.3. Under this alternative, there would be no construction of a new CMRR-NF. CMR Building operations and capabilities would continue to be restricted to levels necessary to maintain an acceptable level of risk to public and worker health and safety. In addition, operation of RLUOB would be included under this alternative, as well as the relocation of a number of people currently working in the CMR Building to RLUOB.

4.4.2 Land Use and Visual Resources

Operations Impacts—Because there would be no land disturbance (no construction) within TA-3 or TA-55 or anywhere else at LANL under this alternative, there would be no impact on land use or the visual environment. Furthermore, continued operation of the existing CMR Building and RLUOB would not change either the land use within or the appearance of TA-3 or TA-55.

4.4.3 Site Infrastructure

Operations Impacts—Projected site infrastructure requirements of CMR Building operations under the Continued Use of CMR Building Alternative are presented in **Table 4–39**. Current CMR Building operations are included in current site requirements and have already been accounted for in the current available site capacities for electricity and water (see Chapter 3, Table 3–3). The addition of RLUOB would add to these requirements under this alternative. As shown in Table 4–39, the combined requirements of the CMR Building and RLUOB make up less than 1 percent of the available site capacity for natural gas and 69 percent of the available site capacity for peak electrical load. Existing infrastructure should be capable of supporting these additional requirements without exceeding capacities. Thus, the net impact on infrastructure is expected to be minimal.

Table 4–39 Continued Use of CMR Building Alternative — Site Infrastructure Requirements for CMR Building and RLUOB Operations

Resource	*Available Site Capacity* [a]	*CMR Building Requirement* [b]	*RLUOB Requirement*	*Total Requirement* [b]	*Percentage of Available Site Capacity*
Electricity					
Energy (megawatt-hours per year)	513,000	No change	59,000	59,000	12
Peak load demand (megawatts)	16	No change	11	11	69
Fuel					
Natural gas (million cubic feet per year)	5,860	No change	38	38	0.6
Water (million gallons per year)	130	No change	7	7	5.4

CMR = Chemistry and Metallurgy Research; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] A calculation based on the system-wide capacity (site-wide for water) minus the current site requirements

[b] The Continued Use of CMR Building Alternative is a continuation of current CMR activities and associated infrastructure requirements. The utilities at the CMR Building are not metered so there are no reliable estimates of utility usage. The values for the "Available Site Capacity" column account for the CMR Building utilities being in the site-wide totals.

Note: Values have been rounded. To convert cubic feet to cubic meters, multiply by 0.028317; gallons to liters, by 3.78533

Source: LANL 2011a:Data Call Tables, 005.

4.4.4 Air Quality and Noise

4.4.4.1 Air Quality

Operations Impacts—Air quality impacts associated with the continued operation of the existing CMR Building were analyzed under the No Action Alternative in the *CMRR EIS*. There would be no increases in emissions or air pollutant concentrations for nonradiological releases (DOE 2003b).

Operation of RLUOB would have minimal air quality impacts. Sources of emissions would occur from daily employee commutes and the testing of three emergency backup generators. Operational air pollutant emissions under this alternative would not exceed the allowable Prevention of Significant Deterioration increments for the Class I area in Bandelier National Monument. Nonradiological emissions for the criteria pollutants are estimated in **Table 4–40**.

Table 4–40 Continued Use of CMR Building Alternative — Nonradiological Operational Emissions of RLUOB

Criteria Pollutant	*Averaging Time*	*NMAAQS (parts per million)*	*Calculated Concentration (parts per million)*
Carbon monoxide	1 hour	13.1	0.002
	8 hours	8.7	0.001
Nitrogen dioxide	Annual	0.05	0.000065
Sulfur dioxide	3 hours	0.5 [a]	0.001
	24 hours	0.1	0.00014
	Annual	0.02	0.000029
PM_{10}	24 hours	150 μg/m³	0.025 μg/m³
Total Suspended Particulates	24 hours	150 μg/m³	0.025 μg/m³
	Annual	60 μg/m³	0.005 μg/m³

μg/m³ = micrograms per cubic meter; CMR = Chemistry and Metallurgy Research; NMAAQS = New Mexico Ambient Air Quality Standards; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] NMAAQS does not have a 3-hour sulfur dioxide standard; therefore, the Federal NAAQS standard is used.

Note: Values have been rounded.

Source: LANL 2011a:Data Call Tables, 005.

Radiological emissions, estimated at 0.00003 curies per year of actinides, could be released from the CMR Building operations. Impacts of these radiological releases are discussed in Section 4.4.10.

4.4.4.2 Greenhouse Gas Emissions

Operations Impacts—Operations at the CMR Building and RLUOB would release greenhouse gases from refrigerants and three backup generators at RLUOB, and employee commutes.[21] Greenhouse gas emissions from utilities (for example, electricity) do not occur directly on site. Total direct (Scope 1) greenhouse gas emissions, excluding electricity use, during normal operations of the existing CMR Building and RLUOB would be approximately 3,500 tons (3,200 metric tons) of carbon-dioxide equivalent per year (see **Table 4–41**). The current greenhouse gas inventory for LANL includes the existing CMR Building; therefore, continued operation of this building would not change the site's current greenhouse gas emissions.

Total greenhouse gases, including both indirect (Scope 2) and direct (Scope 1) emissions during operations of the existing CMR Building and RLUOB would be approximately 42,400 tons (38,500 metric tons) of carbon-dioxide equivalent per year (see Table 4–41). Greenhouse gas emissions for the continued use of CMR Building operating with the RLUOB would be approximately 10 percent of the total site-wide carbon-dioxide-equivalent emissions per year. These greenhouse gases emitted by operations under the Continued Use of CMR Building Alternative would add a relatively small increment to emissions of these gases in the United States and the world.

Table 4–41 Continued Use of CMR Building Alternative — CMR Building and RLUOB Operations Emissions of Greenhouse Gases

Emissions Scope	*Activity*	*Emissions (tons per year)*				
		CO_2	*CH_4 CO_2e*	*N_2O CO_2e*	*HFC CO_2e*	*Total CO_2e*
Scope 1 [a]	Refrigerants used	N/A	N/A	N/A	3,400	3,400
	Backup generator	95	0	0	N/A	95
	Subtotal	95	0	0	3,400	3,500
Scope 2 [b]	Electricity use	38,700	11	160	N/A	38,900
	Total	38,800	11	160	3,400	42,400

CMR = Chemistry and Metallurgy Research; CO_2 = carbon dioxide; CH_4 CO_2e = methane in carbon-dioxide equivalent; N_2O CO_2e = nitrous oxide in carbon-dioxide equivalent; CO_2e = carbon-dioxide equivalent; HFC CO_2e = hydrofluorocarbons in carbon-dioxide equivalent; N/A = not applicable; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Scope 1 sources include direct emissions by stationary sources owned or controlled by LANL.

[b] Scope 2 sources include indirect emissions from the generation of purchased electricity, where the emissions actually occur at sources off site and not at sources owned or controlled by LANL.

Note: Totals may not equal the sum of the contributions due to rounding. To convert tons to metric tons, multiply by 0.90718.

Direct greenhouse gas emissions at LANL are those described as Scope 1. There are no established thresholds for greenhouse gases, but in draft guidance issued February 18, 2010, the CEQ suggested that proposed actions that are reasonably anticipated to cause direct emissions of 27,600 tons (25,000 metric tons) or more of carbon-dioxide equivalent should be evaluated by quantitative and qualitative assessments. Together, the Scope 1 emissions under Continued Use of CMR Building Alternative would be approximately 3,500 tons (3,200 metric tons) of carbon-dioxide equivalent per year and are below the CEQ suggested evaluation level of 27,600 tons (25,000 metric tons) per year set for quantitative and qualitative assessments.

[21] Since there would be no new hires under this alternative, emissions from personnel commutes included in the baseline inventory are not included here.

4.4.4.3 Noise

Operations Impacts—Under this alternative, there would be no new construction or major changes in operations or employment levels. Thus, there would be no change in noise impacts under the Continued Use of CMR Building Alternative.

4.4.5 Geology and Soils

Operations Impacts—Geologic impacts associated with continued operations at the existing CMR Building would primarily consist of regional and local seismic hazards, including earthquakes and potential fault rupture, as summarized in Chapter 3, Section 3.5, and further detailed in the *CMRR EIS* (DOE 2003b) and the *LANL SWEIS* (DOE 2008a). In particular, core drilling studies and geologic mapping have established a number of secondary fault features at TA-3, including a high-angle, southwest-to-northeast-trending fault trace associated with the Rendija Canyon Fault Zone beneath the northern portion of the CMR Building. These fault studies indicate that 8 feet (2.4 meters) of fault displacement have occurred at the CMR Building site. Although the potential for ground deformation from fault rupture is relatively low, with a minimum recurrence interval of 4,000 years, the presence of identified fault structures in association with an identified active and capable fault zone (per 10 CFR Part 100, Appendix A) restricts the operational capability of the existing CMR Building without substantial upgrades and repairs. In addition, the volcanic hazards identified for the Modified CMRR-NF would be similar for the CMR Building at TA-3; impacts could result from ash and pumice falls, mudflows and flooding, seismic activity, lava flows, atmospheric effects and acid rains. Potential impacts from seismic events and from volcanic eruptions are addressed in Section 4.4.10.2, Facility Accidents, and Appendix C, Section C.4.1.

Under this alternative, there would be no additional impacts on geology and soils from operations of RLUOB at TA-55 under normal operating conditions.

4.4.6 Surface-Water and Groundwater Quality

Operations Impacts—There would be no impacts from operations on surface-water resources or groundwater quality under the Continued Use of CMR Building Alternative. Industrial and sanitary effluents would be discharged to sanitary sewer lines for treatment at the Sanitary Wastewater Systems Plant in TA-46. Spill prevention, countermeasures, and control procedures would be employed during operations and transmission of wastewaters from TA-3 and TA-55 to minimize the probability of, and the potential for, an unplanned release that could infiltrate and affect groundwater (LANL 2010d). Because the CMR Building in TA-3 and RLUOB in TA-55 are located on mesa tops and are remote from areas prone to flooding, no impacts on floodplains are expected.

4.4.7 Ecological Resources

Operations Impacts—There would be no new impact on terrestrial and aquatic resources, wetlands, or threatened and endangered species at LANL because no new facilities would be built under the Continued Use of CMR Building Alternative. The CMR Building and RLUOB would not produce emissions or effluent of a quality or at levels that would likely affect wildlife and other ecological resources.

4.4.8 Cultural and Paleontological Resources

Operations Impacts—There would be no impact on cultural resources because there would be no land disturbance (no construction) under the continued use of CMR Building Alternative. Further, continued operations at the existing CMR Building or RLUOB would not affect these resources within either TA-3, TA-55, or the site as a whole.

4.4.9 Socioeconomics

Operations Impacts—Under the Continued Use of CMR Building Alternative, the current employment of approximately 210 workers at the existing CMR Building would continue, although many of these workers may have their offices moved to RLUOB. RLUOB operations would also draw about 140 employees from other locations on the site. No new employment of workers would be required. Therefore, there would be no additional impact on the socioeconomic conditions around LANL under this alternative.

4.4.10 Human Health Impacts

4.4.10.1 Normal Operations

The inventory of radioactive material released in air emissions would be smaller under this alternative than under other alternatives. The inventory of radionuclides emitted under this alternative includes only actinides and none of the fission products and tritium that could be associated with a fully operating CMRR-NF. Emissions from RLUOB, which has a radiological laboratory, are expected to be a small fraction of those estimated to be released from the CMR Building and are not analyzed separately.

The air emissions would be in the form of plutonium, uranium, thorium, and americium isotopes. For conservatism in estimating the human health impacts, all emissions were considered to be plutonium-239 because the human health impacts on a per-curie basis are greater for plutonium-239 than for the other actinides associated with CMR Building activities. **Table 4–42** shows the annual collective dose to the general public living within 50 miles (80 kilometers) of the CMR Building, an average member of the public living within this radius, and an offsite MEI (a hypothetical member of the public residing at the LANL site boundary who receives the maximum dose).

Table 4–42 shows that the annual collective dose to the population living within a 50-mile (80-kilometer) radius of the CMR Building was estimated to be 0.016 person-rem under this alternative. This dose would increase the annual risk of a single latent fatal cancer in the population by 1×10^{-5}. Another way of stating this is that the likelihood that one fatal cancer would occur in the projected 2030 population of about 502,000 people from radiological releases associated with the CMR Building located at TA-3 is about 1 chance in 100,000 per year.

Table 4–42 Continued Use of CMR Building Alternative — Annual Radiological Impacts of CMR Building Operations on the Public

	Maximally Exposed Individual	*Population Within 50 Miles (80 kilometers)*	*Average Individual Within 50 Miles (80 kilometers)*
Dose	0.0023 millirem	0.016 person-rem	0.000032 millirem
Cancer fatality risk [a]	1×10^{-9}	1×10^{-5}	2×10^{-11}
Regulatory dose limit [b]	10 millirem	Not applicable	10 millirem
Dose as a percentage of regulatory limit	0.02	Not applicable	0.0003
Dose from background radiation [c]	480 millirem	240,000 person-rem	480 millirem
Dose as a percentage of background dose	0.0005	0.000005	0.000005

CMR = Chemistry and Metallurgy Research.

[a] Based on a risk estimate of 0.0006 latent cancer fatalities per person-rem (DOE 2003a).

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

[c] The annual individual dose from background radiation at LANL is 480 millirem (see source of natural background radiation in Chapter 3, Section 3.11.1). The 2030 projected population living within 50 miles (80 kilometers) of TA-3 was estimated to be about 502,000.

The average annual dose to an individual in the population would be 0.000032 millirem under this alternative. The corresponding increased risk of an individual developing a fatal cancer from receiving the average dose would be 2×10^{-11} per year, or essentially zero.

The MEI would receive an estimated annual dose of 0.0023 millirem. This dose corresponds to an increased annual risk of developing a fatal cancer of 1×10^{-9}. In other words, the likelihood that the MEI would develop a fatal cancer is about 1 chance in 1 billion for each year of CMR Building operations.

Estimated annual doses to workers involved with CMR Building activities under this alternative are provided in **Table 4–43**. The estimated worker doses are based on historical exposure data for LANL workers and estimates for work to be performed at RLUOB (LANL 2011a:Data Call Tables, 004, 005). Based on the reported data, the average annual dose to a LANL worker who received a measurable dose was 93 millirem. A value of 100 millirem has been used as the estimate of the average annual worker dose per year of operations at the CMR Building.

The average annual worker dose of 100 millirem at the CMR Building and 20 millirem at RLUOB is well below the DOE worker dose limit of 5 rem (5,000 millirem) (10 CFR Part 835) and is significantly less than the recommended Administrative Control Level of 500 millirem (DOE 1999b). The CMR Building average annual dose corresponds to an increased risk of a fatal cancer of 6×10^{-5} per year. In other words, the likelihood that a CMR Building worker would develop a fatal cancer from work-related exposure is about 1 chance in 17,000 for each year of operations.

Table 4–43 Continued Use of CMR Building Alternative — Annual Radiological Impacts of CMR Building and RLUOB Operations on Workers

	Individual Worker	***Worker Population*** [a]
CMR Building dose/fatal cancer risk [b, c]	100 millirem / 6×10^{-5}	21 person-rem / 1×10^{-2}
RLUOB dose/fatal cancer risk [c]	20 millirem / 1×10^{-5}	2.8 person-rem / 2×10^{-3}
Total	Not applicable	24 person-rem / 1×10^{-2}
Dose limit [d, e]	5,000 millirem	Not applicable
Administrative control level [f]	500 millirem	Not applicable

CMR = Chemistry and Metallurgy Research; RLUOB = Radiological Laboratory/Utility/Office Building.
[a] Based on a worker population of approximately 210 for continued operations at the CMR Building and 140 for RLUOB after activities have transitioned to RLUOB.
[b] Based on the average dose to LANL workers who received a measurable dose in the period from 2007 to 2009. A program to reduce doses to as low as is reasonably achievable would be employed to reduce doses to the extent practicable.
[c] Based on a worker risk estimate of 0.0006 latent cancer fatalities per person-rem (DOE 2003a).
[d] Dose limits and administrative control levels do not exist for worker populations.
[e] 10 CFR 835.202.
[f] DOE 1999b.

Based on a radiation worker population of approximately 350 under this alternative (210 for CMR Building and 140 for RLUOB), the estimated annual worker population dose would be 24 person-rem. This worker population dose would increase the likelihood of a fatal cancer within the worker population by 1×10^{-2} per year. In other words, on an annual basis, there is about 1 chance in 100 of one latent fatal cancer developing in the entire worker population as a result of exposures associated with this alternative. The average annual worker dose of about 68 millirem is well below the DOE worker dose limit of 5 rem (5,000 millirem) (10 CFR Part 835) and is significantly less than the recommended Administrative Control Level of 500 millirem (DOE 1999b). This average annual does corresponds to an increased risk of a latent fatal cancer of 0.00004 for each year of operations. In other words, the likelihood that a worker would develop a fatal cancer from annual work-related exposure is about 1 chance in 25,000.

Occupational injury and illness rates for normal operations under this alternative are projected to follow the patterns observed at LANL, as discussed in Chapter 3, Section 3.11.3. Using the worker population of 350, it is expected that the workers would experience about 9 TRCs and about 4 DART cases annually.

Hazardous Chemicals Impacts

No chemical-related health impacts would be associated with this alternative. As stated in the *LANL SWEIS*, the quantities of chemicals that could be released to the atmosphere during normal operations would be both minor and below the screening levels used to determine the need for additional analysis. There would be no construction and operational increase in the use of chemicals under this alternative. Workers would be protected from hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals.

4.4.10.2 Facility Accidents

This section presents a discussion of the potential health impacts on members of the public and workers from postulated accidents at the CMR Building. Under this alternative, the CMR Building and operations would remain unchanged from current limited operations.

Radiological Impacts

Radiological impacts from facility accidents at the CMR Building were evaluated in the *CMRR EIS*. Appendix C of the *CMRR EIS* and Appendix C of this *CMRR-NF SEIS* provide the methodology and assumptions used in developing facility accident scenarios and estimating doses to the general public within 50 miles (80 kilometers), the MEI, and an onsite worker near the facility. However, the material at risk within the CMR Building has been revised to reflect the reduced operating limits currently imposed in the facility due to safety and seismic concerns associated with the facility, as described below. The only other changes in the parameters used from those presented in Appendix C of the *CMRR EIS* are a new population distribution within 50 miles (80 kilometers) of the CMR Building projected to 2030 (projected to be about 502,000 persons), as well as a revised distance to the nearest offsite individual of 0.42 miles (0.67 kilometers) from the CMR Building. All other assumptions are consistent with those presented in Appendix C of the *CMRR EIS*. The doses presented in the *CMRR EIS* were calculated using MACCS2, Version 1.12. In this *CMRR-NF SEIS*, doses were estimated using MACCS2, Version 1.13.1, which corrected numerous known errors in the previous version of the code.

The accident scenarios in the *CMRR EIS* for the CMR Building were reviewed and compared with the accidents in the recent safety analysis documentation for the CMR Building (LANL 2011e) and with potential hazards from volcanic eruptions. For this existing building, the safety-basis scenarios and the NEPA scenarios are similar because they are based on the existing facility and the existing safety analyses. The principal differences between the safety-basis approach and the NEPA approach are the degrees of conservatism in the estimations of the material at risk, release mechanisms, damage ratios, fractions made airborne and respirable, and leak path factors. The safety-basis scenarios below assume damage ratios of 1.0, which are likely conservative by a factor of 10 or more. The fractions made airborne and respirable by the real-world stresses implied by these scenarios are also conservative. Because of the age and construction of the building, the NEPA scenarios would assume similar damage ratios and leak path factors to those of the safety-basis scenarios, and no separate analyses are provided. It is estimated that real-world releases for any of these CMR Building accident scenarios would be somewhat lower than these safety-basis estimates. Operational practices and limits at the CMR Building limit the potential consequences of these accidents by limiting the material at risk within the building.

Tables 4–44 and **4–45** provide the revised population doses and risks from facility accidents. Table 4–44 presents the frequencies and consequences of a postulated set of accidents for the public, represented by the MEI and the general population living within 50 miles (80 kilometers) of the CMR Building, and a noninvolved worker located at the technical area boundary, a distance of 300 yards (280 meters) from the CMR Building. Table 4–45 presents the cancer risks, obtained by multiplying each accident's consequences by the upper limit on the likelihood (frequency per year) that the accident would occur.

Table 4–44 Continued Use of CMR Building Alternative — Accident Frequency and Consequences

Accident	*Frequency (per year)*	*Maximally Exposed Individual*		*Offsite Population* [a]		*Noninvolved Worker at TA Boundary*	
		Dose (rem)	*Latent Cancer Fatality* [b]	*Dose (person-rem)*	*Latent Cancer Fatalities* [c]	*Dose (rem)*	*Latent Cancer Fatality* [b]
Wing-wide fire [d]	0.01	0.26	0.0002	140	0 (0.09)	0.65	0.0004
Seismically induced spill	0.01	2.2	0.001	580	0 (0.4)	21	0.03
Seismically induced spill and fire [e]	0.0001	4.3	0.003	1,200	1 (0.7)	42	0.05
Loading-dock spill/fire	0.01	0.07	0.00004	11	0 (0.007)	0.69	0.0004

CMR = Chemistry and Metallurgy Research; TA = technical area.
[a] Based on a projected 2030 population estimate of about 502,000 persons residing within 50 miles (80 kilometers) of TA-3.
[b] Increased likelihood of an LCF for an individual if the accident occurs.
[c] Increased number of LCFs for the offsite population if the accident occurs (results rounded to 1 significant figure). When the reported value is zero, the result calculated by multiplying the collective dose to the population by the risk factor (0.0006 LCFs per person-rem) is shown in parentheses.
[d] A major fire involving two wings.
[e] In the seismically induced spill and fire accident, two sequential events are considered; first, the seismic spill occurs, then releases of material outside the building occur due to the fire.

Table 4–45 Continued Use of CMR Building Alternative — Annual Accident Risks

Accident	*Risk of Latent Cancer Fatality*		
	Maximally Exposed Individual [a]	*Offsite Population* [b, c]	*Noninvolved Worker at TA Boundary* [a]
Wing-wide fire [d]	2×10^{-6}	9×10^{-4}	4×10^{-6}
Seismically induced spill	1×10^{-5}	4×10^{-3}	3×10^{-4}
Seismically induced spill and fire [e]	3×10^{-7}	7×10^{-5}	5×10^{-6}
Loading-dock spill/fire	4×10^{-7}	7×10^{-5}	4×10^{-6}

CMR = Chemistry and Metallurgy Research; TA = technical area.
[a] Risk of increased likelihood of an LCF to the individual.
[b] Risk of increased number of LCFs for the offsite population.
[c] Based on a projected 2030 estimated population of about 502,000 persons residing within 50 miles (80 kilometers) of TA-3.
[d] A major fire involving two wings.
[e] In the seismically induced spill and fire accident, two sequential events are considered; first, the seismic spill occurs, then releases of material outside the building occur due to the fire.

The accident with the highest potential risk to the offsite population (see Table 4–45) would be an earthquake that would severely damage the CMR Building, resulting in a seismically induced spill of radioactive materials with an annual risk of an LCF for the offsite MEI of 1×10^{-5}. In other words, the offsite MEI's likelihood of developing a latent fatal cancer from this event is about 1 chance in 100,000. This accident would increase the risk of a single LCF in the entire population by 4×10^{-3} per year. In other words, the likelihood of one fatal cancer in the entire population from this event would be about 1 chance in 250 per year. Statistically, the radiological risk for the average individual in the population would be small. The risk of an LCF to a noninvolved worker located at a distance of 300 yards (280 meters) from the CMR Building would be 3×10^{-4}, or about 1 chance in 3,333 per year.

Land contamination—A severe seismic event that results in the failure of building containment also has the potential to release sufficient quantities of plutonium that could lead to land contamination near the facility. Even for the severe earthquakes that result in major damage to the building structure and failure of confinement systems, there should not be large energy sources to drive the materials that would typically be used in the CMR Building, such as plutonium metal and oxides, out of the damaged building and rubble. Seismic collapse scenarios that result primarily in spills could release plutonium materials through the rubble, but that material would not generally go far from the building site. Seismic collapse scenarios that involve large fires have the potential to loft materials such that transport of radioactive materials downwind might result in land contamination at levels that could require monitoring or additional actions.

The Continued Use of CMR Building SEIS scenarios involving a seismically induced spill or a seismically induced spill and fire were modeled to evaluate the potential extent of land that might be contaminated above a screening level of 0.2 microcuries per square meter.[22] Estimates of land area that might be contaminated are highly dependent on specific accident source terms and metrological modeling assumptions. This is because the amount of radioactive material that may accumulate on the ground is highly dependent on the size of the particles that get through the building rubble and are released to the environment (which determines how fast they settle back to the ground), specific accident conditions (for example, presence of a fire), and specific meteorological conditions at the time of the earthquake (for example, high winds). In general, unless there is a fire that can effectively loft the plutonium particles into the air, most of the particles would return to the ground within a few hundred yards of the building location. In the event of a seismically induced spill followed by a large fire at the CMR Building, the heat energy could effectively raise the release height such that ground contamination at the screening level could extend out to approximately 6.2 miles (10 kilometers) from TA-3, depending in large part on the meteorological conditions at the time of the accident.

Areas contaminated above a specified screening level (for example, 0.2 microcuries per square meter) would require further action, such as radiation surveys or cleanup. Costs associated with radiation surveys, cleanup, and continued monitoring could vary widely depending upon the characteristics of the contaminated area and could range in the hundreds of million dollars per square kilometer for land decontamination (NASA 2006). In addition to the potential direct costs, there are potential secondary societal costs associated with the mitigation from such high-consequence accidents. Those costs could include, but may not be limited to, the following:

- Temporary or longer-term relocation of residents
- Temporary or longer-term loss of employment
- Destruction or quarantine of agricultural products
- Land-use restrictions (which could affect real estate values, businesses, and recreational activities)
- Public health effects and medical care

[22] *This* CMRR-NF SEIS *uses a plutonium areal concentration of 0.2 microcuries per square meter as a screening level for determining the lateral extent of contamination that might require cleanup actions (Chanin 1996). This screening level was first proposed by EPA in the late 1970s, but never formally adopted. It has been used in many environmental impact statements to indicate land areas that would or would not likely require remedial actions.*

Dose Impacts from Common Failure Mode Seismic Event—If a severe earthquake were to occur in the Los Alamos area, individuals close to and downwind from the CMR Building and TA-55 might receive exposure from releases of radioactive materials from both buildings. In the *LANL SWEIS*, a site-wide seismic event that corresponded to approximately a PC-3 earthquake[23] resulted in estimated doses from the Plutonium Facility (TA-55-4), the Storage Facility (TA-55-185), and the Safe, Secure Transport Facility (TA-55-355) of 160 rem to the MEI and 14,880 person-rem to the population residing within 50 miles (80 kilometers) of TA-55. About 150 rem of the dose to the MEI was estimated to be from the TA-55 Plutonium Facility, the remaining 10 rem was from the other two facilities.

Under the Continued Use of CMR Building Alternative, the MEI doses from the seismically induced spill or seismically induced spill plus fire for the SEIS scenarios are estimated to be about 2 to 4 rem. Making the conservative assumption that the same MEI affected by releases from the TA-55 area could be affected by releases from the CMR Building, the corresponding doses would be additive. The upgrades to the TA-55 Plutonium Facility are ongoing, but the seismic upgrades will not be completed for a number or years (less than 10) (see Section 4.3.10.2). Prior to completion of the upgrades, the combined doses would be those included in the *LANL SWEIS*, plus the doses from the CMR Building – up to about 164 rem to the MEI and up to 16,100 person-rem to the population for a seismically induced spill plus fire. Once the TA-55 Plutonium Facility upgrades are complete, the dose to the MEI would be about 23 rem and the estimated dose to the population within 50 miles (80 kilometers) of LANL would be about 5,700 person-rem. For the MEI, this analysis takes into account the revised MEI dose of 19 rem (9 rem from the revised 2011 safety basis for the TA-55 Plutonium Facility and 10 rem for releases from other facilities at TA-55, per the 2008 *LANL SWEIS*). Given a severe seismic event accompanied by a fire, these doses represent a probability of the MEI developing a fatal cancer from this dose of 0.03, or approximately 1 chance in 33, and it is expected to result in up to 3 LCFs in the exposed population surrounding the site.

Involved Worker Impacts

The impacts on involved workers are very dependent on the type of accident, the severity of the accident, the location of workers, and protective action taken. Approximately 210 workers would be at the CMR Building during operations in the event of an accident. Any workers near an accident could be at risk of serious injury or death. Following initiation of accident and site emergency alarms, workers in adjacent areas of the facility would evacuate the area in accordance with technical area and facility emergency operating procedures and training.

Hazardous Chemicals and Explosives Impacts

Some of the chemicals used in the CMR Building are both toxic and carcinogenic. The quantities of the regulated hazardous chemicals and explosive materials stored and used in the facility are well below the threshold quantities set by EPA (40 CFR Part 68) and pose minimal potential hazards to the public health and the environment in an accident condition. These chemicals are stored and handled in small quantities (10 to a few hundred milliliters) and would only be a hazard to the involved worker under accident conditions.

[23] *The estimated dose consequences included in the* LANL SWEIS *(DOE 2008b) were based on a PC-3 seismic event with a return period of 2,000 years and a peak horizontal ground acceleration of approximately 0.31 g (the current PC-3 seismic event return period is 2,500 years). The* 2007 Update of the Probabilistic Seismic Hazard Analysis and Development of Seismic Design Ground Motions at the Los Alamos National Laboratory *(LANL 2007a) had been recently issued and an evaluation of the effects of the new data on LANL facilities was just getting underway. The consequences of a current PC-3 seismic event likely would be higher than estimated in the* LANL SWEIS.

4.4.10.3 Intentional Destructive Acts

Analysis of the impacts of terrorist incidents on operations of the CMR Building is presented in a classified appendix to this *CMRR-NF SEIS*. The impacts of some terrorist incidents would be similar to the accident impacts described earlier in this section, while some terrorist incidents may have more severe impacts. A description of how NNSA assesses the vulnerability of its sites to terrorist threats and then designs its response systems is in Section 4.2.10.3.

4.4.11 Environmental Justice

Operations Impacts—Population estimates of the entire population and minority and low-income subsets of the population have been projected to the year 2030 (see Section 4.4.10.1 and Chapter 3, Section 3.10). Consistent with the human health analysis, impacts were analyzed on the potentially affected populations within 50 miles (80 kilometers) of TA-3. In addition, impacts on populations in close proximity were analyzed at additional radial distances of 5, 10, and 20 miles (8, 16, and 32 kilometers).

Table 4–46 shows the impacts on the total and subset populations within 5, 10, and 20 miles (8, 16, and 32 kilometers) of the existing CMR Building at TA-3. The total population within 5 miles (8 kilometers) of the CMR Building is projected to receive a dose of approximately 0.0088 person-rem and an average individual dose of 0.00071 millirem, annually. Within 5 miles (8 kilometers) of the CMR Building, both the average annual dose to an individual of the minority population (0.00076 millirem) and the average annual dose to an individual of the Hispanic population (0.00075 millirem) would be higher than the average annual dose to a member of the total population (0.00071 millirem). Annual doses estimated for all individuals would be very small and similar to the dose to the average individual of the total population (0.00071 millirem per year). This dose represents an increased risk to the exposed individual of developing a latent fatal cancer of 4.1×10^{-10}, or about 1 chance in 2.4 billion, annually.

Table 4–46 Continued Use of CMR Building Alternative — Comparison of Annual Doses to Total Minority, Hispanic, Native American, and Low-Income Populations Within 5, 10, and 20 Miles (8, 16, and 32 kilometers) and to Average Individuals (in 2030)

	5 Miles (8 kilometers)		*10 Miles (16 kilometers)*		*20 Miles (32 kilometers)*	
	Population (person-rem)	*Average Individual (millirem)*	*Population (person-rem)*	*Average Individual (millirem)*	*Population (person-rem)*	*Average Individual (millirem)*
Total population	0.0088	0.00071	0.010	0.00049	0.011	0.00018
Nonminority population	0.0055	0.00069	0.0061	0.00048	0.0064	0.00031
Total minority population	0.0033	0.00076	0.0037	0.00050	0.0050	0.00012
Hispanic population [a]	0.0017	0.00075	0.0019	0.00049	0.0030	0.000090
Native American population	0.000066	0.00069	0.00015	0.00017	0.00027	0.000063
Non-low-income population	0.0085	0.00071	0.0094	0.00049	0.011	0.00020
Low-income population	0.00027	0.00071	0.00032	0.00038	0.00057	0.000077

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility.
[a] The Hispanic population includes all Hispanic persons, regardless of race.

Doses to persons living below the poverty level are also presented in Table 4–46. The average annual dose to an individual, whether below or above the poverty level, would be 0.00071 millirem; this dose represents an increased risk of developing a latent fatal cancer of 4.2×10^{-10}, or about 1 chance in 2.4 billion, annually.

The total population within 10 miles (16 kilometers) of the CMR Building is projected to receive an annual dose of approximately 0.010 person-rem; the average individual dose is projected to be 0.00049 millirem, annually. Within 10 miles (16 kilometers) of TA-3, the average annual dose to a member of the minority would be 0.00050 millirem, compared to an average dose of 0.00048 millirem to a member of the nonminority population or 0.00049 millirem to a member of the total population. A member of the low-income population would receive an average annual dose of about 0.00038 millirem. This dose represents an increased risk to the exposed individual of developing a latent fatal cancer of 2.3×10^{-10}, or about 1 chance in 4.3 billion, annually.

The total population within 20 miles (32 kilometers) of the CMR Building is projected to receive an annual dose of approximately 0.011 person-rem; the average individual dose is projected to be 0.00018 millirem, annually. The average annual dose to a member of the nonminority population (0.00031 millirem) would be higher than the average annual dose to a member of the total population (0.00018 millirem). This dose to the nonminority average individual is very small and represents an increased risk to the exposed individual of developing a latent fatal cancer of 1.1×10^{-11}, or 1 chance in about 9.1 billion, annually. The average annual individual dose to other population subsets would be lower than the average dose to members of the nonminority population. The average annual dose to a member of the low-income population within 20 miles (32 kilometers) of the CMR Building would be lower than the average annual dose to a member of the non-low-income population or the total population.

As shown in **Table 4–47**, the total population within 50 miles (80 kilometers) of the CMR Building under the Continued Use of CMR Building Alternative is projected to receive a dose of approximately 0.016 person-rem and an average individual dose of 0.000032 millirem, annually.

The population subset of nonminority individuals would receive the highest average dose, 0.000039 millirem, annually. This dose is very small and represents an increased risk to the exposed individual of developing a latent fatal cancer of 2.3×10^{-11}, or 1 chance in about 43 billion, annually. Doses also were estimated for the following population subsets: all (total) minorities, Native Americans, and Hispanics of any race. The total minority population is expected to receive a collective dose of 0.0079 person-rem and average individual dose of 0.000027 millirem, annually. This dose represents an increased risk to the exposed individual of developing a latent fatal cancer of 1.6×10^{-11}, or about 1 chance in 61 billion, annually. Native Americans living within 50 miles (80 kilometers) of the CMR Building would receive a collective dose of 0.00048 person-rem and an average individual dose of 0.000018 millirem, annually. This dose represents an increased risk to the exposed individual of developing a latent fatal cancer of 1.1×10^{-11}, or about 1 chance in 90 billion, annually. The Hispanic population would receive a collective dose of 0.0055 person-rem annually; the annual average dose to a member of the Hispanic population would be 0.000024 millirem. This dose represents an increased risk to the exposed individual of developing a latent fatal cancer of 1.4×10^{-11}, or about 1 chance in 70 billion, annually.

Table 4–47 Continued Use of CMR Building Alternative — Comparison of Annual Doses to Total Minority, Hispanic, Native American, and Low-Income Populations Within 50 Miles (80 kilometers) and to Average Individuals (in 2030)

	Population (person-rem)	*Average Individual (millirem)*
Total population	0.016	0.000032
Nonminority population	0.0084	0.000039
Total minority population	0.0079	0.000027
Hispanic population [a]	0.0055	0.000024
Native American population	0.00048	0.000018
Non-low-income population	0.015	0.000034
Low-income population	0.0012	0.000019

CMR = Chemistry and Metallurgy Research.
[a] The Hispanic population includes all Hispanic persons, regardless of race.

Population doses to persons living below the poverty level are also analyzed in Table 4–47. Low-income populations surrounding TA-3 would receive an annual dose of 0.0012 person-rem and an annual average individual dose of 0.000019 millirem. This dose represents an increased risk to the exposed individual of developing a latent fatal cancer of 1.1×10^{-11}, or about 1 chance in 88 billion, annually. Persons living above the poverty level would receive an annual collective dose of 0.015 person-rem and an annual average individual dose of 0.000034 millirem. This dose represents an increased risk to the exposed individual of developing a latent fatal cancer of 2.1×10^{-11}, or about 1 chance in 49 billion, annually.

These data show that the dose to all population subsets surrounding TA-3 at radial distances of 5, 10, 20, and 50 miles (8, 16, 32, and 80 kilometers) would be small and would not result in adverse impacts on human health. Within all radial distances analyzed, the highest population dose projected is to the nonminority population. The average annual individual dose to the minority population and the Hispanic population slightly exceeds that to the nonminority population within the 5- and 10-mile (8- and 16-kilometer) radial distances; however, there is no appreciable difference between projected doses. Within the 20- and 50-mile (32- and 80-kilometer) radial distances from the CMR Building, the dose to the average individual of the nonminority population is projected to be slightly higher than the projected dose to the average individual in the minority population.

A special pathways receptor analysis was performed in support of the 2008 *LANL SWEIS*. In this analysis, it was determined that a special pathways receptor who consumed increased amounts of fish, deer, and elk from the areas surrounding LANL and drank surface water and Indian tea (Cota) along with other potentially contaminated foodstuffs could receive an additional dose of up to 4.5 millirem per year from these special pathways (see Appendix C, Section C.1.4 of the 2008 *LANL SWEIS* [DOE 2008a]). Doses associated with normal operation of the CMR Building would not be expected to increase the dose from these special pathways. Therefore, if the MEI associated with this *CMRR-NF SEIS* were also assumed to be a special pathways receptor, the maximum dose would continue to be about 4.5 millirem per year. This dose is low; it would represent an increase of about 1 percent above the approximately 480 millirem that a person residing near LANL would normally receive annually from natural background radiation. In terms of increased risk of a fatal cancer from the special pathways dose plus the dose from normal operations of the CMRR-NF, it would represent an annual estimated risk of 3×10^{-6} or about 1 chance in 333,000.

Nonradiological air quality impacts are discussed in Section 4.4.4.1. There would be no increases in emissions or air pollutant concentrations for nonradiological releases due to CMR Building or RLUOB operations under the Continued Use of CMR Building Alternative. Nonradiological emissions would remain well below the ambient standards established to protect human health. Therefore, the impact of potential nonradiological air pollutant releases on minority or low-income individuals under this alternative would be considered minor.

Potential impacts on cultural resources at LANL are discussed in Section 4.4.8. Operations under the Continued Use of CMR Building Alternative would not affect resources in TA-55, TA-3, or the site as a whole. Therefore, there are no adverse impacts on cultural resources at LANL from implementing this alternative.

Residents of the Pueblo of San Ildefonso have expressed concern that pollution from CMRR Facility operations could contaminate Mortandad Canyon, which drains onto pueblo land and sacred areas. CMRR Facility operations under this alternative are not expected to adversely affect air or water quality or result in contamination of tribal lands adjacent to the LANL boundary. Impacts on surface-water and groundwater quality are discussed in Section 4.4.6.

As discussed in Section 4.4.13, there are not expected to be any significant impacts on transportation routes or traffic within the ROI from implementing this alternative.

These data show that the total minority, Native American, Hispanic, and low-income populations would not be subjected to disproportionately high and adverse dose impacts from normal operations under the Continued Use of CMR Building Alternative.

4.4.12 Waste Management and Pollution Prevention

Operations Impacts –The projected annual waste volumes from the CMR Building and RLUOB are listed in **Table 4–48** for transuranic and mixed transuranic wastes, low-level and mixed low-level radioactive wastes, and chemical wastes. The projected volumes for the CMR Building are based on average waste generation rates for the CMR Building for the years 2004 through 2008, while the projected volumes for RLUOB are the same as those shown in Section 4.3.12. (The projected volumes for the CMR Building are smaller than the volumes for these wastes projected for operation of the CMR Building under all alternatives in the 2008 *LANL SWEIS* [DOE 2008a]). The CMR Building and RLUOB are designed and operated to accommodate these waste volumes, and no difficulty in managing these volumes for onsite disposal or shipment for offsite disposition is expected on either a CMR Building and RLUOB or LANL site-wide basis.

Radioactive and Chemical Waste

Since the total radioactive and chemical waste volumes listed in Table 4–48 are all smaller than the volumes projected in Section 4.3.12 for the combination of the Modified CMRR-NF and RLUOB and in Section 4.3.12, it was concluded that there would be no significant impacts on available treatment, storage, or disposal capacity expected for the analyzed onsite and offsite waste disposition facilities, a similar conclusion can be made for this alternative.

Table 4–48 Continued Use of CMR Building Alternative — Operational Waste Generation Rates Projected for CMR Building, RLUOB, and Los Alamos National Laboratory Activities

Waste	*CMR Building*	*RLUOB*	*Total*	*Site-wide LANL Projections*
Transuranic and mixed transuranic (cubic yards per year)	8.2	0	8.2	440 to 870 [a]
Low-level radioactive (cubic yards per year)	190	130	310	21,000 to 115,000 [a]
Mixed low-level radioactive (cubic yards per year)	1.8	2.3	4.1	320 to 18,100 [a]
Sanitary solid (tons per year) [b]	36	24	60	– [c]
Sanitary wastewater (gallons per year)	2,730,000	2,490,000	5,220,000	156,000,000 [d]
Liquid low-level radioactive (gallons per year)	67,600	95,800	163,000	4,000,000 [e]
Chemical (tons per year) [f]	0.88	0.50	1.4	3,200 to 5,750 [a]

CMR = Chemistry and Metallurgy Research; RLUOB = Radiological Laboratory/Utility/Office Building.

[a] Projected waste quantities from LANL operations are given as a range in the *LANL SWEIS* (DOE 2008a). The listed value reflects the assumption of the Expanded Operations Alternative in the *LANL SWEIS*, less the waste projected from some activities that were not implemented (see Table 4–57).

[b] The projected quantity of CMR Building and RLUOB sanitary solid waste (municipal trash) was estimated by multiplying the projected annual number of full-time equivalent radiation workers (140 for RLUOB and 210 for CMR Building) by an assumed annual 344 pounds (156 kilograms) of waste generated per person per year (see Chapter 3, Section 3.12.2).

[c] Annual sanitary solid waste quantities were not projected in the 2008 *LANL SWEIS*.

[d] The value shown is the annual volume of wastewater processed at the Sanitary Wastewater Systems Plant in TA-46, assuming operation at its 600,000-gallon-per-day (2.27-million-liter-per-day) design capacity for 260 working days per year (DOE 2003b). Sanitary wastewater and nonradioactive liquid waste are both projected to be routed to the Sanitary Wastewater Systems Plant for treatment.

[e] The value shown is the projected annual liquid low-level radioactive waste treatment rate at RLWTF assuming implementation of the No Action Alternative in the 2008 *LANL SWEIS*; annual treatment of 30,000 gallons of liquid transuranic waste was also projected (DOE 2008a).

[f] Chemical waste is not a formal LANL waste category; however, as was done in the 2008 *LANL SWEIS* (DOE 2008a), the term is used in this *CMRR-NF SEIS* to denote a broad category of materials, including hazardous wastes, toxic wastes, and special waste designated under the New Mexico Solid Waste Regulations.

Note: Totals may not equal the sum of the contributions due to rounding. To convert cubic yards to cubic meters, multiply by 0.76456; tons to metric tons, by 0.90718; gallons to liter, by 3.78533.

Source: DOE 2008a; LANL 2007d, 2009a, 2010a.

Sanitary Solid Waste

The CMR Building employs approximately 210 workers (LANL 2011a:LANL site, 023). If each employee generates 344 pounds (156 kilograms) of sanitary solid waste (municipal trash) (see Chapter 3, Section 3.12.2), the CMR Building would generate about 36 tons (33 metric tons) of sanitary solid waste annually. In addition, about 24 tons (22 metric tons) of sanitary solid waste are projected to result from RLUOB operations annually, or about 60 tons (54 metric tons) from both facilities. This waste would be collected in appropriate waste containers, such as dumpsters, and would be regularly disposed of or recycled by transfer to the Los Alamos County Eco Station located at the Los Alamos County Landfill site within the LANL boundary or by transfer to an offsite solid waste facility permitted to accept the waste. No impacts on available solid waste management capacity are expected because of the small quantity of sanitary solid waste to be managed from CMR Building and RLUOB operations compared to the total quantities of solid waste annually addressed on a county and state basis and the large number of available waste disposition facilities within New Mexico. The annual sanitary solid waste generation from both facilities would represent less than 1 percent of the waste processed in 2009 at the Los Alamos County Eco Station.

Sanitary Wastewater

Under the Continued Use of CMR Building Alternative, the CMR Building would continue to generate sanitary liquid wastewater that would be piped to the Sanitary Wastewater Systems Plant in TA-46 for treatment. Treated wastewater would be pumped to TA-3 to be either recycled at the TA-3 power plant (as makeup water for the cooling towers) or discharged into Sandia Canyon via permitted outfall number 001 (LANL 2010a). The CMR Building sanitary wastewater generation rate is projected to be 2,730,000 gallons (10,000,000 liters) for 260 days per year, assuming that 210 workers each generate 50 gallons (190 liters) of wastewater per day (DOE 2003b). The RLUOB sanitary wastewater generation rate is estimated to be 2,490,000 gallons (9,410,000 liters) per year. The combined wastewater generation rate from both facilities is thus about 5,220,000 gallons (20,000,000 liters) per year. The daily generation rate would represent about 3 percent of the 600,000-gallon (2.3-million-liter) -per day design capacity of the Sanitary Wastewater Systems Plant (DOE 2003b). Therefore, no impacts on available sanitary wastewater treatment capacity are expected from CMR Building and RLUOB operations.

Nonradioactive Liquid Waste

The CMR Building would continue to generate industrial wastewater, and it is expected that this wastewater would continue to be transferred to the Sanitary Wastewater Systems Plant for treatment. If the CMR Building continues to generate a few hundred thousand gallons of industrial wastewater annually (see Chapter 3, Section 3.12.1.4), no impacts on Sanitary Wastewater Systems Plant treatment capacity are expected. Similarly, the small quantities of nonradioactive liquid waste that might be generated at RLUOB would be routed to the Sanitary Wastewater Systems Plant for treatment.

Radioactive Liquid Waste

The CMR Building would continue to generate radioactive liquid waste that would be piped for treatment to RLWTF in TA-50. About 67,600 gallons (256,000 liters) per year of liquid low-level radioactive waste have been projected for CMR Building operations and little or no liquid transuranic waste (Balkey 2011). In addition, about 95,800 gallons (363,000 liters) of liquid low-level radioactive waste and no liquid transuranic waste are annually projected from RLUOB operations. About 163,000 gallons (617,000 liters) per year of liquid low-level radioactive waste and little or no liquid transuranic waste are projected from both facilities. The projected volume would represent about 4 percent of the projected RLWTF treatment rate in the 2008 *LANL SWEIS* (under the *LANL SWEIS* No Action Alternative) (DOE 2008a). No impacts on radioactive liquid waste treatment and discharge capacity are expected from CMR Building and RLUOB operations.

4.4.13 Transportation and Traffic

4.4.13.1 Transportation

Routine (Incident-Free) Transportation

Operations Impacts—**Table 4–49** summarizes the total transportation impacts, as well as transportation impacts on two nearby LANL transportation routes: LANL to Pojoaque, New Mexico, the route segment used by trucks from LANL, and Pojoaque to Santa Fe, New Mexico, the route segment used by trucks traveling on Interstate 25 (such as trucks traveling to WIPP). As stated in Section 4.3.13.1, for analysis purposes in this *CMRR-NF SEIS*, two sites, the NNSS and a commercial facility in Utah, were selected as possible disposal sites for all low-level radioactive waste should the decision be made to dispose of low-level radioactive waste off site. Differences in distance to these two sites and the affected population along the transportation routes result in a range of impacts under each alternative.

Table 4–49 Continued Use of CMR Building Alternative — Annual Risks of Transporting Operational Radioactive Materials

Transport Segments	Offsite Disposal Option [a]	Number of Shipments	Round Trip Kilometers Traveled (thousands)	Incident-Free: Crew: Dose (person-rem)	Incident-Free: Crew: Risk [b]	Incident-Free: Population: Dose (person-rem)	Incident-Free: Population: Risk [b]	Accident: Radiological Risk [b]	Accident: Nonradiological Risk [b]
LANL to Pojoaque	NNSS	24	1.5	0.009	5×10^{-6}	0.003	2×10^{-6}	5×10^{-10}	3×10^{-5}
Pojoaque to Santa Fe		24	2.5	0.02	1×10^{-5}	0.005	3×10^{-6}	3×10^{-10}	5×10^{-5}
Total Route		24	57	0.3	2×10^{-4}	0.1	6×10^{-5}	1×10^{-8}	9×10^{-4}
LANL to Pojoaque	Commercial	24	1.5	0.009	5×10^{-6}	0.003	2×10^{-6}	5×10^{-10}	3×10^{-5}
Pojoaque to Santa Fe [c]		2	0.2	0.004	2×10^{-6}	0.001	8×10^{-7}	2×10^{-10}	4×10^{-6}
Total Route		24	50	0.3	2×10^{-4}	0.09	5×10^{-5}	1×10^{-8}	8×10^{-4}

CMR = Chemistry and Metallurgy Research; LANL = Los Alamos National Laboratory; NNSS = Nevada National Security Site.

[a] Under this option, low-level and mixed low-level radioactive waste would be shipped to either the NNSS or a commercial site in Utah. Transuranic waste would be shipped to the Waste Isolation Pilot Plant.

[b] Radiological risk is expressed in terms of latent cancer fatalities, while nonradiological risk is expressed in terms of the calculated number of traffic accident fatalities.

[c] Shipments of low-level radioactive waste to a commercial disposal site in Utah would not pass along the Pojoaque to Santa Fe segment of highway.

Note: Due to rounding, the risk values may differ slightly from those calculated by multiplying the reported dose times the dose factor of 0.0006 LCFs per rem. To convert kilometers to miles, multiply by 0.62137.

Under this alternative, about 24 offsite shipments of radioactive materials would be made annually to the NNSS in Nevada (or a commercial site in Utah) and WIPP in New Mexico. Maximum transportation impacts would be realized if low-level radioactive waste and mixed low-level radioactive waste were shipped to either the NNSS in Nevada or a commercial site in Utah instead of being disposed of on site. Transuranic waste would be shipped to WIPP. The total projected (one-way) distance traveled on public roads transporting radioactive materials to various locations would range from about 15,500 to 17,700 miles (25,000 to 28,500 kilometers).

The maximum annual dose to the transportation crew from all offsite transportation activities under this alternative was estimated to be about 0.3 person-rem, for both disposal options. The dose to the general population would be about 0.09 to 0.1 person-rem. Accordingly, incident-free transportation would result in a maximum of no (2×10^{-4}) excess LCFs among the transportation workers and no (6×10^{-5}) excess LCFs in the affected population. The estimated dose associated with transport of low-level radioactive waste and mixed low-level radioactive waste to the NNSS is slightly higher because of the longer distance traveled and larger affected population. The differences in estimated doses under either disposal option are very small.

Note that DOE regulations limit the maximum annual dose to a transportation worker to 100 millirem per year unless the individual is a trained radiation worker. The dose to a trained radiation worker is limited to 2 rem per year (DOE 1999b). The potential for a trained radiation worker to develop a fatal latent cancer from an annual dose at the maximum annual exposure is 0.0012. Therefore, an individual transportation worker is not expected to develop a lifetime fatal latent cancer from exposure during these activities.

The doses to the general populations along the routes from LANL to Pojoaque and from Pojoaque to Santa Fe were estimated to be a maximum of 0.005 person-rem. This dose would result in no (3×10^{-6}) excess LCFs among the exposed populations.

Transportation Accidents

Operations Impacts—As stated earlier in Section 4.3.13.1, two sets of analyses were performed for the evaluation of transportation accident impacts involving radioactive materials transport: impacts of maximum reasonably foreseeable accidents (accidents with probabilities greater than 1 in 10 million per year [1×10^{-7}]) and impacts of all accidents (total transportation accidents).

For radioactive materials transported under this alternative, the maximum reasonably foreseeable offsite truck transportation accident with the greatest consequence would involve a truck carrying contact-handled transuranic waste. The probability that such an accident would occur is about 1 in 1.5 million (6.7×10^{-7}) per year in a rural area.[24] If such an accident occurs, the consequences in terms of general population dose would be 0.2 person-rem. Such an exposure could result in no (1×10^{-4}) excess LCFs among the exposed population. This accident would result in a dose of 8.2 millirem to a hypothetical MEI located at a distance of 330 feet (100 meters) and exposed to the accident plume for 2 hours, with a corresponding risk of developing a latent fatal cancer of 5×10^{-6}, or about 1 chance in 200,000.

Under the Continued Use of CMR Building Alternative, estimates of the total offsite transportation accident risks for all projected accidents involving radioactive shipments, regardless of type, are a maximum radiological dose-risk[25] to the general population of 0.02 person-millirem, resulting in no (1×10^{-8}) excess LCFs and a maximum nonradiological (traffic) accident risk of zero (9×10^{-4}) fatalities.

The maximum radiological transportation accident dose-risk to the general populations along the routes from LANL to Pojoaque and from Pojoaque to Santa Fe, New Mexico, would be 0.0008 person-millirem. This dose would result in no (5×10^{-10}) excess LCFs among the exposed populations. The maximum expected traffic accident fatalities along these routes would be zero (5×10^{-5}).

The impacts of transporting various nonradiological materials are presented in terms of distance traveled and numbers of expected traffic accidents and fatalities. This alternative does not include new construction. Therefore, the transport would be limited to the transport of hazardous wastes generated during normal operations, which is expected to be about one shipment per year (see Table 4–36). Based on the travel assumptions described in Section 4.3.13.1, the transportation under this alternative would result in about 330 miles (530 kilometers) traveled, no (1×10^{-5}) traffic accidents, and no (1×10^{-6}) fatalities.

4.4.13.2 Traffic

Operations Impacts—As the continued CMR Building and RLUOB operations would require the same number of employees as currently working these activities on the site, no changes in traffic are anticipated. There would be no change in the impact on traffic or transportation on the internal LANL road system, the vehicle access portals, or the public roadways external to LANL over the existing conditions.

4.5 Facility Disposition

4.5.1 Impacts of CMR Building Decontamination and Decommissioning

Chapter 2, Section 2.8.2, describes the contaminated areas, equipment, and systems within the CMR Building and the processes that would be undertaken for building DD&D. For purposes of analysis, only disposition of the entire CMR Building is addressed in detail because activities associated with this

[24] *The likelihood of an accident in an urban or suburban area is much less than 1 in 10 million per year.*
[25] *Dose-risk includes the probability that an accident will occur. Here, these values were calculated by dividing the radiological risks in terms of LCFs given in Table 4–49 (column 9) by 0.0006, which is the risk of an LCF per person-rem of exposure.*

option would have the greatest potential environmental consequences, including generation of the largest amount of wastes. DD&D procedures for dispositioning the CMR Building would be common actions across each of the alternatives analyzed in this *CMRR-NF SEIS* (see Chapter 2, Section 2.8).

Disposition impacts of the demolition of the CMR Building are discussed qualitatively below for air quality and noise, surface-water and groundwater quality, ecological resources, and human health. Quantitative information has not been presented for these resource areas because project-specific work plans have not been prepared and the CMR Building has not been completely characterized with regard to types and locations of contamination. The waste materials that could be generated by the demolition of the CMR Building are addressed quantitatively, however, as are the impacts of transporting this waste to offsite management facilities; the waste generation and transportation impacts data have been updated since the 2003 *CMRR EIS*. Additional impacts could result from environmental restoration of potential release sites associated with the CMR Building and its vicinity. These potential release sites will be characterized and remediation decisions made in accordance with established processes, including the 2005 Consent Order.

Example potential release sites associated with the CMR Building include the solid waste management units and areas of concern summarized in the following text box.

Example Potential Release Site Associated with the Chemistry and Metallurgy Research Building

Solid Waste Management Unit (SWMU) 03-034(a) consists of two stainless steel and two concrete underground liquid storage tanks located near Wing 9 of the Chemistry and Metallurgy Research (CMR) Building that for a number of years received radioactive liquid waste from Wing 9. A sump pit serving the concrete tanks was used to drain liquid waste to a radioactive liquid waste line to be pumped to the Radioactive Liquid Waste Treatment Facility. Both sets of tanks have been taken offline, and the waste line to the tanks was removed.

Area of Concern (AOC) 03-004(c) is an active dumpster storage area located on an asphalt-covered surface at the main loading dock of the CMR Building, used for staging of boxed low-level radioactive waste before disposal. Runoff from this AOC flows to a storm drain that discharges at an outfall (SWMU 03-054(e)) into Mortandad Canyon. The AOC has been sampled and additional samples will be obtained, leading to a remediation recommendation (LANL 2010g).

SWMU 03-054(e) is an outfall located in upper Mortandad Canyon that discharges effluent from several exterior sources from the CMR Building, including roof drains and surface-water runoff from the asphalt area around the building. The SWMU has been sampled and additional samples will be obtained, leading to a remediation recommendation (LANL 2010g).

Air Quality and Noise

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

Noise levels during disposition activities at the CMR Building would be consistent with those typical of construction activities. As appropriate and in accordance with DOE regulations (10 CFR Part 851), workers would be required to wear hearing protection to avoid adverse effects on hearing. Noninvolved workers at nearby facilities within TA-3 would be able to hear some of the activities; however, the level of noise would not likely be distracting because construction noise at LANL is common. Some wildlife species may avoid the immediate vicinity of the CMR Building due to noise as demolition proceeds;

however, any effects on wildlife resulting from noise associated with demolition activities would be temporary.

Surface-Water and Groundwater Quality

Little or no impacts on water resources are expected. Demolition of the CMR Building would not disturb surface water or generate liquid effluents. Silt fences and other best management practices would be employed to ensure that fine particulates would not be transported by stormwater into surface-water features in the vicinity of the CMR Building. Potable water use at the site would be limited to that necessary for washing equipment, dust control, and worker sanitary facilities.

Ecological Resources

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

Cultural Resources

Under Section 106 of the National Historic Preservation Act, any adverse effects on NRHP-eligible properties must be resolved prior to commencement of project activities. In the case of the CMR Building, which has been determined to be eligible for listing due to its association with events during the Cold War years and its architectural and engineering significance (Garcia, McGehee, and Masse 2009), removal of equipment and DD&D of the facility would constitute an adverse effect. In conjunction with the State Historic Preservation Office, NNSA has developed documentation measures to reduce adverse effects on NRHP-eligible properties at LANL. These measures are incorporated into formal memoranda of agreement between NNSA and the New Mexico Historic Preservation Division. Typical memoranda of agreement terms include the preparation of a detailed report containing the history and description of the affected properties. Other terms include the identification of all drawings for each property, the production of medium-format archival photographs, and the preparation of LANL historic building survey forms. Documentation measures included in NNSA memoranda of agreement are carried out to the standards of the Historic American Building Survey/Historic American Engineering Record (HABS/HAER). Specific levels of HABS/HAER documentation are determined on a case-by-case basis.

Human Health

The primary source of potential consequences to workers and members of the public would be associated with the release of radiological contaminants during the decontamination and demolition processes. The only radiological impact on noninvolved workers or members of the public would be from radiological air emissions. Any emissions of contaminated particulates would be reduced by the use of plastic draping and contaminant containment, coupled with HEPA filtration.

Demolition of the CMR Building would involve the removal of radioactively contaminated and/or asbestos-contaminated material. Asbestos-contaminated material would be removed in accordance with asbestos abatement guidelines. Workers would be protected by personal protective equipment and other engineered and administrative controls. No asbestos would likely be released that could affect members of the public.

Waste Management

All wastes would be handled, managed, packaged, and disposed of in the same manner as wastes generated by other activities at LANL (see Chapter 3, Section 3.12). The amounts and types of wastes are expected to be within the capacity of existing waste management systems and are not expected to impact waste management operations at LANL or elsewhere. Waste minimization and pollution prevention principles would be used to the maximum extent practicable under DOE policy.

Projected annual and total waste quantities per waste type for DD&D of the CMR Building are summarized in **Table 4–50** using a work completion time period of 2 to 4 years.[26] Waste projections are uncertain and have been updated from those presented in the 2003 *CMRR EIS* and 2008 *LANL SWEIS* (DOE 2003b, 2008a) by scaling estimates of contaminated surfaces and equipment (DOE 2003b; LANL 2003) to waste volumes generated from DD&D of known contaminated structures at the former Rocky Flats Plant.

Transuranic (and mixed transuranic) waste would be generated from DD&D of heavily contaminated ducts, radioactive liquid waste piping, hot cells, conveyors, gloveboxes, hoods, and other equipment. Transuranic waste would be packaged in drums or standard waste boxes and shipped to WIPP in reusable Type B shipping packages certified by the U.S. Nuclear Regulatory Commission. The total WIPP capacity for transuranic waste disposal is set at 6.18 million cubic feet (175,600 cubic meters) pursuant to the Waste Isolation Pilot Plant Land Withdrawal Act (DOE 2002b), or 219,000 cubic yards (168,485 cubic meters) of contact-handled transuranic waste (DOE 2009a). Estimates in the Annual *Transuranic Waste Inventory Report – 2010* indicate that approximately 185,000 cubic yards (141,000 cubic meters) of contact-handled transuranic waste would be disposed of at WIPP (emplaced volume plus stored volume) (DOE 2010b), approximately 36,000 cubic yards (27,500 cubic meters) less than the contact-handled transuranic waste permitted capacity. The projected DD&D total of 150 cubic yards (120 cubic meters) would require less than 1 percent of the unsubscribed WIPP disposal capacity. Because the total quantity of transuranic waste that may be disposed of at WIPP is statutorily established, and the operating period for WIPP will depend on the volumes of transuranic waste that may be disposed of at WIPP, WIPP may meet its statutory disposal limit before the end of the operational period of the Modified CMRR-NF. If necessary, transuranic or mixed transuranic waste generated without a disposal pathway would be safely stored pending development of additional disposal capacity.

Bulk low-level radioactive waste would be packaged in soft-sided liners and bags and shipped in reusable intermodal containers, while packaged low-level radioactive waste would be packaged in containers such as B-25 boxes or 55-gallon (208-liter) drums. The waste could be transported off site to NNSS or to commercially licensed facilities for disposal and/or disposed of on site at TA-54, while Area G continues to accept waste.

It is expected that the bulk of the low-level radioactive waste generated by the demolition of the CMR Building would be disposed of at facilities at the NNSS; the existing commercial facility at Clive, Utah; or other commercial facilities as they become available. If CMR Building DD&D requires 2 years to complete, the up to 19,000 cubic yards (15,000 cubic meters) of low-level radioactive waste projected to be generated annually would represent about 30 percent of the average low-level radioactive waste disposal rate at the NNSS and about 9 percent of the current low-level radioactive waste disposal rate at the Clive, Utah, commercial facility (see Section 4.2.12). Considering both facilities, offsite disposal capacity is believed to be adequate.

[26] *The waste projections do not include wastes that could result from remediation decisions for potential release sites that may be located at or in the vicinity of the CMR Building. These potential release sites will be characterized and remediation decisions made in accordance with established processes, including the 2005 Consent Order.*

Table 4–50 Continued Use of CMR Building Alternative — Projected Waste Generation from Decontamination, Decommissioning, and Demolition of the CMR Building

Waste Stream	*Annual Waste Generation*	*Total Waste Generation*
Transuranic waste (cubic yards) [a]	38 – 75	150
Bulk and packaged low-level radioactive waste (cubic yards) [b]	9,500 – 19,000	38,000
Mixed low-level radioactive waste (cubic yards) [c]	70 – 140	280
Solid waste (cubic yards) [d]	27,500 – 53,000	110,000
Chemical waste (tons) [e]	65 – 130	260

CMR=Chemistry and Metallurgy Research.
[a] Includes mixed transuranic waste.
[b] Three-quarters of the low-level radioactive waste is projected to be bulk material to be shipped for disposal in soft-sided liners or bags; the remaining waste is projected to be packaged in containers such as drums and boxes.
[c] Expected to principally include asbestos waste contaminated with radionuclides.
[d] Includes demolition debris and sanitary solid waste generated by workers.
[e] Chemical waste is not a formal LANL waste category; however, as was done in the *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE 2008a), the term is used in this *CMRR-NF SEIS* to denote a variety of materials, 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, including industrial waste, infectious waste, and petroleum-contaminated soil. The waste is expected to be principally asbestos waste.
Note: Total may not equal the sum of the contributions due to rounding. To convert cubic yards to cubic meters, multiply by 0.76456; gallons to liters, by 3.78533.
Source: DOE 2003b, 2008a; LANL 2003.

Mixed low-level radioactive waste would principally consist of asbestos waste contaminated with radionuclides. It would be packaged in containers such as B-25 boxes or 55-gallon (208-liter) drums pending shipment to an offsite treatment, storage, and disposal facility.[27] It is expected that the projected annual generation of mixed low-level radioactive waste would be within the current disposal capacities of the NNSS in Nevada and the commercial facility in Clive, Utah. Using a time period of 2 years, the 140 cubic yards (110 cubic meters) of mixed low-level radioactive waste projected to be generated annually would represent about 9 percent of the average mixed low-level radioactive waste disposal rate at the NNSS and about 2 percent of the current mixed low-level radioactive waste disposal rate at the commercial facility in Clive, Utah (see Section 4.3.12). Furthermore, several additional mixed low-level radioactive waste treatment, storage, and disposal facilities are nationally available.

Solid waste consisting of demolition debris and sanitary solid waste was projected to total up to 53,000 cubic yards (41,000 cubic meters) per year. This waste would be collected in appropriate waste containers such as 20-cubic-yard rolloffs or dumpsters and regularly recycled or disposed of by transfer to the Los Alamos County Eco Station within LANL or to an offsite solid waste facility permitted to accept the waste. No impacts on available solid waste management capacity are expected because of the large number of waste disposition facilities permitted within New Mexico (see Section 4.3.12).

Chemical waste (principally including asbestos that is not radioactively contaminated, but also including polychlorinated biphenyls and Resource Conservation and Recovery Act [RCRA]-regulated hazardous waste) would be packaged in containers such as 55-gallon (208-liter) drums and shipped to offsite recycle or treatment, storage, and disposal facilities. It is expected that the amount of chemical waste generated by demolition of the CMR Building would not exceed the disposal capacity of existing facilities (see Section 4.3.12). Several permitted treatment, storage, and disposal facilities exist within New Mexico and neighboring states; 19 facilities are permitted in New Mexico for disposal of special waste such as

[27] *Asbestos waste contaminated with radionuclides may also be disposed of at LANL TA-54, while Area G continues to accept waste.*

asbestos. In addition, 10 permitted treatment, storage, and disposal facilities for hazardous waste existed in New Mexico as of 2008, and 39 permitted companies for treatment or disposal of polychlorinated biphenyls existed in the United States as of 2010.

About 68,000 gallons (260,000 liters) per year of liquid low-level radioactive waste are projected to be generated during CMR Building decommissioning. This waste would be transferred to RLWTF at TA-50 for treatment (Balkey 2011). Liquid waste from decommissioning of the CMR Building has been considered in LANL forecasts for annual receipt of liquid waste at RLWTF (Balkey 2011), and no impacts on RLWTF capacity are expected.

Transportation

Waste from DD&D of the CMR Building would be transported by truck to recycle or treatment, storage, and disposal sites at LANL or offsite locations. Transport of radioactive waste would present potential risks to workers and the public from radiation exposure as the waste packages are transported along roads and highways. There would also be potential public risks from radiation exposure (expressed as LCFs) should hypothetical traffic accidents result in release of radioactive material, as well as nonradiological risks of public fatalities resulting from the mechanical forces involved in an accident. Possible accident risks from transport of nonradioactive wastes would only involve nonradiological public fatality risks. **Table 4–51** lists the estimated annual number of offsite shipments of wastes from DD&D of the CMR Building using an assumed 2-year completion time period.

Table 4–51 Continued Use of CMR Building Alternative — Annual Number of Offsite Shipments of Wastes from Decontamination, Decommissioning, and Demolition of the CMR Building

Number of Shipments				
Low-Level Radioactive Waste	***Mixed Low-Level Radioactive Waste***	***Transuranic Waste***	***Hazardous Waste***	***Nonhazardous Waste***
1,110	10	10	20	2,700

CMR = Chemistry and Metallurgy Research.
Note: Annual shipment estimates have been rounded.

Table 4–52 summarizes total annual transportation impacts, as well as annual transportation impacts for two transportation routes nearby LANL: LANL to Pojoaque, New Mexico, which is the route segment used by trucks to and from LANL, and Pojoaque to Santa Fe, New Mexico, which is the route segment used by all trucks traveling on Interstate 25 (such as trucks traveling to WIPP). For purposes of analysis, the NNSS in Nevada and a commercial facility in Utah were used as possible disposal sites for low-level radioactive waste and mixed low-level radioactive waste if these wastes are all transported to offsite facilities. The differences in distance from LANL and the affected population along the different transportation routes between these two sites result in a range of impacts.

DD&D of the CMR Building could be completed in as few as 2 years, during which there would be a total of 2,260 offsite shipments of radioactive waste, or an average of 1,130 shipments each year. If DD&D takes a longer time to complete, the annual impacts would be smaller, although the total impacts of shipping all radioactive waste would remain the same. For purposes of analysis, radioactive wastes would be shipped to the NNSS in Nevada (or a commercial site in Utah), and WIPP in New Mexico. The total annual projected (one-way) distance traveled on public roads by trucks transporting radioactive waste would range from about 0.75 to 0.87 million miles (1.2 to 1.4 million kilometers).

Table 4–52 Continued Use of CMR Building Alternative — Annual Risks of Transporting Radioactive Waste from Decontamination, Decommissioning, and Demolition of the CMR Building

Transport Segments	Offsite Disposal Option [a]	Annual Number of Shipments	Round Trip Kilometers Traveled (thousands)	Incident-Free: Crew Dose (person-rem)	Incident-Free: Crew Risk [b]	Incident-Free: Population Dose (person-rem)	Incident-Free: Population Risk [b]	Accident: Radiological Risk [b, c]	Accident: Nonradiological Risk [b]
LANL to Pojoaque	NNSS	1,130	70.3	0.05	3×10^{-5}	0.01	1×10^{-5}	9×10^{-10}	1×10^{-3}
Pojoaque to Santa Fe		1,130	117.5	0.09	5×10^{-5}	0.02	1×10^{-5}	7×10^{-10}	2×10^{-3}
Total		1,130	2,812	1.9	1×10^{-3}	0.4	3×10^{-4}	1×10^{-7}	4×10^{-2}
LANL to Pojoaque	Commercial	1,130	70.3	0.05	3×10^{-5}	0.01	1×10^{-5}	9×10^{-10}	1×10^{-3}
Pojoaque to Santa Fe [d]		10	1.0	0.02	1×10^{-5}	0.006	4×10^{-6}	8×10^{-15}	2×10^{-5}
Total		1,130	2,423	1.6	1×10^{-3}	0.4	2×10^{-4}	9×10^{-8}	4×10^{-2}

CMR = Chemistry and Metallurgy Research; LANL = Los Alamos National Laboratory; NNSS = Nevada National Security Site.

[a] For purposes of analysis, low-level and mixed radioactive wastes would be shipped to either the NNSS or to a commercial site in Utah. All transuranic wastes would be shipped to the Waste Isolation Pilot Plant.

[b] Radiological risk is expressed in terms of latent cancer fatalities, while nonradiological risk is expressed in terms of the calculated number of traffic accident fatalities. Radiological risk was determined using a risk of 0.0006 latent cancer fatalities per person-rem (DOE 2003a).

[c] Radiological accident risk in this table is presented in terms of dose-risk, which considers the probabilities that a range of accidents would occur.

[d] Shipments of low-level radioactive waste to a commercial disposal site in Utah would not pass along the Pojoaque to Santa Fe segment of highway.

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

Impacts of Incident-Free Transportation—The annual dose to the transportation crew from offsite transportation of CMR Building DD&D waste was estimated to range from about 1.6 person-rem for disposal at the commercial disposal site in Utah to about 1.9 person-rem for disposal at the NNSS in Nevada. The dose to the general population (up to about 0.4 person-rem) would be nearly the same whether the waste is shipped to the commercial site in Utah or to the NNSS in Nevada. Using a risk of 0.0006 LCFs per person-rem (DOE 2003a), incident-free transportation would result in no (up to 1×10^{-3}) excess LCFs among transportation workers and no (up to 3×10^{-4}) excess LCFs in the affected population. The estimated doses associated with transport of low-level radioactive waste and mixed low-level radioactive waste to the NNSS in Nevada are higher than those for transport to Utah because of the longer distance traveled and larger affected population. The differences in estimated doses under either disposal option are very small, however, as shown above.

Note that DOE regulations limit the maximum annual dose to a transportation worker to 100 millirem per year unless the individual is a trained radiation worker. The dose to a trained radiation worker is limited to 2 rem per year (10 CFR Part 835). Using a risk of 0.0006 LCFs per rem (DOE 2003a), the potential for a trained radiation worker to develop a fatal latent cancer from an annual dose at the maximum annual exposure would be 0.0012. Therefore, an individual transportation worker is not expected to develop a lifetime fatal latent cancer from exposure during these activities.

The maximum annual dose to the general populations along the routes from LANL to Pojoaque and from Pojoaque to Santa Fe, New Mexico, was estimated to be 0.02 person-rem. Using a risk of 0.0006 LCFs per person-rem (DOE 2003a), this dose would result in no (1×10^{-5}) excess LCFs among the exposed populations.

The maximum dose to an MEI residing at the edge of the transportation route was estimated to be about 0.0002 millirem per shipment. If this individual were similarly exposed to radiation from all shipments of radioactive waste from DD&D of the CMR Building, the maximum annual dose would be about 0.22 millirem, with a risk of developing an LCF of 1.4×10^{-7} (about 1 in 7.3 million).

Impacts of Accidents during Transportation—As stated in Section 4.2.13, two sets of analyses were performed for the evaluation of transportation accident impacts: impacts of all conceivable accidents (total transportation accidents) and impacts of maximum reasonably foreseeable accidents. The first (probabilistic) analysis takes into account the probability of an accident along the transport route and the potential releases to the environment caused by a spectrum of possible accident scenarios, from low-probability accidents with high consequences (large releases) to high-probability accidents (fender benders) with low or no consequences (small or no releases). The consequences and probabilities are summed over all accident probabilities and severity categories to result in probability-weighted values in terms of dose-risk (person-rem) and risk (LCF). The second analysis (maximum reasonably foreseeable accident analysis) presents the public consequences that would result from a severe accident in an urban or suburban area that has a probability greater than 1 in 10 million per year (1×10^{-7}).

As listed in Table 4–52, the maximum radiological transportation accident risk, reflecting all projected accidents involving radioactive shipments regardless of type, is 1×10^{-7} LCFs using a risk of 0.0006 LCFs per person-rem (DOE 2003a). There would be no (4×10^{-2}) risk of a fatality from nonradiological (traffic) accidents.

The maximum radiological transportation accident risk to the general population along the routes from LANL to Pojoaque and from Pojoaque to Santa Fe, New Mexico, would be no (9×10^{-10}) excess LCFs among the exposed populations. There would be no (2×10^{-3}) risk of a fatality from nonradiological (traffic) accidents along these routes.

The maximum reasonably foreseeable offsite truck transportation accident with the greatest consequence would involve a truck carrying contact-handled low-level radioactive waste. The probability that such an accident would occur is about 1 in 667,000 (1.5×10^{-6}) per year in an urban area. If such an accident were to occur, the consequences in terms of general population dose would be about 0.023 person-rem. Using a factor of 0.0006 LCFs per rem or person-rem, such a dose would result in no (1×10^{-5}) excess LCFs among the exposed population. This accident would result in a dose of 0.002 millirem to a hypothetical MEI located at a distance of 330 feet (100 meters) from the accident and exposed to the accident plume for 2 hours. The corresponding risk to the MEI of developing a latent fatal cancer would be 1.2×10^{-9}), or about 1 chance in 793 million.

Impacts of Nonradioactive Waste Transportation—Nonradioactive waste includes demolition debris and sanitary solid waste, as well as chemical waste (mostly consisting of asbestos material). This waste would be shipped to recycle or treatment, storage, and disposal facilities within New Mexico or nearby states. The impacts of transporting this waste were determined by estimating the number of possible fatalities that could result from waste transportation accidents. The number of fatalities was determined as the product of the projected distance traveled by the waste trucks annually and the statistical probability of an accident fatality per distance traveled. Based on the assumptions listed in Section 4.2.13.1, transport of nonradiological waste from CMR Building DD&D would result in about 700,000 miles (1.1 million kilometers) traveled, no (0.2) traffic accidents, and no (0.02) fatalities.

4.5.2 Impacts of 2004 CMRR-NF Decontamination and Decommissioning

Disposition of the 2004 CMRR-NF would be considered at the end of its operational life. Impacts would depend on the disposition decision, which could range from reuse to DD&D of the entire 2004 CMRR-NF.

If complete DD&D is chosen, it is expected that impacts would be comparable to, or, for many resource areas, smaller than those for DD&D of the CMR Building (see Section 4.5.1). Although similar activities involving radioactive material would be performed, the design, construction, and operation of the 2004 CMRR-NF would incorporate the waste minimization and equipment and operational space decontamination principles that have been learned and implemented since the CMR Building was constructed in the early 1950s. Known hazardous or toxic materials, such as asbestos and polychlorinated biphenyls, also would be avoided or minimized during 2004 CMRR-NF construction and operations, and waste minimization and pollution prevention principles would be implemented. All DD&D activities would be conducted in accordance with applicable Federal and state requirements. Specific resource areas are briefly addressed below.

Air Quality and Noise—There would be air emissions from operation of equipment and vehicles, as well as noise. Airborne emissions of pollutants would likely be smaller than those for DD&D of the CMR Building because known hazardous or toxic materials would be avoided or minimized during 2004 CMRR-NF construction and operations. Noise impacts on humans and wildlife would be temporary.

Surface-Water and Groundwater Quality—Little or no impacts on water resources would result from DD&D of the 2004 CMRR-NF. Applicable best management practices would be implemented to reduce the potential for surface-water impacts.

Ecological Resources—Disposition of the 2004 CMRR-NF would take place in a heavily industrialized area. Any wildlife in the area could be temporarily impacted by disposition activities, but impacts would be minimized in accordance with applicable requirements, including protection of specific species.

Cultural Resources—Cultural resources would be managed and protected in accordance with applicable requirements at the time of DD&D of the 2004 CMRR-NF.

Human Health—Human health would be protected in accordance with applicable Federal and state requirements. Any impacts on workers and the public from disposition activities are expected to be less than those associated with DD&D of the CMR Building because known hazardous or toxic materials, such as asbestos and polychlorinated biphenyls, would be avoided or minimized during 2004 CMRR-NF construction and operations.

Waste Management—Waste quantities from DD&D of the 2004 CMRR-NF are expected to be comparable to or (likely) smaller than those for DD&D of the CMR Building. As noted above, although similar activities would be conducted, construction and operation of the 2004 CMRR-NF would reflect 50 years of experience in facility design and operations, and pollution prevention and waste minimization practices would be implemented. Thus, less radioactive and chemical waste is expected than from DD&D of the CMR Building.

The quantity of nonradioactive waste that is expected from DD&D of the 2004 CMRR-NF is expected to be comparable to that for DD&D of the CMR Building. On one hand, the projected floor space of the 2004 CMRR-NF (200,000 square feet [18,600 square meters]) is less than half that of the CMR Building (550,000 square feet [51,100 square meters]), suggesting the quantity of demolition debris from DD&D of the 2004 CMRR-NF would be less than half of that from DD&D of the CMR Building. On the other hand, the 2004 CMRR-NF might be constructed with thicker flooring and walls than the CMR Building, suggesting that the quantity of waste per unit of floor area from DD&D of the 2004 CMRR-NF would be larger than that for DD&D of the CMR Building. These competing influences suggest that the amount of demolition debris from both DD&D of the CMR Building and the 2004 CMRR-NF would be roughly equivalent.

Transportation—2004 CMRR-NF demolition wastes would be transported to recycle or treatment, storage, and disposal sites at LANL or offsite locations in compliance with applicable requirements. Potential impacts are expected to be similar in magnitude to those for CMR Building DD&D, although there could be fewer radioactive waste shipments because less radioactive waste is expected. Impacts cannot be quantified at this time because potential recycle or treatment, storage, and disposal facilities cannot be identified and population distributions along possible transportation routes are unknown.

4.5.3 Impacts of Modified CMRR-NF Decontamination and Decommissioning

Disposition of the Modified CMRR-NF building would be considered at the end of its operational design life of at least 50 years. Impacts would depend on the disposition decision, which could range from reuse to DD&D of the entire facility. If DD&D of the entire facility is chosen, impacts are expected to be comparable to those described under disposition of the CMR Building (see Section 4.5.1). For the same reasons as those discussed in Section 4.5.2, the quantity of demolition debris under this alternative may exceed that from DD&D of the CMR Building because of the increase in the overall size of the Modified CMRR-NF and the thickness of its walls.

4.6 Cumulative Impacts

In accordance with CEQ regulations, a cumulative impacts analysis includes “the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time” (40 CFR 1508.7).

The cumulative impacts analysis for this *CMRR-NF SEIS* includes (1) an examination of cumulative impacts presented in the 2008 *LANL SWEIS*; (2) an evaluation of cumulative impacts since the 2008 *LANL SWEIS* was issued, which are presented in this chapter; and (3) a review of the environmental impacts of past, present, and reasonably foreseeable actions in the region.

Primary sources of information on LANL contributions to cumulative impacts, other than this *CMRR-NF SEIS* and the 2008 *LANL SWEIS*, are listed below:

- *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement*, DOE/EIS-0026-S-2 (DOE 1997b)
- *Environmental Surveillance at Los Alamos During 2009*, LA-14427-ENV (LANL 2010b)
- Notice of Intent to Prepare an *Environmental Impact Statement for the Operation of a Biosafety Level 3 Facility at Los Alamos National Laboratory, Los Alamos, New Mexico*, 70 FR 228, November 29, 2005
- *Final Complex Transformation Supplemental Programmatic Environmental Impact Statement*, DOE/EIS-0236-S4F (DOE 2008c)
- *Draft Environmental Impact Statement for the Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste and GTCC-Like Waste (GTCC EIS)*, DOE/EIS-0375-D (DOE 2011b)

It is also necessary to consider activities implemented by other Federal, state, and local agencies and individuals outside LANL, but within its ROI, including state or local development initiatives; new residential development; new industrial or commercial ventures; clearing land for agriculture; new utility or infrastructure construction and operation; and new waste treatment and disposal activities.

The main facility at Sandia National Laboratories in Albuquerque is located approximately 60 miles (97 kilometers) from LANL. Due to this distance, cumulative impacts other than air emissions are not expected to be influenced by Sandia National Laboratories. For radiological air emissions, the 2009 Sandia National Laboratories dose to the offsite MEI was estimated to be 0.00048 millirem, and the 2009 population dose was estimated to be 0.063 person-rem (SNL 2010). Because the combined impacts would be very small, there would be no significant impact from Sandia National Laboratories, and it is not considered in this cumulative impacts section.

The City of Santa Fe, New Mexico; Los Alamos, Mora, Rio Arriba, Sandoval, San Miguel, Santa Fe, and Taos Counties, New Mexico; the Santa Clara and San Ildefonso Pueblos in New Mexico; the New Mexico Department of Transportation; BLM; and the U.S. Forest Service were contacted for information regarding expected future activities that could contribute to cumulative impacts. The City of Santa Fe and Mora, San Miguel, and Sandoval Counties did not identify any major future actions (Romero 2011; Schiavo 2011; Sena 2011). Santa Fe County, Taos County, and the Santa Clara and San Ildefonso Pueblos did not provide information for the cumulative impacts analysis. The following activities in the region surrounding LANL were identified:

- Rio Arriba County identified a road construction project involving the repaving of approximately 5.6 miles (9 kilometers) of U.S. Route 64 from Lumberton to Monero, New Mexico. The project is ongoing and is expected to be completed by the fall of 2011. The project is located more than 50 miles (80 kilometers) from LANL (Kilgour 2011).

- Los Alamos County and a Japanese agency (New Energy and Industrial Technology Development Organization) are planning a Smart Grid project that includes a 2-megawatt photovoltaic solar array, large-scale battery storage system, and demonstration home. The solar array will be constructed at the former landfill on East Jemez Road; however, before construction can begin, the landfill must be capped according to New Mexico Environment Department regulations (LADPU 2010b; Majure 2011a).

- Los Alamos County identified the Diamond Drive Project, which includes pavement rehabilitation and reconstruction of Diamond Drive from and including the San Ildefonso roundabout up to the Los Alamos Canyon Bridge. The project is currently on phase 4, which has a scheduled completion date of September 30, 2011 (LADPW 2011).

- Los Alamos County is currently installing 8,300 feet (2,500 meters) of 8-inch (20-centimeter), high-density, polyethylene gas line and a new regulator station in the Barranca Mesa Medium Pressure Gas System. The line will extend from North Mesa to Barranca Mesa and will be used to provide a second source of gas to the system and to improve reliability (LADPU 2011a).

- Los Alamos County Department of Public Utilities is currently the lead agency for the reconstruction of the Los Alamos Canyon Dam, which would enable recreation at the Los Alamos Canyon Reservoir. The project began on March 21, 2011, and is scheduled to be completed on November 15, 2011 (LADPU 2011b).

- Los Alamos County recently completed construction of a 3-megawatt, low-flow turbine-generator at the Los Alamos Department of Public Utilities' Abiquiu Plant. The new turbine increased the capacity at the Abiquiu Plant from 13.8 megawatts to 16.8 megawatts and provides additional power to Los Alamos County, including Los Alamos National Laboratory. The project began in November 2009 and was completed in April 2011 (DOE 2011d).

In addition, Los Alamos County has closed the Los Alamos County Landfill and is considering use of the San Juan-Chama water allotment. Solid wastes are now shipped out of the county via the new Eco Station, which consists of the solid waste transfer station (LAC 2010a). The Bayo Wastewater Treatment Facility in Santa Fe County was replaced in 2007 with an advanced wastewater treatment facility in Pueblo Canyon. The abandoned Bayo Wastewater Treatment Facility will be demolished and the site will be reclaimed for natural open space (LAC 2010a). In December of 2010, the Los Alamos Department of Public Utilities released its "Conservation Plan for Water and Energy," which addresses the supply- and demand-side conservation measures for potable water, electricity, and natural gas. The report states that Los Alamos has reached an agreement with the U.S. Bureau of Reclamation for an additional 1,200 acre-feet, or 391 million gallons (1,500 million liters), per year of San Juan-Chama surface water that is currently inaccessible (LADPU 2010a). The Los Alamos Department Public Utilities Board met on June 15, 2011, and a feasibility study for the project is currently under way (Majure 2011b).

A number of projects were identified that would affect the Santa Fe National Forest, including drilling and operating two oil wells, reservoir and dam repair, thinning and prescribed fire, fire salvage, mineral extraction, and grazing allotment (USFS 2010a).

BLM identified smaller projects that would affect BLM lands, such as continued road maintenance, timber harvesting, and grazing permit renewals, as well as larger projects such as the Sandoval County Oil and Gas Lease Sale; *Draft Taos Resource Management Plan*; Mid-America Pipeline Western Expansion Project; Buckman Water Diversion Project; Nutrias Prospect Oil Well; and Windstream Communication's Fiber-Optic Project (BLM 2010b, 2011). These larger projects are described below.

- The Sandoval County Oil and Gas Lease Sale involves BLM's offering of two parcels of about 2,500 acres each (1,000 hectares), located in northern Sandoval County between Cuba and Torreon, New Mexico, at the April 2010 oil and gas lease sale. A Finding of No Significant Impact and a Decision Record were signed on February 2, 2010. The plots of land are located approximately 45 miles (72 kilometers) west of LANL (BLM 2010c). The sale was finalized in April 2010 (Barnes 2011).

- The *Draft Taos Resource Management Plan* is meant to provide guidance for the management of public lands and resources administered by the Taos Field Office of BLM. When completed, the plan will guide the Taos Field Office in the implementation of all its subsequent management actions and site-specific activities (BLM 2010b).

- The Mid-America Pipeline Western Expansion Project added 12 separate loop sections to the existing liquefied natural gas pipeline, which increased system capacity from 225,000 to 275,000 barrels per day. A 23-mile (37-kilometer) segment was placed in Sandoval County, 30 miles (48 kilometers) from the LANL boundary. This segment was constructed parallel to and 25 feet (7.6 meters) away from the existing pipeline right-of-way (BLM 2006a; Enserca 2011).

- The Buckman Water Diversion Project diverts water from the Rio Grande for use by the City of Santa Fe and Santa Fe County. The diversion project withdraws water from the Rio Grande approximately 3 miles (5 kilometers) downstream from where New Mexico State Road 502 crosses the river. The pipelines for this project largely follow existing roads and utility corridors. Potential impacts on fish and aquatic habitats below the proposed project due to effects on water flow are minimal (BDDP 2010a; BLM and USFS 2007). An independent peer review was conducted on behalf of the Buckman Direct Diversion Board to obtain an independent analysis and synthesis of existing information to support a description of potential tap water health risks. This review found no risk to human health from drinking water provided by the Buckman Water Diversion Project (BDDP 2010b). A Memorandum of Understanding regarding water quality monitoring between the Buckman Direct Diversion Board and DOE was published on May 12, 2010, establishing the roles and responsibilities of each agency. The memorandum involves DOE's funding of sampling programs and analysis to ensure no contamination enters the water supply, as well as coordination and sharing of data obtained from sampling between both agencies (BDDP 2010a). In January 2011, the New Mexico Environment Department approved a fourth source of water to be distributed from the Buckman Direct Diversion Project to consumers in the City of Santa Fe and Santa Fe County. In spring 2011, the Buckman Direct Diversion Project provided approximately 15 million gallons (57 million liters) per day of drinking water (BDDP 2011).

- Windstream Communication's Fiber-Optic Project involves adding approximately 21 miles (43 kilometers) of buried fiber-optic cable in Sandoval County. The cable would link the Cuba exchange in the northeast with an existing fiber-optic line in the southwest (BLM 2009a). A Finding of No Significant Impact and Decision Record for the project were released on November 4, 2009. The project is approximately 40 miles (64 kilometers) northwest of LANL (BLM 2009b, 2009c).

- The Nutrias Prospect Oil Well involves Blue Dolphin Production, LLC, drilling an exploratory oil well in Rio Arriba County on public land leased to Blue Dolphin by BLM. The project is located approximately 50 miles northwest of LANL on a 1.43-acre (0.58-hectare) well pad. In addition to the pad, a 1,310-foot-long (399–meter-long) and 50-foot-wide (15–meter-wide) access road would be needed to connect the well pad to an existing road. The purpose of this project is to determine whether petroleum or other fossil hydrocarbons are present and, if so, whether their production is economically feasible. An environmental assessment and a biological survey report have been prepared, with the public comment period ending on July 3, 2011 (BLM 2011).

Another project would upgrade the existing 46-kilovolt transmission loop system that serves central Santa Fe County with a 115-kilovolt system (PNM 2005). No major new transmission lines are planned for the region around LANL (WAPA 2010).

No new Federal highways are planned within 50 miles (80 kilometers) of LANL (FHWA 2011). A number of state transportation projects are ongoing or planned. Many of these are relatively minor maintenance, upgrading, widening, and resurfacing projects. Some of the more-substantial transportation projects in the region include the following (NMDOT 2011):

- Santa Fe Cerrillos Road City Lead Project
- NM 599 Interchange at Jaguar Drive
- NM 41 Clark Hill to US 285 alignment study and environmental assessment
- Interstate 25 Corridor Study

Although maintenance of the transportation infrastructure in the region would continue and a number of upgrade, expansion, and widening projects are scheduled over the next 5 years or so, no new major highway projects are scheduled that could substantially contribute to cumulative impacts at LANL.

The list of EPA National Priorities List sites (also known as Superfund sites) was reviewed to determine whether these sites could contribute to cumulative impacts at LANL. Only one site is within 50 miles

(80 kilometers) of LANL. The North Railroad Avenue groundwater contamination plume is located over 12 miles (19 kilometers) from the LANL boundary in Rio Arriba County (EPA 2011).

Most of these actions at other sites are not expected to affect the cumulative impacts of LANL activities because of their distance from LANL; their routine nature; their relatively small size; and the zoning, permitting, environmental review, and construction requirements they must meet. Available documentation reviewed to assess cumulative impacts includes the following sources:

U.S. Bureau of Land Management

- *Final Environmental Impact Statement for the Buckman Water Diversion Project* (BLM and USFS 2007)
- An Independent Peer Review and a Memorandum of Understanding for the *Final Environmental Impact Statement for the Buckman Water Diversion Project* (BDDP 2010a, 2010b)
- *San Juan Public Lands (San Juan Field Center & San Juan National Forest) Final Environmental Impact Statement (EIS) Northern San Juan Basin Coal Bed Methane Project* (BLM 2006b)
- Draft Taos Resource Management Plan (BLM 2010a)
- *Environmental Assessment for Nutrias Prospect Oil Well* (BLM 2011)

U.S. Forest Service

- "Schedule of Proposed Action 1/01/2011 to 3/31/2011, Santa Fe National Forest" (USFS 2011)
- *Decision Notice and Finding of No Significant Impact for the Restoration of Los Alamos Dam and Reservoir* (USFS 2010b)

U.S. Bureau of Reclamation

- *Upper Rio Grande Basin Water Operations Review Final Environmental Impact Statement* (ACE, Reclamation, and ISC 2007)
- *Final Environmental Impact Statement City of Albuquerque Drinking Water Project* (Reclamation 2004)

National Park Service

- *Fire Management Plan for Bandelier National Monument* (NPS 2005)

State of New Mexico

- *2004–2006 State of New Mexico Integrated Clean Water Act §303(d) §305(b) Report* (NMED 2004)
- "State of New Mexico Standards for Interstate and Intrastate Surface Waters" (NMAC 20.6.4)

Most present and reasonably foreseeable future actions planned for LANL were addressed in the 2008 *LANL SWEIS*. In this section, cumulative site impacts are presented only for those resources that were not addressed in the 2008 *LANL SWEIS* and could reasonably be expected to be affected by the preferred alternative. These include site infrastructure, sustainability, air quality, ecological resources, human health effects of normal operations, waste management, and transportation of radioactive materials. Cumulative impacts associated with the remaining resource areas (such as socioeconomics and surface-water quality) would not change from those presented in the 2008 *LANL SWEIS* due to environmental impacts associated with implementing any of the alternatives evaluated in this SEIS. The methodology for assessing cumulative impacts is presented in Appendix B.

Site Infrastructure Requirement Impacts – Implementation of the Modified CMMR-NF Alternative would result in the greatest cumulative infrastructure impacts when added to the projected infrastructure requirements for other LANL activities and the demands of other non-LANL users. **Table 4–53** presents the estimated combined infrastructure requirements during construction of the Modified CMRR-NF in addition to other LANL and non-LANL requirements during the same timeframe. Included in the other LANL site requirements would be the continued operation of the CMR Building. Should the projections be fully realized, LANL and Los Alamos County could cumulatively require 97 percent of the current electric peak load capacity, 61 percent of the total available electrical capacity, 92 percent of the available water capacity, and 27 percent of the available natural gas capacity. In addition, 19,200 gallons (73,000 liters) of propane would be delivered by truck annually during the construction phase of the project. In the near term, no infrastructure capacity constraints are anticipated. LANL operational demands to date on key infrastructure resources, including electricity and water, have been below the levels projected in the 2008 *LANL SWEIS* and well within site capacities. For example, actual electric peak load for LANL in 2010 was approximately 69 megawatts compared to the 109 megawatts projected in the 2008 *LANL SWEIS* (LANL 2011a:Infrastructure 014). Inclusion of infrastructure requirements associated with the construction of potential alternatives being analyzed for the *GTCC EIS* at LANL could require an additional increase for electric peak load (3 percent), electricity (1 percent), and water (less than 1 percent) (DOE 2011b).

Table 4–53 Estimated Combined Infrastructure Requirements at Los Alamos (Construction)

Resource	***System Capacity*** [a]	***LANL Current Site Requirement*** [b]	***Current Los Alamos County Requirement*** [b]	***Available System Capacity***	***Modified CMRR-NF Alternative*** [c]	***Remaining Capacity***
Electricity						
Energy (megawatt-hours per year)	1,226,000	563,000	150,000	513,000	31,000	482,000
Peak load demand (megawatts)	140	101	23	16	12	4
Natural Gas (million cubic feet per year)	8,070	1,200	1,020	5,860	0	5,860
Water (million gallons per year)	1,807	412	1,241	153	4–5	148–149

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; LANL = Los Alamos National Laboratory.

[a] Data from 2008 *LANL SWEIS*, Chapter 5, Table 5–83, for the No Action Alternative.

[b] Data from Tables 3.4.1-1, 3.4.2-1, 3.4.2-2, 3.4.3-1 of the *SWEIS Yearbook – 2008* (LA-UR-10-03439), with the exception of the Los Alamos County requirement for natural gas, which was calculated using the projected requirement for the No Action Alternative in the 2008 *LANL SWEIS* (Table 5–83) and data from Table 3.4.1-1 of the *SWEIS Yearbook – 2008.* In addition, adjustments were made to reflect higher usage associated with the Metropolis Complex and Material Disposal Area remediation activities as included in the Expanded Operations Alternative in the *LANL SWEIS* (selected in the associated Records of Decision) and exclusion of requirements associated with the 2003 CMRR Facility, as included in the No Action Alternative in the *LANL SWEIS.*

[c] Data from Table 4–15 of this *CMRR-NF SEIS*.

Note: To convert gallons to liters, multiply by 3.7854; cubic feet to cubic meters, by 0.028317.

Source: DOE 2008b; LANL 2011a:Data Call Tables, 002, 003.

Table 4–54 presents the estimated combined infrastructure requirements of operating the Modified CMRR-NF and RLUOB in addition to other LANL and non-LANL requirements during the same timeframe. Requirements to operate the Modified CMRR-NF are higher than those associated with operating either the existing CMR Building (under the Continued Use of CMR Building Alternative) or those estimated for the 2004 CMRR-NF (under the No Action Alternative). Should these projections be fully realized, LANL and Los Alamos County could cumulatively require more than 100 percent of the current electric peak load capacity, 71 percent of its total available electrical capacity, 92 percent of the available water capacity, and 28 percent of the available natural gas capacity. Of most concern is the potential to exceed electric peak load capacity. Regardless of the decisions to be made regarding the CMRR-NF, adding a third transmission line and/or reconductoring the existing two transmission lines are being studied by LANL to increase transmission line capacities up to 240 megawatts, providing additional capacity across the site. If the proposed TA-50 electrical substation is constructed, it would provide reliable additional electrical power as the independent power feed to the existing TA-55 complex and the CMRR Facility. LANL is also considering establishing an independent power feed to the existing TA-55 complex and the CMRR Facility from TA-3 or TA-5/52 along existing utility rights-of-way. If additional capacity and reliability can be added to the existing TA-3 substation, this would negate the need to build the proposed TA-50 substation.

Table 4–54 Estimated Combined Infrastructure Requirements at Los Alamos (Operations)

Resource	*System Capacity* [a]	*Current LANL Requirement* [b]	*Current Los Alamos County Requirement* [b]	*Available System Capacity*	*Modified CMRR-NF Alternative* [c]	*Remaining Capacity*
Electricity						
Energy (megawatt-hours per year)	1,226,000 [d]	563,000	150,000	513,000	161,000	352,000
Peak load demand (megawatts)	140 [d]	101	23	16	26	0
Natural Gas (million cubic feet per year)	8,070	1,200	1,020	5,860	58	5,800
Water (million gallons per year)	1,807	412	1,241	153	16	137

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; LANL = Los Alamos National Laboratory.

[a] Data from 2008 *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico (LANL SWEIS)*, Chapter 5, Table 5–83, for the No Action Alternative.

[b] Data from Tables 3.4.1-1, 3.4.2-1, 3.4.2-2, 3.4.3-1 of the *SWEIS Yearbook – 2008* (LA-UR-10-03439), with the exception of the Los Alamos County requirement for natural gas, which was calculated using the projected requirement for the No Action Alternative in the 2008 *LANL SWEIS* (Table 5–83) and data from Table 3.4.1-1 of the *SWEIS Yearbook – 2008*. In addition, adjustments were made to reflect higher usage associated with the Metropolis Complex and Material Disposal Area remediation activities as included in the Expanded Operations Alternative in the *LANL SWEIS* (selected in the associated Records of Decision) and exclusion of requirements associated with the 2003 CMRR Facility, as included in the No Action Alternative in the *LANL SWEIS*.

[c] Data from Table 4–17 of this *CMRR-NF SEIS*.

[d] Does not include addition of an electrical substation in TA-50 capable of providing up to another 40 megawatts peak load capacity.

Note: To convert gallons to liters, multiply by 3.7854; cubic feet to cubic meters, by 0.028317.

Sources: DOE 2008b; LANL 2011a:Infrastructure, 011, 012, 013.

Los Alamos County, as owner and operator of the Los Alamos Water Supply System, is now the primary water supplier serving LANL. DOE transferred ownership of 70 percent of its water rights to the county and leases the remaining 30 percent. LANL is currently using approximately 76 percent of its water allotment, and the county is using about 98 percent of its allotment. County concerns about its water availability will be heightened if development plans move forward for construction of additional homes in White Rock and Los Alamos on land that is being conveyed to the county from LANL.

Los Alamos County has implemented a *Conservation Plan for Water and Energy* (LADPU 2010a). In this plan, the county describes a number of steps it has taken to conserve water, including an effluent reuse washwater system associated with the county's wastewater treatment plant that is estimated to conserve approximately 12 million gallons (45 million liters) annually (LADPU 2010a). Los Alamos County has the right to use up to 390 million gallons (1.5 billion liters) of San Juan-Chama Transmountain Diversion Project water annually and is in the process of determining how best to make this water accessible to the county (LADPU 2010a). Neither the conservation savings nor the San Juan-Chama water was included in the analysis shown above.

In addition, the use of the Sanitary Effluent Reclamation Facility at LANL may be expanded to include other areas of LANL. Plans are to expand the Sanitary Effluent Reclamation Facility to provide additional treatment to treated effluent from the Sanitary Wastewater Systems Plant to allow the reclaimed water to be used to support the nonpotable water demands for the TA-3 Power Plant, the Metropolis Center for Modeling and Simulation, and the Laboratory Data Communications Center. Such expansions could save millions of gallons of water annually.

Sustainability—Concern for sustainability of resources is increasing in response to a variety of limiting factors. Not only is the Federal Government responding to this direction, but also state and local governments and private citizens. At every level, conservation and "green" practices and choices are taking hold to conserve natural resources by using them efficiently. DOE has responded to this by adopting policy and issuing directives that require the inclusion of sustainable principles in building design.

As described in Appendix B, Section B.2.3, LANL is responsible for meeting goals for conserving and reducing water and energy use on a site-wide effort. The *LANL Engineering Standards Manual* (ISD 341-2, Chapter 14), *LANL Sustainable Design Guide* (2002) provides direction for energy- and water-efficient design and construction of new and renovated facilities. These closely mirror the principles and strategies embedded in achieving Leadership in Energy and Environmental Design® (LEED) certification under the various U.S. Green Building Council rating systems. Improved performance in new and existing facilities, decommissioning of older facilities, and improving the performance of existing infrastructure are all needed strategies to meet long-term goals for reduced consumption.

As part of its site-wide commitment to sustainability, LANL outlined goals and methods in the *Fiscal Year 2011 Site Sustainability Plan* (LANL 2010e) for managing energy and water needs and controlling its generation of greenhouse gases. The plan balances the need to provide for demands of its specialized nuclear facilities and evolving capabilities with those of achieving sustainability goals site-wide. Some planned projects are specifically aimed at improving supply infrastructure, such as the Sanitary Effluent Reclamation Facility and the planned addition of the electrical substation in TA-50. The plan identifies actions for providing onsite renewable energy systems, such as coordination with Los Alamos County to modify existing utility contracts to allow for purchasing of electricity from photovoltaic sources.

Other measures address pollution prevention and minimization of waste. Measures to achieve this are varied. For example, recommissioning existing heating, ventilating, and air conditioning systems ensure the systems are operating efficiently. Requiring high-performing, sustainable building standards in new construction and major renovations and reducing the footprint of heated space (through demolition of outdated and redundant facilities) will achieve a more-effective use of energy and reduce water use over the long term. Other projects would replace old, inefficient systems and equipment (such as the old steam plant). Bringing on Smart Grid technologies over the next 5 years would manage demand and energy flow, reducing the need to size systems for high peak demands. Implementation of a Sustainable Acquisition Plan and Energy Savings Performance Contracts will require vendors and contractors to provide products and services that meet sustainable criteria for environmentally preferable, non-ozone-depleting, recycled content and nontoxic materials, as well as energy efficiency. The benefits of these changes will take several years to fully realize and will depend on future funding.

The inclusion of LEED certification for new facilities (including the Modified CMRR-NF) is part of the larger effort to reduce energy intensity at LANL and to shift to sustainability. The Modified CMRR-NF incorporates these goals to the extent achievable while meeting other requirements for safety and security. The inclusion of energy- and water-efficient systems and design and the use of environmentally sound materials and construction practices would lessen the anticipated impact of this new facility on achieving site-wide sustainability compared to an equivalent standard facility without these measures.

Air Quality Impacts—The effect of operations at the Modified CMRR-NF under the Modified CMRR-NF Alternative on air quality conditions at LANL would be equal to or higher than those estimated under either the Continued Use of CMR Building or No Action Alternative because of the larger number of backup generators (seven) being tested in the Modified CMRR-NF. The effect of the Modified CMRR-NF would be well within the levels of concentrations analyzed under the No Action Alternative in the *LANL SWEIS*, which were below the New Mexico Ambient Air Quality Standards and Federal standards for all of the criteria pollutants. As such, LANL would remain in compliance with all Federal and state ambient air quality standards, as shown in **Table 4–55**. Effects on air quality from associated construction and excavation activities would be temporary and localized, as discussed in the air quality sections of this chapter.

Table 4–55 Nonradiological Air Quality Concentration at Technical Area 55 Site Boundary – Operations

Criteria Pollutant	*Averaging Time*	*New Mexico Ambient Air Quality Standards (ppm)*	*Calculated Concentration (ppm)* [a]	*Maximum Facility-Wide Concentration (ppm)* [a]
Carbon monoxide	1 hour	13	0.002	1.2
	8 hours	8.7	0.001	0.22
Nitrogen dioxide	Annual	0.05	0.000079	0.00
Sulfur dioxide	3 hours [b]	0.5	0.001	0.20
	24 hours	0.1	0.00018	0.04
	Annual	0.02	0.000035	0.00
PM_{10}	24 hours	150 μg/m^3	0.031 μg/m^3	102 μg/m^3
Total suspended particulates	24 hours	150 μg/m^3	0.031 μg/m^3	135 μg/m^3
	Annual	60 μg/m^3	0.006 μg/m^3	5.7 μg/m^3

μg/m^3 = micrograms per cubic meter; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 micrometers; ppm = parts per million.

[a] The annual concentrations were analyzed at locations to which the public has access: the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

[b] New Mexico does not have a standard for sulfur dioxide 3-hour or PM_{10} 24-hour; thus, the Federal standard was used.

Source: DOE 2003a, 2008a.

Greenhouse Gas Impacts—The greenhouse gases emitted by operations at the Modified CMRR-NF and RLUOB would add a relatively small increment to emissions of these gases in the United States and the world. Overall greenhouse gas emissions in the United States during 2009 totaled about 6,575 million tons (5,965 million metric tons) of carbon-dioxide equivalent (DOE 2011c). By way of comparison, annual operational emissions of greenhouse gases from the Modified CMRR-NF and RLUOB would equal about 0.002 percent of the United States' total emissions in 2009. However, emissions from the proposed facility in combination with past and future emissions from all other sources would contribute incrementally to climate change. At present, there is no methodology that would allow DOE to estimate the specific impacts this increment of climate change would produce in the vicinity of the facility or elsewhere.

The U.S. Global Change Research Program report, *Global Climate Change Impacts in the United States*, states that the U.S. average temperature has risen by an amount comparable to global increases and is very likely to rise more than the global average over this century, with some variation from place to place. These climate changes in the southwest United States could result in a drier future climate. Combined with the historical record of severe drought and the current uncertainty regarding the exact causes and drivers of these past events, the Southwest must be prepared for droughts that could potentially result from multiple causes. The types of environmental changes resulting from severe drought and other regional climate changes could include in an increased risk of drought and flooding, resulting in greater risk to human beings and their infrastructure, impacts on urban air quality and electricity demands, and a change in tourism and recreation (Karl et al. 2009). Of those environmental changes, drought and wildfire could potentially result in impacts under the three alternatives in this *CMRR-NF SEIS*. The CMR Building and the Modified CMRR-NF would not present significant risk due to drought and wildfires because of the noncombustible materials used in their construction and because they are surrounded by buffer areas in which combustible materials, including vegetation, are kept to a minimum. Therefore, even if the frequency of wildfires is increased by global climate change, these facilities would not be directly affected (see Appendix C). Other facilities at LANL could potentially be more susceptible to impacts from wildfires. Actions were taken at LANL following the recent Las Conchas fire that will reduce those impacts even further. These actions included installing additional stormwater controls and monitoring systems in canyon bottoms where trace Cold War-era contamination may be present, removing more than 1,200 cubic yards (920 cubic meters) of sediment in anticipation of flash flooding, and installing sampling gauges on the Laboratory's western boundary to compare run-on water with run-off water (LANL 2011g). Water use at LANL is expected to remain below its allotment under all three alternatives, so there would likely be no impact from lack of sufficient water for construction and operation (see Infrastructure sections). Some of the climate change effects may eventually necessitate adaptation in activities at LANL, including increased consideration of the effects of heat stress on employees' activities, increased attention to dust control, and changes in stormwater management practices.

Ecological Resources Impacts—Most of the construction activities for the Modified CMRR-NF would take place on previously disturbed land with little value as habitat. There would be short-term impacts on non-protected species. Best management practices and implementation measures set forth in the LANL *Threatened and Endangered Species Habitat Management Plan for Los Alamos National Laboratory* (LANL 2011c) and supporting documentation would be used during construction activities across the site, including on those associated with the proposed Modified CMRR-NF site and its various support areas (laydown areas, batch plants, spoils areas, parking areas) to minimize the potential for adverse effects on plant and animal communities and on threatened and endangered or special interest species. Proposed construction sites and associated support areas would be surveyed for the presence of special status species, including threatened and endangered species, before construction begins, and appropriate actions would be developed. After construction, temporary structures would be removed and the sites would be regraded and revegetated with native species. Since actions associated with construction of the Modified CMRR-NF would minimally impact ecological resources at LANL, they would not meaningfully contribute to cumulative impacts to these resources within the region.

Public and Occupational Health and Safety – Normal Operations Impacts—**Table 4–56** presents the estimated cumulative impacts of radiological emissions and radiation exposure under the 2008 *LANL SWEIS* Expanded Operations Alternative (DOE 2008a), the doses associated with operation of the Modified CMRR-NF and RLUOB under the Modified CMRR-NF Alternative of this SEIS, plus doses associated with the disposal of greater-than-Class C waste at LANL. The estimated doses under the

LANL SWEIS Expanded Operations Alternative, which reflects the highest level of operations that would be expected to occur at LANL, represent a conservative estimate of the doses that could result from ongoing LANL activities because they include doses associated with the continued operation of the Los Alamos Neutron Science Center (LANSCE) and ongoing remediation of MDAs at LANL. Operation of LANSCE is the predominant contributor to offsite dose to the population surrounding LANL. Remediation of MDAs at LANL is the predominant contributor to worker dose.

Table 4–56 Estimated Cumulative Radiological Impacts from Normal Operations

	Maximally Exposed Individual		*Population Within 50 Miles (80 kilometers)*		*Site Workers*	
	Dose (millirem per year)	*LCF Risk per Year*	*Collective Dose (person-rem per year)*	*Excess LCFs per Year*	*Collective Dose (person-rem per year)*	*Excess LCFs per Year*
LANL SWEIS Expanded Operations Alternative	8.2	4.9×10^{-6}	36	0.022	543	0.33
Modified CMRR-NF Alternative	0.31	1.9×10^{-7}	1.8	0.001	Included above	Included above
GTCC EIS	N/A	N/A	N/A	N/A	5	0.003
Total LANL Dose	8.5	5.1×10^{-6}	37.8	0.023	548	0.33

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; LCF = latent cancer fatality; N/A = not available.
Source: DOE 2008a, 2011b.

The Modified CMRR-NF Alternative impacts are expected to be about equal to those that would have been realized from operation of the 2004 CMRR-NF and greater than those associated with continued operation of the CMR Building due to reduced operations at that building. In addition, the *LANL SWEIS* totals include operation of the CMRR Facility, and this analysis does not make any adjustment for a reduction in dose that would be realized when the existing CMR Building is completely shut down. Beyond activities at LANL, no other activities in the area surrounding LANL are expected to result in radiological impacts on the public beside those associated with natural background radiation and other background radiation, as discussed in Chapter 3, Section 3.11.1. The projected dose from continued LANL operations is a small fraction of the dose persons living near LANL receive annually from natural background radiation and other sources such as diagnostic x-rays.

No LCFs are expected for the MEI or the general population. The dose to the offsite MEI is expected to remain within the 10-millirem-per-year limit required by 40 CFR Part 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities." There would be a small increase in the annual risk of an LCF among the general public from LANL operations: from 1 chance in 45 to 1 chance in 43.

If the Expanded Operations Alternative MDA Removal Option were implemented, collective worker doses would average approximately 540 person-rem per year. The addition of impacts from the operation of the Modified CMRR-NF and RLUOB would not change this estimate because the worker dose of approximately 61 person-rem per year was included in the estimate in the 2008 *LANL SWEIS* (DOE 2008a). The 540 person-rem projected dose under the Expanded Operations Alternative in the *LANL SWEIS* corresponds to an annual risk of an LCF in the worker population of 0.3 (or for each 3 years of operation, 1 chance of an LCF in the worker population). Worker doses would decrease by about 140 person-rem per year after the MDA remediation work is completed (DOE 2008a). Inclusion of the *GTCC EIS* (DOE 2011b) estimate for work at LANL, should that alternative be chosen, would add about 5 person-rem per year, but would not increase the annual risk to workers appreciably. Individual worker doses would be maintained as low as is reasonably achievable and within applicable regulatory limits.

The estimated doses shown in Table 4–56 are a very small fraction of the normal background dose received by the population in and around LANL. Chapter 3, Section 3.11.1, of this *CMRR-NF SEIS* provides an analysis of radiation in the environment around LANL that is attributed to external, naturally occurring radiation and radiation from past and present operations at LANL. Natural background radiation was estimated to range from approximately 340 to 580 millirem per year, compared to the estimated doses from LANL operations of 8.5 millirem per year to the MEI and less than 0.1 millirem per year to the average individual living within 50 miles (80 kilometers) of LANL.

Waste Management Impacts—Cumulative amounts of waste generated at LANL would be greatest if the Expanded Operations Alternative described in the 2008 *LANL SWEIS* (DOE 2008a) is fully implemented. This alternative included substantial waste generation rates at LANL, largely due to remediation of MDAs and DD&D of facilities. **Table 4–57** presents the estimated annual amount of radioactive and nonradioactive waste that would be generated at LANL if the Modified CMRR-NF is constructed and DD&D of the existing CMR Building is performed. The Modified CMRR-NF Alternative waste generation rates are expected to be about equal to those that would have be realized from operation of the 2004 CMRR-NF and greater than those associated with continued operation of the CMR Building due to reduced operations at that building. Table 4–57 also includes the revised waste generation estimates associated with DD&D of the CMR Building (see Section 4.5.1).

The contribution to cumulative waste management impacts from other proposed actions at LANL, particularly the overall waste generation at LANL during the next 10 years from the disposition of buildings and environmental restoration efforts, could be large. Construction and demolition wastes would be recycled and reused to the extent practicable. Existing waste treatment and disposal facilities would be used according to specific waste types. The estimated waste generation totals for LANL have been adjusted to reflect the cancellation of the Global Nuclear Energy Partnership program, the decision not to build a Consolidated Nuclear Facility at LANL, and a reduction in the amount of waste associated with building pits at LANL. The Expanded Operations Alternative in the 2008 *LANL SWEIS* included waste associated with the production of 80 pits per year at LANL. NNSA decisions did not include this expansion of pit production at LANL so the waste associated with this expansion has been removed from the 2008 projection.

Transuranic wastes generated during DD&D of the existing CMR Building would be within the level of impacts forecast under the Expanded Operations Alternative described in the 2008 *LANL SWEIS*. The available capacity of WIPP, or the new capacity of its replacement facility, is expected to be sufficient to accommodate the estimated cumulative volumes of transuranic waste from LANL operations (DOE 2008a). After the adjustments discussed above, site-wide waste projections would be higher for construction and demolition waste than those estimated under the Expanded Operations Alternative in the 2008 *LANL SWEIS* (DOE 2008a) due to the increased waste estimates for DD&D of the existing CMR Building. As described in the 2008 *LANL SWEIS*, low-level radioactive waste generation rates would be substantial under the Expanded Operations Alternative if all waste from MDAs were removed. Offsite disposal options for most of the low-level radioactive waste at LANL include NNSA's NNSS and commercial facilities (DOE 2008a). Mixed low-level radioactive waste generation is also projected to potentially increase, but the quantity would be much smaller than the quantity of low-level radioactive waste generated. Mixed low-level radioactive waste may be sent off site for treatment of the hazardous component and possibly returned to LANL (or elsewhere) for disposal as low-level radioactive waste. For commercial facilities, some restrictions apply to acceptance of waste based on the origin (state of origin and DOE- or non-DOE-generated) and radiological characteristics of the waste.

Table 4–57 Estimated Annual Cumulative Waste Generated at Los Alamos National Laboratory (cubic yards)

Waste Type	*LANL Operations* [a]	*CMRR-NF SEIS Modified CMRR-NF Alternative* [b]	*CMR Building DD&D* [c]	*Revised LANL Operations*
Expanded Operations Transuranic	530 to 3,300	88	38 to 75	570 to 1,030
Less Manufacturing of up to 80 Pits	0 to -250			
Less GNEP	0 to -900			
Less Consolidated Nuclear Facility	0 to -1,200			
Less earlier CMR Building Operations Estimate	-90			
Less earlier CMR Building DD&D Estimate	0			
Plus GTCC [d]	0			
Revised Total	440 to 870			
Low-level radioactive	27,700 to 141,400	2,640	9,500 to 19,000	33,000 to 137,000
Less Manufacturing of up to 80 Pits	0 to -410			
Less GNEP	0 to -3,400			
Less Consolidated Nuclear Facility	0 to -12,000			
Less earlier CMR Building Operations Estimate	-2,600			
Less earlier CMR Building DD&D Estimate	-4,000 to -8,000			
Plus GTCC [d]	5			
Revised Total	21,000 to 115,000			
Mixed low-level radioactive	390 to 18,300	26	70 to 140	420 to 18,300
Less Manufacturing of up to 80 Pits	0			
Less GNEP	0 to -4			
Less Consolidated Nuclear Facility	0 to -72			
Less earlier CMR Building Operations Estimate	-30			
Less earlier CMR Building DD&D Estimate	-38 to -75			
Plus GTCC [d]	0			
Revised Total	320 to 18,100			
Construction and Demolition Waste	64,000 to 72,000	2600	27,500 to 55,000	177,000 to 208,000
Less earlier CMR Building DD&D Estimate	-5,000 to -10,000			
Plus GTCC [d]	88,000			
Revised Total	147,000 to 150,000			
Chemical Waste (million pounds)	6.4 to 12.9	0.024	0.13	6.6 to 11.8
Less Consolidated Nuclear Facility	0 to -1.4			
Less earlier CMR Building Operations Estimate	-0.025			
Plus GTCC [d]	0.05			
Revised Total	6.4 to 11.5			

CMR = Chemistry and Metallurgy Research; CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility; DD&D = decontamination, decommissioning, and demolition; GNEP = Global Nuclear Energy Partnership; GTCC = greater-than-Class C; LANL = Los Alamos National Laboratory.

[a] Data from Table 5–84 of the 2008 *LANL SWEIS* Expanded Operations Alternative divided by 10 to show annual rates, except GTCC.

[b] Data from Table 4–35 of this *CMRR-NF SEIS*, except GTCC.

[c] Data from Table 4–50 of this *CMRR-NF SEIS*, except GTCC. Work to be done over a 2- to 4-year period.

[d] Highest annual data computed from information in Table 5.3.11–1 of the *GTCC EIS* (DOE 2011b).

Note: To convert cubic yards to cubic meters, multiply by 0.76456.

Source: DOE 2008a; LANL 2011a:Data Call Tables, 004.

Significant quantities of nonradioactive solid wastes, including construction and demolition debris, would be generated under the Expanded Operations Alternative if all wastes were removed from MDAs. Demolition of the CMR Building would increase the lower and upper bounds of this estimate based on the latest projections for the amount of this waste that may be generated during the demolition period. Construction of the Borehole Alternative for disposal of greater-than-class C waste at LANL would also increase the generation of solid waste at LANL, should this alternative be implemented. The closure of the Los Alamos County Landfill means that solid wastes would be disposed of via the Los Alamos County Eco Station, where wastes would be segregated and then transported to an appropriately permitted solid waste landfill. Construction and demolition wastes would be recycled and reused to the extent practicable.

Debris that cannot be recycled would be disposed of at solid waste landfills or construction and demolition debris landfills.

Radioactive Material Transportation Impacts—The collective doses, cumulative health effects, and traffic fatalities resulting from approximately 130 years (from 1943 to 2073) of radioactive material and waste transport across the United States were estimated in Table 5–85 of the 2008 *LANL SWEIS*[28] (DOE 2008a). The total collective worker doses from all types of shipments (general transportation, historical DOE shipments, reasonably foreseeable actions, and shipments under the 2008 *LANL SWEIS* No Action Alternative) were estimated to be 381,700 person-rem. The total collective doses to the general public were estimated to be 343,680 person-rem, which would result in about 206 excess LCFs among the affected general population. The total estimated traffic fatalities associated with accidents involving radioactive material and waste transports would be up to 119. The majority of the collective doses for workers and the general population would be associated with the general transportation of radioactive material. Examples of these activities include shipments of radiopharmaceuticals to nuclear medicine laboratories and shipments of commercial low-level radioactive waste to commercial disposal facilities. The majority of the traffic fatalities would be due to the general transportation of radioactive materials (28 fatalities) and reasonably foreseeable actions (85 fatalities). The estimated doses associated with radioactive material transportation associated with the Modified CMRR-NF under any of the alternatives being considered in this SEIS, and as described in Section 4.3.13, would not change these estimates.

4.7 Mitigation

Following the issuance of a ROD, NNSA is required to prepare a mitigation action plan that addresses any mitigation commitments expressed in the ROD (10 CFR 1021.331). The mitigation action plan would explain how certain measures would be planned and implemented to mitigate any adverse environmental impacts identified in the ROD. The mitigation action plan would be prepared before NNSA would take any action requiring mitigation.

Based on the analyses of the environmental consequences resulting from the proposed action, no mitigation measures would be necessary for many of the resource areas because the potential environmental impacts would be well below acceptable levels of promulgated standards. Activities would follow standard procedures for minimizing construction impacts on air and surface-water quality, noise, operational and public health and safety, and accident prevention. These practices are required by Federal and state licensing and permitting requirements, as discussed in Chapter 5. The 2008 *LANL SWEIS* (DOE 2008a) provides a discussion of existing programs and controls at LANL that ensure that construction activities and operations are performed within the constraints of applicable regulations, applicable DOE orders, contractual requirements, and approved policies and procedures. Examples of these programs and controls include the Environmental Surveillance and Compliance Program, the *Threatened and Endangered Species Habitat Management Plan*, the *Cultural Heritage Management Plan*, the NPDES Industrial Stormwater Permit Program, and the Groundwater Protection Management Program.

Public comments indicated concern about water usage and construction traffic. The following paragraphs discuss possible mitigation actions for these, as well as electrical usage.

Although projections indicate that LANL operational demands would remain within the site's annual water use ceiling quantity, total water demand within LANL and Los Alamos County is approaching 92 percent of the county-managed rights to withdraw water from the regional aquifer. Water reduction goals at LANL include reducing the use of potable water by at least 16 percent of the 2007 level by fiscal year 2015. Executive Order 13514 requires a 26 percent reduction in potable water use by fiscal year 2020, as well as

[28] *Included in these estimates for LANL were shipments associated with the CMR Building and the CMRR Project.*

a 20 percent reduction in industrial, landscaping, and agricultural water use by fiscal year 2020 from a fiscal year 2010 baseline. In light of these goals, the CMRR Project is investigating the use of treated effluent water in construction activities.

With the additional projected demands of the Modified CMRR-NF, peak electrical power demand could exceed current capacity. Independent of a decision on the CMRR-NF, adding a third transmission line and/or reconductoring two existing lines to increase transmission capacity to LANL and Los Alamos County are being studied. One or both of these actions, plus construction of the proposed TA-50 substation or providing another power feed from the TA-3 substation, would add the capacity to meet the peak power demand.

Construction of the Modified CMRR-NF would affect both traffic on the roads around LANL and on site. There would be up to 790 construction workers during the peak construction period under both options of the Modified CMRR-NF Alternative. Under this alternative, construction workers would park their personal vehicles in a parking lot to be built in TA-72 and would be shuttled by bus to the construction site. Scheduling work shifts and transportation of construction materials to off-peak times may alleviate traffic congestion if that becomes a problem. In addition, lighting in the parking lot could be turned off at night when not required by workers to mitigate light impacts on nearby areas.

4.8 Resource Commitments

This section describes the unavoidable, adverse environmental impacts that could result from the proposed action; the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity; and irreversible and irretrievable commitments of resources. Unavoidable, adverse environmental impacts are impacts that would occur after implementation of all feasible mitigation measures. The relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity addresses issues associated with the condition and maintenance of existing environmental resources used to support the proposed action and the utility of these resources after their use. Resources that would be irreversibly and irretrievably committed are those that cannot be recovered or recycled and those that are consumed or reduced to unrecoverable forms.

4.8.1 Unavoidable, Adverse Environmental Impacts

Implementing the alternatives considered in this *CMRR-NF SEIS* would result in unavoidable, adverse impacts on the human environment. In general, these impacts would come from incremental impacts attributed to the operations of either the existing CMR Building or a CMRR-NF at TA-55.

CMRR-NF and RLUOB operations at LANL would have minimal unavoidable, adverse impacts related to air emissions and greenhouse gas emissions. Air emissions would include various chemical or radiological constituents in the routine emissions typical of nuclear facility operations, although CMRR-NF and RLUOB activities would not release major emissions to the atmosphere at LANL. Air emissions at LANL would occur regardless of CMRR-NF and RLUOB activities. These impacts have been addressed in various LANL NEPA documents. Overall air quality at LANL would not be changed by implementing any of the alternatives analyzed in this SEIS.

Operations at the existing CMR Building or the CMRR-NF at TA-55 would result in unavoidable radiation exposure to workers and the general public. Workers would be exposed to radiation and chemicals associated with analytical chemistry and materials characterization, uranium processing, actinide research, processing and fabrication, and metallography. The incremental annual dose contribution from operations at the existing CMR Building or the CMRR-NF at TA-55 to the offsite MEI, general population, and workers is discussed in Sections 4.2.10, 4.3.10, and 4.4.10.

The generation of radioactive and nonradioactive waste would be unavoidable. Any waste generated during operations would be collected, treated, stored, and eventually removed for suitable recycling or disposal in accordance with applicable EPA regulations.

The decontamination and decommissioning of the CMR Building would result in the one-time generation of radioactive and nonradioactive waste material that could affect storage requirements. This would be an unavoidable impact on the amount of available and anticipated storage space and the requirements of disposal facilities at LANL or off site.

Temporary construction impacts associated with the construction of the CMRR-NF at TA-55 would also be unavoidable. These impacts would include the generation of fugitive dust; noise; associated greenhouse gases; increased construction vehicle and worker traffic; temporary disruption of habitat for non-protected species; and the use of resources, including land, mineral, and energy resources.

4.8.2 Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Implementation of any of the proposed alternatives, including the No Action Alternative, would cause short-term commitments of resources and would permanently commit certain resources (such as energy). Under each alternative, the short-term use of resources would result in potential long-term benefits to the environment and the enhancement of long-term productivity by decreasing overall health risks to workers, the public, and the surrounding environment by reducing their exposure to hazardous and radioactive substances.

Under the proposed action, overall CMRR-NF and RLUOB operations would not change from those operations described in the 2008 *LANL SWEIS* (DOE 2008a) for the existing CMR Building. The short-term use and commitment of environmental resources under the No Action and Modified CMRR-NF Alternatives would include the use of space and materials required to construct the new building, the commitment of new operations support facilities, transportation, and use of other consumable resources and materials for CMR operations. Workers, the public, and the environment would be exposed to increased amounts of hazardous and radioactive materials over the short term from the relocation of CMR Building operations under these alternatives and the associated materials, including process emissions and the handling of waste from equipment refurbishment.

Regardless of the alternative selected, air emissions associated with either the existing CMR Building or the CMRR-NF and RLUOB would introduce small amounts of radiological and nonradiological constituents to the air of the regions around LANL. These emissions would result in additional air pollutants and exposure, but would not impact compliance with air quality or radiation exposure standards at LANL. There would be no significant residual environmental effects on long-term environmental viability.

The management and disposal of sanitary solid waste and nonrecyclable radiological waste over the project's lifespan would require a small increase in energy and space at LANL treatment, storage, and disposal facilities or their replacement offsite disposal facilities. Regardless of the alternative selected, land required to meet the solid waste needs would require a long-term commitment of terrestrial resources.

Continued employment, expenditures, and tax revenues generated during the implementation of any of the alternatives would directly benefit the local, regional, and state economies over the short term. Long-term economic productivity could be facilitated by local governments investing project-generated tax revenues into infrastructure and other required services.

The short-term resources needed to construct and operate the CMRR-NF and RLUOB at LANL would not affect the long-term productivity of LANL. Workers, the public, and the environment could be exposed to increased amounts of hazardous and radioactive materials over the period of construction due to relocation of materials, including process emissions, and handling of radioactive waste.

4.8.3 Irreversible and Irretrievable Commitments of Resources

Irreversible and irretrievable commitments of resources under each alternative potentially would include land, mineral, and energy resources during the lifespan of the project and the energy and water used during operations.

Energy expended would be in the form of fuel for equipment and vehicles, electricity for facility operations and construction (under some alternatives), and human labor. CMRR-NF construction and CMRR-NF or CMR Building and RLUOB operations would generate nonrecyclable waste streams, such as radioactive and nonradioactive solid waste and some wastewater. Construction of CMRR-NF would consume large quantities of construction materials such as steel, sand, gravel, flyash, and cement. However, certain materials and equipment used during construction and operations could be recycled.

Land would be used for both the construction of a new facility and the disposal of hazardous and radioactive waste. The commitment of land for the new facility is discussed in Sections 4.2.2, 4.3.2, and 4.4.2.

CHAPTER 5
APPLICABLE LAWS, REGULATIONS, AND OTHER REQUIREMENTS

5 APPLICABLE LAWS, REGULATIONS, AND OTHER REQUIREMENTS

5.1 Introduction

As part of the National Environmental Policy Act (NEPA) process, an environmental impact statement (EIS) must consider whether actions described under its alternatives would threaten a violation of Federal, state, or local law or requirement imposed for the protection of the environment (40 *Code of Federal Regulations* [CFR] 1508.27) or require a permit, license, or other entitlement (40 CFR 1502.25). This chapter provides a summary of environmental requirements, agreements, and permits that relate to consolidation and relocation of mission-critical chemistry and metallurgy research (CMR) capabilities. This chapter includes the requirements from the 2003 *Final Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE 2003b) that remain valid, as well as new requirements identified since the first EIS was prepared.

A number of Federal environmental laws affect environmental protection, health, safety, compliance, and/or consultation at every U.S. Department of Energy (DOE) location. Certain environmental requirements also have been delegated to state authorities for enforcement and implementation, and state legislatures have adopted additional laws to protect health and safety and the environment. It is DOE policy to conduct its operations in a manner that ensures the protection of public health, safety, and the environment through compliance with all applicable Federal and state laws, regulations, directives, and other requirements.

The various action alternatives analyzed in this *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 (CMRR-NF SEIS)* involve either the operation of existing DOE facilities or the construction and operation of new DOE facilities and the transportation of materials. Actions required to comply with statutes, regulations, and other Federal, state, and local requirements may depend on whether a facility is newly built (preoperational) or is incorporated in whole or in part into an existing facility. Chapter 2 provides a detailed discussion of these alternatives.

5.2 Background

Requirements governing the consolidation and relocation of CMR operations arise primarily from six sources: Congress, Federal agencies, Executive orders, state legislatures, state agencies, and local governments. In general, Federal statutes establish national policies, create broad legal requirements, and authorize Federal agencies to create regulations that conform to the statutes. Detailed implementation of these statutes is delegated to various Federal agencies such as DOE, the U.S. Department of Transportation, and the U.S. Environmental Protection Agency (EPA). For many environmental laws under EPA jurisdiction, state agencies may be delegated responsibility for the majority of program implementation activities, such as permitting and enforcement, but EPA usually retains oversight of the delegated program.

Some applicable laws, such as NEPA, the Endangered Species Act, and the Emergency Planning and Community Right-To-Know Act, require specific reports and/or consultations rather than ongoing permits or activities. Such requirements would be satisfied through the legal/regulatory process, including preparation of this *CMRR-NF SEIS*, leading to the consolidation and relocation of CMR operations.

Other applicable laws establish general requirements that must be satisfied, but do not include processes (such as the issuance of permits or licenses) to consider compliance prior to specific instances of violations or other events that trigger their provisions. These include the Toxic Substances Control Act (which addresses polychlorinated biphenyl [PCB] transformers and other designated substances); the Federal Insecticide, Fungicide, and Rodenticide Act; the Hazardous Materials Transportation Act; and (in the case of a hazardous substance spill) the Comprehensive Environmental Response, Compensation, and Liability Act (also known as Superfund).

Executive orders establish policies and requirements for Federal agencies. Such orders are applicable to Executive branch agencies, but do not have the force of law or regulation.

State legislatures develop their own laws to supplement, as well as implement, Federal laws for protection of air, water, and groundwater quality. State legislation may address solid waste management programs; locally rare or endangered species; and local resource, historic, and cultural values. The laws of local governments add an additional level of public protection, often focusing on zoning, utilities, and public health and safety concerns.

Regulatory agreements and compliance orders may also be initiated to establish responsibilities and timeframes for Federal facilities to come into compliance with provisions of applicable Federal and state laws. There are also other agreements, memoranda of understanding, or formalized arrangements that establish cooperative relationships and requirements.

The alternatives being considered for the consolidation and relocation of CMR operational capabilities and materials would all be located within New Mexico, on Los Alamos National Laboratory (LANL) property controlled by DOE. For a broader review of environmental regulations and compliance issues at LANL, see the 2008 *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE 2008a).

DOE has authority to regulate some environmental activities, as well as the health and safety aspects of nuclear facility operations. The Atomic Energy Act of 1954, as amended, is the principal authority for DOE regulatory activities not externally regulated by other Federal or state agencies. Regulation of DOE activities is primarily established through the use of DOE orders and regulations.

External environmental laws, regulations, and Executive orders can be categorized as applicable to either broad environmental planning and consultation requirements or regulatory environmental protection and compliance activities, although some requirements are applicable to both planning and operations compliance.

Section 5.3 of this chapter discusses the major applicable Federal laws and regulations that impose nuclear safety and environmental protection requirements on the subject facilities and might require the facilities to obtain a permit or license (or amendment thereof) prior to initiation of the relocation project. Each of the applicable regulations and statutes establishes how activities are to be conducted or how potential releases of pollutants are to be controlled or monitored. They include requirements for the issuance of permits or licenses for new operations or new emission sources and for amendments to existing permits or licenses to allow new types of operations at existing sources.

Section 5.4 discusses applicable Executive orders. Section 5.5 identifies applicable DOE directives and regulations for compliance with the Atomic Energy Act; the Occupational Safety and Health Act; and other environmental, safety, and health requirements. Section 5.6 identifies state and local laws, regulations, and ordinances, as well as local agreements potentially affecting the consolidation and relocation of CMR operations. Section 5.7 discusses consultations with applicable agencies and federally recognized Native American tribes.

5.3 Applicable Federal Laws and Regulations

This section describes the Federal environmental, safety, and health laws and regulations that could apply to the various alternatives analyzed in this *CMRR-NF SEIS*. These regulations address such areas as energy conservation, administrative requirements and procedures, nuclear safety, and classified information. They are identified in **Table 5–1**. For ease of identification, a citation column is included in the table, where laws are identified using a *United States Code* (U.S.C.) or Public Law citation, regulations are identified with a CFR citation, and Executive orders are listed by number. This table does not include DOE directives, which are provided in Section 5.5, or state requirements, which are provided in Section 5.6.

Table 5–1 Potentially Applicable Environmental, Safety, and Health Laws, Regulations, and Executive Orders

Laws, Regulations, Orders, Other Requirements	*Citation*
Radioactive Materials and Waste Management	
Atomic Energy Act of 1954, as amended	42 U.S.C. 2011 et seq.
Bob Stump National Defense Authorization Act for Fiscal Year 2003	Public Law 107-314
"Byproduct Material"	10 CFR Part 962
"Environmental Radiation Protection Standards for Management of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Materials"	40 CFR Part 191
Low-Level Radioactive Waste Policy Act of 1980, as amended	42 U.S.C. 2021 et seq.
Price-Anderson Act	42 U.S.C. 2210
Waste Isolation Pilot Plant Land Withdrawal Act, as amended	Public Law 102-579, as amended by Public Law 104-201
"Schedule C–Quantities of Radioactive Materials Requiring Consideration of the Need for an Emergency Plan for Responding to a Release"	10 CFR 30.72, Schedule C
Ecological Resources	
Bald and Golden Eagle Protection Act of 1973, as amended	16 U.S.C. 668 et seq.
Endangered Species Act of 1973, as amended	16 U.S.C. 1531 et seq.
Farmland Protection Policy Act of 1981	7 U.S.C 4201 et seq.
Fish and Wildlife Coordination Act	16 U.S.C. 661 et seq.
Invasive Species	Executive Order 13112
Migratory Bird Treaty Act of 1918, as amended	16 U.S.C. 703 et seq.
Protection of Wetlands	Executive Order 11990
Responsibilities of Federal Agencies to Protect Migratory Birds	Executive Order 13186
Cultural and Paleontological Resources	
American Indian Religious Freedom Act of 1978	42 U.S.C. 1996
Antiquities Act of 1906, as amended	16 U.S.C. 431 et seq.
Archaeological and Historic Preservation Act of 1960, as amended	16 U.S.C. 469 et seq.
Archaeological Resources Protection Act of 1979, as amended	16 U.S.C. 470aa et seq.
Consultation and Coordination with Indian Tribal Governments	Executive Order 13175
Indian Sacred Sites	Executive Order 13007
Manhattan Project National Historical Park Study Act	Public Law 108-340
National Historic Preservation Act of 1966, as amended	16 U.S.C. 470 et seq.
Protection and Enhancement of the Cultural Environment	Executive Order 11593

Laws, Regulations, Orders, Other Requirements	***Citation***
Native American Graves Protection and Repatriation Act of 1990	25 U.S.C. 3001 et seq.
Preserve America	Executive Order 13287
"Protection of Historic and Cultural Properties"	36 CFR Part 800
Trails for America in the 21st Century	Executive Order 13195
Worker Safety and Health	
"Chronic Beryllium Disease Prevention Program"	10 CFR Part 850
"Occupational Radiation Protection"	10 CFR Part 835
Occupational Safety and Health Act of 1970	29 U.S.C. 651 et seq.
"Occupational Safety and Health Standards"	29 CFR Part 1910
Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction	Executive Order 12699
"Worker Safety and Health Program"	10 CFR Part 851
Radiological Safety Oversight and Radiation Protection	
"Procedural Rules for DOE Nuclear Activities"	10 CFR Part 820
"Nuclear Safety Management"	10 CFR Part 830
Transportation	
Hazardous Materials Transportation Act of 1975, as amended	49 U.S.C. 5101 et seq.
"Packaging and Transportation of Radioactive Material"	10 CFR Part 71
"Hazardous Materials Tables and Communications Emergency Response Information Requirements"	49 CFR Part 172
Emergency Planning, Pollution Prevention, and Conservation	
Assignment of Emergency Preparedness Responsibilities	Executive Order 12656
Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (also known as Superfund)	42 U.S.C. 9601 et seq.
Emergency Management and Assistance	44 CFR 1.1
Emergency Planning and Community Right-to-Know Act	42 U.S.C. 11001 et seq.
Federal Emergency Management	Executive Order 12148
Federal Compliance with Pollution Control Standards	Executive Order 12088
Federal Leadership in Environmental, Energy and Economic Performance	Executive Order 13514
Homeland Security Act of 2002	6 U.S.C. 101 et seq.
Justice Assistance Act of 1984	42 U.S.C. 3701–3799
National Defense Industrial Resources Preparedness	Executive Order 12919
Pollution Prevention Act of 1990	42 U.S.C. 13101 et seq.
Proliferation of Weapons of Mass Destruction	Executive Order 12938
Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988, as amended	42 U.S.C. 5121
Strengthening Federal Environmental, Energy, and Transportation Management	Executive Order 13423
Superfund Implementation	Executive Order 12580
Environmental Justice and Protection of Children	
Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	Executive Order 12898
Protection of Children from Environmental Health Risks and Safety Risks	Executive Order 13045
Environmental Quality	
Council on Environmental Quality National Environmental Policy Act Regulations	40 CFR Parts 1500–1508
"Energy Code for New Federal, Commercial, and Multi-Family High Rise Residential Buildings," "Energy Efficiency Standards for New Federal Low-Rise Residential Buildings"	10 CFR Part 434, 10 CFR Part 435
Energy Independence and Security Act of 2007	Public Law 110-140

Laws, Regulations, Orders, Other Requirements	***Citation***
"Federal Energy Management and Planning Programs"	10 CFR Part 436
Federal Insecticide, Fungicide, and Rodenticide Act	7 U.S.C. 136 et seq.
National Environmental Policy Act of 1969	42 U.S.C. 4321 et seq.
"National Environmental Policy Act Implementing Procedures"	10 CFR Part 1021
Protection and Enhancement of Environmental Quality	Executive Order 11514
Relating to Protection and Enhancement of Environmental Quality	Executive Order 11991
Air Quality and Noise	
Clean Air Act of 1970, as amended	42 U.S.C. 7401 et seq.
"National Emission Standards for Hazardous Air Pollutants"	40 CFR Part 61
"National Emission Standards for Hazardous Air Pollutants for Source Categories"	40 CFR Part 63
Noise Control Act of 1972, as amended	42 U.S.C. 4901 et seq.
"Standards of Performance for New Stationary Sources"	40 CFR Part 60
Water Resources	
Clean Water Act of 1972, as amended	33 U.S.C. 1251 et seq.
"Compliance with Floodplain and Wetland Environmental Review Requirements"	10 CFR Part 1022
"EPA-Administered Permit Programs: The National Pollutant Discharge Elimination System"	40 CFR Part 122
Floodplain Management	Executive Order 11988
"National Primary Drinking Water Regulations"	40 CFR Parts 141–149
Safe Drinking Water Act of 1974, as amended	42 U.S.C. 300(f) et seq.
Hazardous Waste and Materials Management	
"EPA Administered Permit Programs: The Hazardous Waste Permit Program"	40 CFR Part 270
Federal Facility Compliance Act of 1992	Public Law 102-386
"Hazardous Waste Management System"	40 CFR Part 260
"Land Disposal Restrictions"	40 CFR Part 268
"Standards for Universal Waste Management"	42 CFR Part 273
Resource Conservation and Recovery Act of 1976, as amended	42 U.S.C. 6901 et seq.
Toxic Substances Control Act of 1976	15 U.S.C. 2601 et seq.

CFR = *Code of Federal Regulations*, U.S.C. = *United States Code*.

American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996)—This act reaffirms American Indian religious freedom under the First Amendment and sets U.S. policy to protect and preserve the inherent and constitutional right of American Indians to believe, express, and exercise their traditional religions. This act further requires Federal actions to avoid interfering with access to sacred locations and traditional resources that are integral to the practice of religions.

Antiquities Act of 1906, as amended (16 U.S.C. 431 et seq.)—This act protects historic and prehistoric ruins, monuments, and antiquities, including paleontological resources, on federally controlled lands from appropriation, excavation, injury, and destruction without permission from the appropriate Federal department.

Archaeological and Historic Preservation Act of 1960, as amended (16 U.S.C. 469 et seq.)—The purpose of this act is to preserve historical and archaeological data (including relics and specimens) that might otherwise be irreparably lost or destroyed as a result of Federal actions.

Archaeological Resources Protection Act of 1979, as amended (16 U.S.C. 470aa et seq.)—This act requires a permit for any excavation or removal of archaeological resources from Federal or American Indian lands. Excavation must be undertaken to further archaeological knowledge in the public interest, and resources removed are to remain the property of the United States. This law also requires that, whenever any Federal agency finds that its activities may cause irreparable loss or destruction of significant scientific, prehistoric, or archaeological data, that agency must notify the U.S. Department of the Interior and may request the Department of the Interior to undertake the recovery, protection, and preservation of such data. Consent must be obtained from the American Indian tribe or Federal agency that has authority over the land on which a resource is located before issuance of a permit, and the permit must contain the terms and conditions requested by the tribe or Federal agency.

Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.), as amended by the Price-Anderson Act (42 U.S.C. 2210) and the Bob Stump National Defense Authorization Act (Public Law 107-314)— This act provides fundamental jurisdictional authority to DOE and the U.S. Nuclear Regulatory Commission (NRC) over governmental and commercial use of nuclear materials. The Atomic Energy Act authorizes DOE to establish standards to protect health or minimize dangers to life or property for activities under DOE jurisdiction. DOE has issued a series of orders that establish an extensive system of standards and requirements to ensure safe operation of DOE facilities (see Section 5.5).

DOE regulations are found in Title 10 of the CFR. The DOE regulations that are most relevant to radioactive materials and waste management and worker health and safety include the following:

- "Nuclear Safety Management" (10 CFR Part 830)
- "Occupational Radiation Protection" (10 CFR Part 835)
- "Chronic Beryllium Disease Prevention Program" (10 CFR Part 850)
- "Worker Safety and Health Program" (10 CFR Part 851)
- "Byproduct Material" (10 CFR Part 962)

The Atomic Energy Act also gives EPA the authority to develop generally applicable standards for protection of the general environment from radioactive materials. EPA has promulgated several regulations under this authority. The EPA regulation that is relevant to the radioactive materials and waste management activities addressed in this *CMRR-NF SEIS* is the "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes" (40 CFR Part 191). This regulation establishes radiation standards for the management and storage of spent nuclear fuel, high-level radioactive waste, and transuranic waste at facilities regulated by NRC or Agreement States, as well as radiation standards for management and storage of spent nuclear fuel, high-level radioactive waste, and transuranic waste at disposal facilities operated by DOE that are not regulated by NRC or Agreement States. The regulation also establishes limitations on radiation doses that might occur after closure of the disposal system. These standards include both individual protection requirements and groundwater protection standards.

The Price-Anderson Act, which was signed into law in 1957 as an amendment to the Atomic Energy Act of 1954, provides for payment of public liability claims in the event of a nuclear incident. The following are key features of this act:

- Assures the availability of billions of dollars to compensate members of the public who suffer a loss as the result of a nuclear incident
- Establishes a simplified claims process for the public to expedite recovery for losses

- Provides for immediate emergency reimbursement of costs associated with any evacuation that may be ordered
- Establishes liability limits for each nuclear incident involving commercial nuclear energy and government use of nuclear materials
- Guarantees that the Federal Government will review the need for compensation beyond that provided

The Bob Stump National Defense Authorization Act, enacted by the Congress in 2002, amended the Atomic Energy Act to add Section 234C, requiring DOE to promulgate worker health and safety regulations to cover contractors with Price-Anderson indemnification agreements in their contracts. DOE promulgated regulations under this act in February 2006 (71 *Federal Register* [FR] 6857) as 10 CFR Part 851, "Worker Safety and Health Program." The regulations codified and enhanced the DOE worker protection program.

Bald and Golden Eagle Protection Act of 1973, as amended (16 U.S.C. 668 et seq.)—This act makes it unlawful to take, pursue, molest, or disturb bald (American) and golden eagles, their nests, or their eggs anywhere in the United States. A permit must be obtained from the U.S. Department of the Interior to relocate a nest that interferes with resource development or recovery operations.

Clean Air Act of 1970, as amended (42 U.S.C. 7401 et seq.)—This act is intended to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population." Section 118 of the Clean Air Act (42 U.S.C. 7418) requires that each Federal agency with jurisdiction over any property or facility engaged in any activity that might result in the discharge of air pollutants comply with "all Federal, state, interstate, and local requirements" regarding the control and abatement of air pollution.

Section 109 of the Clean Air Act (42 U.S.C. 7409 et seq.) directs EPA to set National Ambient Air Quality Standards for criteria pollutants. EPA has identified and set National Ambient Air Quality Standards under 40 CFR Part 50 for the following criteria pollutants: particulate matter, sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, and lead. Section 111 of the Clean Air Act (42 U.S.C. 7411) requires establishment of national standards of performance for new or modified stationary sources of atmospheric pollutants. Section 160 of the Clean Air Act (42 U.S.C. 7470 et seq.) requires that specific emission increases be evaluated prior to permit approval to prevent significant deterioration of air quality. Section 112 of the Clean Air Act (42 U.S.C. 7412) requires specific standards for releases of hazardous air pollutants (including radionuclides).

Emissions of air pollutants are regulated by EPA under 40 CFR Parts 50 through 99. Emissions of radionuclides and hazardous air pollutants from DOE facilities are regulated under the National Emission Standards for Hazardous Air Pollutants Program (40 CFR Parts 60, 61, and 63).

Clean Water Act of 1972, as amended (33 U.S.C. 1251 et seq.)—The Clean Water Act, which amended the Federal Water Pollution Control Act, was enacted to "restore and maintain the chemical, physical, and biological integrity of the Nation's water." The Clean Water Act prohibits the "discharge of toxic pollutants in toxic amounts" to navigable waters of the United States. Section 313 of the Clean Water Act requires all branches of the Federal Government engaged in any activity that might result in a discharge of runoff of pollutants to surface waters to comply with Federal, state, interstate, and local requirements. Section 404 of the Clean Water Act gives the U.S. Army Corps of Engineers permitting authority over activities that discharge dredge or fill materials into waters of the United States, including wetlands.

The Clean Water Act also provides guidelines and limitations for effluent discharges from point source discharges and establishes the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES program is administered by EPA, pursuant to regulations in 40 CFR Part 122, and authority may be delegated to states. Sections 401 through 405 of the Water Quality Act of 1987 added Section 402(p) to the Clean Water Act, which requires EPA to establish regulations for permits for stormwater discharges associated with industrial activities, including construction activities disturbing 5 or more acres (2 hectares) (64 FR 68721). After March 2003, the threshold for obtaining a permit was lowered to 1 acre (0.4 hectares). Stormwater provisions of the NPDES program are set forth in 40 CFR 122.26. Permit modifications are required if discharge effluent is altered.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. 9601 et seq.) (also known as Superfund)—CERCLA provides (1) a program for emergency response to and reporting of a release or threat of a release of a hazardous substance to the environment and (2) a statutory framework for remediation of hazardous substance releases from Federal, state, and private sites. Using the Hazard Ranking System, contaminated sites are ranked and may be included on the National Priorities List. Section 120 of CERCLA specifies requirements for investigations, remediation, and natural resource restoration, as necessary, at Federal facilities, and also provides reporting requirements for hazardous substance contamination on properties to be transferred. LANL is not on the National Priorities List. Potential release sites at LANL are investigated and remediated under state authorities.

Emergency Management and Assistance (44 CFR 1.1)—This regulation contains the policies and procedures for the Federal Emergency Management Act, National Flood Insurance Program, Federal Crime Insurance Program, Fire Prevention and Control Program, Disaster Assistance Program, and Preparedness Program, including radiological planning and preparedness.

Emergency Planning and Community Right-to-Know Act (42 U.S.C. 11001 et seq.)—This amendment to CERCLA requires that facilities provide notice to and coordinate emergency planning with communities and government agencies concerning inventories and any unplanned releases of specific hazardous chemicals. EPA implements this act under regulations found in 40 CFR Parts 355, 370, and 372. Under Subtitle A of this act, Federal facilities are required to provide information to and coordinate with local and state emergency response planning authorities to ensure that emergency plans are sufficient to respond to unplanned releases of hazardous substances. Voluntary implementation of the provisions of this act at LANL began in 1987, and chemical inventories and emissions have been reported annually since 1988.

Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)—This act is intended to prevent the further decline of endangered and threatened species and to restore these species and their habitats. Section 7 of this act requires Federal agencies that have reason to believe that a prospective action may affect an endangered or threatened species or its habitat to consult with the U.S. Fish and Wildlife Service (USFWS) of the U.S. Department of the Interior or the National Marine Fisheries Service of the U.S. Department of Commerce to ensure the action does not jeopardize the species or destroy its habitat. If, despite reasonable and prudent measures to avoid or minimize such impacts, the species or its habitat would be jeopardized by the action, a review process is specified to determine whether the action may proceed as an incidental taking (50 CFR Part 17).

"Energy Code for New Federal, Commercial, and Multi-Family High Rise Residential Buildings" (10 CFR Part 434) and "Energy Efficiency Standards for New Federal Low-Rise Residential Buildings" (10 CFR Part 435)—The provisions of these regulations provide minimum standards for energy efficiency and energy conservation performance for the design of new Federal, commercial, and multi-family high rise residential buildings and new Federal low-rise residential buildings. The performance standards are designed to achieve the maximum practicable improvements in energy efficiency and conservation and increases in the use of nondepletable sources of energy.

Energy Independence and Security Act of 2007 (Public Law 110-140)—This act establishes energy management goals and requirements and amends portions of the National Energy Conservation Policy Act. This act sets Federal energy management requirements in several areas, including the following: energy reduction goals for Federal buildings; facility management/benchmarking; performance and standards for new building, major renovations, and high-performance buildings; energy savings performance contracts; metering; energy-efficient product procurement; Office of Management and Budget reporting; and reductions in petroleum use/increases in alternative fuel use.

Farmland Protection Policy Act of 1981 (7 U.S.C. 4201 et seq.)—This act requires Federal agencies to consider prime or unique farmlands when planning major projects and programs on Federal lands. Federal agencies are required to use prime and unique farmland criteria developed by the U.S. Department of Agriculture's Soil Conservation Service. Under the Farmland Protection Policy Act, the Soil Conservation Service is authorized to maintain an inventory of prime and unique farmlands in the United States to identify the location and extent of rural lands important in the production of food, fiber, forage, and oilseed crops (7 CFR Part 657).

"Federal Energy Management and Planning Programs" (10 CFR Part 436)**—**The objectives of Federal energy management and planning programs are (1) to apply energy conservation measures to and improve the design of Federal buildings such that the energy consumption per gross square foot of Federal buildings in use during fiscal year 1995 is at least 10 percent less than the energy consumption per gross square foot in 1985; (2) to promote the methodology and procedures for conducting life-cycle cost analyses of proposed investments in building energy systems, building water systems, and energy and water conservation measures; (3) to promote the use of energy savings performance contracts by Federal agencies for implementation of privately financed investment in building and facility energy conservation measures for existing federally owned buildings; and (4) to promote efficient use of energy in all agency operations through general operations plans.

Federal Facility Compliance Act of 1992 (42 U.S.C. 6961 et seq.)—This act, enacted on October 6, 1992, amends the Resource Conservation and Recovery Act (RCRA), making Federal facilities subject to potential fines and penalties for violations of RCRA, the law that sets requirements for management of hazardous waste. Prior to its passage, mixed waste stored at DOE sites generally did not comply with RCRA mixed waste land disposal restrictions because of a lack of treatment options. This act requires DOE to (1) prepare and submit a national inventory report identifying its mixed waste volume, characteristics, treatment capacity, and available technologies and (2) prepare and submit (to the appropriate state or EPA regulators) Site Treatment Plans for developing or using the needed treatment capacity along with schedules for treating the mixed waste at each DOE site. The LANL approved Site Treatment Plan is enforced by a compliance order issued by the New Mexico Environment Department in October 1995. It is available for public review.

Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136 et seq.)—This act regulates the use, registration, and disposal of several classes of pesticides to ensure that pesticides are applied in a manner that protects the applicators, workers, and the environment. Implementing regulations include recommended procedures for the disposal and storage of pesticides (40 CFR Part 165) and worker protection standards (40 CFR Part 170).

Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.)—This act promotes effective planning and cooperation between Federal, state, public, and private agencies for the conservation and rehabilitation of the Nation's fish and wildlife and authorizes the U.S. Department of the Interior to provide assistance. This act requires consultation with USFWS on the possible effects of construction, projects, or activities affecting bodies of water in excess of 10 acres (approximately 4 hectares) in surface area on wildlife. This act also requires consultation with the head of the state agency that administers wildlife resources in the affected state.

Hazardous Materials Transportation Act of 1975, as amended (49 U.S.C. 5101 et seq.)—This act requires the U.S. Department of Transportation to prescribe uniform national regulations for transportation of hazardous materials (including radioactive materials). Most state and local regulations regarding such transportation that are not substantively the same as the U.S. Department of Transportation regulations are preempted (49 U.S.C. 5125). This, in effect, allows state and local governments to enforce only the Federal regulations, not to change or expand upon them.

This program is administered by the Research and Special Programs Administration of the U.S. Department of Transportation, which, when covering the same activities, coordinates its regulations with NRC (under the Atomic Energy Act) and EPA (under RCRA). The U.S. Department of Transportation regulations, which may be found in 49 CFR Parts 171 through 178 and 49 CFR Parts 383 through 397, contain requirements for identifying a material as hazardous or radioactive. These regulations interface with the NRC regulations for identifying material, but U.S. Department of Transportation hazardous material regulations govern the hazard communication (such as marking, labeling, vehicle placarding, and emergency response information) and shipping requirements. Requirements for transport by rail, air, and public highway are included. In addition, EPA regulations established in 40 CFR Part 262 apply to offsite transportation of hazardous wastes from LANL.

Public access to many portions of the LANL facility is controlled at all times through the use of gates and guards. Onsite transportation of hazardous materials, wastes, and contaminated equipment that is conducted entirely on DOE property is subject to applicable DOE directives and safety requirements set forth in 10 CFR Part 830, Subpart B. Offsite transportation of hazardous materials, wastes, and contaminated equipment from LANL over public highways is subject to applicable U.S. Department of Transportation and EPA regulations, as well as applicable DOE directives.

The NRC "Packaging and Transportation of Radioactive Material" (10 CFR Part 71) regulations include detailed packaging design requirements and package certification testing requirements. Complete documentation of design and safety analysis and the results of required certification tests are submitted to NRC to certify the package for use. This certification testing involves the following components: heat, physical drop onto an unyielding surface, water submersion, puncture by dropping the package onto a steel bar, and gas tightness.

Justice Assistance Act of 1984 (42 U.S.C. 3701–3799)—This act establishes emergency Federal law enforcement assistance to state and local governments in responding to a "law enforcement emergency," defined as an uncommon situation that requires law enforcement, that is or threatens to become of serious or epidemic proportions, and with respect to which state and local resources are inadequate to protect the lives and property of citizens or to enforce the criminal law. Emergencies that are not of an ongoing or chronic nature (for example, the Mount Saint Helens volcanic eruption) are eligible for Federal law enforcement assistance, including funds, equipment, training, intelligence information, and personnel.

Low-Level Radioactive Waste Policy Act of 1980, as amended (42 U.S.C. 2021 et seq.)—This act amends the Atomic Energy Act to specify that the Federal Government is responsible for disposal of low-level radioactive waste generated by certain activities and that each state is responsible for disposal of other low-level radioactive waste generated within its borders. It provides for and encourages interstate compacts to carry out state responsibilities. As a result of this act, low-level radioactive waste owned or generated by DOE remains the responsibility of the Federal Government.

Manhattan Project National Historical Park Study Act (Public Law 108-340)—This act directs the Secretary of the Interior to conduct a study on the preservation and interpretation of the historic sites of the Manhattan Project for potential inclusion in the National Park System (October 18, 1998).

Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703 et seq.)—This act is intended to protect birds that follow common migration patterns across the United States, Canada, Mexico, Japan, and Russia. It regulates the harvest of migratory birds by specifying conditions such as mode of harvest, hunting seasons, and bag limits. This act stipulates that it is unlawful, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, …any migratory bird…or any part, nest, or egg of any such bird." Although no permit for the proposed Chemistry and Metallurgy Research Building Replacement (CMRR) Project is required under this act, DOE is required to consult with USFWS regarding impacts on migratory birds and to avoid or minimize these effects in accordance with the U.S. Fish and Wildlife Service Mitigation Policy. A split of authority currently exists between Federal courts regarding whether this act applies to Federal agencies.

National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 et seq.)—The purposes of NEPA are to (1) declare a national policy that will encourage productive and enjoyable harmony between people and their environment, (2) promote efforts that will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of people, (3) enrich the understanding of the ecological systems and natural resources important to the Nation, and (4) establish a Council on Environmental Quality (CEQ). NEPA establishes a national policy requiring that Federal agencies consider the environmental impacts of major Federal actions significantly affecting the quality of the human environment before making decisions and taking actions to implement those decisions. Implementation of NEPA requirements in accordance with CEQ regulations (40 CFR Parts 1500–1508) can result in a categorical exclusion, an environmental assessment and Finding of No Significant Impact, or an EIS and Record of Decision. This *CMRR-NF SEIS* was prepared in accordance with NEPA requirements, CEQ regulations for implementing the procedural requirements of NEPA (40 CFR Parts 1500–1508), and "National Environmental Policy Act Implementing Procedures" (10 CFR Part 1021; DOE Order 451.1B, Change 1). It discusses reasonable alternatives and their potential environmental consequences.

National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 et seq.)—This act requires that sites with significant national historic value be placed on the National Register of Historic Places, which is maintained by the Secretary of the Interior. The major provisions of this act for DOE consideration are Sections 106 and 110. Both sections aim to ensure that historic properties are appropriately considered in planning Federal initiatives and actions. Section 106 is a specific, issue-related mandate to which Federal agencies must adhere. It is a reactive mechanism driven by a Federal action. Section 110, in contrast, sets out broad Federal agency responsibilities with respect to historic properties. It is a proactive mechanism that emphasizes ongoing management of historic preservation sites and activities at Federal facilities. No permits or certifications are required under this act.

Section 106 requires the head of any Federal agency with direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking to ensure compliance with the provisions of the act. It compels Federal agencies to "take into account" the effect of their projects on historical and archaeological resources and to give the Advisory Council on Historic Preservation the opportunity to comment on such effects. Section 106 mandates consultation during Federal actions if the undertaking has the potential to affect a historic property. This consultation normally involves State or Tribal Historic Preservation Officers, or both, and may include other organizations and individuals, such as local governments and American Indian tribes. If an adverse effect is found, the consultation often ends with the execution of a Memorandum of Agreement that states how the adverse effect will be resolved.

The regulations implementing Section 106, found in 36 CFR Part 800, were revised on December 12, 2000, to modify the process by which Federal agencies consider the effects of their undertakings on historic properties and to provide the Advisory Council on Historic Preservation with a reasonable opportunity to comment on such undertakings, as required by Section 106 of this act. In promulgating the new regulations, CEQ sought to better balance the interests and concerns of various users of the Section 106 process, including Federal agencies, State Historic Preservation Officers, Tribal Historic Preservation Officers, American Indians and Native Hawaiians, industry, and the public.

Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 et seq.)—This act establishes a means for American Indians to request the return or repatriation of human remains and other cultural items presently held by Federal agencies or federally assisted museums or institutions. This act also contains provisions regarding the intentional excavation and removal of, inadvertent discovery of, and illegal trafficking in American Indian human remains and cultural items. Major actions under this law include the following: (1) establishing a review committee with monitoring and policymaking responsibilities; (2) developing regulations for repatriation, including procedures for identifying lineal descent or cultural affiliation needed for claims; (3) providing oversight of museum programs designed to meet the inventory requirements and deadlines of this law; and (4) developing procedures to handle unexpected discoveries of graves or grave goods during activities on Federal or tribal lands. All Federal agencies that manage land or are responsible for archaeological collections obtained from their lands or generated by their activities must comply with this act. DOE managers of ground-disturbing activities on Federal and tribal lands are to be aware of the statutory provisions treating inadvertent discoveries of American Indian remains and cultural objects. Regulations implementing this act are found in 43 CFR Part 10.

Noise Control Act of 1972, as amended (42 U.S.C. 4901 et seq.)—Section 4 of the Noise Control Act of 1972, as amended, directs all Federal agencies to carry out "to the fullest extent within their authority" programs within their jurisdictions that further the national policy of promoting an environment free from noise that jeopardizes health and welfare. Federal, state, and local agencies enforce the standards and requirements of this act to regulate noise at facilities such as LANL. DOE must comply with this act for any of the activities being considered in this *CMRR-NF SEIS*.

Occupational Safety and Health Act of 1970 (29 U.S.C. 651 et seq.)—Section 4(b)(1) of the Occupational Safety and Health Act exempts DOE and its contractors from the occupational safety requirements of the Occupational Safety and Health Administration. However, 29 U.S.C. 668 requires Federal agencies to establish their own occupational safety and health programs for their places of employment, consistent with Occupational Safety and Health Administration standards. DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees,* states that DOE will implement a written worker protection program that (1) provides a place of employment free from recognized hazards that are causing or are likely to cause death or serious physical harm to their employees, and (2) integrates all requirements contained in paragraphs 4a to 4l of DOE Order 440.1A;

29 CFR Part 1960, "Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters;" and other related site-specific worker protection activities.

"Occupational Safety and Health Standards" (29 CFR Part 1910)—This regulation establishes Occupational Safety and Health Administration requirements for employee safety in a variety of working environments. It addresses employee emergency and fire prevention plans (Section 1910.38), hazardous waste operations and emergency response (Section 1920.120), and hazards communication (Section 1910.1200) to make employees aware of the dangers they face from hazardous materials in their workplace. These regulations do not directly apply to Federal agencies. However, Section 19 of the Occupational Safety and Health Act (29 U.S.C. 668) requires all Federal agencies to have occupational safety programs "consistent" with Occupational Safety and Health Act standards.

Pollution Prevention Act of 1990 (42 U.S.C. 13101 et seq.)—This act establishes a national policy for waste management and pollution control. Source reduction is given first preference, followed by environmentally safe recycling, with disposal or releases to the environment as a last resort. In response to the policies established by the Pollution Prevention Act, DOE committed to participation in the Superfund Amendments and Reauthorization Act, Section 313, EPA 33/50 Pollution Prevention Program. The goal for facilities involved in compliance with Section 313 was to achieve a 33 percent reduction (from a 1993 baseline) in the release of 17 priority chemicals by 1997. On November 12, 1999, then-U.S. Secretary of Energy Bill Richardson established 14 pollution prevention and energy efficiency goals for DOE to build environmental accountability and stewardship into DOE's decisionmaking process. Under these goals, DOE strives to minimize waste and maximize energy efficiency as measured by continuous cost-effective improvements in the use of materials and energy, using the years 2005 and 2010 as interim measurement points.

"Schedule C–Quantities of Radioactive Materials Requiring Consideration of the Need for an Emergency Plan for Responding to a Release" (10 CFR 30.72, Schedule C)—This section of the regulations provides a list that is the basis for both the public and private sector to determine whether the radiological materials they handle must have an emergency response plan for unscheduled releases and is one of the threshold criteria documents for DOE hazards assessments required by DOE Order 151.C, *Comprehensive Emergency Management System*. The *Federal Radiological Emergency Response Plan*, dated May 1, 1996, primarily discusses offsite Federal response in support of state and local governments with jurisdiction during a peacetime radiological emergency.

Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988, as amended (42 U.S.C. 5121)—This act provides an orderly, continuing means of providing Federal Government assistance to state and local governments in managing their responsibilities to alleviate suffering and damage resulting from disasters. The President, in response to a state governor's request, may declare an "emergency" or "major disaster" to provide Federal assistance under this act. The President, in Executive Order 12148, as amended, delegated all functions except those in Sections 301, 401, and 409 to the Director of the Federal Emergency Management Agency. The act provides for the appointment of a Federal coordinating officer who will operate in the designated area with a state coordinating officer for the purpose of coordinating state and local disaster assistance efforts with those of the Federal Government.

Safe Drinking Water Act of 1974, as amended (42 U.S.C. 300(f) et seq.)—The primary objective of the Safe Drinking Water Act is to protect the quality of public drinking water supplies and sources. The implementing regulations, administered by EPA unless delegated to the states, establish standards applicable to public water systems. These regulations include maximum contaminant levels (including those for radioactivity) in public water systems, which are defined as water systems with at least 15 service connections that are used by year-round residents or regularly serve at least 25 year-round residents. EPA regulations implementing the Safe Drinking Water Act are found in 40 CFR Parts 141 through 149. For radioactive material, the regulations specify that the average annual concentration of beta particles and photon energy from manmade radionuclides in drinking water, as delivered to the user by such a system, shall not produce a dose equivalent to the total body or an internal organ greater than 4 millirem per year. They further specify a concentration limit for gross alpha particle activity (excluding radon and uranium) of 15 picocuries per liter and for uranium of 0.03 milligrams per liter (40 CFR 141.66). Other programs established by the Safe Drinking Water Act include the Sole Source Aquifer Program, the Wellhead Protection Program, and the Underground Injection Control Program.

Solid Waste Disposal Act of 1965, as amended by the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments of 1984 (42 U.S.C. 6901 et seq.)—This act, as amended, governs the transportation, treatment, storage, and disposal of hazardous and nonhazardous wastes. Under RCRA, which amended the Solid Waste Disposal Act of 1965, EPA defines and identifies hazardous waste; establishes standards for its transportation, treatment, storage, and disposal; and requires permits for persons engaged in hazardous waste activities. Section 3006 of RCRA (42 U.S.C. 6926) allows states to establish and administer these permit programs with EPA approval.

The EPA regulations implementing RCRA are found in 40 CFR Parts 260 through 283. The New Mexico Environment Department is authorized to administer the RCRA program in New Mexico and issued the RCRA operating permit. Regulations imposed on a generator or on a treatment, storage, or disposal facility vary according to the type and quantity of hazardous waste generated, treated, stored, or disposed of and the methods of treatment, storage, and disposal.

Toxic Substances Control Act of 1976 (15 U.S.C. 2601 et seq.)—This act provides EPA with the authority to require testing of chemical substances entering the environment and to regulate them as necessary. The law complements and expands existing toxic substance laws, such as Section 112 of the Clean Air Act and Section 307 of the Clean Water Act. This act requires compliance with the inventory reporting and chemical control provisions of the legislation to protect the public from risks of exposure to chemicals.

This act also imposes strict limitations on the use and disposal of PCBs, chlorofluorocarbons, asbestos, dioxins, certain metal-working fluids, and hexavalent chromium. EPA issued the disposal authorization documents for management of its PCB waste disposal facility in Technical Area 54.

Waste Isolation Pilot Plant Land Withdrawal Act (Public Law 102-579) and Waste Isolation Pilot Plant Land Withdrawal Act Amendments (Public Law 104-201)—The Waste Isolation Pilot Plant Land Withdrawal Act withdrew land from the public domain for the purpose of creating and operating the Waste Isolation Pilot Plant (WIPP), the geologic repository in New Mexico designated as the national disposal site for defense transuranic waste. The act also defined the characteristics and amount of waste that can be disposed of at the facility. Amendments to the act exempt waste to be disposed of at WIPP from the RCRA land disposal restrictions. Prior to sending any transuranic waste from LANL to WIPP, DOE would have to determine whether the waste meets all statutory and regulatory requirements for disposal at WIPP.

5.4 Applicable Executive Orders

This section identifies environment-, health-, and safety-related Executive orders applicable to LANL operations. Activities under all alternatives would need to be conducted in compliance with applicable Executive orders. Chapter 3 describes the resources at LANL and Chapter 4 discusses the potential impacts on those resources under each alternative. Consultations with applicable agencies and federally recognized Native American nations, as required by these Executive orders, are discussed in Section 5.7.

Executive Order 11514, *Protection and Enhancement of Environmental Quality* (March 5, 1970), as amended by Executive Orders 11541 (July 1, 1970) and 11991 (May 24, 1977)—This Executive order requires Federal agencies to continually monitor and control their activities to (1) protect and enhance the quality of the environment and (2) develop procedures to ensure the fullest practicable provision of timely public information and understanding of Federal plans and programs that may have potential environmental impact so that interested parties can submit their views. DOE has issued regulations (10 CFR Part 1021) and DOE Order 451.1B, *National Environmental Policy Act Compliance Program*, for compliance with this Executive order.

Executive Order 11593, *Protection and Enhancement of the Cultural Environment* (May 13, 1971)— This Executive order directs Federal agencies to locate, inventory, and nominate properties under their jurisdiction or control to the National Register of Historic Places if they qualify. This process requires DOE to provide the Advisory Council on Historic Preservation an opportunity to comment on the possible impacts of proposed activities on any potentially eligible or listed resources.

Executive Order 11990, *Protection of Wetlands* (May 24, 1977)—This Executive order (implemented by DOE in 10 CFR Part 1022) requires Federal agencies to avoid any short- or long-term adverse impacts on wetlands wherever there is a practicable alternative. Each agency must also provide opportunities for early public review of any plans or proposals for new construction in wetlands.

Executive Order 11988, *Floodplain Management* (May 24, 1977)—This Executive order (implemented by DOE in 10 CFR Part 1022) requires Federal agencies to establish procedures to ensure that the potential effects of flood hazards and floodplain management are considered for any action undertaken in a floodplain and that floodplain impacts are avoided to the extent practicable.

Executive Order 12088, *Federal Compliance with Pollution Control Standards* (October 13, 1978), as amended by Executive Order 12580, *Superfund Implementation* (January 23, 1987)—This Executive order directs Federal agencies to comply with applicable administrative and procedural pollution control standards established by, but not limited to, the Clean Air Act, the Noise Control Act, the Clean Water Act, the Safe Drinking Water Act, the Toxic Substances Control Act, and RCRA.

Executive Order 12148, *Federal Emergency Management* (July 20, 1979), as amended by Executive Order 12919, *National Defense Industrial Resources Preparedness*, the Homeland Security Act of 2002 (Public Law 107-296), and Title 3 of U.S.C. Section 301—This Executive order transfers functions and responsibilities associated with Federal emergency management to the director of the Federal Emergency Management Agency. This order assigns the director the responsibility to establish Federal policies for, and to coordinate all civil defense and civil emergency planning, management, mitigation, and assistance functions of, Executive branch agencies. The amendment replaces the name "Federal Emergency Management Agency" with "Department of Homeland Security" wherever it appears.

Executive Order 12656, *Assignment of Emergency Preparedness Responsibilities* (November 18, 1988)—This Executive order assigns emergency preparedness responsibilities to Federal departments and agencies.

Executive Order 12699, *Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction* (January 5, 1990)—This Executive order requires Federal agencies to do the following in a cost-effective manner: (1) reduce risks to occupants of buildings owned, leased, or purchased by the Federal Government or constructed with Federal assistance and to persons who would be affected by failures of Federal buildings in earthquakes; (2) improve the capability of existing Federal buildings to function during or after an earthquake; and (3) reduce earthquake losses of public buildings. Each Federal agency responsible for the design and construction of a Federal building shall ensure that the building is designed and constructed in accordance with appropriate seismic design and construction standards.

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (February 11, 1994)—This Executive order requires each Federal agency to identify and address the disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

The CEQ, which oversees the Federal Government's compliance with Executive Order 12898 and NEPA, has developed guidelines to assist Federal agencies in incorporating the goals of Executive Order 12898 into the NEPA process. This guidance, published in 1997, is intended to "…assist Federal agencies with their NEPA procedures so that environmental justice concerns are effectively identified and addressed." As part of this process, DOE conducted an analysis to determine whether implementing any of the proposed alternatives would result in disproportionately high or adverse impacts on minority and low-income populations. The results of this analysis are discussed in the environmental justice sections of Chapter 4 of this *CMRR-NF SEIS* for each of the alternatives under consideration.

Executive Order 12938, *Proliferation of Weapons of Mass Destruction* (November 14, 1994)—This Executive order states that the proliferation of nuclear, biological, and chemical weapons ("weapons of mass destruction") and the means of delivering such weapons constitute an unusual and extraordinary threat to the national security, foreign policy, and economy of the United States and that a national emergency would be declared to deal with that threat.

Executive Order 13007, *Indian Sacred Sites* (May 24, 1996)—This Executive order directs Federal agencies to (1) accommodate access to and ceremonial use of American Indian sacred sites by their religious practitioners and (2) avoid adversely affecting the physical integrity of such sacred sites to the extent practicable and when consistent with essential agency functions. Where appropriate, agencies are to maintain the confidentiality of sacred sites.

Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks* (April 21, 1997), as amended by Executive Order 13229 (October 9, 2001)—This Executive order requires each Federal agency to give high priority to identifying and assessing environmental health risks and safety risks that may disproportionately affect children and to ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health or safety risks.

Executive Order 13112, *Invasive Species* (February 3, 1999)—This Executive order requires Federal agencies to prevent the introduction of invasive species; to provide for their control; and to minimize their economic, ecological, and human health impacts.

Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments* (November 6, 2000)—This Executive order supplements the Executive Memorandum (dated April 29, 1994) entitled, "Government-to-Government Relations with Tribal Governments," and states that each Executive branch department and agency shall consult, to the greatest extent practicable and to the extent permitted by law, with tribal governments prior to taking actions that affect federally recognized tribal governments. This order also states that each Executive branch department and agency shall assess the impact of Federal Government plans, projects, programs, and activities on tribal trust resources and assure that tribal government rights and concerns are considered during the development of such plans, projects, programs, and activities.

Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds* (January 10, 2001)—This Executive order directs departments and agencies to take certain actions to further implement the Migratory Bird Treaty Act. Specifically, this order directs Federal agencies whose direct activities will likely result in the take of migratory birds to develop and implement a Memorandum of Understanding with USFWS to promote the conservation of bird populations.

Executive Order 13195, *Trails for America in the 21st Century* (January 18, 2001)—This Executive order states that Federal agencies will, to the extent permitted by law and where practicable—and in cooperation with tribes, states, local governments, and interested citizen groups—protect, connect, promote, and assist trails of all types throughout the United States.

Executive Order 13287, *Preserve America* (March 3, 2003)—The goals of the initiative addressed by this Executive order include a greater shared knowledge about the Nation's past, strengthened regional identities and local pride, increased local participation in preserving cultural and natural heritage assets, and support for the economic vitality of our communities. This order establishes Federal policy to provide leadership in preserving America's heritage by actively advancing the protection, enhancement, and contemporary use of the historic properties owned by the Federal Government and by promoting intergovernmental cooperation and partnerships for the preservation and use of historic properties.

Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management* (January 24, 2007)—This Executive order sets goals for Federal agencies to conduct their environmental, transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically, and fiscally sound, integrated, continuously improving, efficient, and sustainable manner.

Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance* (October 5, 2009)—The goals of this Executive order are to expand upon the energy reduction and environmental performance requirements of Executive Order 13423. Executive Order 13514 sets numerous Federal energy requirements in several areas, including accountability and transparency, strategic sustainability performance planning, greenhouse gas management, sustainable buildings and communities, water efficiency, electronic products and services, fleet and transportation management, and pollution prevention and waste reduction. Activities under all of the alternatives would need to be conducted to comply with this order.

5.5 Applicable U.S. Department of Energy Directives and Regulations

The Atomic Energy Act authorizes DOE to establish standards to protect health and minimize the dangers to life or property from activities under DOE's jurisdiction. Through a series of DOE orders and regulations, an extensive system of standards and requirements has been established to ensure safe operation of DOE facilities.

DOE regulations are found in Title 10 of the CFR. These regulations address such areas as energy conservation, administrative requirements and procedures, nuclear safety, and classified information. For the purposes of this *CMRR-NF SEIS*, relevant regulations include "Procedural Rules for DOE Nuclear Activities" (10 CFR Part 820), "Nuclear Safety Management" (10 CFR Part 830), "Occupational Radiation Protection" (10 CFR Part 835), "National Environmental Policy Act Implementing Procedures" (10 CFR Part 1021), and "Compliance with Floodplain and Wetland Environmental Review Requirements" (10 CFR Part 1022).

A number of DOE directives have been issued in support of environmental, safety, and health programs. Many of these were revised and reorganized to reduce duplication and eliminate obsolete provisions. The new DOE Directives System is organized by series, with each directive identified by three digits. Directives can include policies, orders, notices, manuals, and guides.

Existing DOE directives (identified by four digits) are expected to be revised and converted to the new DOE numbering system. All current directives are in effect without regard to the expiration date. The major DOE directives pertaining to the alternatives of this *CMRR-NF SEIS* are listed in **Table 5–2**.

Table 5–2 Applicable U.S. Department of Energy Directives

DOE Directive Number	***Title***	***Date***
Leadership/Management Planning		
P 141.1	Department of Energy Management of Cultural Resources	5-2-2001
O 144.1	Department of Energy American Indian Tribal Government Interactions and Policy	1-16-2009 Chg 1: 11-6-2009
O 151.1C	Comprehensive Emergency Management System	11-2-2005
O 153.1	Departmental Radiological Emergency Response Assets	6-27-2007
Information and Analysis		
O 221.1A	Reporting Fraud Waste and Abuse to the Office of Inspector General	4-19-2008
O 221.2A	Cooperation with the Office of Inspector General	2-25-2008
O 221.3A	Establishment of Management Decisions on Office of Inspector General Reports	4-19-2008
P 226.1B	DOE Oversight Policy	4-25-2011
O 226.1B	Implementation of DOE Oversight Policy	4-25-2011
O 231.1B	Environment, Safety and Health Reporting	6-27-2011
M 231.1-2	Occurrence Reporting and Processing of Operations Information	8-19-2003
Work Processes		
O 410.1	Central Technical Authority Responsibilities Regarding Nuclear Safety Requirements	8-28-2007
O 410.2	Management of Nuclear Materials	8-17-2009
O 413.1B	Internal Control Program	10-28-08
O 413.2B	Laboratory Directed Research and Development	4-19-2006
O 413.3B	Program and Project Management for the Acquisition of Capital Assets	11-29-2011
O 414.1D	Quality Assurance	4-25-2011
P 420.1	"Department of Energy Nuclear Safety Policy"	2-8-2011

DOE Directive Number	Title	Date
O 420.1B	Facility Safety	12-22-2005 Chg 1: 4-19-10
O 422.1	Conduct of Operations	6-29-2010
O 425.1D	Verification of Readiness to Start Up or Restart Nuclear Facilities	4-16-2010
P 426.1	Federal Technical Capability Policy for Defense Nuclear Facilities	12-10-1998
O 426.1	Federal Technical Capability	11-19-2009
O 426.2	Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities	4-21-2010
O 430.1B	Real Property Asset Management	9-24-2003 Chg 1: 2-8-2008 Chg 2: 4-25-2011
O 433.1B	Maintenance Management Program for DOE Nuclear Facilities	4-21-2010
P 434.1	Conduct and Approval of Select Agent and Toxin Work at Department of Energy Sites	6-5-2009
O 435.1	Radioactive Waste Management	7-9-1999 Chg 1: 8-28-2001 Certified 1-9-2007
M 435.1-1	Radioactive Waste Management Manual	7-9-1999 Chg 1: 6-19-2001 Certified 1-9-2007 Chg 2: 6-8-2011
O 436.1	Departmental Sustainability	5-2-2011
O 440.1B	Worker Protection Program for DOE (Including the National Nuclear Security Administration) Federal Employees	5-17-2007 Chg 1: 8-21-2007
M 440.1-1A	DOE Explosives Safety Manual	1-9-2006
P 441.1	DOE Radiological Health and Safety Policy	4-26-1996
M 441.1-1	Nuclear Material Packaging Manual	3-7-2008
O 450.2	Integrated Safety Management	4-25-2011
P 450.4A	Integrated Management Policy	4-25-2011
O 451.1B	National Environmental Policy Act Compliance Program	10-26-2000 Chg 1: 9-28-2001 Chg 2: 6-25-2010
O 452.1D	Nuclear Explosive and Weapon Surety Program	4-14-2009
O 452.2D	Nuclear Explosive Safety	4-14-2009
M 452.2-1A	Nuclear Explosive Safety Manual	4-14-2009
M 452.2-2	Nuclear Explosive Safety Evaluation Processes	4-14-2009
O 452.3	Management of the Department of Energy Nuclear Weapons Complex	6-8-2005
O 452.4B	Security and Use Control of Nuclear Explosives and Nuclear Weapons	1-22-2010
O 452.6A	Nuclear Weapon Surety Interface with the Department of Defense	4-14-2009
O 452.7	Protection of Use Control Vulnerabilities and Designs	5-14-2010
P 454.1	Use of Institutional Controls	4-9-2003
P 456.1	Secretarial Policy Statement on Nanoscale Safety	9-15-2005 Certified 9-23-2010
O 456.1	The Safe Handling of Unbound Engineered Nanoparticles	6-6-2011
O 457.1	Nuclear Counterterrorism	2-7-2006
M 457.1-1	Control of Improvised Nuclear Device Information	8-10-2006
O 460.1C	Packaging and Transportation Safety	5-14-2010
O 460.2A	Departmental Materials Transportation and Packaging Management	12-22-2004
M 460.2-1A	Radioactive Material Transportation Practices Manual	6-4-2008
O 461.1B	Packaging and Transportation for Offsite Shipment of Materials of National Security Interest	12-20-2010

DOE Directive Number	***Title***	***Date***
O 461.2	Onsite Packaging and Transfer or Transportation of Materials of National Security Interest	4-26-2004 Chg 1: 10-31-2010
O 462.1	Import and Export of Category 1 and 2 Radioactive Sources and Aggregated Quantities	11-10-2008
P 470.1A	Safeguards and Security Program	12-29-2010
O 470.2B	Independent Oversight and Performance Assurance Program	10-31-2002
O 470.3B	Graded Security Protection (GSP) Policy	8-12-2008
O 470.4A	Safeguards and Security Program	5-25-2007
M 470.4-1	Safeguards and Security Program Planning and Management	8-26-2005 Chg 1: 3-7-2006 Chg 2: 10-20-2010
M 470.4-5	Personnel Security	8-26-2005
N 470.5	Implementation of Section 1072 of the National Defense Authorization Act for Fiscal Year 2008	8-12-2009
O 471.1B	Identification and Protection of Unclassified Controlled Nuclear Information	3-1-2010
O 471.3	Identifying and Protecting Official Use Only Information	4-9-2003 Chg. 1: 1-12-2011
M 471.3-1	Manual for Identifying and Protecting Official Use Only Information	4-9-2003 Chg. 1: 1-13-2011
O 471.6	Information Security	6-20-2011
O 473.3	Protection Program Operation	6-29-2011
O 474.2	Nuclear Material Control and Accountability	6-27-2011
O 475.2A	Identifying Classified Information	2-1-2011
Environmental Quality and Impact		
O 458.1	Radiation Protection of the Public and the Environment	2-11-2011
O 5480.30	Nuclear Reactor Safety Design Criteria	1-19-2003 Chg 1: 3-14-2001

M = Manual, N = Notice, O = Order, P = Policy.

5.6 Applicable State and Local Laws, Regulations, and Agreements

Certain environmental requirements, including some discussed in Section 5.3, have been delegated to state authorities for implementation and enforcement. It is DOE policy to conduct its operations in an environmentally safe manner that complies with all applicable laws, regulations, and standards, including state laws and regulations. A list of applicable state and local laws, regulations, and agreements is provided in **Table 5–3**.

Table 5–3 Applicable State and Local Regulations, and Agreements

Laws, Regulations, Agreements	***Citation***	***Requirements***
Endangered Plant Species	*New Mexico Administrative Code* (NMAC) Title 19, Chapter 21, "Endangered Plants" (revised November 30, 2006).	Establishes plant species list and rules for collection.
Environmental Oversight and Monitoring Agreement	Agreement in Principle Between DOE and the State of New Mexico, November 2000.	Provides DOE support for state activities in environmental oversight, monitoring, access, and emergency response.
Federal Facility Compliance Order	October 1995 (issued to both DOE and LANL).	Order used by the New Mexico Environment Department to enforce the Federal Facility Compliance Act. It requires compliance with the approved LANL Site Treatment Plan, which documents the development and use of treatment capacities and technologies, as well as use of offsite facilities for treating mixed radioactive waste stored at LANL.
Los Alamos County Noise Restrictions	*Los Alamos County Code*, Chapter 8.28.	Imposes noise restrictions and makes provisions for exceedances.
Environmental Improvement Act	*New Mexico Statutes Annotated* (NMSA) 1978, Sections 74-1-1 through 74-1-15; NMAC Sections 20.5.1 through 20.5.17, August 15, 2003. The New Mexico Environment Department recently changed its regulations for storage tanks, combining the regulations for aboveground and underground storage tanks into the Petroleum Storage Tank regulations. Petroleum Storage Tank regulations are found in NMAC Sections 20.5.1 through 20.5.17; filed for publication in the *New Mexico Register* on July 16, 2003; effective August 15, 2003.	Aboveground tank regulations were modified to include requirements for the registration, installation, modification, repair, and closure or removal of aboveground storage tanks, as well as release detection, record-keeping, and financial responsibility in the state of New Mexico.
New Mexico Air Quality Control Act	NMSA Chapter 74, "Environmental Improvement," Article 2, "Air Pollution" (revised October 31, 2002), and implementing regulations at NMAC Title 20, "Environmental Protection," Chapter 2, "Air Quality" (revised October 31, 2002).	Establishes air quality standards and requires a permit prior to construction or modification of an air contaminant source. Also requires an operating permit for major producers of air pollutants and imposes emission standards for hazardous air pollutants.
New Mexico Cultural Properties Act	NMSA Chapter 18, "Libraries and Museums," Article 6, "Cultural Properties."	Establishes the State Historic Preservation Office and requirements to prepare an archaeological and historic survey and consult with the State Historic Preservation Office.
New Mexico Groundwater Protection Act	NMSA Chapter 74, Article 6B, "Groundwater Protection."	Establishes state standards for protection of groundwater from leaking underground storage tanks.
New Mexico Hazardous Chemicals Information Act	NMSA Chapter 74, Article 4E-1, "Hazardous Chemicals Information."	Implements the hazardous chemical information and toxic release reporting requirements of the Emergency Planning and Community Right-to-Know Act of 1986 (SARA Title III) for covered facilities.

Laws, Regulations, Agreements	***Citation***	***Requirements***
New Mexico Hazardous Waste Act	NMSA Chapter 74, Article 4, "Hazardous Waste," and implementing regulations found in NMAC Title 20, "Environmental Protection," Chapter 4, "Hazardous Waste" (revised June 14, 2000).	Establishes permit requirements for construction, operation, modification, and closure of a hazardous waste management facility and establishes state standards for cleanup of releases from leaking underground storage tanks.
New Mexico Endangered Plant Species Act	NMSA Chapter 75, "Miscellaneous Natural Resource Matters," Article 6, "Endangered Plants."	Requires coordination with the State of New Mexico.
New Mexico Night Sky Protection Act	NMSA Chapter 74, Article 12, "Night Sky Protection": 74-12-1 to 74-12-10 (House Bill 39/A, March 1, 1999).	Regulates outdoor night lighting fixtures to preserve and enhance the State of New Mexico's dark sky while promoting safety, conserving energy, and preserving the environment for astronomy.
New Mexico Radiation Protection Act	NMSA Chapter 74, Article 3, "Radiation Control" and implementing regulations found in NMAC Title 20, Chapter 3, "Radiation Protection" (revised April 15, 2004) "Environmental Protection."	Establishes state requirements for worker protection.
New Mexico Raptor Protection Act	NMSA Chapter 17, Article 2-14.	Makes it unlawful to take, attempt to take, possess, trap, ensnare, injure, maim, or destroy any of the species of hawks, owls, and vultures.
New Mexico Solid Waste Act	NMSA Chapter 74, Article 9, Solid Waste Act, and implementing regulations found in NMAC Title 20, "Environmental Protection," Chapter 9, "Solid Waste" (revised November 27, 2001).	Requires permit prior to construction or modification of a solid waste disposal facility.
New Mexico Water Quality Act	NMSA Chapter 74, Article 6, "Water Quality," and implementing regulations found in NMAC Title 20, "Environmental Protection," Chapter 6, "Water Quality" (revised February 16, 2006).	Establishes water quality standards and requires a permit prior to the construction or modification of a water discharge source.
New Mexico Wildlife Conservation Act	NMSA Chapter 17, "Game and Fish," Article 2, "Hunting and Fishing Regulations," Part 3, Wildlife Conservation Act.	Requires a permit and coordination if a project may disturb habitat or otherwise affect threatened or endangered species.
Compliance Order on Consent	March 1, 2005 (entered into by the State of New Mexico, DOE, and the University of California) (NMED 2005).	Requires site investigations of known or potentially contaminated sites at LANL and cleanup in accordance with a specified process and schedule.
Pueblo Accords	DOE 2006 Restatement of Accords with the Pueblos of Cochiti, Jemez, Santa Clara, and San Ildefonso.	Set forth the specifications for maintaining a government-to-government relationship between DOE and each of the four pueblos closest to LANL.
Threatened and Endangered Species of New Mexico	NMAC Title 19, "Natural Resources and Wildlife," Chapter 33, "Threatened and Endangered Species," Section 19.33.6.8 (revised December 29, 2006).	Establishes the list of threatened and endangered species.

LANL = Los Alamos National Laboratory.

5.7 Consultations

5.7.1 Consultations Requirements

Certain laws and Executive orders require consultation and coordination by DOE with other governmental entities, including other Federal agencies, state and local agencies, and federally recognized Native American nations. These consultations must occur on a timely basis and are generally required before any land disturbance can begin. Most of these consultations are related to biotic resources, cultural resources, and Native American rights.

The biotic resource consultations generally pertain to the potential for activities to disturb sensitive species or habitats. Cultural resource consultations relate to the potential for disruption of important cultural resources and archaeological sites. Native American consultations concern the sovereign rights of tribal nations regarding the potential for disturbance of ancestral sites and the traditional practices.

5.7.1.1 Ecological Resources

With respect to biotic resources, the National Nuclear Security Administration (NNSA) has determined that the proposed action would be similar to those described as acceptable in the Los Alamos National Laboratory *Threatened and Endangered Species Habitat Management Plan* (LANL 2011c); however, consultation by NNSA is necessary to comply with the provisions of 50 CFR Part 402 (Section 7), "Interagency Cooperation – Endangered Species Act of 1973, as amended." NNSA initiated consultation with USFWS, as the Federal agency with regulatory responsibility for the Endangered Species Act, in April 2003 regarding the CMRR Facility (that is, the CMRR Nuclear Facility and the Radiological Laboratory/Utility/Office Building). Subsequent consultations occurred in February 2005, January 2006, August 2007, June 2009, and May 2011.

Consultations resulted in concurrence by USFWS with NNSA's determination that construction and operation of the CMRR Facility in Technical Area 55, including use of other areas for construction support activities, may affect, but are not likely to adversely affect, either individuals of threatened or endangered species currently listed by USFWS or their critical habitat at LANL (see USFWS responses in Section 5.7.2).

5.7.1.2 Cultural Resources

Although the CMRR Nuclear Facility site in Technical Area 55 has already been excavated for the purpose of geologic characterization (no cultural resources were found) and other associated sites required for the project were selected because cultural resource sites either were not present or could easily be avoided, the LANL staff would further evaluate whether any of the subject activities would affect eligible or potentially eligible cultural resources prior to any ground-disturbing activities. *A Plan for the Management of the Cultural Heritage at Los Alamos National Laboratory, New Mexico (Cultural Resources Management Plan)* (LANL 2006a), is a comprehensive institutional plan that defines the responsibilities, requirements, and methods for managing cultural resources at LANL. It provides an overview of the cultural resources program and establishes procedures for effective compliance with the National Historic Preservation Act, as well as with other historic preservation laws specific to the cultural heritage of LANL. The *Cultural Resources Management Plan* makes the public aware of the stewardship responsibilities of and actions taken by NNSA to manage cultural resources at LANL. It also provides a framework for consultation with and visitation of resources by local pueblos and tribes. In accordance with the *Cultural Resources Management Plan*, a cultural resource assessment is made of areas that may be affected by the proposed project. NNSA officially notifies the pueblos and tribes that are culturally affiliated with the area now occupied by LANL regarding proposed CMRR-NF project activities that have a potential to affect their respective cultural resources. The *Cultural Resources Management Plan* and its associated implementing Programmatic Agreement were approved by the Los Alamos Site Office, the New Mexico State Historic Preservation Officer, and the Advisory Council on Historic Preservation in 2000. An updated *Cultural Resources Management Plan* was approved and a new Programmatic Agreement was signed in 2006. A review (conducted every 5 years) of the *Cultural Resources Management Plan* is currently underway; when approved it will lead to a new Programmatic Agreement.

Should any adverse impacts be identified as a result of activities evaluated in this *CMRR-NF SEIS*, NNSA would work with the State Historic Preservation Office, as well as any of the culturally affiliated pueblos and tribes, to resolve any adverse effects. Previous consultation documents regarding the CMRR Project are not listed because they contain protected information about the location of culturally sensitive sites.

5.7.1.3 Federally Recognized Native American Nations

DOE is aware of and in compliance with Executive Order 13175, which requires all Federal agencies to engage in consultation and coordination with tribal governments on matters of mutual concern. Consistent with that order, DOE promulgated DOE Order 144.1 to provide further amplifying guidance. Acting under that order, the Los Alamos Site Office continues its long-standing practice of engaging area tribal authorities through several mechanisms. The mechanisms include specific Accords between DOE and four Pueblo governments (Cochiti, San Ildefonso, Jemez, and Santa Clara) whose lands are adjacent to or near LANL. The Accords set forth the specifications for maintaining a government-to-government relationship between DOE and each of the four Pueblos. These Accords have been in place since 1992, and are renewed periodically.

Further, NNSA requires the LANL contractor to incorporate provisions of DOE Order 144.1 into its management of LANL. Beyond engagement with the four Accord Pueblos, continuous liaison is maintained with member tribes of the Eight Northern Indian Pueblos Council, the All Indian Pueblos Council, and others as relevant to the programs and activities of the site. NNSA and the site contractor have frequent informational and coordinating meetings with federally recognized tribes. For example, monthly meetings are held with Santa Clara Pueblo representatives, quarterly government-to-government consultations are held with Pueblo of San Ildefonso representatives, and joint semi-annual meetings are held by DOE Environmental Management and NNSA with all nuclear-impacted tribes across the country, including those surrounding LANL.

In addition to addressing environmental and other concerns, these formal interactions have led to mutually beneficial economic engagements. In fiscal year 2010, LANL awarded over $100 million in contracts to Native American and tribally owned businesses and additional substantial contracts have been awarded in fiscal year 2011.

With respect to this *CMRR-NF SEIS*, in addition to activities undertaken in accordance with the *Cultural Resources Management Plan*, NNSA notified the tribal governments in the seven northern counties of New Mexico and offered to provide individual briefings. Several briefings were held, including formal briefings to the duly assembled Tribal Council of the Pueblo of San Ildefonso, and the duly assembled Council of the Santa Clara Pueblo. Further, leaders of the Pueblo of San Ildefonso, Santa Clara Pueblo, and the Eight Northern Indian Pueblos Council have toured the CMRR Project on several occasions.

5.7.2 Consultation Letters

Consultation letters associated with this *CMRR-NF SEIS* are attached at the end of this section. They include correspondence from USFWS in response to requests for Section 7 consultation under the Endangered Species Act.

Department of Energy
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

APR 0 4 2003

Dr. Joy Nicholopoulos, Field Supervisor
U.S. Department of the Interior
Fish and Wildlife Service
New Mexico Ecological Services Field Office
2105 Osuna NE
Albuquerque, NM 87113

Reference: Transmittal of a Biological Assessment and Request for Formal Consultation Regarding the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory

Dear Dr. Nicholopoulos:

The Department of Energy (DOE), National Nuclear Security Administration (NNSA) is proposing to construct and operate a new replacement facility for the existing Chemistry and Metallurgy Research (CMR) Building at Los Alamos National Laboratory (LANL). The preferred proposed location for the new facility (referred to as the CMRR Facility) is within Technical Area (TA)-55 at LANL; the existing CMR Building is located within TA-3 at LANL. The estimated time for initiation of construction is 2004; it is estimated that the new facility would become operational in 2010 and the project would be completed in about 2012. Construction of the new facility could involve the construction of one to three new buildings, support structures, new parking areas, and could include the rerouting of a small portion of Pajarito Road along the edge of Two-Mile Canyon.

Construction activities would be expected to continue year-round, once initiated. Small portions of Mexican spotted owl (*Strix occidentalis lucida*) potential nesting, roosting and foraging habitat could be removed during the project's construction phase; parking lot lighting and increased noise generation and human activities in the vicinity could also occur next to the remaining potential habitat areas during the project's operational phase. No individual Mexican spotted owls have been observed in the vicinity of TA-55 over the last 5 years. NNSA has, therefore, determined that the construction and operation of the new CMRR Facility <u>may affect and is likely to adversely affect</u> the Mexican spotted owl potential habitat at TA-55. Potential foraging habitat for the bald eagle (*Haliaeetus leucocephalus*) also exists at TA-55; however, NNSA has determined that the construction and operation of the new CMRR Facility <u>may affect but is not likely to adversely affect</u> the bald eagle potential habitat at TA-55.

APR 0 4 2003

Dr. Joy Nicholopoulos 2

A Biological Assessment with appropriate site information is provided to the Fish and Wildlife Service as an enclosure to this letter, as we engage in the Formal Consultation process under Section 7 of the Endangered Species Act (50 CFR 402.14, Formal Consultation). We look forward to an expeditious completion of this consultation process.

If you have any questions during this consultation process, please call Ms. Elizabeth Withers, of my staff, at (505) 667-8690 or Dr. Tim Haarmann, Biology Team Leader for the University of California at LANL, at (505) 667-5019.

Sincerely,

E. Dennis Martinez

for:

Ralph E. Erickson
Manager
Los Alamos Site Office

OOM:1RE-017

Enclosure

cc w/o enclosure:
Elizabeth Withers, OFO, LASO
John Stetson, PWT, LASO
Tim Haarmann, LANL, MS-M887

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
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April 15, 2003

Cons. # 2-22-03-F-0302

Ralph E. Erickson, Manager
Department of Energy
National Nuclear Security Administration
Los Alamos Area Office,
Los Alamos, New Mexico 87544

Dear Mr. Erickson:

This letter acknowledges the U.S. Fish and Wildlife Service's (Service) April 4, 2003, receipt of your April 4, 2003, letter requesting initiation of formal section 7 consultation under the Endangered Species Act as amended (16 U.S.C. § 1531 to 1544 *et seq.*) (ESA). The consultation concerns the possible effects of your proposed construction and operation of a new replacement facility for the existing Chemistry and Metallurgy Research Building at Los Alamos National Laboratory, Los Alamos County, New Mexico on Mexican spotted owl (*Strix occidentalis lucia*) and the bald eagle (*Haliaeetus leucocephalus*).

The Service has now received the information necessary to initiate formal consultation, as outlined in the regulations governing interagency consultation (50 CFR § 402.14). All information required of you to initiate this consultation was either included with your letter and assessment or is otherwise accessible for our consideration and reference.

Section 7 allows the Service up to 90 calendar days to conclude formal consultation with your agency and an additional 45 calendar days to prepare our biological opinion (unless we mutually agree to an extension). Therefore, we expect to provide you with our biological opinion no later than August 17, 2003.

As a reminder, the ESA requires that after initiation of formal consultation, the Federal action agency may not make any irreversible or irretrievable commitment of resources that limit future options. This practice ensures agency actions do not preclude the formulation or implementation of reasonable and prudent alternatives that avoid jeopardizing the continued existence of endangered or threatened species or destroying or modifying their critical habitats.

Ralph E. Erickson, Manager 2

We have assigned log number 2-22-03-F-0302 to this consultation. Please refer to that number in future correspondence on this consultation. If we can be of further assistance, please contact Santiago R. Gonzales of my staff at (505) 761-4755.

Sincerely,

Joy E. Nicholopoulos

Joy E. Nicholopoulos
State Supervisor

cc:
NEPA Compliance Officer, Department of Energy, National Nuclear Security Administration, Los Alamos, NM (Attn: Elizabeth Withers)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
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2105 Osuna NE
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May 14, 2003

Cons. # 2-22-03-F-0302

Ralph E. Erickson, Area Manager
Department of Energy
Los Alamos Area Office
Los Alamos, New Mexico 87544

Dear Mr. Erickson:

This letter transmits the U.S. Fish and Wildlife Service's (Service) review of the proposed Department of Energy (DOE), National Nuclear Security Administration construction of a Chemistry Metallurgy Research Building Replacement Project (CMRR) and its effects on the bald eagle (*Haliaeetus leucocephalus*) and Mexican spotted owl (*Strix occidentalis lucida*) (owl) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). The DOE has submitted the Biological Assessment (BA): The Potential Effects of the Chemistry and Metallurgy Research Facility Replacement Project on Federally Listed Threatened, Endangered, and Sensitive Species Los Alamos National Laboratory (LANL), Los Alamos, New Mexico dated April 2003. The BA evaluated the anticipated effects on federally listed species and their habitats, resulting from the construction of the CMRR at Technical Area 55 (TA-55) of LANL. The proposed project will consist of two to three buildings (a total of 200,000 square feet [sq ft] and utilize approximately 16 hectares (ha) (40 acres [ac]) in Los Alamos County, New Mexico.

The Service concurs with your "may affect, not likely to adversely affect" determination for the bald eagle at TA-55. The following reasons are given to support our concurrence; 1) only foraging habitat exists at the proposed CMRR location and 2) bald eagles have not been recorded foraging on or near the proposed construction location.

The DOE has determined that the proposed CMRR "is likely to adversely affect" the owl. Based on information provided in the April 4, 2003, BA and other information available to the Service, and telephone conversations with your staff, we believe the appropriate conclusion is "may affect, not likely to adversely affect" for the owl. The following reasons are given to support our determination: 1) no owls have been recorded in the project area; 2) owls have not been found nesting or roosting within 2.7 kilometers (1.6 miles) of the proposed CMRR; 3) only approximately 7.8 ha (19.3 ac) in the core and 6.8 ha (16.8 ac) in buffer areas of area of environmental interest (AEI) habitat may be disturbed; 4) potential disturbance during construction of the CMRR is expected to be insignificant or discountable based on the

Ralph E. Erickson, Area Manager 2

information provided in the BA; 4) Delaney *et al.* (1997) suggested that owls may habituate to repeated noise disturbance exposures as the nesting season progresses; 5) they also reported that owls did not flush at distances greater than 105 meters (m) from the noise source; 6) Gallegos *et al.* (1997) and Gonzales *et al.* (1997) reported at least 100 potential nesting sites in the Canon de Valle and Los Alamos Canyon AEIs; therefore, nest-site selection should not be precluded; 7) the size of the building site 16.2 ha (40 ac) is insignificant; and 8) LANL will conduct owl presence/absence surveys before CMRR construction activities begin. Therefore, we believe that the effects of the CMRR project on the owl will be insignificant or discountable because of the small project size and disturbance of impact, and the habitat has not been occupied for at least 8 years.

The Service appreciates the thorough analyses provided in the BA and your efforts to protect endangered and threatened species. Please contact the Service if you have questions or wish to discuss our conclusion.

Please contact the Service if: 1) future surveys detect listed, proposed or candidate species in habitats where they have not been previously observed; 2) the project is changed or new information reveals additional effects of the proposed action to listed species; 3) a new species is listed or critical habitat designated that may be affected by the proposed action. In future communications regarding this project, please refer to Consultation #2-22-03-F-0302. If we can be of further assistance, please contact Santiago R. Gonzales of my staff at (505) 761-4755.

Sincerely,

Joy E. Nicholopoulos

Joy E. Nicholopoulos
State Supervisor

cc:
Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
Director, New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division, Santa Fe, New Mexico

Literature Cited

Delaney, K. D., T. G. Grubb, and L. L. Pater. 1997. Effects of helicopter noise on nesting Mexican spotted owls. Report to Holloman Air Force Base, US Air Force, Alamogordo, New Mexico. 49 pp.

Gallegos, A. F., G. J. Gonzales, K. D. Bennett, and L. E. Pratt. 1997. Preliminary risk assessment of the Mexican spotted owl under a spatially-weighted foraging regime at the Los Alamos National Laboratory. Los Alamos National Laboratory Report LA:13259-MS. 62 pp.

Gonzales, G. J., A. F. Gallegos, and T. S. Foxx. 1997. Second annual review update: preliminary risk assessment of federally listed species at the Lao Alamos National Laboratory. Los Alamos National Laboratory. Los Alamos National Laboratory Report LA-UR-97-4732. 14 pp.

United States Department of the Interior

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March 9, 2005

Cons. # 2-22-03-I-0302

Ms. Elizabeth R. Withers
ESA Program Manager
National Nuclear Security Administration
Los Alamos Site Ofice
Los Alamos, New Mexico 87544

Dear Ms. Withers:

Thank you for your February 1, 2005, biological assessment (BA) of The Potential Effects of the Chemistry and Metallurgy Research Facility Replacement Project on Federally Listed Threatened , Endangered, and Sensitive Species Los Alamos National Laboratory, Los Alamos, New Mexico. The Los Alamos National Laboratory (LANL) proposes to construct replacement buildings for the Chemistry and Metallurgy Research (CMR) facility along Pajarito Road in the central portion of LANL. The proposed action would construct additional buildings and their associated parking lots north and south of the existing Prajarito Road. Your letter requesting consultation for the proposed project and its effects on the threatened Mexican spotted owl (owl) (*Strix occidentalis lucida*) and the bald eagle (*Haliaeetus leucocephalus*) was received by the U.S. Fish and Wildlife Service (Service) on February 2, 2005. The LANL has determined that proposed construction "may affect, is not likely to adversely affect" the owl and the bald eagle.

The following information about the proposed project was provided in the BA or was otherwise available to the Service:

- Surveys conducted to protocol did not detect owls in the project area.
- No cutting of trees larger than 8 inches diameter at chest height would take place in the canyon or on the canyon rim.
- Trees on the canyon rims would be retained to provide a screen for the canyon habitat.
- No thinning of trees smaller than 8 inches diameter or ground clearing would take place in the canyons until the areas are surveyed.
- There are no protected activity centers (PACs) within the project area.
- Seasonal occupancy surveys for owls and bald eagles would be conducted before construction would commence.
- All exposed soils would be re-vegetated with native seed mix as soon as construction is completed.
- All trees planted in association with construction would be native species for this elevation and forest type.
- Presence and absence for bald eagles would be monitored during construction in the fall and winter.

Ms. Elizabeth R. Withers 2

- If a bald eagle were present within 0.25 mile of the project area in the morning before project activity begins, or arrives during breaks in project activity, the contactor would be required to suspend all activity until the bird left of its own volition; or an Ecology Group biologist, in consultation with the Service, determines that the potential for harassment is minimal.
- If bald eagles are consistently found in the immediate project area during the construction periods, the biologist would contact the Service to determine if formal consultation under the Endangered Species Act is required.

We find that your proposed action and associated activities would conform with the Mexican Spotted Owl Recovery Plan (U.S. Fish and Wildlife Service 1995) because owl prey habitat would be retained or only temporarily impacted. We also find that potential effects to bald eagles would be minimal. For these reasons and the information listed above, the Service concurs with your determination that the proposed action "may affect, is not likely to adversely affect" the owl and the bald eagle.

This concludes consultation for the Chemistry and Metallurgy Research Facility Replacement Project. Please contact the Service if: (1) new information reveals effects of the agency action that may affect the species to an extent not considered in this consultation; (2) the agency action is subsequently modified in a manner that causes an effect to the species that was not considered by the proposed action, (3) owls or bald eagles are detected within the project area, and (4) a new species is listed or critical habitat designated that may be affected by the proposed project.

We appreciate the thorough analyses provided in the letter and the EA and your efforts to protect endangered and threatened species. In future communications regarding this project, please refer to consultation #2-22-03-I-0302. If we can be of further assistance, please contact Santiago R. Gonzales of my staff at (505) 761-4755.

Sincerely,

Susan MacMullin

Susan MacMullin
Field Supervisor

cc:
Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
Director, New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division, Santa Fe, New Mexico

United States Department of the Interior

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06 FEB 10 [illegible] 1:55

February 7, 2006

Cons. # 2-22-03-I-0302

Ms. Elizabeth R. Withers
ESA Program Manager
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

Dear Ms. Withers:

Thank you for your January 19, 2006, amended biological assessment (BA) of the potential effects of the Chemistry and Metallurgy Research Facility Replacement (CMRR) Project, Los Alamos National Laboratory, Los Alamos, New Mexico. The Los Alamos National Laboratory (LANL) proposes to construct replacement buildings for the CMRR facility along Pajarito Road in the central portion of LANL. The proposed action would construct additional buildings and their associated parking lots north and south of the existing Pajarito Road. The amended BA analyzes the potential effects on threatened and endangered species of the CMRR project as previously revised with the additional construction of an electrical substation for the combined Technical Area-55 and CMRR complex in the area south of Pajarito Road. Your letter requesting consultation for the proposed project and its effects on the threatened Mexican spotted owl (owl) (*Strix occidentalis lucida*) and the bald eagle (*Haliaeetus leucocephalus*) was received by the U.S. Fish and Wildlife Service (Service) on January 19, 2006. You determined that proposed construction "may affect, is not likely to adversely affect" the owl and the bald eagle, and requested concurrence.

The following information about the proposed project was provided in the BA or was otherwise available to the Service:

- Owls have been found nesting or roosting approximately 1.6 miles and 0.5 miles fro the proposed CMRR.
- Owlets were produced in 1994, 1999, and 2004.
- A new owl was detected in 2004 and 2005 season, young may have been produced in 2005.
- Owls have not been detected in Pajarito or Two-Mile Canyons.
- The 115-kV substation would be constructed with bird-friendly protective devices.
- Lighting will meet New Mexico Sky Lighting Act requirements.
- Trees cutting will be selective to limit tree removal.
- Disturbance and noise would be kept to a minimum at the proposed CMRR construction site.

- No cutting of trees larger than 8 inches in diameter at chest height would take place in the canyon or directly on the canyon rim.
- Trees on the canyon rims would be retained to provide a screen for the canyon habitat.
- No thinning of trees smaller than 8 inches diameter or ground clearing would take place in the canyons until the areas are surveyed.
- There are no protected activity centers (PACs) within the project area.
- Seasonal occupancy surveys for owls and bald eagles would be conducted before construction would commence.
- All exposed soils would be re-vegetated with native seed mix as soon as construction is completed.
- All trees planted in association with construction would be native species for this elevation and forest type.
- Presence and absence for bald eagles would be monitored during construction in the fall and winter.
- If a bald eagle were present within 0.25 mile of the project area in the morning before project activity begins, or arrives during breaks in project activity, the contactor would be required to suspend all activity until the bird left of its own volition; or an Ecology Group biologist, in consultation with the Service, determines that the potential for harassment is minimal.
- If bald eagles are consistently found in the immediate project area during the construction periods, the biologist would contact the Service to determine if formal consultation under the Endangered Species Act is required.

We find that your proposed amended action and associated activities conform with the Mexican Spotted Owl Recovery Plan (U.S. Fish and Wildlife Service 1995) because the disturbed owl prey habitat is less than 1 percent of the total Pajarito or Sandia-Mortandad owl habitat and therefore, insignificant and discountable. We also find that potential effects to bald eagles would be minimal. For these reasons and the information listed above, the Service concurs with your determination that the proposed action "may affect, is not likely to adversely affect" the owl and the bald eagle.

This concludes consultation for the Chemistry and Metallurgy Research Facility Replacement Project as amended. Please contact the Service if: (1) new information reveals effects of the agency action that may affect the species to an extent not considered in this consultation; (2) the agency action is subsequently modified in a manner that causes an effect to the species that was not considered by the proposed action, (3) owls or bald eagles are detected within the project area, and (4) a new species is listed or critical habitat designated that may be affected by the proposed project.

We appreciate the thorough analyses provided in the letter and the EA and your efforts to protect endangered and threatened species. In future communications regarding this project, please refer

Ms. Elizabeth R. Withers 3

to consultation #2-22-03-I-0302. If we can be of further assistance, please contact Santiago R. Gonzales of my staff at (505) 761-4755.

Sincerely,

for Brian Hanson
Acting Field Supervisor

cc:
Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
Director, New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division, Santa Fe, New Mexico

United States Department of the Interior

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September 26, 2007

Cons. # 22420-2007-I-0126

Vicki Loucks, Biological Resource Program Manager
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

Dear Ms. Loucks:

This letter responds to your August 13, 2007, Biological Assessment (BA) requesting informal consultation for expanding the footprint of the Chemistry and Metallurgy Research facility at Los Alamos National Laboratory (LANL), Los Alamos, New Mexico to the east for additional lay down areas and to construct and operate a cement plant. According to the BA, the proposed project would develop an additional lay down area for storage of soil spoils and staged equipment as well as construction and operation of a cement plant to provide concrete for the construction work. The total project area covers 141.76 acres. Your letter requesting consultation for the proposed project and its effects on the threatened Mexican spotted owl (owl) (*Strix occidentalis lucida*) and the bald eagle (*Haliaeetus leucocephalus*) was received by the U.S. Fish and Wildlife Service (Service) on August 15, 2007. LANL has determined that the proposed project "may affect, is not likely to adversely affect" the owl and the bald eagle.

According to the Federal Register (50 CFR Part 7, 2007), the Service removed the bald eagle from the Federal list of Threatened and Endangered Wildlife, effective August 8, 2007. Due to this decision, consultation under Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. § 1531 *et seq.*) is not required for the bald eagle. Therefore, impacts to the bald eagle from the proposed project will not be evaluated further in this letter.

According to the BA, the following Reasonable and Prudent Alternatives would be implemented to lessen the impact from the proposed project:

- Keep disturbance and noise to a minimum at the site.
- Areas of lowest tree density should be used when choosing any access routes.
- No cutting of trees larger than 8 inches diameter at chest height would take place in the canyon or on the canyon rim.
- Trees on the canyon rims would be retained to provide a screen for the canyon habitat.
- No thinning of trees smaller than 8 inches diameter or ground clearing would take place in the canyons until the areas are surveyed.
- There are no protected activity centers (PACs) within the project area.
- Seasonal occupancy surveys for owls would be conducted before construction would commence.

- Final lighting of the facilities and roads will be kept at a minimum to limit the lighting of the surrounding forest and canyon.
- Appropriate erosion and runoff controls would be employed to reduce erosion and limit sedimentation.
- Excessive parking areas, off-road travel, materials storage areas, and crossing of streams must be avoided.
- All exposed soils would be re-vegetated with native seed mix as soon as construction is completed.
- All trees planted in association with construction would be native species for this elevation and forest type.
- All equipment maintenance and fueling must be completed at least 100 feet from stream channel.
- New temporary staging areas will be rehabilitated using native vegetation.

We find that your proposed action and associated activities would conform with the Mexican Spotted Owl Recovery Plan (U.S. Fish and Wildlife Service 1995) because owl prey habitat would be retained or only temporarily impacted. Surveys conducted to protocol did not detect owls in the project area. For these reasons and the information listed above, the Service concurs with your determination that the proposed action "may affect, is not likely to adversely affect" the owl.

This concludes consultation for the Chemistry and Metallurgy Research Facility Replacement project. Please contact the Service if: (1) new information reveals effects of the agency action that may affect the species to an extent not considered in this consultation; (2) the agency action is subsequently modified in a manner that causes an effect to the species that was not considered by the proposed action, (3) owls are detected within the project area, and (4) a new species is listed or critical habitat designated that may be affected by the proposed project.

We appreciate the thorough analyses provided in the BA and your efforts to protect endangered and threatened species. If we can be of further assistance, please contact Lynn Gemlo of my staff at (505) 761-4726.

Sincerely,

Nancy R. Riley

for Wally Murphy
Field Supervisor

cc:
Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
Director, New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division, Santa Fe, New Mexico

United States Department of the Interior

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09

August 6, 2009

Cons. # 22420-09-I-0066

Ms. Vicki D. Loucks
Biological Resource Program Manager
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

Dear Ms. Loucks:

Thank you for your June 26, 2009, letter and amended Biological Assessment (BA) requesting informal consultation of the Potential Change in Project Effects of the Chemistry and Metallurgy Research Facility Replacement Project on Federally Listed Threatened and Endangered Species at Los Alamos National Laboratory (LANL), Los Alamos, New Mexico. According to the amended BA, LANL is proposing to construct a replacement for the Chemistry and Metallurgy Research Facility which includes new buildings, a 115-kV substation, and associated parking lots on the north and south sides of Pajarito Road. The amended BA describes a change in the proposed action which includes moving the underground utilities from the north side of Pajarito Road to the south by one road width to the edge of Two-Mile Canyon for 3,000 feet. The proposed electrical substation would also be moved as far south as possible while remaining on the mesa. Your letter requesting consultation for the proposed project and its effects on the threatened Mexican spotted owl (*Strix occidentalis lucida*) (MSO) was received by the Service on June 30, 2009. LANL has determined that the proposed project "may affect, is not likely to adversely affect" the MSO.

The following information about the proposed project was provided in the BA or was otherwise available to the Service:

- Surveys conducted to protocol through 2009 did not detect MSO in the project area.
- No cutting of trees larger than 8 inches diameter at chest height would take place in the canyon or on the canyon rim.
- Trees on the canyon rims would be retained to provide a screen for the canyon habitat.
- Seasonal MSO occupancy surveys will be completed in the project area.
- There are no protected activity centers (PACs) within the project area.
- All exposed soils would be re-vegetated with native seed mix as soon as construction is completed.
- All trees planted in association with construction would be native species for this elevation and forest type.

Ms. Vicki D. Loucks 2

We find that your proposed action and associated activities would conform with the Mexican Spotted Owl Recovery Plan (U.S. Fish and Wildlife Service 1995) because MSO prey habitat would be retained or only temporarily impacted. For these reasons and the information listed above, the Service concurs with your determination that the proposed action "may affect, is not likely to adversely affect" the MSO.

This concludes consultation for the Chemistry and Metallurgy Research Facility Replacement Project. Please contact the Service if: (1) new information reveals effects of the agency action that may affect the species to an extent not considered in this consultation; (2) the agency action is subsequently modified in a manner that causes an effect to the species that was not considered by the proposed action, (3) MSO are detected within the project area, and (4) a new species is listed or critical habitat designated that may be affected by the proposed project.

We appreciate the thorough analyses provided in the BA and your efforts to protect endangered and threatened species. In future communications regarding this project, please refer to consultation # 22420-2009-I-0066. If we can be of further assistance, please contact Lynn Gemlo of my staff at (505) 761-4726.

Sincerely,

Patricia G. Zenone

Acting for Wally Murphy
Field Supervisor

cc:
Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
Director, New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division, Santa Fe, New Mexico

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
2105 Osuna NE
Albuquerque, New Mexico 87113
Phone: (505) 346-2525 Fax: (505) 346-2542

May 2, 2011

Cons. # 22420-2011-I-0052

Vicki D. Loucks
Biological Resource Program Manager
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544

Dear Ms. Loucks:

This responds to your April 6, 2011, cover letter and biological assessment (BA) requesting informal consultation for the effects from temporary spoils storage, staging, new parking, and vehicle turnaround at Los Alamos National Laboratory, New Mexico, received on April 8, 2011. As documented in your BA, which is hereby incorporated by reference, we find that your proposed action will have insignificant and discountable effects to the Mexican spotted owl (*Strix occidentalis lucida*). Therefore, the Service concurs with your determination of "may affect, not likely to adversely affect".

This concludes section 7 consultation regarding the proposed action. If monitoring or other information results in modification or the inability to complete all aspects of the proposed action, consultation should be reinitiated. Please contact the Service if: 1) future surveys detect listed, proposed or candidate species in habitats where they have not been previously observed; 2) the proposed action changes or new information reveals effects of the proposal to listed species that have not been considered in this analysis; or 3) a new species is listed or critical habitat designated that may be affected by the action.

Thank you for your concern for endangered species and New Mexico's wildlife habitats. If you have any questions, please contact Lynn Gemlo of my staff at the letterhead address or at (505) 761-4726.

Sincerely,

Wally Murphy
Field Supervisor

cc:
Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
Director, New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division, Santa Fe, New Mexico

CHAPTER 6
GLOSSARY

6 GLOSSARY

***actinide* —** Any member of the group of elements with atomic numbers from 89 (actinium) to 103 (lawrencium), including uranium and plutonium. All members of this group are radioactive.

***activation products* —** Nuclei, usually radioactive, formed by bombardment and absorption in material with neutrons, protons, or other nuclear particles.

***active fault* —** A fault that is likely to have another earthquake sometime in the future. Faults are commonly considered to be active if they have moved one or more times in the last 10,000 years (i.e., during the Quaternary Period).

***acute exposure* —** A single, short-term exposure to a radiation source, a toxic substance, or other stressors that may result in biological harm. Pertaining to radiation, the absorption of a relatively large amount of radiation (or intake of radioactive material) over a short period of time.

***administrative control level* —** A dose level that is established well below the regulatory limit to administratively control and help reduce individual and collective radiation doses. Facility management should establish an annual facility administrative control level that should, to the extent feasible, be more restrictive than the more general administrative control level.

***aggregate* —** Any of various loose, particulate materials, such as sand, gravel, or pebbles, added to a cementing agent to make concrete, plaster, or grout.

***air pollutant* —** Generally, an airborne substance that could, in high enough concentrations, harm living things or cause damage to materials. From a regulatory perspective, an air pollutant is a substance for which emissions or atmospheric concentrations are regulated or for which maximum guideline levels have been established due to potential harmful effects on human health and welfare.

***air quality control region* —** Geographic subdivisions of the United States, designed to deal with pollution on a regional or local level. Some regions span more than one state.

***alluvium (alluvial)* —** Unconsolidated, poorly sorted detrital sediments ranging from clay to gravel sizes deposited by streams.

***alpha particle* —** A positively charged particle ejected spontaneously from the nuclei of some radioactive elements. It is identical to a helium nucleus and has a mass number of 4 and an electrostatic charge of +2. It has low penetrating power and a short range (a few centimeters in air). (See *alpha radiation*.)

***alpha radiation* —** A strongly ionizing, but weakly penetrating, form of radiation consisting of positively charged alpha particles emitted spontaneously from the nuclei of certain elements during radioactive decay. Alpha radiation is the least penetrating of the four common types of ionizing radiation (alpha, beta, gamma, and neutron). Even the most energetic alpha particle generally fails to penetrate the layers of dead cells covering the skin and can be easily stopped by a sheet of paper. Alpha radiation is most hazardous when an alpha-emitting source resides inside an organism. (See *alpha particle*.)

***A.M. peak hour* —** The highest design hour of traffic on a roadway in the morning (A.M.) hours. A.M. hours are typically between 7 and 9 A.M.

***ambient air* —** The surrounding atmosphere as it exists around people, plants, and structures.

***ambient air quality standards* —** The level of pollutants in the air prescribed by regulations that may not be exceeded during a specified time in a defined area. Air quality standards are used to provide a measure of the health-related and visual characteristics of the air.

***analytical chemistry* —** The branch of chemistry that deals with the separation, identification, and determination of the components of a sample.

***annual average daily traffic (AADT)* —** The total volume of traffic passing a point or segment of a highway in both directions for 1 year divided by the number of days in a year.

***aquatic* —** Living or growing in, on, or near water.

***aquifer* —** A body of rock or sediment that is capable of transmitting groundwater and yielding usable quantities of water to wells or springs.

***archaeological sites (resources)* —** Any location where humans have altered the terrain or discarded artifacts during either prehistoric or historic times.

***areas of environmental interest (AEI)* —** Areas within Los Alamos National Laboratory (LANL) that are being managed and protected because of their significance to biological or other resources. Habitats of threatened and endangered species that occur or may occur at LANL are designated as AEIs. In general, a threatened and endangered species AEI consists of a core area that contains important breeding or wintering habitat for a specific species and a buffer area around the core area. The buffer protects the area from disturbances that would degrade the value of the core area to the species.

***artifact* —** An object produced or shaped by human workmanship of archaeological or historical interest.

***arterial roadway* —** A roadway that primarily serves through traffic and that secondarily provides access to adjoining properties.

***as low as is reasonably achievable (ALARA)* —** An approach to radiation protection to manage and control worker and public exposures (both individual and collective) and releases of radioactive material to the environment to as far below applicable limits as social, technical, economic, practical, and public policy considerations permit. ALARA is not a dose limit, but, rather, a process for minimizing doses to as far below limits as is practicable.

***atmospheric dispersion* —** The process of air pollutants being dispersed in the atmosphere. This occurs by wind that carries the pollutants away from their source, by turbulent air motion that results from solar heating of the Earth's surface, and by air movement over rough terrain and surfaces.

***Atomic Energy Commission* —** A five-member commission, established by the Atomic Energy Act of 1946, to supervise nuclear weapons design, development, manufacturing, maintenance, modification, and dismantlement. In 1974, the Atomic Energy Commission was abolished, and all functions were transferred to the U.S. Nuclear Regulatory Commission (NRC) and the Administrator of the Energy Research and Development Administration. The Energy Research and Development Administration was later terminated, and functions vested by law in the Administrator were transferred to the Secretary of Energy.

***atomic number* —** The number of positively charged protons in the nucleus of an atom or the number of electrons in an electrically neutral atom.

attainment area — An area that the U.S. Environmental Protection Agency has designated as being in compliance with one or more of the National Ambient Air Quality Standards for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. An area may be in attainment for some pollutants, but not for others. (See *ambient air quality standards*, *nonattainment area*, and *particulate matter*.)

attractiveness level — A categorization of nuclear material types and compositions that reflects the relative ease of processing and handling required to convert a material to a nuclear explosive device.

barrier — Any material or structure that prevents or substantially delays movement of radionuclides toward the accessible environment.

basalt — The most common volcanic rock, dark gray to black in color, high in iron and magnesium, and low in silica. It is typically found in lava flows.

baseline — The existing environmental conditions against which impacts of a proposed action and its alternatives can be compared.

bearing capacity — Capacity of soil to support the loads applied to the ground.

beryllium — An extremely lightweight element with the atomic number 4. It is metallic and is used in reactors as a neutron reflector.

best management practices (BMPs) — Structural, nonstructural, and managerial techniques, to prevent or reduce negative impacts or to promote positive impacts. They are the most effective and practical means for controlling impacts that are compatible with the productive use of the resource to which they are applied. BMPs are used in both urban and agricultural areas. BMPs can include schedules of activities; prohibitions of practices; maintenance procedures; treatment requirements; operating procedures; and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

beta particle — A particle emitted in the radioactive decay of many radionuclides. A beta particle is identical to an electron. It has a short range in air and a small ability to penetrate other materials.

block — A U.S. Census Bureau term describing small areas bounded on all sides by visible features or political boundaries; used in tabulation of census data.

bound — To use simplifying assumptions and analytical methods in an analysis of impacts or risks such that the result overestimates, or describes an upper limit on (i.e., "bounds"), potential impacts or risks.

cancer — The name given to a group of diseases characterized by uncontrolled cellular growth, with cells having invasive characteristics such that the disease can transfer from one organ to another.

capable fault — A fault that has exhibited one or more of the following characteristics: (1) movement at or near the ground surface at least once within the past 35,000 years, or movement of a recurring nature within the past 500,000 years; (2) macroseismicity instrumentally determined with records of sufficient precision to demonstrate a direct relationship with the fault; and/or (3) a structural relationship to a capable fault according to characteristic (1) or (2) above, such that movement on one could reasonably be expected to be accompanied by movement on the other.

***carbon dioxide* —** A colorless, odorless gas that naturally occurs in the atmosphere; it also results from fossil fuel combustion and biomass burning.

***carbon dioxide equivalent* —** A metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP. As the reference gas, carbon dioxide has a GWP of 1.

***carbon monoxide* —** A colorless, odorless, poisonous gas produced by incomplete fossil fuel combustion.

***carcinogen* —** An agent that may cause cancer. Ionizing radiation is a physical carcinogen; there are also chemical and biological carcinogens. Biological carcinogens may be external (e.g., viruses) or internal (genetic defects).

***cask* —** A heavily shielded container used to store or ship radioactive materials.

***categories of special nuclear material (Categories I, II, III, and IV)* —** A designation determined by the quantity and type of special nuclear material or a designation of a special nuclear material location based on the type and form of the material and the amount of nuclear material present. A designation of the significance of special nuclear material based upon the material type, form of the material, and amount of material present in an item, grouping of items, or in a location.

***cavate* —** Consists of a room carved into a cliff face within the Bandelier Tuff geological formation. The category includes isolated cavates, multi-roomed contiguous cavates, and groups of adjacent cavates that together form a cluster or complex.

***cell* —** See *hot cell*.

***Class I areas* —** Specifically designated areas where the degradation of air quality is stringently restricted (e.g., many national parks and wilderness areas). (See *Prevention of Significant Deterioration*.)

***Class II areas* —** Most of the country not designated as Class I is designated as Class II. Class II areas are generally cleaner than air quality standards require, and moderate increases in new pollution are allowed after an impacts review mandated by regulations.

***classified information* —** (1) Information that has been determined pursuant to Executive Order 12958, any successor order, or the Atomic Energy Act of 1954 (42 *United States Code* [U.S.C.] 2011) to require protection against unauthorized disclosure; (2) certain information requiring protection against unauthorized disclosure in the interest of national defense and security or foreign relations of the United States pursuant to Federal statute or Executive order.

***climbing lane* —** A passing lane added on an upgrade to allow traffic to pass heavy vehicles whose speeds are reduced.

***collective dose* —** The sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation. Collective dose is expressed in units of person-rem or person-sieverts.

***collector roadway* —** A roadway that primarily serves to provide access to adjoining properties and to provide traffic circulation within the local area.

***colluvium (colluvial)* —** A loose deposit of rock debris accumulated at the base of a cliff or slope.

***community (biotic)* —** All plants and animals occupying a specific area under relatively similar conditions.

***community (environmental justice)* —** A group of people or a site within a spatial scope exposed to risks that potentially threaten health, ecology, or land values or who are exposed to industry that stimulates unwanted noise, smells, industrial traffic, particulate matter, or other nonaesthetic impacts.

***computational modeling* —** Use of a computer to develop a mathematical model of a complex system or process and to provide conditions for testing it.

***conformity* —** Conformity is defined in the Clean Air Act as (1) an action's compliance with an implementation plan's purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards, (2) expeditious attainment of such standards, and (3) assurance that such activities will not: cause or contribute to any new violation of any standard in any area; increase the frequency or severity of any existing violation of any standard in any area; or delay timely attainment of any standard, required interim emission reduction, or other milestones in any area.

***contact-handled waste* —** Radioactive waste or waste packages whose external dose rate is low enough to permit contact handling by humans during normal waste management activities (typically, waste with a surface dose rate not greater than 200 millirem per hour). (See *remote-handled waste*.)

***container* —** Regarding radioactive waste, the metal envelope in the waste package that provides the primary containment function of the waste package, which is designed to meet the containment requirements of Title 10 of the *Code of Federal Regulations* (CFR), Part 60 (10 CFR Part 60).

***contamination* —** The deposition of undesirable radioactive material on the surfaces of structures, areas, objects, or people.

***criteria pollutants* —** An air pollutant that is regulated by the National Ambient Air Quality Standards. The U.S. Environmental Protection Agency must describe the characteristics and potential health and welfare effects that form the basis for setting, or revising, the standard for each regulated pollutant. Criteria pollutants include sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and two size classes of particulate matter, less than 10 micrometers (0.0004 inches) in diameter, and less than 2.5 micrometers (0.0001 inches) in diameter. New pollutants may be added to, or removed from, the list of criteria pollutants as more information becomes available.

***critical habitat* —** Habitat essential to the conservation of an endangered or threatened species that has been designated as critical by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR Part 424). (See *endangered species* and *threatened species*.)

The lists of critical habitats can be found in 50 CFR 17.95 (fish and wildlife), 50 CFR 17.96 (plants), and 50 CFR Part 226 (marine species).

***criticality* —** The condition in which a system is capable of sustaining a nuclear chain reaction.

***cultural resources* —** Archaeological sites, historical sites, architectural features, traditional use areas, and Native American sacred sites.

***cumulative impacts* —** Impacts on the environment that result when the incremental impact of a proposed action is added to the impacts from other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non–Federal) or person undertakes the other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time (40 CFR 1508.7).

***curie* —** A unit of radioactivity equal to 37 billion disintegrations per second (i.e., 37 billion becquerels); also, a quantity of any radionuclide or mixture of radionuclides having 1 curie of radioactivity.

***day–night average sound level* —** The 24-hour, “A-weighted” equivalent sound level expressed in decibels. A 10-decibel penalty is added to sound levels between 10:00 P.M. and 7:00 A.M. to account for increased annoyance due to noise during night hours.

***decibel (dB)* —** A unit for expressing the relative intensity of sounds on a logarithmic scale from 0 for the average least perceptible sound to about 130 for the average level at which sound causes pain to humans. For traffic and industrial noise measurements, the A-weighted decibel (dBA), a frequency-weighted noise unit, is widely used. The dBA scale corresponds approximately to the frequency response of the human ear and thus correlates well with loudness.

***decibel, A-weighted (dBA)* —** A unit of frequency-weighted sound pressure level, measured by the use of a metering characteristic and the “A” weighting specified by the American National Standards Institution (ANSI S1.4-1983 [R1594]) that accounts for the frequency response of the human ear.

***decommissioning* —** Retirement of a facility, including any necessary decontamination and/or dismantlement.

***decontamination* —** The actions taken to reduce or remove substances that pose a substantial present or potential hazard to human health or the environment, such as radioactive or chemical contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques.

***defense-in-depth* —** The use of multiple, independent protection elements combined in a layered manner so that the system capabilities do not depend on a single component to maintain effective protection against defined threats.

***degrees Centigrade (° C)* —** A unit for measuring temperature using the Centigrade scale in which the freezing point of water is 0° and the boiling point is 100°.

***degrees Fahrenheit (° F)* —** A unit for measuring temperature using the Fahrenheit scale in which the freezing point of water is 32° and the boiling point is 212°.

***depleted uranium* —** Uranium whose content of the fissile isotope uranium-235 is less than the 0.7 percent (by weight) found in natural uranium, so that it contains more uranium-238 than natural uranium.

***deposition* —** In geology, the laying down of potential rock-forming materials; sedimentation. In atmospheric transport, the settling out on ground and building surfaces of atmospheric aerosols and particles (“dry deposition”), or their removal from the air to the ground by precipitation (“wet deposition” or “rainout”).

***design basis* —** For nuclear facilities, information that identifies the specific functions to be performed by a structure, system, or component, and the specific values (or ranges of values) chosen for controlling parameters for reference bounds for design. These values may be: restraints derived from generally accepted state-of-the-art practices for achieving functional goals; requirements derived from analysis (based on calculation and/or experiments) of the effects of a postulated accident for which a structure, system, or component must meet its functional goals; or requirements derived from Federal safety objectives, principles, goals, or requirements.

***design-basis earthquake* —** The earthquake that a system, component, or structure is designed to withstand and maintain a certain level of performance. For a performance category 3 facility, the design-basis earthquake has a return period of 2,500 years.

***design-basis threat* —** The elements of a threat postulated for the purpose of establishing requirements for safeguards and security programs, systems, components, equipment, and information. (See *threat*.)

***design response spectra (DRS)* —** Response spectra used for design. The DRS are equal to the product of the Uniform Hazard Response Spectra and the Design Factor and are defined at a control location in the free field.

***detention pond* —** An area where excess stormwater is collected and stored or held temporarily to prevent flooding and erosion.

***diversion* —** The unauthorized removal of nuclear material from its approved use or authorized location.

***dose (radiological)* —** A generic term meaning absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or committed equivalent dose. It is a measure of the energy imparted to matter by ionizing radiation. The unit of dose is the rem or rad. (See *dose equivalent*, *effective dose equivalent*, and *rad*.)

***dose equivalent* —** A measure of radiological dose that correlates with biological effect on a common scale for all types of ionizing radiation. Defined as a quantity equal to the absorbed dose in tissue multiplied by a quality factor (the biological effectiveness of a given type of radiation) and all other necessary modifying factors at the location of interest. The units of dose equivalent are the rem and sievert.

***drinking water standards* —** The level of constituents or characteristics in a drinking water supply specified in regulations under the Safe Drinking Water Act as the maximum permissible.

***ecosystem* —** A community of organisms and their physical environment interacting as an ecological unit.

***effective dose equivalent* —** The dose value obtained by multiplying the dose equivalents received by specified tissues or organs of the body by the appropriate weighting factors applicable to the tissues or organs irradiated, and then summing all of the resulting products. It includes the dose from internal and external radiation sources. The effective dose equivalent is expressed in units of rem or sieverts.

***effluent* —** A waste stream flowing into the atmosphere, surface water, ground water, or soil. Most frequently, the term applies to wastes discharged to surface waters.

***emission* —** A material discharged into the atmosphere from a source operation or activity.

***emission standards* —** Legally enforceable limits on the quantities and/or kinds of air contaminants that can be emitted into the atmosphere.

endangered species — Plants or animals that are in danger of extinction through all or a significant portion of their ranges and that have been listed as endangered by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR Part 424). The lists of endangered species can be found in 50 CFR 17.11 (wildlife), 50 CFR 17.12 (plants), and 50 CFR 222.23(a) (marine organisms).

engineered backfill — Material that is specially prepared to refill the excavation surrounding the building and restore the former ground surface.

enriched uranium — Uranium whose content of the fissile isotope uranium-235 is greater than the 0.7 percent (by weight) found in natural uranium. (See *uranium* and *highly enriched uranium*.)

environment, safety, and health requirements — In the context of the U.S. Department of Energy (DOE), encompasses those requirements, activities, and functions in the conduct of all DOE and DOE-controlled operations that are concerned with impacts on the biosphere; compliance with environmental laws, regulations, and standards controlling air, water, and soil pollution; limiting the risks to the well-being of both the operating personnel and the general public; and protecting property against accidental loss and damage. Typical activities and functions related to this program include, but are not limited to, environmental protection, occupational safety, fire protection, industrial hygiene, health physics, occupational medicine, process and facility safety, nuclear safety, emergency preparedness, quality assurance, and radioactive and hazardous waste management.

environmental impact statement (EIS) — The detailed written statement required by Section 102(2)(C) of the National Environmental Policy Act (NEPA) for a proposed major Federal action significantly affecting the quality of the human environment. A U.S. Department of Energy (DOE) EIS is prepared in accordance with applicable requirements of the Council on Environmental Quality NEPA regulations in 40 CFR Parts 1500–1508 and the DOE NEPA regulations in 10 CFR Part 1021. The statement includes, among other information, discussions of the environmental impacts of the proposed action and all reasonable alternatives; adverse environmental effects that cannot be avoided should the proposal be implemented; the relationship between short-term uses of the human environment and enhancement of long-term productivity; and any irreversible and irretrievable commitments of resources.

environmental justice — The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, local, and tribal programs and policies. Executive Order 12898 directs Federal agencies to make achieving environmental justice part of their missions by identifying and addressing disproportionately high and adverse effects of agency programs, policies, and activities on minority and low-income populations.

ephemeral watercourse — A stream that flows only after a period of heavy precipitation.

fault — A fracture or a zone of fractures within a rock formation along which vertical, horizontal, or transverse slippage has occurred. A normal fault occurs when the hanging wall has been depressed in relation to the footwall. A reverse fault occurs when the hanging wall has been raised in relation to the footwall.

fault escarpment — A steep slope or long cliff that results from faulting and separates two relatively level areas of differing elevations.

fissile materials —

General definition: Although sometimes used as a synonym for fissionable material, this term has acquired a more restricted meaning; namely, any material fissionable by low-energy (i.e., thermal or slow) neutrons. Fissile materials include uranium-235, uranium-233, plutonium-239, and plutonium-241.

Definition specific to hazardous materials transportation: Plutonium-238, plutonium-239, plutonium-241, uranium-233, uranium-235, or any combination of these radionuclides. The definition does not apply to nonirradiated natural uranium and depleted uranium, and natural uranium or depleted uranium that has been irradiated in a thermal reactor. Certain additional exceptions are provided in 49 CFR 173.453.

fission — A nuclear transformation that is typically characterized by the splitting of a heavy nucleus into at least two other nuclei, the emission of one or more neutrons, and the release of a relatively large amount of energy. Fission of heavy nuclei can occur spontaneously or be induced by neutron bombardment.

fission products — Nuclei (fission fragments) formed by the fission of heavy elements, plus the nuclides formed by the fission fragments' radioactive decay.

floodplain — The lowlands and relatively flat areas adjoining inland and coastal waters and the flood-prone areas of offshore islands. Floodplains include, at a minimum, that area with at least a 1.0 percent chance of being inundated by a flood in any given year.

The *base floodplain* is defined as the area that has a 1.0 percent or greater chance of being flooded in any given year. Such a flood is known as a 100-year flood.

The *critical action floodplain* is defined as the area that has at least a 0.2 percent chance of being flooded in any given year. Such a flood is known as a 500-year flood. Any activity for which even a slight chance of flooding would be too great (e.g., the storage of highly volatile, toxic, or water-reactive materials) should not occur in the critical action floodplain.

The *probable maximum flood* is the hypothetical flood considered to be the most severe reasonably possible flood, based on the comprehensive hydrometeorological application of maximum precipitation and other hydrological factors favorable for maximum flood runoff (e.g., sequential storms and snowmelts). It is usually several times larger than the maximum recorded flood.

formation — In geology, the primary unit of formal stratigraphic mapping or description. Most formations possess certain distinctive features.

freeway — A multilane divided highway with a minimum of two lanes in each direction and full access control.

fugitive emissions — (1) Emissions that do not pass through a stack, vent, chimney, or similar opening where they could be captured by a control device, or (2) any air pollutant emitted to the atmosphere other than from a stack. Sources of fugitive emissions include pumps; valves; flanges; seals; area sources such as ponds, lagoons, landfills, or piles of stored material (e.g., coal); and road construction areas or other areas where earthwork is occurring.

fumarolic — Pertaining to a vent in the ground surface, located in or near a volcano, from which hot gases, especially steam, are emitted.

***gamma radiation* —** High-energy, short wavelength, electromagnetic radiation emitted from the nucleus of an atom during radioactive decay. Gamma radiation frequently accompanies alpha and beta emissions and always accompanies fission. Gamma rays are very penetrating and are best stopped or shielded by dense materials, such as lead or depleted uranium. Gamma rays are similar to, but are usually more energetic than, x-rays.

***geology* —** The science that deals with the Earth: the materials, processes, environments, and history of the planet, including rocks and their formation and structure.

***glovebox* —** A large enclosure that separates workers from equipment used to process hazardous material while allowing the workers to be in physical contact with the equipment; normally constructed of stainless steel, with large laminated safety-glass windows. Workers have access to equipment through the use of heavy-duty, lead-impregnated rubber gloves, the cuffs of which are sealed in portholes in the glovebox windows.

***ground motion attenuation relationships* —** Predictions of ground motion parameters using a simplified model in which the effects of the earthquake source are represented by earthquake magnitude or moment.

***groundwater* —** Water below the ground surface in a zone of saturation.

Related definition: Subsurface water is all water that exists in the interstices of soil, rocks, and sediment below the land surface, including soil moisture, capillary fringe water, and groundwater. That part of subsurface water in interstices completely saturated with water is called groundwater.

***habitat* —** The environment occupied by individuals of a particular species, population, or community.

***half-life* —** The time in which one-half of the atoms of a particular radionuclide disintegrate to another nuclear form. Half-lives for specific radionuclides vary from millionths of a second to billions of years.

***Hazard Quotient* —** The value used as an assessment of non-cancer-associated toxic effects of chemicals, e.g., kidney or liver dysfunction. It is a ratio of the estimated exposure to that exposure at which it would be expected that adverse health effects would begin to be produced. It is independent of cancer risk, which is calculated only for those chemicals identified as carcinogens.

***hazards classification* —** The process of identifying the potential threat to human health of a chemical substance.

***hazardous air pollutants* —** Air pollutants not covered by the National Ambient Air Quality Standards, but that may present a threat of adverse human health or environmental effects. Those specifically listed in 40 CFR 61.01 are asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride. More broadly, hazardous air pollutants are any of the 189 pollutants listed in or pursuant to Section 112(b) of the Clean Air Act. Very generally, hazardous air pollutants are any air pollutants that may realistically be expected to pose a threat to human health or welfare.

***hazardous chemical* —** Under 29 CFR Part 1910, Subpart Z, hazardous chemicals are defined as “any chemical which is a physical hazard or a health hazard.” Physical hazards include combustible liquids, compressed gases, explosives, flammables, organic peroxides, oxidizers, pyrophorics, and reactives. A health hazard is any chemical for which there is good evidence that acute or chronic health effects occur in exposed individuals. Hazardous chemicals include carcinogens; toxic or highly toxic agents; reproductive toxins; irritants; corrosives; sensitizers; hepatotoxins; nephrotoxins; agents that act on the hematopoietic system; and agents that damage the lungs, skin, eyes, or mucous membranes.

***hazardous material* —** A material, including a hazardous substance, as defined by 49 CFR 171.8, that poses a risk to health, safety, and property when transported or handled.

***hazardous substance* —** Any substance subject to the reporting and possible response provisions of the Clean Water Act and the Comprehensive Environmental Response, Compensation, and Liability Act.

***hazardous waste* —** A category of waste regulated under the Resource Conservation and Recovery Act (RCRA). To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in 40 CFR 261.20–261.24 (i.e., ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by the U.S. Environmental Protection Agency in 40 CFR 261.31 through 261.33.

***high-efficiency particulate air (HEPA) filter* —** An air filter capable of removing at least 99.97 percent of particles 0.3 micrometers (about 0.00001 inches) in diameter. These filters include a pleated fibrous medium, typically fiberglass, capable of capturing very small particles.

***high-level radioactive waste* —** High-level radioactive waste is the highly radioactive waste material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations, and other highly radioactive material that the U.S. Nuclear Regulatory Commission, consistent with existing law, determines by rule requires permanent isolation.

***highly enriched uranium* —** Uranium whose content of the fissile isotope uranium-235 has been increased through enrichment to 20 percent or more (by weight). (See *enriched uranium* and *depleted uranium*.)

***historic resources* —** Physical remains that postdate the emergence of written records; in the United States, they are architectural structures or districts, archaeological objects, and archaeological features dating from 1492 and later.

***hot cell* —** A shielded facility that requires the use of remote manipulators for handling radioactive materials.

***hydro-collapse* —** The process whereby soils that appear to be strong and stable in their natural (dry) state rapidly consolidate under wetting conditions, generating large and often unexpected settlement.

***hydrology* —** The science dealing with the properties, distribution, and circulation of natural water systems.

***indirect jobs* —** Within a regional economic area, jobs generated or lost in related industries as a result of a change in direct employment.

***intracontinental rift zone* —** A large area within a continent in which plates of the Earth's crust are moving away from each other, forming an extensive system of fractures and faults.

***ion* —** An atom that has too many or too few electrons, causing it to be electrically charged.

***ionizing radiation* —** Alpha particles, beta particles, gamma rays, high-speed electrons, high-speed protons, and other particles or electromagnetic radiation that can displace electrons from atoms or molecules, thereby producing ions.

irradiated — Exposure to ionizing radiation. The condition of reactor fuel elements and other materials in which atoms bombarded with nuclear particles have undergone nuclear changes.

isotope — Any of two or more variations of an element in which the nuclei have the same number of protons (i.e., the same atomic number), but different numbers of neutrons so that their atomic masses differ. Isotopes of a single element possess almost identical chemical properties, but often different physical properties. (e.g., carbon-12 and -13 are stable, while carbon-14 is radioactive).

joule — A metric unit of energy, work, or heat, equivalent to one watt-second, 0.737 foot-pounds, or 0.239 calories.

latent cancer fatalities — Deaths from cancer resulting from, and occurring some time after, exposure to ionizing radiation or other carcinogens.

level of service — A quantitative measure describing operational conditions within a traffic stream, based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience.

loam — A rich soil consisting of a mixture of sand and clay and decaying organic materials.

low-income population — Low-income populations, defined in terms of U.S. Census Bureau annual statistical poverty levels (*Current Population Reports,* Series P-60 on Income and Poverty), may consist of groups or individuals who live in geographic proximity to one another or who are geographically dispersed or transient (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect. (See *environmental justice* and *minority population*.)

low-level radioactive waste — Radioactive waste that is not high-level radioactive waste, transuranic waste, spent nuclear fuel, or byproduct tailings from processing of uranium or thorium ore. Low-level radioactive waste is generated in many physical and chemical forms and levels of contamination.

low-slump concrete — A concrete mix that is stiffer and spreads less than a slump concrete when emplaced. Low-slump concrete contains less water than normal concrete.

magnitude — A quantity characteristic of the total energy released by an earthquake that describes its effects at a particular place. Magnitude is determined by taking the common logarithm (base 10) of the largest ground motion recorded on a seismograph during the arrival of a seismic wave type and applying a standard correction factor for distance to the epicenter. Three common types of magnitude are Richter (or local) (ML), P body wave (mb), and surface wave (Ms).

Additional magnitude scales, notably the moment magnitude (Mw), have been introduced to increase uniformity in representation of earthquake size. *Moment magnitude* is defined as the rigidity of the rock multiplied by the area of faulting multiplied by the amount of slip.

A one-unit increase in magnitude (for example, from magnitude 6 to magnitude 7) represents a 30-fold increase in the amount of energy released.

***material at risk (MAR)* —** the amount of radionuclides (in grams or curies of activity for each radionuclide) available to be acted on by a given physical stress. For facilities, processes, and activities, the MAR is a value representing some maximum quantity of radionuclide present or reasonably anticipated for the process or structure being analyzed. Different MARs may be assigned for different accidents as it is only necessary to define the material in those discrete physical locations that are exposed to a given stress. For example, a spill may involve only the contents of a tank in one glovebox. Conversely, a seismic event may involve all of the material in a building.

***material control and accountability* —** The part of safeguards that detects or deters theft or diversion of nuclear materials and provides assurance that all nuclear materials are accounted for appropriately.

***materials characterization* —** The measurement of basic material properties, and the change in those properties as a function of temperature, pressure, or other factors.

***maximally exposed individual* —** A hypothetical individual whose location and habits result in the highest total radiological or chemical exposure (and thus dose) from a particular source for all exposure routes (e.g., inhalation, ingestion, direct exposure).

***maximally exposed individual (transportation analysis)* —** A hypothetical individual receiving radiation doses from transporting radioactive materials on the road. For the incident-free transport operation, the maximally exposed individual would be an individual stuck in traffic next to the shipment for 30 minutes. For accident conditions, the maximally exposed individual is assumed to be an individual located approximately 33 meters (100 feet) directly downwind from the accident.

***maximum contaminant level* —** The designation for U.S. Environmental Protection Agency (EPA) standards for drinking water quality under the Safe Drinking Water Act. The maximum contaminant level for a given substance is the maximum permissible concentration of that substance in water delivered by a public water system. Primary maximum contaminant levels (40 CFR Part 141) are intended to protect public health and are federally enforceable. They are based on health factors, but are also required by law to reflect the technological and economic feasibility of removing the contaminant from the water supply. Secondary maximum contaminant levels (40 CFR Part 143) are set by EPA to protect the public welfare. The secondary drinking water regulations control substances in drinking water that primarily affect aesthetic qualities (such as taste, odor, and color) relating to the public acceptance of water. These regulations are not federally enforceable, but are intended as guidelines for the states.

***megawatt* —** A unit of power equal to 1 million watts. Megawatt-thermal is commonly used to define heat produced, while megawatt-electric defines electricity produced.

***meteorology* —** The science dealing with the atmosphere and its phenomena, especially as it relates to weather.

***micron* —** One-millionth of 1 meter.

***migration* —** The natural movement of a material through the air, soil, or groundwater; also, seasonal movement of animals from one area to another.

***millirem* —** One-thousandth of 1 rem (0.001 rem).

minority population — Minority refers to individuals who are members of the following population groups: American Indian or Alaska Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. "Minority populations" include either a single minority group or the total of all minority persons in the affected area. They may consist of groups of individuals living in geographic proximity to one another or a geographically dispersed/transient set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect. (See *environmental justice* and *low-income population*.)

mitigate — Mitigation includes: avoiding an impact altogether by not taking a certain action or parts of an action; minimizing impacts by limiting the degree or magnitude of an action and its implementation; rectifying an impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; or compensating for an impact by replacing or providing substitute resources or environments.

mixed waste — Waste that contains both hazardous waste, as defined under the Resource Conservation and Recovery Act, and source material, special nuclear material, or by-product material subject to the Atomic Energy Act.

Modified Mercalli Intensity — A level on the modified Mercalli scale. A measure of the perceived intensity of earthquake ground shaking with 12 divisions, from I (not felt by people) to XII (nearly total damage). It is a unitless expression of observed effects.

National Emission Standards for Hazardous Air Pollutants — Standards set by the U.S. Environmental Protection Agency for air pollutants that are not covered by the National Ambient Air Quality Standards and that may, at sufficiently high levels, cause increased fatalities, irreversible health effects, or incapacitating illness. These standards are given in 40 CFR Parts 61 and 63. National Emission Standards for Hazardous Air Pollutants are given for many specific categories of sources (e.g., equipment leaks, industrial process cooling towers, dry-cleaning facilities, petroleum refineries). (See *hazardous air pollutants*.)

National Pollutant Discharge Elimination System — A provision of the Clean Water Act that prohibits discharge of pollutants into waters of the United States unless a special permit is issued by the U.S. Environmental Protection Agency, a state, or, where delegated, a tribal government. The National Pollutant Discharge Elimination System permit lists either permissible discharges, the level of cleanup technology required for wastewater, or both.

National Register of Historic Places — The official list of the Nation's cultural resources that are worthy of preservation. The National Park Service maintains the list under direction of the Secretary of the Interior. Buildings, structures, objects, sites, and districts are included in the National Register for their importance in American history, architecture, archaeology, culture, or engineering. Properties included on the National Register range from large-scale, monumentally proportioned buildings to smaller-scale, regionally distinctive buildings. The listed properties are not just of nationwide importance; most are significant primarily at the state or local level. Procedures for listing properties on the National Register are found in 36 CFR Part 60.

neutron — An uncharged elementary particle with a mass slightly greater than that of the proton. Neutrons are found in the nucleus of every atom heavier than hydrogen-1.

nitrogen — A natural element with the atomic number 7. It is diatomic in nature and is a colorless and odorless gas that constitutes about four-fifths of the volume of the atmosphere.

nitrogen oxides — Refers to the oxides of nitrogen, primarily nitrogen oxide and nitrogen dioxide. These are produced in the combustion of fossil fuels and can constitute an air pollution problem. Nitrogen dioxide emissions contribute to acid deposition and the formation of atmospheric ozone.

noise — Undesirable sound that interferes or interacts negatively with the human or natural environment. Noise may disrupt normal activities (e.g., hearing, sleep), damage hearing, or diminish the quality of the environment.

nonattainment area — An area that the U.S. Environmental Protection Agency has designated as not meeting (i.e., not being in attainment of) one or more of the National Ambient Air Quality Standards for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. An area may be in attainment for some pollutants, but not for others.

nonplastic soils — Soils that are not clay-rich.

nonproliferation — Preventing the spread of nuclear weapons, nuclear weapon materials, and nuclear weapon technology.

normal operations — All normal (incident-free) conditions and those abnormal conditions that frequency estimation techniques indicate occur with a frequency greater than 0.1 events per year.

Notice of Intent — The notice that an environmental impact statement (EIS) will be prepared and considered. The notice is intended to briefly describe the proposed action and possible alternatives; describe the agency's proposed scoping process including whether, when, and where any scoping meeting will be held; and state the name and address of a person within the agency who can answer questions about the proposed action and the EIS.

nuclear weapon component — A part of a nuclear weapon that contains fissionable or fusionable material.

nuclear criticality — See *criticality*.

nuclear explosive — Any assembly containing fissionable and/or fusionable materials and main-charge high-explosive parts or propellants capable of producing a nuclear detonation.

nuclear facility — A facility subject to requirements intended to control potential nuclear hazards. Defined in U.S. Department of Energy directives as any nuclear reactor or any other facility whose operations involve radioactive materials in such form and quantity that a significant nuclear hazard potentially exists for the employees or the general public.

nuclear material — Composite term applied to: special nuclear material; source material such as uranium, thorium, or ores containing uranium or thorium; and byproduct material, which is any radioactive material that is made radioactive by exposure to the radiation incident or to the process of producing or using special nuclear material.

nuclear weapon — The general name given to any weapon in which the explosion results from the energy released by reactions involving atomic nuclei, by fission, fusion, or both.

nuclear weapons complex — The sites supporting the research, development, design, manufacture, testing, assessment, certification, and maintenance of the Nation's nuclear weapons and the subsequent dismantlement of retired weapons.

***nuclide* —** A species of atom characterized by the constitution of its nucleus and, hence, by the number of protons, the number of neutrons, and the energy content.

***Occupational Safety and Health Administration* —** The U.S. Federal Government agency that oversees and regulates workplace health and safety; created by the Occupational Safety and Health Act of 1970.

***offsite* —** The term denotes a location, facility, or activity occurring outside of the boundary of a U.S. Department of Energy complex site.

***onsite* —** The term denotes a location or activity occurring within the boundary of a U.S. Department of Energy complex site.

***outfall* —** The discharge point of a drain, sewer, or pipe as it empties into a body of water.

***ozone* —** The triatomic form of oxygen; in the stratosphere, ozone protects the Earth from the Sun's ultraviolet rays, but in lower levels of the atmosphere, ozone is considered an air pollutant.

***package* —** For radioactive materials, the packaging, together with its radioactive contents, as presented for transport (the packaging plus the radioactive contents equals the package).

***packaging* —** The assembly of components necessary to ensure compliance with Federal regulations. It may consist of one or more receptacles, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle tie-down system and auxiliary equipment may be designated as part of the packaging.

***paleontological resources* —** The physical remains, impressions, or traces of plants or animals from a former geologic age; may be sources of information on ancient environments and the evolutionary development of plants and animals.

***paleoseismic* —** Pertaining to ancient seismic events.

***paleotopographic surface* —** The topographic surface of a given area in the geologic past.

***particulate matter (PM)* —** Any finely divided solid or liquid material, other than uncombined (i.e., pure) water. A subscript denotes the upper limit of the diameter of particles included. Thus, PM_{10} includes only those particles equal to or less than 10 micrometers (0.0004 inches) in diameter; $PM_{2.5}$ includes only those particles equal to or less than 2.5 micrometers (0.0001 inches) in diameter.

***peak ground acceleration* —** A measure of the maximum horizontal acceleration (as a percentage of the acceleration due to the Earth's gravity) experienced by a particle on the surface of the Earth during the course of earthquake motion.

***peak hour traffic* —** The volume of traffic anticipated to occur in the 30th highest traffic hour of the year; used by engineers to determine the level of service.

***perched groundwater* —** A body of groundwater of small lateral dimensions separated from an underlying body of groundwater by an unsaturated zone.

***Permian* —** The final geologic time period of the Paleozoic era, spanning between about 286 and 245 million years ago.

***permeability* —** In geology, the ability of rock or soil to transmit a fluid.

***perennial stream* —** A stream that flows throughout the year.

***person-rem* —** A unit of collective radiation dose applied to populations or groups of individuals (see *collective dose*); that is, a unit for expressing the dose when summed across all persons in a specified population or group. One person-rem equals 0.01 person-sieverts.

***physiographic province* —** A geographic region with a specific geomorphology and often specific subsurface rock type or structural elements.

***pit* —** The core element of a nuclear weapons primary or fission component. The pit contains a potentially critical mass of fissile material, such as plutonium-239 or highly enriched uranium, arranged in a subcritical geometry and surrounded by some type of casing.

***plume* —** The elongated volume of contaminated water or air originating at a pollutant source such as an outlet pipe or a smokestack. A plume eventually diffuses into a larger volume of less-contaminated material as it is transported away from the source.

***plutonium* —** A heavy, radioactive, metallic element with the atomic number 94. It is produced artificially by neutron irradiation of uranium. Plutonium has 15 isotopes with atomic masses ranging from 232 to 246 and half-lives from 20 minutes to 76 million years. Its most important isotope is fissile plutonium – plutonium-239.

***plutonium-239* —** An isotope of plutonium with a half-life of 24,110 years that is the primary radionuclide in weapons-grade plutonium. When plutonium-239 decays, it emits alpha particles.

***P.M. peak hour* —** The highest design hour of traffic on a roadway in the afternoon (P.M.) hours. P.M. hours are typically between 4 P.M. and 6 P.M.

***population dose* —** See *collective dose*.

***prehistoric resources* —** The physical remains of human activities that predate written records; they generally consist of artifacts that may alone or collectively yield otherwise inaccessible information about the past.

***Prevention of Significant Deterioration (PSD)* —** Regulations established to prevent significant deterioration of air quality in areas that already meet National Ambient Air Quality Standards. Specific details of PSD are found in 40 CFR 51.166. Among other provisions, cumulative increases in sulfur dioxide, nitrogen dioxide, and PM_{10} levels after specified baseline dates must not exceed specified maximum allowable amounts. These allowable increases, also known as increments, are especially stringent in areas designated as Class I areas (e.g., national parks, wilderness areas) where the preservation of clean air is particularly important. All areas not designated as Class I are currently designated as Class II. Maximum increments in pollutant levels are also given in 40 CFR 51.166 for Class III areas, if any such areas should be so designated by the U.S. Environmental Protection Agency. Class III increments are less stringent than those for Class I or Class II areas.

***probabilistic risk* —** A comprehensive, logical, and structured methodology that accounts for population dynamics and human activity patterns at various levels of sophistication, considering time-space distributions and sensitive subpopulations. The probabilistic method results in a more complete characterization of the exposure information available, which is defined by probability distribution functions. This approach offers the possibility of an associated quantitative measure of the uncertainty around the value of interest.

***process* —** Any method or technique designed to change the physical or chemical character of the product.

***Quaternary* —** The second geologic time period of the Cenozoic era, dating from about 1.6 million years ago to the present. It contains two epochs: the Pleistocene and the Holocene. It is characterized by the first appearance of human beings on Earth.

***radiation (ionizing)* —** Particles (alpha, beta, neutrons, and other subatomic particles) or photons (i.e., gamma, x-rays) emitted from the nucleus of unstable atoms as a result of radioactive decay. Such radiation is capable of displacing electrons from atoms or molecules in the target material (such as biological tissues), thereby producing ions.

***radioactive waste* —** In general, waste that is managed for its radioactive content. Waste material that contains source, special nuclear, or byproduct material is subject to regulation as radioactive waste under the Atomic Energy Act. Also, waste material that contains accelerator-produced radioactive material or a high concentration of naturally occurring radioactive material may be considered radioactive waste.

***radioactivity* —**

> *Defined as a process:* The spontaneous transformation of unstable atomic nuclei, usually accompanied by the emission of ionizing radiation.
>
> *Defined as a property:* The property of unstable nuclei in certain atoms to spontaneously emit ionizing radiation during nuclear transformations.

***radioisotope or radionuclide* —** An unstable isotope that undergoes spontaneous transformation, emitting radiation. (See *isotope*.)

***radon* —** A gaseous, radioactive element with the atomic number 86, resulting from the radioactive decay of radium. Radon occurs naturally in the environment and can collect in unventilated enclosed areas, such as basements. Large concentrations of radon can cause lung cancer in humans.

***Record of Decision (ROD)* —** A concise public document that records a Federal agency's decision(s) concerning a proposed action for which the agency has prepared an environmental impact statement. The ROD is prepared in accordance with the requirements of the Council on Environmental Quality National Environmental Policy Act regulations (40 CFR 1505.2). A ROD identifies the alternatives considered in reaching the decision, the environmentally preferable alternative(s), factors balanced by the agency in making the decision, whether all practicable means to avoid or minimize environmental harm have been adopted, and if not, why they were not. (See *environmental impact statement*.)

***region of influence (ROI)* —** A site-specific geographic area in which the principal direct and indirect effects of actions are likely to occur and are expected to be of consequence for local jurisdictions.

rem (roentgen equivalent man) — A unit of dose equivalent. The dose equivalent in rem equals the absorbed dose in rad in tissue multiplied by the appropriate quality factor and possibly other modifying factors. Derived from "roentgen equivalent man," referring to the dosage of ionizing radiation that will cause the same biological effect as 1 roentgen of x-ray or gamma-ray exposure. One rem equals 0.01 sievert. (See *dose equivalent*.)

remediation — The process, or a phase in the process, of rendering radioactive, hazardous, or mixed waste environmentally safe, whether through processing, entombment, or other methods.

remote-handled waste — In general, refers to radioactive waste that must be handled at a distance to protect workers from unnecessary exposure (waste with a dose rate of 200 millirem per hour or more at the surface of the waste package). (See *contact-handled waste*.)

right-sizing — Facility modification, rearrangement, and refurbishment necessary to size future weapon manufacturing facilities appropriately for the workload to be accomplished. In general, right-sizing involves reduction in the size of facilities, but not in their capabilities. Right-sizing is not driven by assumptions about future U.S. Department of Energy budget levels, but rather by the need to size facilities at the level necessary for long-term workload accomplishment.

riparian — Of, on, or relating to the banks of a natural course of water.

risk — The probability of a detrimental effect from exposure to a hazard. To describe impacts, risk is often expressed quantitatively as the probability of an adverse event occurring multiplied by the consequence of that event (i.e., the product of these two factors). However, a separate presentation of probability and consequence to describe impacts is often more informative.

roadway capacity — The maximum sustainable flow rate at which vehicles reasonably can be expected to traverse a section of roadway.

runoff — The portion of rainfall, melted snow, or irrigation water that flows across the ground surface and eventually enters streams.

safeguards — An integrated system of physical protection, material accounting, and material control measures designed to deter, prevent, detect, and respond to unauthorized access, possession, use, or sabotage of nuclear materials.

safety analysis report — A report that systematically identifies potential hazards within a nuclear facility, describes and analyzes the adequacy of measures to eliminate or control identified hazards, and analyzes potential accidents and their associated risks. Safety analysis reports are used to ensure that a nuclear facility can be constructed, operated, maintained, shut down, and decommissioned safely and in compliance with applicable laws and regulations. Safety analysis reports are required for U.S. Department of Energy (DOE) nuclear facilities and as a part of applications for U.S. Nuclear Regulatory Commission (NRC) licenses. The NRC regulations or DOE orders and technical standards that apply to the facility type provide specific requirements for the content of safety analysis reports. (See *nuclear facility*.)

sanitary waste — Waste generated by normal housekeeping activities, liquid or solid (includes sludge), that are not hazardous or radioactive.

scope — In a document prepared pursuant to the National Environmental Policy Act, the range of actions, alternatives, and impacts to be considered.

scoping — An early and open process for determining the scope of issues and alternatives to be addressed in an environmental impact statement (EIS) (or other National Environmental Policy Act [NEPA] documents) and for identifying the significant issues related to a proposed action. The scoping period begins after publication in the *Federal Register* of a Notice of Intent to prepare an EIS (or other NEPA document). The public scoping process is that portion of the process where the public is invited to participate. The U.S. Department of Energy (DOE) also conducts an early internal scoping process for environmental assessments or EISs (and supplemental environmental impact statements [SEISs]). For EISs and SEISs, this internal scoping process precedes the public scoping process. DOE's scoping procedures are found in 10 CFR 1021.311.

security — An integrated system of activities, systems, programs, facilities, and policies for the protection of restricted data and other classified information or matter, nuclear materials, nuclear weapons and nuclear weapons components, and/or U.S. Department of Energy contractor facilities, property, and equipment.

security category — The U.S. Department of Energy uses a cost-effective, graded approach to providing special nuclear materials safeguards and security. Quantities of special nuclear materials are categorized as Security Category I, II, III, or IV, with the greatest quantities included under Security Category I and lesser quantities included in descending order under Security Categories II through IV. Types and compositions of special nuclear materials are further categorized by their "attractiveness" to saboteurs using an alphabetical system. Materials that are most attractive for conversion into nuclear explosive devices are identified by the letter "A." Less attractive materials are designated progressively by the letters "B" through "E."

seismic — of, subject to, or caused by an earth vibration resulting from an earthquake or an explosion.

seismic moment — A quantity used by earthquake seismologists to measure the size of an earthquake.

seismic wave velocity — The speed at which waves of energy travel through the Earth.

seismicity — The relative frequency and distribution of earthquakes.

severe accident — An accident with a frequency of less than 10^{-6} per year that would have more-severe consequences than a design-basis accident in terms of damage to the facility, offsite consequences, or both.

shielding — In regard to radiation, any material of obstruction (e.g., bulkheads, walls, or other construction) that absorbs radiation to protect personnel or equipment.

shutdown — For a U.S. Department of Energy (DOE) reactor, the condition in which a reactor has ceased operations, and DOE has officially declared that it does not intend to operate it further.

sievert — The SI (International System of Units) unit of radiation dose equivalent. The dose equivalent in sieverts equals the absorbed dose in grays multiplied by the appropriate quality factor (1 sievert = 100 rem). (See *rem*.)

silica gel — An amorphous, highly adsorbent form of silicon dioxide.

soil cohesion — The ability of soil molecules to bind together.

soil compressibility — Used in the earth sciences to quantify the ability of a soil or rock to reduce in volume with applied pressure.

***soils* —** All unconsolidated materials above bedrock. Natural earthy materials on the Earth's surface, in places modified or even made by human activity, containing living matter, and supporting or capable of supporting plants out of doors.

***source material* —** In general, material from which special nuclear material can be derived. Under the Atomic Energy Act and U.S. Nuclear Regulatory Commission regulations, source material means uranium and thorium in any physical or chemical form, as well as ores that contain one-twentieth of 1 percent (0.05 percent) or more by weight of uranium or thorium. (See *special nuclear material*.)

***special nuclear material(s)* —** A category of material subject to regulation under the Atomic Energy Act, consisting primarily of fissile materials. It is defined to mean plutonium, uranium-233, uranium enriched in the isotopes of uranium-233 or -235, and any other material that the U.S. Nuclear Regulatory Commission determines to be special nuclear material, but it does not include source material.

***spectral (response) acceleration* —** An approximate measure of the acceleration (as a percentage of the acceleration due to Earth's gravity) experienced by a building, as modeled by a particle on a massless vertical rod having the same natural period of vibration as the building.

***spoils* —** The soil and rock (uncontaminated) removed from an excavation. If excavated material is contaminated with chemical or radioactive constituents, it is managed as waste.

***staging* —** The process of using several layers to achieve a combined effect greater than that of one layer.

***stockpile* —** The inventory of active nuclear weapons for the strategic defense of the United States.

***stockpile stewardship program* —** A program that ensures the operational readiness (i.e., safety and reliability) of the U.S. nuclear weapons stockpile through the appropriate balance of surveillance, experiments, and simulations.

***sulfur oxides* —** Common air pollutants, primarily sulfur dioxide, a heavy, pungent, colorless gas (formed in the combustion of fossil fuels, considered a major air pollutant), and sulfur trioxide. Sulfur dioxide is involved in the formation of acid rain. It can also irritate the upper respiratory tract and cause lung damage.

***surface water* —** All bodies of water on the surface of the Earth and open to the atmosphere, such as rivers, lakes, reservoirs, ponds, seas, and estuaries.

***sustainable development* —** The incorporation of concepts and principles in the development of the built environment that are responsive (not harmful) to the environment, use materials and resources efficiently, and are sensitive to surrounding communities. Sustainable development and design encompasses the materials to build and maintain a building, the energy and water needed to operate the building, and the ability to provide a healthy and productive environment for occupants of the building.

sustainable buildings *(or high-performance buildings)* — buildings designed and built to minimize resource consumption, reduce life cycle costs, and maximize health and environmental performance across a wide range of measures – from indoor air quality to habitat protection.

***threat* —** (1) A person, group, or movement with intentions to use extant or attainable capabilities to undertake malevolent actions against U.S. Department of Energy interests; (2) the capability of an adversary coupled with his intentions to undertake any actions detrimental to the success of program activities or operation.

***threatened species* —** Any plants or animals likely to become endangered species within the foreseeable future throughout all or a significant portion of their ranges and which have been listed as threatened by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures set in the Endangered Species Act and its implementing regulations (50 CFR Part 424). (See *endangered species*.)

***total effective dose equivalent* —** The sum of the effective dose equivalent from external exposures and the committed effective dose equivalent from internal exposures.

***transuranic* —** Refers to any element whose atomic number is higher than that of uranium (atomic number 92), including neptunium, plutonium, americium, and curium. All transuranic elements are produced artificially and are radioactive.

***transuranic waste* —** Radioactive waste not classified as high-level radioactive waste and that contains more than 100 nanocuries (3,700 becquerels) per gram of alpha-emitting transuranic isotopes with half-lives greater than 20 years.

trip or ***trip end* —** A single or one-directional vehicle movement.

***tuff* —** A fine-grained rock composed of ash or other material formed by volcanic explosion or aerial expulsion from a volcanic vent.

***Type B packaging* —** A regulatory category of packaging for transportation of radioactive material. The U.S. Department of Transportation and U.S. Nuclear Regulatory Commission (NRC) require Type B packaging for shipping highly radioactive material. Type B packages must be designed and demonstrated to retain their containment and shielding integrity under severe accident conditions, as well as under the normal conditions of transport. The current NRC testing criteria for Type B packaging designs (10 CFR Part 71) are intended to simulate severe accident conditions, including impact, puncture, fire, and immersion in water. The most widely recognized Type B packages are the massive casks used for transporting spent nuclear fuel. Large-capacity cranes and mechanical lifting equipment are usually needed to handle Type B packages.

***uniform hazard response spectra (UHRS)* —** Response spectra derived so that the annual probability of exceeding the spectral quantity (acceleration, displacement, etc.) is the same for any spectral frequency. Determined in accordance with ANSI/ANS 2.27 and 2.29.

***uranium* —** A radioactive, metallic element with the atomic number 92; the heaviest naturally occurring element. Uranium has 14 known isotopes, of which uranium-238 is the most abundant in nature. Uranium-235 is commonly used as a fuel for nuclear fission. (See *enriched uranium*, *highly enriched uranium*, and *depleted uranium*.)

***U.S. Nuclear Regulatory Commission (NRC)* —** The Federal agency that regulates the civilian nuclear power industry in the United States.

***vault (special nuclear material)* —** A penetration-resistant, windowless enclosure with an intrusion alarm system activated by opening the door; walls, a floor, and a ceiling substantially constructed of materials that afford forced-penetration resistance at least equivalent to that of 20-centimeter- (8-inch-) thick reinforced concrete; and a built-in combination-locked steel door, which for existing structures is at least 2.54 centimeters (1 inch) thick exclusive of bolt work and locking devices, and which for new structures meets standards set forth in Federal specifications and standards.

***viewshed* —** The extent of an area that may be viewed from a particular location. Viewsheds are generally bounded by topographic features such as hills or mountains.

***vital area* —** A type of U.S. Department of Energy security area that is located within the Protected Area and that has a separate perimeter and access controls to afford layered protection, including intrusion detection, for vital equipment.

***Visual Resource Management class* —** Any of the classifications of visual resources established through application of the Visual Resources Management process of the U.S. Bureau of Land Management. Four classifications are employed to describe different degrees of modification to landscape elements: Class I areas where the natural landscape is preserved, including national wilderness areas and the wild sections of national wild and scenic rivers; Class II areas with very limited land development activity, resulting in visual contrasts that are seen but do not attract attention; Class III areas, in which development may attract attention, but the natural landscape still dominates; and Class IV areas, in which development activities may dominate the view and may be the major focus in the landscape.

***volatile organic compounds* —** A broad range of organic compounds, often halogenated, that vaporize at ambient or relatively low temperatures (e.g., benzene, chloroform, and methyl alcohol). In regard to air and water pollution, any organic compound that participates in atmospheric photochemical reaction, except for those designated by the Administrator of the U.S. Environmental Protection Agency as having negligible photochemical reactivity.

***waste management* —** The planning, coordination, and direction of those functions related to the generation, handling, treatment, storage, transport, and disposal of waste, as well as associated surveillance and maintenance activities.

***waste minimization and pollution prevention* —** An action that economically avoids or reduces the generation of waste and pollution by source reduction, reducing the toxicity of hazardous waste and pollution, improving energy use, or recycling. These actions are consistent with the general goal of minimizing present and future threats to human health, safety, and the environment.

***watt* —** A unit of power equal to 1 joule per second. (See *joule*.)

***welded tuff* —** a tuff that was sufficiently hot at the time of deposition to weld together (see *tuff*).

***wetland* —** Those areas that are inundated by surface or groundwater with a frequency sufficient to support, and that, under normal circumstances, do or would support, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas (e.g., sloughs, potholes, wet meadows, river overflow areas, mudflats, natural ponds).

***yield* —** The force, in tons of TNT [2,4,6-trinitrotoluene], of a nuclear or thermonuclear explosion.

CHAPTER 7
REFERENCES

7 REFERENCES

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CHAPTER 8
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8 LIST OF PREPARERS

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SEIS RESPONSIBILITIES: HUMAN HEALTH IMPACTS

Education: M.E., Nuclear Engineering, Rensselaer Polytechnic Institute
B.S., Nuclear Engineering, Rensselaer Polytechnic Institute

Experience/Technical Specialty:
Thirty-one years. Nuclear risk analysis.

SUSAN GOODAN, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: LEED CONSTRUCTION

Education: Master of Architecture, University of New Mexico
B.A., Ethics/Archaeology, University of Cape Town, South Africa

Experience/Technical Specialty:
Twenty-one years. Project manager and environmental planner.

MILTON GORDEN, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: COMMENT RESPONSE

Education: B.S., Nuclear Engineering, North Carolina State University

Experience/Technical Specialty:
Twenty years. Waste management, transportation, human health impacts, socioeconomics, and environmental remediation technologies.

HEATHER GORDON, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: GIS SUPPORT

Education: M.S., Geography, University of New Mexico
B.A., Environmental Studies and Planning, Sonoma State University

Experience/Technical Specialty:
Twelve years. GIS (geographic information system) support.

CHADI D. GROOME, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: COMMENT RESPONSE

Education: M.S., Environmental Engineering Sciences, University of Florida
B.S., Zoology, Clemson University

Experience/Technical Specialty:
Twenty-eight years. Environmental, NEPA, and nuclear regulatory compliance, permitting, and licensing; NPDES permitting; radioactive and hazardous waste management.

MARK GROSSENBACHER, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: TRANSPORTATION AND TRAFFIC ANALYSIS

Education: B.S., Civil Engineering, University of Missouri at Rolla

Experience/Technical Specialty:
Twenty-seven years. Transportation planning and traffic engineering.

AMANDA HANSEN, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: AIR QUALITY AND NOISE

Education: Ph.D., Meteorology, Florida State University
M.S., Meteorology, Florida State University
B.S., Marine Science, Florida State University

Experience/Technical Specialty:
Eight years. Air quality and monitoring.

NICOLE HARDEN, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: AFFECTED ENVIRONMENT, ECOLOGICAL RESOURCES

Education: B.S., Biology, Indiana University

Experience/Technical Specialty:
One year. Ecological resources and affected environment.

ROBERT HULL, LOS ALAMOS TECHNICAL ASSOCIATES, INC.
SEIS RESPONSIBILITIES: ALTERNATIVES, SITE TECHNICAL LIAISON

Education: Doctoral Studies, Civil Engineering, Stanford University
M.S., Civil Engineering, Stanford University
M.S., Geochemistry and Environmental Geology, Florida State University
B.S., Geology, Florida State University

Experience/Technical Specialty:
Thirty-seven years. Environmental impacts assessments, environmental baseline surveys, human health risk assessment, and environmental remediation.

ROY KARIMI, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: TRANSPORTATION AND TRAFFIC, HUMAN HEALTH IMPACTS

Education: Sc.D., Nuclear Engineering, Massachusetts Institute of Technology
N.E., Nuclear Engineering, Massachusetts Institute of Technology
M.S. Nuclear Engineering, Massachusetts Institute of Technology
B.S., Chemical Engineering, Abadan Institute of Technology

Experience/Technical Specialty:
Thirty years. Nuclear power plant safety, risk and reliability analysis, design analysis, criticality analysis, accident analysis, consequence analysis, spent fuel dry storage safety analysis, and probabilistic risk assessment.

MATTHEW MIELKE, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: COMMENT RESPONSE

Education: B.S., Environmental Science and Policy, University of Maryland, College Park

Experience/Technical Specialty:
One year. Groundwater modeling and technical writing.

BRIAN MINICHINO, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: LEAD - METHODOLOGY, RESOURCE COMMITMENTS, DATA AND QUALITY MANAGEMENT

Education: B.S., Chemistry, Virginia Polytechnic Institute and State University

Experience/Technical Specialty:
Two years. Quality assurance/quality control and technical writing.

STEVE MIXON, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: TECHNICAL EDITOR

Education: B.S., Communications, University of Tennessee

Experience/Technical Specialty:
Twenty-one years. Program analyst, technical writer and editor, speechwriter, and publications specialist.

DOUGLAS OUTLAW, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: HUMAN HEALTH IMPACTS

Education: Ph.D., Nuclear Physics, North Carolina State University
M.S., Nuclear Physics, North Carolina State University
B.S., Physics, North Carolina State University

Experience/Technical Specialty:
Thirty-three years. Nuclear physics, safety analysis, and risk assessment.

GARY ROLES, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: WASTE MANAGEMENT AND POLLUTION PREVENTION

Education: M.S., Nuclear Engineering, University of Arizona
B.S., Mechanical Engineering, Arizona State University

Experience/Technical Specialty:
Thirty-one years. Radioactive waste management, regulatory and compliance analysis, and NEPA analysis.

PERRY RUSSELL, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: GEOLOGY AND SOILS

Education: M.S., Geological Sciences, California State University
B.A., Geological Sciences, University of California

Experience/Technical Specialty:
Twenty-four years. Professional Geologist/hydrogeologist. Geology, water resources, hazardous materials, and public safety.

SEAN SCHATZEL, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Education: B.A., Political Economics/Public Administration, Bloomsburg University

Experience/Technical Specialty:
Four years. Socioeconomics and environmental justice.

JAMES SCHINNER, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: LEAD - AFFECTED ENVIRONMENT, LAND USE, VISUAL RESOURCES, ECOLOGICAL RESOURCES, CULTURAL AND PALEONTOLOGICAL RESOURCES

Education: Ph.D., Wildlife Management, Michigan State University
M.S., Zoology, University of Cincinnati
B.S., Zoology, University of Cincinnati

Experience/Technical Specialty:
Thirty-eight years. Ecological field assessments, NEPA documentation, and regulatory reviews.

ALISON SMITH-CHURCHILL, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: TECHNICAL EDITOR

Education: B.A., English Language and Literature, University of Maryland, College Park

Experience/Technical Specialty:
Four years. NEPA document preparation.

MIKE SMITH, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: TRANSPORTATION AND TRAFFIC

Education: J.D., Doctor of Jurisprudence, West Virginia University
M.S., Civil Engineering, University of Missouri
B.S., Engineering of Mines, West Virginia University

Experience/Technical Specialty:
Twenty-nine years. Professional engineer. Transportation engineering support and remedial/environmental design.

ELLEN TAYLOR, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: LEAD – INTRODUCTION AND PURPOSE AND NEED FOR AGENCY ACTION, PROJECT DESCRIPTION AND ALTERNATIVES, MITIGATION MEASURES

Education: Ph.D., Biology, University of Pennsylvania
B.A., Zoology, University of Vermont

Experience/Technical Specialty:
Twenty-seven years. Environmental compliance and NEPA assessments.

JOHN W. WILLIAMS, SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
SEIS RESPONSIBILITIES: PROJECT DEVELOPMENT AND ANALYSIS

Education: Ph.D., Physics, New Mexico State University
M.S., Physics, New Mexico State University
B.S., Mathematics, North Texas State University

Experience/Technical Specialty:
Thirty years. Geographical information systems and demographics.

CHAPTER 9
DISTRIBUTION LIST

9 DISTRIBUTION LIST

The U.S. Department of Energy provided copies of the *Final 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 (CMRR-NF SEIS)* to Federal, State, and local elected and appointed government officials and agencies; Native American representatives; national, state, and local environmental and public interest groups; and other organizations and individuals as listed. Approximately 100 copies of the complete *CMRR-NF SEIS*, 150 copies of the Summary of the *CMRR-NF SEIS*, and 550 CDs of the *CMRR-NF SEIS* were sent to interested parties. Copies will be provided to others on request.

United States Congress

U.S. Senate – New Mexico

The Honorable Jeff Bingaman
The Honorable Tom Udall

U.S. Senate Committees

Committee on Appropriations
The Honorable Daniel K. Inouye, Chairman
The Honorable Thad Cochran, Vice Chairman

Committee on Appropriations, Subcommittee on Energy and Water Development
The Honorable Dianne Feinstein, Chairman
The Honorable Lamar Alexander, Ranking Member

Committee on Armed Services
The Honorable Carl Levin, Chairman
The Honorable John S. McCain, Ranking Member

Committee on Armed Forces, Subcommittee on Strategic Forces
The Honorable Ben Nelson, Chairman
The Honorable Jeff Sessions, Ranking Member

Committee on Energy and Natural Resources
The Honorable Jeff Bingaman, Chairman
The Honorable Lisa Murkowski, Ranking Member

Committee on Energy and Natural Resources, Subcommittee on Energy
The Honorable Maria Cantwell, Chairman
The Honorable James E. Risch, Ranking Member

Committee on Environment and Public Works
The Honorable Barbara Boxer, Chairman
The Honorable James M. Inhofe, Ranking Member

Committee on Environment and Public Works, Subcommittee on Clean Air and Nuclear Safety
The Honorable Thomas R. Carper, Chairman
The Honorable John Barrasso, Ranking Member

U.S. House of Representatives – New Mexico

The Honorable Martin T. Heinrich, District 1
The Honorable Steve Pearce, District 2
The Honorable Ben Ray Lujan, District 3

U.S. House of Representatives Committees

Committee on Appropriations
The Honorable Harold Rogers, Chairman
The Honorable Norman Dicks, Ranking Member

Committee on Appropriations, Subcommittee on Energy and Water Development
The Honorable Rodney P. Frelinghuysen, Chairman
The Honorable Peter J. Visclosky, Ranking Member

Committee on Armed Services
The Honorable Howard P. McKeon, Chairman
The Honorable Adam Smith, Ranking Member

Committee on Armed Services, Subcommittee on Strategic Forces
The Honorable Michael R. Turner, Chairman
The Honorable Loretta Sanchez, Ranking Member

Committee on Energy and Commerce
The Honorable Fred Upton, Chairman
The Honorable Henry A. Waxman, Ranking Member

Committee on Energy and Commerce, Subcommittee on Energy and Power
The Honorable Ed Whitfield, Chairman
The Honorable Bobby L. Rush, Ranking Member

Committee on Energy and Commerce, Subcommittee on Environment and the Economy
The Honorable John Shimkus, Chairman
The Honorable Gene Green, Ranking Member

Committee on Science, Space, and Technology
The Honorable Ralph M. Hall, Chairman
The Honorable Eddie Bernice Johnson, Ranking Member

Committee on Science, Space, and Technology, Subcommittee on Energy and Environment
The Honorable Andy Harris, Chairman
The Honorable Brad Miller, Ranking Member

Federal Agencies

Bandelier National Monument
National Park Service
Santa Fe National Forest
U.S. Army Corps of Engineers
U.S. Department of Justice
U.S. Department of the Air Force
U.S. Department of the Army
U.S. Department of the Interior
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service

State Government

New Mexico State Government

Governor
Susana Martinez

Senators
Eric G. Griego
Lynda M. Lovejoy
Richard C. Martinez
John Pinto

Representatives
Rhonda S. King
Ben B. Lujan
Patricia A. Lundstrom
Alfred Park
Debbie A. Rodella
Henry Saavedra
Nick L. Salazar
Jim W. Hall
James P. White

State NEPA Points of Contact

F. David Martin, New Mexico Environment Department

State Agencies

New Mexico Department of Homeland Security and Emergency Management
Michael S. Duvall, Cabinet Secretary

New Mexico Economic Development Department
Jon Barela, Cabinet Secretary Designee
Steve Gonzales, Community Development, Team Leader – Region 2

New Mexico Energy, Minerals, and Natural Resources Department
John H. Bemis, Cabinet Secretary – Designate
Stewart Liley

New Mexico Environment Department
Bill Bartels, Environmental Scientist, DOE Oversight Bureau
Eric Galloway, Hydrologist, DOE Oversight Bureau
John Kieling, Acting Chief, Hazardous Waste Bureau
Thomas Skibitski, Bureau Chief, DOE Oversight Bureau
Butch Tongate, Acting Deputy Secretary
Steve Yanicak, Staff Manager, DOE Oversight Bureau

Local Government

Alice Lucero, Mayor, Espanola
Randy M. Autio, Acting County Administrator, County of Los Alamos
Martha Perkins, Senior Planner, County of Los Alamos
Sharon Stover, County Council Chair, County of Los Alamos
Cathy McAnally, Secretary to the Superintendent, Los Alamos Public Schools
Gene Schmidt, Superintendent, Los Alamos Public Schools
Tomas Campos, III, County Manager, Rio Arriba County
Joan May, Chair, San Miguel County Board of Commissioners
David Coss, Mayor, Santa Fe
Virginia Vigil, Chair, Santa Fe Board of County Commissioners
Alex Puglisi, Environmental Compliance Specialist, Public Utilities Department, City of Santa Fe
Katherine Miller, County Manager, Santa Fe County
Darren M. Cordova, Mayor, Taos
Larry Sanchez, County Commissioner, Taos
Renee Lucero, Town Clerk, Taos

Citizens Advisory Board

Menice S. Manzanares, Executive Director, Northern New Mexico Citizens Advisory Board

Native American Representatives

Neil Weber, Director, Department of Environmental and Cultural Preservation, Pueblo of San Ildefonso
Michael Miller, Director, Eight Northern Indian Pueblo Council
Mark Chino, President, Mescalero Apache Tribe
Holly Houghten, Tribal Historic Preservation Officer, Mescalero Apache Tribe
Randall Vicente, Governor, Pueblo of Acoma
Jacob Pecos, Environmental Director, Pueblo of Cochiti
Robert B. Pecos, Governor, Pueblo of Cochiti
Michael Toledo, Governor, Pueblo of Jemez
Greg Kaufman, Resource Protection Officer, Pueblo of Jemez
Perry Martinez, Governor, Pueblo of San Ildefonso
Paul Baca, Pueblo of Santa Clara
Joseph M. Chavarria, Environmental Director, Pueblo of Santa Clara
Walter Dasheno, Governor, Pueblo of Santa Clara

Public Reading Rooms and Libraries

A complete copy of the *CMRR-NF SEIS* and references may be reviewed at any of the reading rooms and libraries listed below.

Espanola Public Library
313 North Paseo de Onate
Espanola, NM 87532
(505) 747-6087

DOE Public Reading Room
Government Information Department
Zimmerman Library
1 University of New Mexico
Albuquerque, NM 87131
(505) 277-7180

Los Alamos National Laboratory
Research Library
TA-3-207
Los Alamos, NM 87545
(505) 667-0216

Mesa Public Library
2400 Central Avenue
Los Alamos, NM 87544
(505) 662-8240

New Mexico State Library
1209 Camino Carlos Rey
Santa Fe, NM 87507
(505) 476-9717

Santa Fe Public Library
145 Washington Street
Santa Fe, NM 87501
(505) 955-6780

Santa Fe Public Library
Oliver La Farge Branch
1730 Llano Street
Santa Fe, NM 87505
(505) 955-4860

U.S. Department of Energy
Freedom of Information Act Reading Room
1000 Independence Avenue, SW, 1G-033
Washington, DC 20585
(202) 586-5955

Organizations/Public Interest Groups

Lesley Weinstock, Agua es Vida Action Team
Dorelen Bunting, Albuquerque Center for Peace and Justice
Doug McClellen, Albuquerque Journal North
Adam Rankin, Albuquerque Journal North
Katherine M. Fuchs, Alliance for Nuclear Accountability
Susan Gordon, Alliance for Nuclear Accountability
Brian Shields, Amigos Bravos, Inc.
Rose Marie Cecchini, Catholic Charities of Gallup Diocese

David McCoy, Citizen Action New Mexico
Janet Greenwald, Citizens for Alternatives to Radioactive Dumping
Taunja Berquam, Office of Representative Peter Visclosky, Committee on Appropriations, Subcommittee on Energy and Water Development
Rob Blair, Office of Representative Rodney Frelinghuysen, Committee on Appropriations, Subcommittee on Energy and Water Development
Kari Bingen, Office of Representative Michael Turner, Committee on Armed Services, Subcommittee on Strategic Forces
Leonor Tomero, Office of Representative Loretta Sanchez, Committee on Armed Services, Subcommittee on Strategic Forces
Carrie Apostolou, Office of Senator Lamar Alexander, Committee on Appropriations, Subcommittee on Energy and Water Development
Doug Clapp, Office of Senator Dianne Feinstein, Committee on Appropriations, Subcommittee on Energy and Water Development
Madelyn Creedon, Office of Senator Ben Nelson, Comm. on Committee on Armed Services, Subcommittee on Strategic Forces
Daniel Lerner, Office of Senator Jeff Sessions, Committee on Armed Services, Subcommittee on Strategic Forces
Joni Arends, Concerned Citizens for Nuclear Safety
Robin Laughlin, Concerned Citizens for Nuclear Safety
Basia Miller, Ph.D., Concerned Citizens for Nuclear Safety
Andrea Guajardo, Conejos County Clean Water, Inc.
Mary Alice Trujillo, Conejos County Clean Water, Inc.
Clarissa Duran, CSO del Norte/Una Resolana
S. Kotowski, Embudo Valley Environmental Monitoring Group
Jessica Frechette-Gutfreund, Espanola Valley Women’s Health
Michelle Peixinho, Espanola Valley Women’s Health
Tom Clements, Friends of the Earth
Robert Chavez, H.O.P.E./TOTB Tewa Women United EJ
Kathy Smith, Immaculate Heart of Mary Parish
Angela Moreno, Indigenous Women's Health Program
Phil Parker, Journal Santa Fe/North
Jean Nichols, La Comunidad
John Severance, LA Monitor
Manuel Pino, Laguna Acoma Coalition for a Safe Environment
Bonnie Bonneau, Legions of Living Light
Eddie Archuleta, Liuna Local Union 16
Rocco Davis, LiUNA!
Amber Novey, LiUNA! Pacific Southwest
Sarah Meyer, Los Alamos Monitor
Greg Mello, Los Alamos Study Group
Trish Mello, Los Alamos Study Group
Aaron Tovish, Mayors for Peace
Laura Watchempino, Multicultural Alliance for a Safety Environment
Geoffrey H. Fettus, Natural Resources Defense Council
Jim Haber, Nevada Desert Experience
Leslie Elgood, New Mexico Community Capital
Sarah Wellers, New Mexico Community Foundation
James Baird, Jr., New Mexico Conference of Churches
James Leehan, New Mexico Conference of Churches
Virginia Miller, New Mexico Department of Peace Initiative
Douglas Meiklejohn, New Mexico Environmental Law Center
Paul Friesema, Northwestern University
Rick Wayman, Nuclear Age Peace Foundation
Diane D'Arrigo, Nuclear Information & Resource Service
Jay Coghlan, Nuclear Watch New Mexico
Scott Kovac, Nuclear Watch New Mexico
Geoffrey Petrie, Nuclear Watch New Mexico

John Witham, Nuclear Watch New Mexico
Glenn Carroll, Nuclear Watch South
Ralph Hutchison, Oak Ridge Environmental Peace Alliance
Antonio Sandoval, Office of U.S. Congressman Martin Heinrich
Jennifer A. Catachis, Office of U.S. Congressman Ben R. Lujan
Matt Ruybal, Office of U.S. Congressman Ben R. Lujan
Andrew Black, Office of U.S. Senator Jeff Bingaman
Sara Cobb, Office of U.S. Senator Tom Udall
Michele Jacquez-Ortis, Office of U.S. Senator Tom Udall
Charles Pergler, Pajarito Group of the Sierra Club
James M. DiLuzio, Paulist Fathers
Bud Ryan, Pax Christi New Mexico
Kevin Martin, Peace Action and Peace Action Education Fund
Peggy Prince, Peace Action New Mexico
Cat Ral, Peace Action New Mexico
Edwin Fernandez, Penasco Area Communities Association, Inc.
Peter Wilk, Physicians for Social Responsibility
R. Daniel Beavers, Plumbers & Pipefitters; U.A. Local Union No. 412
Kathy Keith, Regional Development Corporation
LeRoy Moore, Ph.D., Rocky Mountain Peace and Justice Center
Juan Montes, Rural Alliance for Military Accountability
Bernard Foy, Sangre de Cristo Audubon Society
Bruce Krasnow, Santa Fe New Mexican
Jeff Tollefson, Santa Fe New Mexican
Kathryn Sherlock, Ph.D., Santa Fe RESULTS
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Michelle Victoria-Delon, Smart Lifeways LLC
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William Paul Robinson, Southwest Research and Information Center
Ann Hunkins, Tewa Women United
Everette A. Rael, Tewa Women United
Corrine Sanchez, Tewa Women United
Kathy Sanchez, Tewa Women United
Beata Tsosie-Pena, Tewa Women United
Jerry Stein, President, The Peace Farm
Alice Roos, The Sanctuary Foundation
Charles E. Cole, The United Methodist Church
Alicia Dressman, Think Outside the Bomb National Youth Network
Lisa Putkey, Think Outside the Bomb
Marcus Page, Trinity Nuclear Abolition
Marylia Kelley, Tri-Valley CAREs
Scott Yundt, Tri-Valley CAREs
J. Gilbert Sanchez, Tribal Environmental Watch Alliance
Jennette Bando, Una Resolana/TWU’s Environmental Justice Focus Group
David Garcia, Una Resolana
Enrique Martinez, Una Resolana
Luis Pena, Una Resolana
Rosalia Triana, Una Resolana
Lisbeth Gronlund, Union of Concerned Scientists
Norman Budow, Veterans Organization – WW-2
Melissa Larson, Wholly Rags
Susan Shaer, Women’s Action for New Directions

Individuals

The following individuals have been sent a copy of the *CMRR-NF SEIS* or have been notified by electronic mail that the SEIS is available in electronic format on NNSA's website.

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Martha Eichler
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Beth Enson
Kelly Epstein
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Ayman Fadel
Dee Feeney
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Spencer Floyd
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B. Foy
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Robert H. Gilkeson
John E. Glenski
Fred Goddard
Mike Gomez
Melissa Padilla Gomez
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Jade Gordon
Carole Gorecki
Carol Green
Jeanne Green
Nona Lee Gregg
Ruth Halcomb
Annal Hansen
Renee Hardy
Jennifer Harris
Marta Harrison
Lisabeth Harward
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Colleen Hayes
Thomas Heck
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Stephanie Hiller
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Carrie Leven
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Donald R. Machen
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Rina Swentzell
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Terry Thompson
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Natasha Torres
Patricia Trujillo
Pedro Trujillo
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J.R. Truvillo
Beata Tsosie-Pena
Melvin Turcanik
Bill Uebelher
Jim Ullrich
Mary vanderBerg Green
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Bob Walsh
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Shelley Waxman
Astrid Webster
Grant Weherley
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Laura Woodford
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Bill Wordman
Maureen Wright
K. Wylie
Eric M. Xubi Wilson
John W. Zemblidge
Claudia Ziermann

CHAPTER 10
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APPENDIX A
FEDERAL REGISTER NOTICES

This appendix presents *Federal Register* notices related to this *Final 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 (CMRR-NF SEIS)*. They include Records of Decision from previous programmatic, site-wide, and project-specific environmental impacts statements, as well as notices related to the current SEIS. The following *Federal Register* notices are included:

76 FR 28222	Extension of the Public Review and Comment Period and Announcement of an Additional Public Hearing for the Draft 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, NM
76 FR 24018	Notice of Availability of the Draft 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, NM
75 FR 67711	Extension of Scoping Period for 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, NM
75 FR 60745	Notice of Intent to Prepare a 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, NM
74 FR 33232	Record of Decision: Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory, Los Alamos, NM
73 FR 77644	Record of Decision for the Complex Transformation Supplemental Programmatic Environmental Impact Statement—Operations Involving Plutonium, Uranium, and the Assembly and Disassembly of Nuclear Weapons
73 FR 55833	Record of Decision: Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, NM
69 FR 6967	Record of Decision: Final Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project, Los Alamos National Laboratory, Los Alamos, NM

DEPARTMENT OF ENERGY

National Nuclear Security Administration

Extension of the Public Review and Comment Period and Announcement of an Additional Public Hearing for the Draft 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, NM

AGENCY: National Nuclear Security Administration, U.S. Department of Energy.

ACTION: Extension of Public Review and Comment Period and Announcement of an additional Public Hearing.

SUMMARY: On April 29, 2011, the National Nuclear Security Administration (NNSA), a semi-autonomous agency within the U.S. Department of Energy (DOE), published a notice of availability for the *Draft 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* (CMRR–NF DSEIS; DOE/EIS–0350–S1). That notice stated that the public review and comment period would continue until June 13, 2011. NNSA has decided to extend the public comment period by 15 days through June 28, 2011 and to hold an additional public hearing on Monday, May 23, 2011 in Albuquerque, NM.

ADDRESSES: The Draft CMRR–NF SEIS and its reference material are available for review on the NNSA NEPA Web site at: *http://nnsa.energy.gov/nepa/cmrrseis*. Copies of the Draft CMRR–NF SEIS are also available for review at: The Los Alamos National Laboratory, Oppenheimer Study Center, Building TA3–207, West Jemez Road, Los Alamos, New Mexico; the Office of the Northern New Mexico Citizens Advisory Board, 1660 Old Pecos Trail, Suite B, Santa Fe, New Mexico; and the Zimmerman Library, University of New Mexico, Albuquerque, New Mexico. The Draft CMRR–NF SEIS or its Summary may be obtained upon request by leaving a message on the Los Alamos Site Office (LASO) CMRR–NF SEIS Hotline at (toll free) 1–877–427–9439; or by writing to: U.S. Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, 3747 West Jemez Road, TA–3 Building 1410, Los Alamos, New Mexico 87544, Attn: Mr. John Tegtmeier, CMRR–NF SEIS Document Manager; or by facsimile ((505) 667–5948); or by e-mail at: *NEPALASO@doeal.gov.*

FOR FURTHER INFORMATION CONTACT: For general information on the NNSA NEPA process, please contact: Ms. Mary Martin (NA–GC), NNSA NEPA Compliance Officer, U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585, or telephone 202–586–9438.

For general information concerning the DOE NEPA process, contact: Ms. Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance (GC–54), U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585; (202) 586–4600; leave a message at (800) 472–2756; or send an e-mail to *askNEPA@hq.energy.gov.* Additional information regarding DOE NEPA activities and access to many DOE NEPA documents are available on the Internet through the DOE NEPA Web site at *http://nepa.energy.gov.*

SUPPLEMENTARY INFORMATION: The Council on Environmental Quality's implementing regulations for the National Environmental Policy Act (NEPA) (40 CFR 1502.9[c][1] and [2]) and DOE's NEPA implementing regulations (10 CFR 1021.314) require the preparation of a supplement to an environmental impact statement (EIS) when there are substantial changes to a proposal or when there are significant new circumstances or information relevant to environmental concerns. DOE may also prepare a supplemental EIS at any time to further the purposes of NEPA. Pursuant to these provisions, the NNSA has prepared a supplemental environmental impact statement (SEIS) to assess the potential environmental impacts of the construction and operation of the nuclear facility portion of the Chemistry and Metallurgy Research Building Replacement Project (CMRR–NF) at Los Alamos National Laboratory (LANL), Los Alamos, New Mexico.

The CMRR Project was first analyzed in the 2003 *Final Environmental Impact Statement for the Proposed Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, NM* (the CMRR EIS) (DOE/EIS–0350), and NNSA issued a Record of Decision for the CMRR Project in February 2004 (68 FR 6420) announcing its decision to construct and operate a two building CMRR facility within Technical Area-55 (TA–55) at Los Alamos National Laboratory (LANL) in order to meet its need to sustain mission-critical specialized nuclear chemistry and metallurgy capabilities at LANL in a safe, secure and environmentally sound manner. Since that time, NNSA has constructed one of the two buildings for the CMRR Project (the Radiological Laboratory/Utility/Office Building, also called the RLUOB), and has engaged in project planning and design processes for the second building, the CMRR–NF. The planning and design processes for the CMRR–NF have identified the need for various changes to the original design for the structure and additional project elements not envisioned in the 2003 NEPA analyses. These proposed changes, identified subsequent to the ROD, are the subject of the CMRR–NF SEIS analyses.

On April 29, 2011, the National Nuclear Security Administration (NNSA), published a notice of availability for the *Draft 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* (CMRR–NF DSEIS; DOE/EIS–0350–S1) (76 FR 24018). That notice stated that the public review and comment period would continue until June 13, 2011. NNSA has decided to extend the public comment period by 15 days through June 28, 2011. NNSA has also decided to hold one additional public hearing during the comment period.

The newly added public hearing will take place on Monday, May 23, 2011 in Albuquerque, NM. The complete schedule for public hearings on the Draft CMRR–NF SEIS with all dates, times, and locations is the following:

• Monday, May 23, 2011, at 5 p.m. to 9 p.m., Albuquerque Marriott, Salon F, 2101 Louisiana Boulevard, NE., Albuquerque, NM.

• Tuesday, May 24, 2011, at 5 p.m. to 9 p.m., Holiday Inn Express, 60 Entrada Drive, Los Alamos, NM.

• Wednesday, May 25, 2011, at 5 p.m. to 9 p.m., Santa Claran Hotel, 464 N. Riverside Drive, Española, NM.

• Thursday, May 26, 2011, at 5 p.m. to 9 p.m., Santa Fe Community College, Jemez Rooms, 6401 Richards Avenue, Santa Fe, NM.

The first half hour of each hearing will be conducted as an open house-style session with subject matter experts available to discuss the project and answer questions; the remainder of the hearing will be devoted to receiving oral and written comments.

NNSA invites stakeholders and members of the public to submit comments on the Draft CMRR–NF SEIS during the public comment period, which started with the publication of the Environmental Protection Agency's

Notice of Availability in the **Federal Register** on April 29, 2011 and will continue for 60 days until June 28, 2011. NNSA will consider comments received after this date to the extent practicable as it prepares the Final CMRR–NF SEIS. Questions or Comments concerning the Draft CMRR–NF SEIS can be submitted to the NNSA Los Alamos Site Office at the same postal and electronic addresses given above. Additionally, the LASO CMRR–NF SEIS Hotline provides instructions on how to record comments. Please mark all envelopes, faxes and e-mail: "Draft CMRR–NF SEIS Comments".

Issued in Washington, DC, on May 10, 2011.

Thomas P. D'Agostino,

Administrator, National Nuclear Security Administration.

[FR Doc. 2011–11909 Filed 5–13–11; 8:45 am]

BILLING CODE 6450–01–P

DEPARTMENT OF ENERGY

National Nuclear Security Administration

Notice of Availability of the Draft 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, NM

AGENCY: National Nuclear Security Administration, U.S. Department of Energy.

ACTION: Notice of availability and public hearings.

SUMMARY: The National Nuclear Security Administration (NNSA) announces the availability of the *Draft 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* (Draft CMRR–NF SEIS) (DOE/EIS–0350–S1), and the dates and locations for public hearings to receive comments on the Draft CMRR–NF SEIS. The Draft CMRR–NF SEIS analyzes the potential environmental impacts of alternatives for constructing and operating the nuclear facility (NF) portion of the Chemistry and Metallurgy Research Building Replacement (CMRR) Project. The CMRR Project was first analyzed in the 2003 *Final Environmental Impact Statement for the Proposed Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, NM* (the CMRR EIS) (DOE/EIS–0350), and NNSA issued a Record of Decision for the CMRR Project in February 2004 (68 FR 6420) announcing its decision to construct and operate a two building CMRR facility within Technical Area-55 (TA–55) at Los Alamos National Laboratory (LANL) in order to meet its need to sustain mission-critical specialized nuclear chemistry and metallurgy capabilities at LANL in a safe, secure and environmentally sound manner. Since that time, NNSA has constructed one of the two buildings for the CMRR Project (the Radiological Laboratory/Utility/Office Building, also called the RLUOB), and has engaged in project planning and design processes for the second building, the CMRR–NF. The planning and design processes for the CMRR–NF have identified the need for various changes to the original design for the structure and additional project elements not envisioned in the 2003 NEPA analyses. These proposed changes, identified subsequent to the ROD, are the subject of the CMRR–NF SEIS analyses.

The Draft CMRR–NF SEIS considers a No Action Alternative (the 2004 CMRR–NF), and two action alternatives (the Modified CMRR–NF Alternative, and the Continued Use of CMR Building Alternative). Under the No Action Alternative, NNSA analyzes construction and operation of the CMRR–NF as it was originally envisioned in 2004, although it has been determined that the structural design in this alternative would not meet current nuclear facility design safety requirements. Thus, this alternative no longer meets NNSA's purpose and need.

The Modified CMRR–NF Alternative incorporates currently identified construction and operational requirements for the CMRR–NF, and meets NNSA's purpose and need. The Continued Use of CMR Building Alternative analyzes continued use of the CMR Building for as long as it may be safe to do so, together with the RLUOB, although this alternative would not fully meet NNSA's purpose and need. The Modified CMRR Alternative is NNSA's preferred alternative.

DATES: NNSA invites stakeholders and members of the public to submit comments on the Draft CMRR–NF SEIS during the public comment period, which starts with the publication of the Environmental Protection Agency's Notice of Availability in the **Federal Register** and extends for 45 days until June 13, 2011. NNSA will consider comments received after this date to the extent practicable as it prepares the Final CMRR–NF SEIS.

NNSA will hold three public hearings on the Draft CMRR–NF SEIS at the following dates, times, and locations:

• Tuesday, May 24, 2011, at 5 p.m. to 9 p.m., Holiday Inn Express, 60 Entrada Drive, Los Alamos, NM.

• Wednesday, May 25, 2011, at 5 p.m. to 9 p.m., Santa Claran Hotel, 464 N. Riverside Drive, Española, NM.

• Thursday, May 26, 2011, at 5 p.m. to 9 p.m., Santa Fe Community College, Jemez Rooms, 6401 Richards Avenue, Santa Fe, NM.

The first half hour of each hearing will be conducted as an open house-style session with subject matter experts available to discuss the project and answer questions; the remainder of the hearing will be devoted to receiving oral and written comments.

ADDRESSES: The Draft CMRR–NF SEIS and its reference material are available for review on the NNSA NEPA Web site at: *http://nnsa.energy.gov/nepa/cmrrseis*. Copies of the Draft CMRR–NF SEIS are also available for review at: the Los Alamos National Laboratory, Oppenheimer Study Center, Building TA3–207, West Jemez Road, Los Alamos, New Mexico; the Office of the Northern New Mexico Citizens Advisory Board, 1660 Old Pecos Trail, Suite B, Santa Fe, New Mexico; and the Zimmerman Library, University of New Mexico, Albuquerque, New Mexico. The Draft CMRR–NF SEIS or its Summary may be obtained upon request by leaving a message on the Los Alamos Site Office (LASO) CMRR–NF SEIS Hotline at (toll free) 1–877–427–9439; or by writing to: U.S. Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, 3747 West Jemez Road, TA–3 Building 1410, Los Alamos, New Mexico, 87544, Attn: Mr. John Tegtmeier, CMRR–NF SEIS Document Manager; or by facsimile ((505) 667–5948); or by e-mail at: *NEPALASO@doeal.gov.*

Questions or Comments concerning the Draft CMRR–NF SEIS can be submitted to the NNSA Los Alamos Site Office at the same postal and electronic addresses given above. Additionally, the LASO CMRR–NF SEIS Hotline will have instructions on how to record comments. Please mark all envelopes, faxes and e-mail: "Draft CMRR–NF SEIS Comments".

For general information about the DOE NEPA process, please contact: Ms. Carol Borgstrom, Director, Office of NEPA Policy and Compliance (GC–54), U.S. Department of Energy, 1000 Independence Avenue SW., Washington, DC 20585, (202) 586–4600, or leave a message at 1–800–472–2756. Additional information regarding DOE NEPA activities and access to many of DOE's NEPA documents are available on the Internet through the DOE NEPA Web site at *http://nepa.energy.gov.*

SUPPLEMENTARY INFORMATION: The NNSA has prepared the Draft CMRR SEIS in accordance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations that implement the procedural provisions of NEPA (40 CFR parts 1500–1508), and DOE regulations implementing NEPA (10 CFR 1021). These regulations require the preparation of a supplement to an environmental impact statement (EIS) when there are substantial changes to a proposal or when there or significant new circumstances or information relevant to environmental concerns. An agency may also supplement an EIS to further the purposes of NEPA.

Background. LANL is located in north-central New Mexico, 60 miles north-northeast of Albuquerque, 25 miles northwest of Santa Fe, and 20 miles southwest of Española in Los Alamos and Santa Fe Counties. It is located between the Jemez Mountains to the west and the Sangre de Cristo Mountains and Rio Grande to the east. LANL occupies an area of about 40 square miles (104 square kilometers). It is a multidisciplinary, multipurpose institution engaged in theoretical and experimental research and development. LANL performs scientific research and development, and production mission support activities that are critical to the accomplishment of the NNSA's national security objectives as reflected in previous NEPA decisions based on the *Stockpile Stewardship and Management Programmatic EIS* (DOE/EIS–0236) and the *Complex Transformation Supplemental Programmatic EIS* (SPEIS) (DOE/EIS–0236–S4). LANL's role in NNSA mission objectives includes a wide range of scientific and technological capabilities that support nuclear materials handling, processing and fabrication; stockpile management; materials and manufacturing technologies; nonproliferation programs; research and development support for national defense and homeland security programs; and DOE waste management activities.

The CMR facility, located in TA–3 at LANL, houses unique analytical chemistry (AC) and material characterization (MC) support capabilities needed to execute NNSA mission activities. However, CMR is nearly 60 years old. A 1998 seismic study identified two small parallel faults beneath the northernmost portion of the CMR Building. The presence of these faults has given rise to operational and safety concerns related to the structural integrity of the building should a seismic event affecting LANL take place. CMR Building operations and capabilities are currently restricted in scope due to both safety and security constraints; it cannot be operated to the full extent needed to meet NNSA operational requirements. In the late 1990s, NNSA began to develop plans to relocate the CMR Building capabilities elsewhere at LANL to ensure its ability to provide AC and MC support for national security and other NNSA missions. The CMRR EIS was prepared and issued in 2003, followed by a ROD in 2004.

The RLUOB portion of the CMRR project has been completely planned and constructed at TA–55 over the past 7 years. During this same time period, project planning and design for the CMRR–NF has progressed. The CMRR–NF planning process has identified several project requirements that were not envisioned when the CMRR EIS was prepared and issued in 2003. Various facility modifications to address current DOE and NNSA nuclear facility design requirements and sustainable design principals have been identified by NNSA. Several ancillary and support project requirements in addition to those previously analyzed in the CMRR EIS have also been identified. The modifications to the proposed CMRR–NF structural design would allow the building to be operated to the full extent needed to meet NNSA objectives for the CMRR Facility.

NNSA conducted a public scoping process that began with the publication of a Notice of Intent (NOI) in the **Federal Register** on October 1, 2010, in which NNSA announced its intention to prepare the CMRR–NF SEIS and invited public comment on the scope of the NEPA analysis. The NOI also announced the schedule for public scoping meetings that were held on October 19, 2010, and on October 20, 2010, in White Rock and Pojoaque, New Mexico, respectively. In addition to the public meetings, the public was encouraged to provide comments via mail, e-mail, and fax. All scoping comments received were considered by NNSA in preparing the Draft CMRR SEIS.

Alternatives. The Draft CMRR–NF SEIS analyzes the following three alternatives:

No Action Alternative. The No Action Alternative (also referred to as the 2004 CMRR–NF) reflects the CMRR–NF as it was described and analyzed in the 2003 CMRR EIS and selected in the 2004 ROD (69 FR 6967) and the 2008 Complex Transformation SPEIS ROD (73 FR 77656).

This alternative also includes two additional project activities that were not included in the 2003 CMRR EIS but were analyzed in the 2008 *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (the LANL SWEIS, DOE/EIS –0380), which analyzed the CMRR Facility as part of on-going and future LANL operations. These additional project elements are the transportation and storage of up to 150,000 cubic yards (115,000 cubic meters) per year of excavated soil and spoils from the construction site, and the installation of a new 115-kilovolt electric substation on the existing power distribution loop in TA–50. The 2004 CMRR–NF would have been constructed at TA–55, adjacent to the RLUOB. It is now known, however, that the 2004 CMRR–NF design would not be able to be constructed to meet the nuclear facility design standards required for NNSA to safely conduct the full suite of AC and MC mission work needed by NNSA and DOE. Under the No Action Alternative, the 2004 CMRR–NF would have been constructed as a two-storied building with one above ground level and one below ground level, together with connecting tunnels, material storage vaults, utility structures and trenches, security structures, parking area(s) and a variety of other support areas (such as material laydown areas, concrete batch plant, and equipment storage and parking areas). The building would have comprised about 200,000 square feet (18,600 square meters) of solid floor space, while the total amount of laboratory workspace where mission-related AC and MC operations would be performed would have been about 22,500 square feet (2,100 square meters) in size.

Modified CMRR–NF Alternative. The Modified CMRR–NF would be constructed at the same TA–55 location adjacent to the RLUOB which is identified for the No Action Alternative and would enable NNSA to safely conduct the full suite of AC and MC mission work needed by NNSA and DOE. The Modified CMRR–NF would be constructed with additional structural and reinforcing concrete and steel; additional soil excavation, soil stabilization, and foundation work would also be necessary. The building would comprise about 344,000 square feet (31,000 square meters) of useable floor space divided between four stories and a partial roof level. The total amount of laboratory workspace where mission-related AC and MC operations would be performed would be about 22,500 square feet (2,100 square meters) in size. Additionally, a set of dedicated fire suppression water storage tanks would be located within the Modified CMRR–NF building. This proposed project would differ from the 2004 CMRR–NF in that it would include facility modifications to address DOE and NNSA nuclear facility design standards including seismic safety, nuclear safety basis requirements, security needs, and sustainable design principals and would also include certain additional infrastructure enhancements and construction support activities.

The Modified CMRR–NF Alternative includes two construction options, the Deep Excavation Option and the Shallow Excavation Option. The two construction options consider excavation depths that would allow NNSA to construct the building either below or above a layer of poorly welded volcanic tuff (ash) present at the TA–55 site. The Modified CMRR Alternative is NNSA's preferred alternative; however, NNSA has not identified a preferred construction option at this time.

Continued Use of CMR Building Alternative. Under this alternative, NNSA would continue to carry out laboratory operations in the existing CMR Building at TA–3, with radiological laboratory and administrative support operations moving into the newly constructed RLUOB at TA–55. The continued operation of the CMR Building over an extended period of time would result in continued reduction of laboratory space as operations are further consolidated, or eliminated. It may also include further reductions in operations that could be identified as necessary over time based on the limited ability of the CMR Building to be safely operated and maintained in a physically prudent fashion. This alternative would not meet NNSA's need to carry out AC and MC operations at a level that would support the entire range of DOE and NNSA mission needs.

Public Hearings and Invitation to Comment. NNSA will hold three public hearings on the Draft CMRR–NF SEIS as described in this Notice under **DATES.** Individuals who would like to present comments orally at these hearings must register upon arrival at the hearing. Speaking time will be allotted by the hearing moderator to each individual wishing to speak so as to ensure that as many people as possible have the opportunity to speak. NNSA representatives will be available during the open house portion of these hearings to discuss the Draft CMRR–NF SEIS and the analyses in it. Following the plenary session, the public will have an opportunity to provide oral and written comments.

Following the end of the public comment period on the Draft CMRR–NF SEIS described above, the NNSA will consider and respond to the comments received during the comment period on the Draft CMRR–NF SEIS in the Final CMRR–NF SEIS, and issue the Final CMRR–NF SEIS. NNSA decision-makers will consider the environmental impact analysis presented in the Final CMRR–NF SEIS, along with other information, in making decisions related to CMRR–NF.

Signed in Washington, DC, on April 21, 2011.

Thomas P. D'Agostino,

Administrator, National Nuclear Security Administration.

[FR Doc. 2011–10406 Filed 4–28–11; 8:45 am]

BILLING CODE 6450–01–P

DEPARTMENT OF ENERGY

Extension of Scoping Period for 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, NM

AGENCY: National Nuclear Security Administration, U.S. Department of Energy.

ACTION: Notice; extension of scoping period.

SUMMARY: On October 1, 2010, the National Nuclear Security Administration (NNSA), a semi-autonomous agency within the U.S. Department of Energy (DOE), published a notice of intent to prepare 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* (CMRR–NF SEIS; DOE/EIS–0350–S1). That notice stated that the scoping period would continue until November 1, 2010. NNSA has extended the public scoping period through November 16, 2010.

ADDRESSES: Written comments or suggestions concerning the scope of the CMRR–NF SEIS, or requests for more information on the SEIS and public scoping process, should be directed to: Mr. John Tegtmeier, CMRR–NF SEIS Document Manager, U.S. Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, 3747 West Jemez Road, TA–3 Building 1410, Los Alamos, New Mexico, 87544; facsimile at 505–667–5948; or e-mail at: *NEPALASO@doeal.gov.* Mr. Tegtmeier may also be reached by telephone at 505–665–0113. Additionally, may record their comments, ask questions concerning the EIS, or request to be placed on the EIS mailing or document distribution list by leaving a message on the SEIS Hotline at (toll free) 1–877–427–9439. The Hotline will provide instructions on how to record comments and requests.

FOR FURTHER INFORMATION CONTACT: For general information on the NNSA NEPA process, please contact: Ms. Mary Martin (NA–56), NNSA NEPA Compliance Officer, U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585, or telephone 202–586–9438.

For general information concerning the DOE NEPA process, contact: Ms. Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance (GC–54), U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585; (202) 586–4600; leave a message at (800) 472–2756; or send an e-mail to *askNEPA@hq.energy.gov.* Additional information regarding DOE NEPA activities and access to many DOE NEPA documents are available on the Internet through the DOE NEPA Web site at *http://nepa.energy.gov.*

SUPPLEMENTARY INFORMATION: The Council on Environmental Quality's implementing regulations for the National Environmental Policy Act (NEPA) (40 CFR 1502.9[c] [1] and [2]) and DOE's NEPA implementing regulations (10 CFR 1021.314) require the preparation of a supplement to an environmental impact statement (EIS) when there are substantial changes to a proposal or when there are significant new circumstances or information relevant to environmental concerns. DOE may also prepare a supplemental EIS at any time to further the purposes of NEPA. Pursuant to these provisions, the NNSA intends to prepare a supplemental environmental impact statement (SEIS) to assess the potential environmental impacts of the construction and operation of the nuclear facility portion of the Chemistry and Metallurgy Research Building Replacement Project (CMRR–NF) at Los Alamos National Laboratory (LANL), Los Alamos, New Mexico.

On October 1, 2010, NNSA published a notice of intent to prepare 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). That notice stated that the scoping period would continue until November 1, 2010. In response to public requests, NNSA has extended the public scoping period through November 16, 2010. NNSA will consider comments received after this date to the extent practicable as it prepares the Draft CMRR–NF SEIS.

Issued in Washington, DC, on November 1, 2010.

Thomas P. D'Agostino,

Administrator, National Nuclear Security Administration.

[FR Doc. 2010–27864 Filed 11–1–10; 4:15 pm]

BILLING CODE 6450–01–P

DEPARTMENT OF ENERGY

National Nuclear Security Administration

Notice of Intent To Prepare a 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, NM

AGENCY: U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA).

ACTION: Notice of intent.

SUMMARY: The Council on Environmental Quality's implementing regulations for the National Environmental Policy Act (NEPA) (40 CFR 1502.9[c][1] and [2]) and DOE's NEPA implementing regulations (10 CFR 1021.314) require the preparation of a supplement to an environmental impact statement (EIS) when there are substantial changes to a proposal or when there are significant new circumstances or information relevant to environmental concerns. DOE may also prepare a supplemental EIS at any time to further the purposes of NEPA. Pursuant to these provisions, the NNSA, a semi-autonomous agency within the DOE, intends to prepare a supplemental environmental impact statement (SEIS) to assess the potential environmental impacts of the construction and operation of the nuclear facility portion of the Chemistry and Metallurgy Research Building Replacement Project (CMRR–NF) at Los Alamos National Laboratory (LANL), Los Alamos, New Mexico.

The CMRR Project, including the CMRR–NF, was the subject of NNSA's *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; the CMRR EIS) issued in November 2003, and a February 2004 Record of Decision (ROD) (69 FR 6967). Over time, due in large part to detailed site geotechnical investigations, some aspects of the CMRR–NF Project have changed from what was foreseen when the CMRR EIS was prepared. The potential environmental impacts of these proposed changes will be analyzed in the CMRR–NF SEIS.

DATES: NNSA invites stakeholders and members of the public to submit comments and suggestions on the scope of the SEIS during the SEIS scoping period, which starts with the publication of this Notice and will continue for 30 days until November 1, 2010. NNSA will consider all comments received or postmarked by that date in defining the scope of this SEIS. Comments received or postmarked after that date will be considered to the extent practicable. Two public scoping meetings will be held to provide the public with an opportunity to present comments, ask questions, and discuss concerns regarding the SEIS with NNSA officials. Public scoping meetings will be held on October 19, 2010, at the White Rock Town Hall, 139 Longview Drive, White Rock, New Mexico and October 20, 2010, at the Cities of Gold Casino Hotel, Pojoaque, New Mexico. Both meetings will begin at 4 p.m. and end at 7 p.m. The NNSA will publish additional notices regarding the scoping meetings in local newspapers in advance of the scheduled meetings. Any necessary changes will be announced in the local media.

Any agency, state, pueblo, tribe, or unit of local government that desires to be designated a cooperating agency should contact Mr. John Tegtmeier at the address listed below by the closing date of the scoping period.

ADDRESSES: Written comments or suggestions concerning the scope of the CMRR–NF SEIS or requests for more information on the SEIS and public scoping process should be directed to: Mr. John Tegtmeier, CMRR–NF SEIS Document Manager, U.S. Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, 3747 West Jemez Road, TA–3 Building 1410, Los Alamos, New Mexico, 87544; facsimile at 505–667–5948; or e-mail at: *NEPALASO@doeal.gov.* Mr. Tegtmeier may also be reached by telephone at 505–665–0113.

In addition to providing comments at the public scoping meetings, all interested parties are invited to record their comments, ask questions concerning the EIS, or request to be placed on the EIS mailing or document distribution list by leaving a message on the SEIS Hotline at (toll free) 1–877–427–9439. The Hotline will provide instructions on how to record comments and requests.

FOR FURTHER INFORMATION CONTACT: For general information on the NNSA NEPA process, please contact: Ms. Mary Martin (NA–56), NNSA NEPA Compliance Officer, U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585, or telephone 202–586–9438. For general information about the DOE NEPA process, please contact: Ms. Carol Borgstrom, Director, Office of NEPA Policy and Compliance (GC–54), U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585, telephone 202–586–4600, or leave a message at 1–800–472–2756. Additional information about the DOE NEPA process, an electronic archive of DOE NEPA documents, including those referenced in this announcement, and other NEPA resources are provided at *http://nepa.energy.gov.*

SUPPLEMENTARY INFORMATION: LANL is located in north-central New Mexico, 60 miles north-northeast of Albuquerque, 25 miles northwest of Santa Fe, and 20 miles southwest of Española in Los Alamos and Santa Fe Counties. It is located between the Jemez Mountains to the west and the Sangre de Cristo Mountains and Rio Grande to the east. LANL occupies an area of about 25,600 acres [10,360 hectares] or approximately 40 square miles and is operated for NNSA by a contractor, Los Alamos National Security, LLC. It is a multidisciplinary, multipurpose institution engaged in theoretical and experimental research and development. LANL has been assigned science, research and development, and production mission support activities that are critical to the accomplishment of the NNSA's national security objectives as reflected in the Stockpile Stewardship and Management Programmatic EIS (DOE/EIS–0236) and the Complex Transformation Supplemental Programmatic EIS (DOE/EIS–0236–S4). LANL's main role in NNSA mission objectives includes a wide range of scientific and technological capabilities that support nuclear materials handling, processing and fabrication; stockpile management; materials and manufacturing technologies; nonproliferation programs; research and development support for national defense and homeland security programs; and DOE waste management activities.

The capabilities needed to execute the NNSA mission activities require facilities at LANL that can be used to handle actinides and other radioactive materials in a safe and secure manner. (The actinides are any of a series of 14 chemical elements with atomic numbers ranging from 89 (actinium) through 103 (lawrencium)). Of primary importance are the facilities located within the Chemistry and Metallurgy Research (CMR) Building and the Plutonium Facility (located at Technical Areas (TAs) 3 and 55, respectively), which are used for processing, characterizing, and storage of special nuclear material. (Special nuclear material is defined by the Atomic Energy Act of 1954 as plutonium, uranium-233, or uranium enriched in the isotopes uranium-233 or uranium-235). Most of the LANL mission support functions previously listed require analytical chemistry, material characterization, and actinide research and development support capabilities that currently exist within the CMR Building and are not available elsewhere. Other unique capabilities are located at the adjacent Plutonium Facility. Work is sometimes moved between the CMR Building and the Plutonium Facility to make use of the full suite of capabilities that these two facilities provide. CMR Building operations and capabilities are currently restricted in scope due to safety and security constraints; it cannot be operated to the full extent needed to meet NNSA operational requirements.

The CMR building contains about 550,000 square feet (about 51,100 square meters) of floor space on two floors divided between a main corridor and seven wings. It was constructed in the early 1950s. DOE maintained and upgraded the building over time to provide for continued safe operations. However, beginning in 1997 and 1998, a series of operational, safety, and seismic issues surfaced regarding the long-term viability of the CMR Building. In January 1999, the NNSA approved a strategy for managing operational risks at the CMR Building. The strategy included implementing operational restrictions to ensure safe operations. These restrictions are impacting the assigned mission activities conducted at the CMR Building. This strategy also committed NNSA to develop plans to relocate the CMR capabilities elsewhere at LANL to maintain support of national security and other NNSA missions. The CMRR EIS was prepared and issued in 2003, followed by a ROD in 2004.

The CMRR EIS analyzed four action alternatives: (1) The construction and operation of a new CMRR facility at TA–55; (2) the construction of a new CMRR facility at a "greenfield" location within TA–6; (3) a "hybrid" alternative maintaining administrative offices and support functions at the existing CMR building with a new Hazard Category 2 laboratory facility built at TA–55; and, (4) a "hybrid" alternative with the laboratory facility being constructed at TA–6. The CMRR EIS also analyzed a no action alternative where the existing CMR building would continue to be kept in service. In the 2004 ROD, NNSA announced its decision to implement the preferred alternative (alternative 1): To construct a new CMRR facility which would include a single above-ground, consolidated nuclear material-capable, Hazard Category 2 laboratory building (construction option 3) with a separate, adjacent administrative office and support functions building, now referred to as the CMRR Radiological Laboratory/Utility/Office Building (CMRR RLUOB). Upon completion, the CMRR Facility would replace the CMR Building, operations would be moved to the new CMRR Facility, and the vacated CMR Building would undergo decommissioning, decontamination, and demolition. (While the CMRR RLUOB has been constructed in TA–55 at LANL, the installation of laboratory equipment has not been completed and operations have not begun). Since 2004, the planning process for the construction and operation of the CMRR–NF has continued to progress and take into consideration newly gathered site-specific data and safety and security requirements.

Purpose and Need: The NNSA's purpose and need for proposing the construction and operation of the CMRR–NF have not changed since the CMRR EIS was prepared and issued in 2003. NNSA needs to provide the physical means for accommodating the CMR Building's functional, mission-critical nuclear capabilities, and to consolidate activities for safer and more efficient operations. In the 2003 CMRR EIS, NNSA analyzed the potential environmental impacts associated with the proposed relocation of LANL analytical chemistry (AC) and materials characterization (MC), and associated research and development capabilities that currently exist primarily at the existing CMR building, to a newly constructed facility, and operation of the new facility for the next 50 years. In the May 2008, *Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EIS–0380), the CMRR was considered and its potential environmental impacts analyzed as a part of the No Action Alternative and each of the action alternatives for continued operation of LANL.

The potential environmental impacts associated with the construction and operation of the CMRR–NF were also analyzed within certain alternatives in the Complex Transformation SPEIS (DOE/EIS–0236–S4) as part of the proposal to reconfigure and streamline NNSA's nuclear security enterprise. NNSA issued two RODs based on the Complex Transformation SPEIS analysis in December 2008. In the SPEIS ROD for operations involving plutonium, uranium, and the assembly and disassembly of nuclear weapons (73 FR 77644), NNSA announced its decision to retain plutonium manufacturing and research and development at LANL, and in support of these activities, to proceed with construction and operation of the CMRR–NF at LANL as essential to its ability to meet national security requirements regarding the nation's nuclear deterrent.

Proposed Action and Alternatives

Proposed Action: The Proposed Action is to construct the CMRR–NF at TA–55. Over time some aspects of the proposed CMRR–NF Project plans have changed. These proposed changes include, for example:

- Changes to the CMRR–NF structure required for seismic safety based on new information from additional geotechnical investigations conducted at the site. These changes involve incorporating additional structural steel and concrete into the building construction and increasing the quantity of material that must be excavated for the building foundation;
- Changes to the infrastructure to support the CMRR–NF construction activities, such as concrete batch plants, construction material lay-down areas and warehouses, and temporary office trailers and parking areas. Some of these changes involve the use of additional acreage. Most of these proposed changes are temporary in duration;
- Changes to the CMRR–NF structure to ensure 10 CFR part 830 nuclear safety basis requirements are met for facility engineering controls to ensure protection of the public, workers, and the environment; and
- Changes to incorporate additional sustainable design principles and environmental conservation measures. These changes minimize the environmental impacts of construction and operation of the CMRR–NF.

The potential environmental impacts of these and similar changes will be analyzed in the CMRR–NF SEIS.

No Action Alternative: The No Action alternative would be the construction of the CMRR–NF and the ancillary and support activities as announced in the 2004 ROD.

CMR Alternative 1: Do not construct a replacement facility to house the capabilities planned for the CMRR–NF. Continue to perform analytical chemistry, material characterization, and actinide research and development activities in the CMR Building, with no facility upgrades, while performing routine maintenance at the level needed to sustain programmatic operations for as long as feasible.

CMR Alternative 2: Same as CMR Alternative 1, but includes making the extensive facility upgrades needed to sustain CMR programmatic operations for another 20 to 30 years.

Preliminary Identification of Environmental Issues. NNSA has tentatively identified the following issues for analysis in this SEIS. Additional issues may be identified as a result of the scoping process.

1. Potential impacts to air, water, soil, visual resources and viewsheds.
2. Potential impacts to plants and animals, and to their habitats, including Federally-listed threatened or endangered species and their critical habitats.
3. Potential impacts from irretrievable and irreversible consumption of natural resources and energy, including transportation issues.
4. Potential impacts to cultural resources, including historical and prehistorical resources and traditional cultural properties.
5. Potential impacts to infrastructure and utilities.
6. Potential impacts to socioeconomic conditions.
7. Potential environmental justice impacts to minority and low-income populations.
8. Potential cumulative impacts from the Proposed Action and alternatives together with other past, present, and reasonably foreseeable actions at LANL.

CMRR–NF SEIS Preparation Process: The scoping process for a NEPA document is an opportunity for the public to assist the NNSA in determining the alternatives and issues for analysis. Alternatives may be added, deleted, or modified as a result of scoping. The purpose of the scoping meetings is to receive oral and written comments from the public. The meetings will use a format to facilitate dialogue between NNSA and the public and will be an opportunity for individuals to provide written or oral statements. NNSA welcomes specific comments or suggestions on the content of these alternatives, or on other alternatives that should be considered. The above list of issues to be considered in the SEIS analysis is tentative and is intended to facilitate public comment on the scope of the SEIS. It is not intended to be all-inclusive, nor does it imply any predetermination of potential impacts. The CMRR–NF SEIS will describe the potential environmental impacts of the alternatives, using available data where possible and obtaining additional data where necessary. Copies of written comments and transcripts of oral comments will be available as soon as practicable after the public scoping meeting on the Internet at: *http://www.doeal.gov/laso/NEPADocuments.aspx.*

Following the scoping period announced in this Notice of Intent, and after consideration of comments received during scoping, NNSA will prepare a *Draft Supplemental Environmental Impact Statement for the Construction of the Chemistry and Metallurgy Replacement Project's Nuclear Facility at Technical Area-55 Within Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EIS–0350–S1). Comments received on the Draft SEIS during the planned 45-day comment period will be considered and addressed in the Final SEIS, which NNSA anticipates issuing by July 2011. NNSA will issue a ROD no sooner than 30 days after publication by the Environmental Protection Agency of a Notice of Availability of the Final SEIS.

Issued in Washington, DC, this 28th day of September 2010.

Thomas P. D'Agostino,

Administrator, National Nuclear Security Administration.

[FR Doc. 2010–24681 Filed 9–30–10; 8:45 am]

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DEPARTMENT OF ENERGY

National Nuclear Security Administration

Record of Decision: Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory, Los Alamos, NM

AGENCY: National Nuclear Security Administration, U.S. Department of Energy.

ACTION: Record of decision.

SUMMARY: The National Nuclear Security Administration (NNSA), a separately organized agency within the U.S. Department of Energy (DOE), is issuing this Record of Decision (ROD) for the continued operation of the Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico, pursuant to the *Final Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico,* DOE/EIS–0380 (SWEIS) (73 FR 28453, May 16, 2008). This ROD is the second ROD based on the information and analyses contained in the SWEIS and other factors, including comments received on the SWEIS, costs, technical and security considerations, and the missions of NNSA. These decision factors also include results from the analyses in the October 24, 2008, *Final Complex Transformation Supplemental Programmatic Environmental Impact Statement* (DOE/EIS–0236–S4, 73 FR 63460) (Complex Transformation SPEIS) and its two RODs (73 FR 77644, 73 FR 77656, December 19, 2008). NNSA issued the first ROD for the continued operation of LANL based on the SWEIS (73 FR 55833) on September 26, 2008.

In the LANL SWEIS, NNSA analyzed three alternatives for the continued operation of LANL: (1) No Action, (2) Reduced Operations, and (3) Expanded Operations. NNSA identified the Expanded Operations Alternative as its Preferred Alternative.

For this second ROD, NNSA continues to select the No Action Alternative, announced in the 2008 ROD as its decision for continuing the operation of LANL, and has decided to implement additional elements of the Expanded Operations Alternative. Specific projects that will be implemented under this ROD are: (1) Complete the environmental remediation and closure of Technical Area 18 (TA–18) Pajarito Site; (2) complete the environmental remediation and closure of TA–21 (also referred to as the Delta Prime or DP Site); (3) refurbish the Plutonium Facility Complex at TA–55; (4) construct and operate a new Radioactive Liquid Waste Treatment Facility in TA–50 and operate a zero liquid discharge facility in TA–52 as an auxiliary action; (5) install additional processors and equipment to further expand the capabilities and operation level of the Nicholas C. Metropolis Center for Modeling and Simulation in TA–3; and (6) construct and operate a new Science and Engineering Complex at TA–62. These projects and the changes in operations associated with them are needed to support DOE and NNSA missions; to maintain and improve the safety and security of existing capabilities at LANL; and to further LANL intra-site facility consolidation. Decisions that NNSA is announcing in this ROD will not change the plutonium pit production throughput capability at LANL (20 plutonium pits per year), nor will they influence or be impacted by future decisions that may be made based on the upcoming Nuclear Posture Review.[1]

FOR FURTHER INFORMATION CONTACT: For copies of the SWEIS, the 2008 SWEIS ROD or this ROD, or to receive further information about other issues regarding the Los Alamos Site Office's National Environmental Policy Act (NEPA) compliance program, contact: Mr. George J. Rael, Assistant Manager Environmental Operations, NEPA Compliance Officer, U.S. Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, 3747 West Jemez Road, Los Alamos, NM

[1] The Nuclear Posture Review is a congressionally mandated comprehensive review of U.S. nuclear deterrence policy and strategy that the Secretary of Defense will conduct in consultation with the Secretary of Energy and the Secretary of State. The requirement for this review can be found in the National Defense Appropriations Act for 2008, Public Law 110–181.

87544. Mr. Rael may be contacted by telephone at (505) 665–5658, or by e-mail at LASO.SWEIS@doeal.gov. For information on the DOE NEPA process, contact: Ms. Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance (GC–20), U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585, (202) 586–4600, or leave a message at (800) 472–2756. Additional information regarding DOE NEPA activities and access to many DOE NEPA documents, including those referenced in this ROD, are available on the Internet through the DOE NEPA Web site at *http://www.gc.energy.gov/nepa/*.

SUPPLEMENTARY INFORMATION:

Background

NNSA prepared this ROD pursuant to the regulations of the Council on Environmental Quality (CEQ) for implementing NEPA (40 CFR parts 1500–1508) and DOE's NEPA Implementing Procedures (10 CFR part 1021). Decisions presented in this second ROD are based on information and analysis contained in the SWEIS (including a classified appendix that assesses the potential environmental impacts of a representative set of credible intentional destructive acts that include terrorism scenarios) (73 FR 28453, May 16, 2008), comments received on the Final SWEIS; NNSA's two December 19, 2008, RODs resulting from information and analysis contained in the Complex Transformation SPEIS (73 FR 77644, 73 FR 77656); and other factors, including costs, technical and security considerations, and the missions of NNSA.

LANL is a multidisciplinary, multipurpose research institution in north-central New Mexico, about 60 miles (97 kilometers) north-northeast of Albuquerque, and about 25 miles (40 kilometers) northwest of Santa Fe. LANL occupies about 25,600 acres (10,360 hectares), or approximately 40 square miles (104 square kilometers). About 2,000 structures with approximately 8.6 million square feet under roof serve to house LANL operations and activities, with about half the square footage used as laboratory or production space, and the remaining half used for administrative, storage, service, and other purposes.

LANL is one of three national security laboratories within NNSA's Nuclear Security Enterprise. The main role of LANL in the fulfillment of NNSA and DOE missions is scientific and technological work that supports nuclear materials handling and processing, and weapons component fabrication; stockpile management; materials and manufacturing technologies; nonproliferation programs; and waste management activities. LANL plays a key role in providing stewardship for the nation's nuclear stockpile that includes manufacturing some nuclear weapons components, such as plutonium pits. In addition to weapons component manufacturing, LANL performs weapons component testing, stockpile assurance, component replacement, surveillance, and maintenance. Research and development activities at LANL include high explosives processing, chemical research, nuclear physics research, materials science research, systems analysis and engineering, human genome mapping, biotechnology applications, and remote sensing technologies. Work at LANL is also conducted for other Federal agencies such as the Departments of Defense and Homeland Security, as well as for universities, institutions, and private entities.

The alternatives evaluated in the SWEIS span a range of potential operations from minimum levels that would maintain essential mission support capabilities (Reduced Operations Alternative), through the highest reasonably foreseeable levels that could be supported by current facilities or new facilities (Expanded Operations Alternative). The No Action Alternative analyzed in the SWEIS is essentially a continuation of current operations based on previous NEPA analyses and decisions, including the 1999 LANL SWEIS (DOE/EIS–0238, January 1999) and its ROD (64 FR 50797, September 20, 1999). The Reduced Operations and Expanded Operations Alternatives analyzed in the SWEIS are reductions or expansions of the level of operations for the No Action Alternative. As a matter of convenience, actions associated with implementing the March 2005 LANL Compliance Order on Consent (Consent Order) with the State of New Mexico [2] are only analyzed in the Expanded Operations Alternative. However, NNSA stated in the SWEIS that DOE intends to implement actions necessary to comply with the Consent Order, regardless of decisions it makes on other actions analyzed in the LANL SWEIS.

The 2008 SWEIS ROD announced NNSA's decision to continue to implement the No Action Alternative with certain elements of the Expanded Operations Alternative. These specific elements were: (1) Continuing to implement actions necessary to comply with the Consent Order, which requires investigation and remediation of environmental contamination at LANL; (2) broadening the types and quantities of radioactive sealed sources for isotopes of Cobalt, Iridium, Californium and Radium, (Co-60, Ir-192, Cf-252, Ra-226), that LANL will manage and store prior to disposal; (3) expanding the capabilities and operational level of the Nicholas C. Metropolis Center for Modeling and Simulation to support the Roadrunner super computing platform; (4) performing research regarding beryllium detection and mitigation measures; (5) retrieving and disposing of about 3,100 cubic yards of contact-handled and 130 cubic yards of remote-handled legacy transuranic (TRU) waste from below-ground storage; (6) planning, design, construction, and operation of the Waste Management Facilities Transition projects to facilitate actions required by the Consent Order; (7) repairing and replacing mission critical cooling system components for buildings in Technical Area–55 (TA–55); and (8) completing final design of a new Radioactive Liquid Waste Treatment Facility, and designing and constructing the zero liquid discharge facility auxiliary component of the new treatment facility.

NNSA has previously announced its determination that the Expanded Operations Alternative is both its Preferred Alternative and the Environmentally Preferred Alternative. Considering the many aspects of the alternatives analyzed in the SWEIS, and looking out over the long term, NNSA believes that the implementation of changes analyzed in the Expanded Operations Alternative would allow it to best achieve both its mission and environmental responsibilities. Under this alternative, NNSA would be better positioned to minimize the use of electricity and water; streamline operations through consolidation; replace older laboratory and production facilities with new buildings that incorporate modern safety, security, and energy efficiency standards improving NNSA's ability to protect human health; reduce the ''footprint'' of LANL as a whole; and allow some areas to return to a natural state.

NNSA published as Volume 3 of the SWEIS all comments received on the

[2] The March 2005 LANL Compliance Order on Consent was issued pursuant to the New Mexico Hazardous Waste Act and entered into by the State of New Mexico, the Department of Energy and its Management and Operating Contractor to address requirements concerning certain groundwater contaminants toxic pollutants and explosive compounds. The Consent Order may be viewed at *http://www.lanl.gov/environment/compliance/consent_order.shtml.*

Draft SWEIS together with NNSA's responses, and discussions of how comments resulted in changes to the document. The 2008 SWEIS ROD included a detailed discussion of the comments received on the Final SWEIS, and will not be repeated here. In response to the concern raised by several of the commenters that proceeding with an increase in plutonium pit production at this time would be premature, NNSA agrees that making decisions at this time on future plutonium pit production levels is premature, and will delay making any decisions in this area until after the completion of the upcoming Nuclear Posture Review. Decisions that NNSA is announcing in this ROD will not change the 20 plutonium pits per year level of plutonium pit production throughput capability established in the 1999 LANL SWEIS ROD.

On December 19, 2008, NNSA issued two RODs based in part on the Complex Transformation SPEIS for the continued transformation of the nuclear weapons complex. One ROD addressed the implementation of programmatic alternatives involving plutonium, uranium, and the assembly and disassembly of nuclear weapons (73 FR 77644). The other announced the implementation of project-specific alternatives involving tritium research and development, flight test operations, and major environmental test facilities (73 FR 77656). NNSA's programmatic decision to retain and consolidate plutonium pit manufacturing and research and development work at LANL means that special nuclear materials and work performed with plutonium will be consolidated from some of the other NNSA sites to LANL. This decision supports the transformation of the nuclear weapons complex into a smaller, more efficient nuclear security enterprise that can respond to changing national security challenges and ensure the long-term safety, security, and reliability of the nuclear weapons stockpile. Two of NNSA's project-specific decisions also directly affect LANL operations: (1) The consolidation of tritium research and operations at the Savannah River Site, which reduces tritium operations at LANL; and (2) the consolidation of major environmental test facilities at Sandia National Laboratories/New Mexico, which closes four facilities at LANL.

Basis for Decision

In this second ROD, NNSA is announcing its decision to continue to implement the No Action Alternative with the addition of elements from the Expanded Operations Alternative of the SWEIS. NNSA has also decided that it will now implement additional elements from the Expanded Operations Alternative that complement the actions taken under the 2008 SWEIS ROD. These additional elements collectively include increases in the operation of some existing facilities and the implementation of a limited number of additional new facility projects needed to support ongoing stockpile stewardship and environmental closure and remediation programs; to enhance nuclear safety and security; and to provide modern features for the protection of workers and the environment. NNSA will continue to undertake intra-site consolidation of operations and activities to reduce the physical ''footprint'' of LANL and improve efficiency and address the LANL Land Transfer requirements of Public Law 105–119. NNSA also will continue to coordinate with the DOE's Office of Environmental Management to execute environmental closure and remediation actions including major material disposal area (MDA) remediation, canyon cleanups and all activities necessary to meet Consent Order requirements, the LANL Federal Facility Compliance Agreement, and DOE commitments regarding the use of resources provided through the American Recovery and Reinvestment Act of 2009 (ARRA) (Pub. L. 111–5).

Environmental Impacts Associated With Decisions

In making the decisions announced in this ROD, NNSA considered the potential impacts for normal operations (those operations without accidents or intentional destructive acts) as well as impacts analyzed in the SWEIS from potential accidents and intentional destructive acts, including credible terrorism scenarios, on workers and surrounding populations, as it did in developing the 2008 ROD. NNSA also evaluated the potential impacts associated with the irreversible or irretrievable commitments of resources, and the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. These analyses and results are described in the Summary and Chapters 4 and 5 of the SWEIS. Additional project specific analyses are included in the Appendices to the SWEIS.

Decisions

Operations at LANL provide a wide range of scientific and technological capabilities for NNSA's National Nuclear Security Enterprise (Nuclear Weapons Complex). NNSA's decisions are based on its current and anticipated mission responsibilities and its need to continue to operate LANL in a manner that allows NNSA to efficiently and effectively fulfill its mission responsibilities in an environmentally protective and fiscally prudent manner. The need for the decisions identified in this ROD exists regardless of any future decisions that may be made about the level of plutonium pit production at LANL. National security policies and related laws require NNSA to maintain the Nation's nuclear weapons stockpile, as well as its core competencies in nuclear weapons. The nuclear facilities at LANL are essential to NNSA's ability to execute this core program and to support NNSA's aggressive and far-reaching nuclear non-proliferation efforts. The changes in operations and new projects announced in this ROD are needed to fulfill NNSA and DOE mission responsibilities and meet various requirements that have arisen since 1999, and are consistent with recent decisions regarding the nuclear weapons complex transformation.

Consistent with the decisions announced in the first ROD under the SWEIS, NNSA and DOE's Office of Environmental Management will continue to implement actions required by the March 2005 Consent Order along with other activities needed for environmental cleanup at LANL:

(1) Analytical chemistry sample processing, waste management activities such as waste characterization operations and waste processing, storage and transportation actions, as well as waste disposal at appropriate waste disposal facilities located both on-site and off-site; (2) the clearing of site vegetation; (3) decontamination, decommissioning and demolition (DD&D) of structures and buildings with priority to those that must be removed to reach buried contamination; (4) exhumation of buried contamination; (5) exhumation and transportation of soil and rock from on-site borrow pits; (6) construction of roads to reach sites with heavy equipment, lay-down areas for equipment and materials and waste storage and staging, and parking sites to meet the needs of vehicles involved in transporting wastes, equipment and materials; and (7) delineation and fencing of clean-up sites.

Environmental cleanup projects that will be undertaken and completed under this ROD include:

- Completing the remediation and closure of TA–18 Pajarito Site. This would include relocating remaining operations to existing facilities within LANL, performing the DD&D of existing site structures and completing remediation of the TA–18 canyon-bottom site.

• Completing the remediation and closure of TA–21 Delta Prime (DP) Site with an emphasis on DD&D and environmental remediation of MDAs. This would include the DD&D of the TA–21 buildings. Those structures that cover or could interfere with activities to investigate and remediate MDAs and other potential release sites under the Consent Order would be given priority. Both DP West and DP East facilities will undergo DD&D and thorough characterization, decontamination, and demolition, with waste disposal dependent on facility characterization information. The underlying waste sites can then be properly investigated, considered for corrective actions that may be required under the Consent Order and remediated as appropriate.

The NNSA has also decided to implement the additional projects specified in this ROD that involve the design, construction and operation of new replacement buildings, and the renovation of certain existing facilities. This decision includes the implementation of all associated actions needed to facilitate construction or renovation projects, including those related to the transfer of operations, and those necessary for the DD&D of spaces vacated by moving existing facilities. These projects are part of the vision that NNSA has established for the future Nuclear Security Enterprise.

NNSA's vision for the future remains a smaller, safer, more secure and less expensive enterprise that leverages the scientific and technical capabilities of its workforce to meet all our national security requirements. The specific projects that NNSA has decided to implement are:

• Refurbish the Plutonium Facility Complex (PF–4) at TA–55: This refurbishment project consists of seven subprojects that either replace or upgrade obsolete and/or worn-out facility components/safety systems or address regulatory-driven requirements at the PF–4 building in TA–55. Replacement and maintenance of critical infrastructure and safety systems is necessary to ensure the reliability of this facility and compliance with safety and regulatory requirements.

• Construct and operate a new Radioactive Liquid Waste Treatment Facility, (RLWTF), at TA–50 together with the operation of a zero liquid discharge facility at TA–52 as an auxiliary action: These actions replace/restore an existing capability at LANL for processing radioactive liquid wastes. The existing RLWTF at TA–50 is the only facility available at LANL to treat a broad range of transuranic and low-level radioactive liquid wastes. It is an aging facility (over 40 years old) that has exceeded its design life.

• Install additional processors and equipment as necessary to further expand the capabilities and operation level of the Nicholas C. Metropolis Center for Modeling and Simulation at TA–3: These actions will be undertaken to support future operations up to the level of operations analyzed in the SWEIS as attainable through the consumption of a maximum electric power use of 15 megawatts, and a maximum potable water use of 51 million gallons per year. Calculations performed at the Nicholas C. Metropolis Center support the continued certification of the nuclear weapons stockpile without conducting underground nuclear tests, and also support research on global energy challenges and other scientific issues.

• Construct and operate a new Science and Engineering Complex at TA–62 (analyzed as the Science Complex Option 1 in Appendix G of the SWEIS): This action consolidates offices and light laboratories currently located in several outmoded structures at LANL into a new, state-of-the-art facility of approximately 400,000 gsf. It would support scientific research activities in both basic and applied sciences. Execution of this project would be accompanied by DD&D of excess structures at LANL.

The NNSA will implement changes to operational levels at existing facilities and install new infrastructure analyzed as part of the Expanded Operations Alternative that support decisions announced in this ROD, the 2008 SWEIS ROD and the two SPEIS RODs. The changes to on-going operational levels at existing facilities (and their replacement facilities) include: (1) Changes and increases to the capabilities for waste storage, characterization, packaging, and labeling at solid and liquid radioactive waste and chemical waste management and treatment facilities to support the processing and disposition of transuranic, low-level and mixed low-level radioactive waste, and chemical waste from site DD&D activities; and (2) the performance of site assessments, soil remediation, and the enhancement of field capabilities to support of environmental remediation and risk mitigation at LANL.

Mitigation Measures

As described in the SWEIS, NNSA and LANL operate pursuant to a number of Federal laws including environmental laws, DOE Orders, and Federal, State, and local controls, and agreements. Many of these mandate actions that serve to mitigate potential adverse environmental impacts. A Los Alamos Mitigation Action Plan (MAP) for the SWEIS RODs has been issued and will be reviewed and updated as necessary to implement this ROD. As discussed in the 2008 ROD, this MAP contains a summary of all commitments for LANL that are either underway or will be initiated. These commitments include such actions as continued forest management efforts, trail management efforts, and implementation of a variety of site sampling and monitoring measures, as well as additional measures to reduce potable water use and pollutant emissions and implement resource conservation initiatives.

In addition, with respect to concerns raised by the Santa Clara Pueblo, as discussed in the 2008 ROD, NNSA will continue its efforts to support the Pueblo and other tribal entities in matters of human health and will participate in various intergovernmental efforts to protect indigenous practices and locations of concern. NNSA will conduct government-to-government consultations with the Pueblo and other tribal entities to incorporate these matters into the MAP.

Issued at Washington, DC, this 29 day of June 2009.

Thomas P. D'Agostino,

Administrator, National Nuclear Security Administration.

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DEPARTMENT OF ENERGY

Record of Decision for the Complex Transformation Supplemental Programmatic Environmental Impact Statement—Operations Involving Plutonium, Uranium, and the Assembly and Disassembly of Nuclear Weapons

AGENCY: National Nuclear Security Administration, U.S. Department of Energy.

ACTION: Record of decision.

SUMMARY: The National Nuclear Security Administration (NNSA), a separately organized agency within the U.S. Department of Energy (DOE), is issuing this Record of Decision (ROD) for the continued transformation of the nuclear weapons complex (Complex). This ROD is based on information and analyses contained in the *Complex Transformation Supplemental Programmatic Environmental Impact Statement* (SPEIS) (DOE/EIS–0236–S4) issued on October 24, 2008 (73 FR 63460); comments received on the SPEIS; other NEPA analyses as noted; and other factors, including cost, technical and security considerations, and the missions of NNSA. The SPEIS analyzes the potential environmental impacts of alternatives for transforming the nuclear weapons complex into a smaller, more efficient enterprise that can respond to changing national security challenges and ensure the long-term safety, security, and reliability of the nuclear weapons stockpile.

The alternatives analyzed in the SPEIS are divided into two categories: programmatic and project-specific. Programmatic alternatives involve the restructuring of facilities that use or store significant (i.e., Category I/II) quantities of special nuclear material (SNM).[1] These facilities produce plutonium components (commonly called pits [2]), produce highly enriched uranium (HEU) components (including secondaries [3]), fabricate high explosives (HE) components, and assemble and disassemble nuclear weapons. The decisions announced in this ROD relate to the programmatic alternatives analyzed in the SPEIS. NNSA is issuing a separate ROD relating to the project-specific alternatives.

NNSA has decided to implement its preferred programmatic alternative as described in the SPEIS and summarized in this ROD. This decision will transform the plutonium and uranium manufacturing aspects of the complex into smaller and more efficient operations while maintaining the capabilities NNSA needs to perform its national security missions. The three major elements of the decisions announced in this ROD are:

(1) Manufacturing and research and development (R&D) involving plutonium will remain at the Los Alamos National Laboratory (LANL) in New Mexico. To support these activities, NNSA will construct and operate the Chemistry and Metallurgy Research Replacement–Nuclear Facility (CMRR–NF) at LANL as a replacement for portions of the Chemistry and Metallurgy Research (CMR) facility, a structure that is more than 50 years old

[1] As defined in section 11 of the *Atomic Energy Act of 1954,* special nuclear material is: (1) Plutonium, uranium enriched in the isotope 233 or in the isotope 235 and any other material which the U.S. Nuclear Regulatory Commission determines to be special nuclear material; or (2) any material artificially enriched by any of the foregoing. Special nuclear material is separated into Security Categories I, II, III, and IV based on the type, attractiveness level, and quantity of the material. Categories I and II require the highest level of security.

[2] A pit is the central core of a nuclear weapon, principally made of plutonium or enriched uranium.

[3] A secondary is the component of a nuclear weapon that contains elements needed to initiate the fusion reaction in a thermonuclear explosion.

and faces significant safety and seismic challenges to its continued operation.

(2) Manufacturing and R&D involving uranium will remain at the Y–12 National Security Complex in Tennessee. NNSA will construct and operate a Uranium Processing Facility (UPF) at Y–12 as a replacement for existing facilities that are more than 50 years old and face significant safety and maintenance challenges to their continued operation.

(3) Assembly and disassembly of nuclear weapons and high explosives production and manufacturing will remain at the Pantex Plant in Texas.

These decisions will best enable NNSA to meet its statutory mission while minimizing technical risks, risks to mission objectives, costs, and environmental impacts. These decisions continue the transformation begun following the end of the Cold War and the cessation of nuclear weapons testing, particularly decisions announced in the 1996 ROD for the *Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (SSM PEIS) (DOE/EIS–0236) (61 FR 68014; Dec. 26, 1996). This ROD explains why NNSA is making these programmatic decisions, why it is appropriate to make them at this time, and the flexibility NNSA has to adapt these decisions as needed in response to any changes in national security requirements that may occur in the near term.

FOR FURTHER INFORMATION CONTACT: For further information on the Complex Transformation SPEIS or this ROD, or to receive copies of these, contact: Ms. Mary E. Martin, NNSA NEPA Compliance Officer, Office of Environmental Projects and Operations, NA–56, U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585, toll free 1–800–832–0885 ext. 69438. A request for a copy of the SPEIS or this ROD may be sent by facsimile to 1–703–931–9222, or by e-mail to *complextransformation@nnsa.doe.gov*. The SPEIS, this ROD, the project-specific ROD, and additional information regarding complex transformation are available at *http://www.ComplexTransformationSPEIS.com* and *http://www.nnsa.doe.gov*.

For information on DOE's NEPA process, contact: Ms. Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance (GC–20), U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585, 202–586–4600, or leave a message at 800–472–2756. Additional information regarding DOE NEPA activities and access to many DOE NEPA documents are available through the DOE NEPA Web site at: *http://www.gc.energy.gov/NEPA*.

SUPPLEMENTARY INFORMATION:

Background

NNSA prepared this ROD pursuant to the regulations of the Council on Environmental Quality (CEQ) for implementing the *National Environmental Policy Act* (NEPA) (40 CFR Parts 1500–1508) and DOE's NEPA Implementing Procedures (10 CFR Part 1021). This ROD is based on information and analyses contained in the *Complex Transformation Supplemental Programmatic Environmental Impact Statement* (SPEIS) (DOE/EIS–0236-S4) issued on October 24, 2008 (73 FR 63460); comments received on the SPEIS; other NEPA analyses as noted; other factors, including cost, technical and security considerations, and the missions of NNSA. NNSA received approximately 100,000 comment documents on the Draft SPEIS from Federal agencies; state, local, and tribal governments; public and private organizations; and individuals. In addition, during the 20 public hearings that NNSA held, more than 600 speakers made oral comments.

National security policies require DOE, through NNSA, to maintain the United States' nuclear weapons stockpile, as well as the nation's core competencies in nuclear weapons. Since completing the SSM PEIS and associated ROD in 1996, DOE has pursued these objectives through the Stockpile Stewardship Program. This program emphasizes development and application of greatly improved scientific and technical capabilities to assess the safety, security, and reliability of existing nuclear warheads without nuclear testing. Throughout the 1990s, DOE also took steps to consolidate the Complex to its current configuration of three national laboratories (and a flight test range operated by Sandia National Laboratories), four industrial plants, and a nuclear test site. This Complex enables NNSA to design, develop, manufacture, maintain, and repair nuclear weapons; certify their safety, security, and reliability; conduct surveillance on weapons in the stockpile; store Category I/II SNM; and dismantle and disposition retired weapons. Sites within the Complex and their current weapons program missions are described in the following paragraphs.

Lawrence Livermore National Laboratory (LLNL), Livermore, California—LLNL conducts research, design, and development of nuclear weapons; designs and tests advanced technology concepts; provides safety, security, and reliability assessments and certification of stockpile weapons; conducts plutonium and tritium R&D, hydrotesting, HE R&D and environmental testing; and stores Category I/II quantities of SNM. LLNL also conducts destructive and nondestructive surveillance evaluations on pits to evaluate their reliability. NNSA is currently removing Category I/II SNM from the site and by 2012 LLNL will not maintain these categories of SNM. NNSA is constructing the National Ignition Facility (NIF) at LLNL, which will allow a wide variety of high-energy-density investigations. NIF is scheduled to begin operations in 2009.

Los Alamos National Laboratory (LANL), Los Alamos, New Mexico—LANL conducts research, design, and development of nuclear weapons; designs and tests advanced technology concepts; provides safety, security, and reliability assessments and certification of stockpile weapons; maintains production capabilities for limited quantities of plutonium components (i.e., pits) for delivery to the stockpile; manufactures nuclear weapon detonators for the stockpile; conducts plutonium and tritium R&D, hydrotesting, HE R&D and environmental testing; and stores Category I/II quantities of SNM. LANL also conducts destructive and nondestructive surveillance evaluations on pits to assess their reliability.

Nevada Test Site (NTS), 65 miles northwest of Las Vegas, Nevada—NTS maintains the capability to conduct underground nuclear testing; conducts high hazard experiments involving nuclear material and high explosives; provides the capability to process and dispose of a damaged nuclear weapon or improvised nuclear device; conducts non-nuclear experiments; conducts hydrodynamic testing and HE testing; conducts research and training on nuclear safeguards, criticality safety, and emergency response; and stores Category I/II quantities of SNM.

Pantex Plant (Pantex), Amarillo, Texas—Pantex dismantles retired weapons; fabricates HE components, and performs HE R&D; assembles HE, nuclear, and non-nuclear components into nuclear weapons; repairs and modifies weapons; performs nonintrusive pit modification;[4] and evaluates and performs surveillance of weapons. Pantex stores Category I/II

[4] Nonintrusive pit modification involves changes to the external surfaces and features of a pit.

quantities of SNM for the weapons program and stores other SNM in the form of surplus plutonium pits pending transfer to SRS for disposition.

Savannah River Site (SRS), Aiken, South Carolina—SRS extracts tritium and performs loading, unloading, and surveillance of tritium reservoirs, and conducts tritium R&D. SRS does not store Category I/II quantities of SNM for NNSA's weapons activities, but does store Category I/II quantities for other DOE activities. SRS is currently receiving Category I/II surplus, non-pit plutonium from LLNL for storage pending its disposition.

Y–12 National Security Complex (Y–12), Oak Ridge, Tennessee—Y–12 manufactures uranium components for nuclear weapons, cases, and other nuclear weapons components; evaluates and tests these components; stores Category I/II quantities of HEU; conducts dismantlement, storage, and disposition of HEU; and supplies HEU for use in naval reactors.

The following two sites are part of the Complex but would not be affected by decisions announced in this ROD.

Kansas City Plant (KCP), Kansas City, Missouri—KCP manufactures and procures non-nuclear components for nuclear weapons and evaluates and tests these components. KCP has no SNM. The General Services Administration, as the lead agency, and NNSA, as a cooperating agency, prepared an Environmental Assessment (DOE/EA–1592, Apr. 2008) regarding the potential environmental impacts of modernizing the facilities and infrastructure for the non-nuclear production activities conducted by the KCP as well as moving these activities to other locations. The agencies issued a Finding of No Significant Impact (73 FR 23244; Apr. 29, 2008) regarding an alternative site in the Kansas City area. The SPEIS does not assess alternatives for the activities conducted at the KCP.

Sandia National Laboratories (SNL), Albuquerque, New Mexico; Livermore, California; and other locations—SNL conducts systems engineering of nuclear weapons; conducts research, design, and development of non-nuclear components; manufactures non-nuclear components, including neutron generators, for the stockpile; provides safety, security, and reliability assessments of stockpile weapons; and conducts HE R&D, tritium R&D, and environmental testing. The principal laboratory is located in Albuquerque, New Mexico (SNL/NM); a division of the laboratory (SNL/CA) is located in Livermore, California. SNL also operates the Tonopah Test Range (TTR) near Tonopah, Nevada, for flight testing of gravity weapons (including R&D and testing of nuclear weapons components and delivery systems). In 2008, NNSA completed the removal of SNL/NM's Category I/II SNM. SNL/NM no longer stores or uses these categories of SNM on an ongoing basis, although it may use Category I/II SNM for limited periods in the future. No SNM is stored at TTR, although some test operations have involved SNM.

Alternatives Considered

NNSA has been considering how to continue the transformation of the Complex since the Nuclear Posture Review [5] was transmitted to Congress by the Department of Defense in early 2002. NNSA considered the Stockpile Stewardship Conference in 2003, the Department of Defense Strategic Capabilities Assessment in 2004, the recommendations of the Secretary of Energy Advisory Board Task Force on the Nuclear Weapons Complex Infrastructure in 2005, and the Defense Science Board Task Force on Nuclear Capabilities in 2006 as to how transformation should continue. Based on these studies and other information, NNSA developed the range of reasonable alternatives for the Complex that could reduce its size, reduce the number of sites with Category I/II SNM (and storage locations for these categories of SNM within sites), eliminate redundant activities, and improve the responsiveness of the Complex. The following programmatic capabilities involving SNM are evaluated in the SPEIS:

- Plutonium operations, including pit manufacturing; Category I/II SNM storage; and related R&D;
- Enriched uranium operations, including canned subassembly manufacturing, assembly, and disassembly; Category I/II SNM storage; and related R&D; and
- Weapons assembly and disassembly and HE production (collectively, A/D/HE).

The programmatic alternatives analyzed in the SPEIS are discussed in the following paragraphs.

No Action Alternative. NNSA evaluated a No Action Alternative, which represents continuation of the status quo including implementation of past decisions. Under the No Action Alternative, NNSA would not make additional major changes to the SNM missions now assigned to its sites.

Programmatic Alternative 1: Distributed Centers of Excellence. This alternative would locate the three major SNM functional capabilities (plutonium, uranium, and weapons assembly and disassembly) involving Category I/II quantities of SNM at two or three separate sites. This alternative would create a consolidated plutonium center (CPC) for R&D, storage, processing, and manufacture of pits. Production rates of up to 125 pits per year for single shift operations and up to 200 pits annually for multiple shifts and extended work weeks are assessed for a CPC in this alternative. A CPC could consist of new facilities, or modifications to existing facilities at LANL, NTS, Pantex, SRS, or Y–12. The SPEIS also evaluated an option under this alternative that would upgrade facilities at LANL to produce up to 80 pits per year. This option would involve the construction and operation of the CMRR-NF. Highly-enriched uranium storage and uranium operations would continue at Y–12. Under this alternative, NNSA analyzed two options—construction of a new UPF and an upgrade of existing facilities at Y–12. The weapons A/D/HE mission would remain at Pantex under this programmatic alternative.

Programmatic Alternative 2: Consolidated Centers of Excellence. NNSA would consolidate the three major SNM functions (plutonium, uranium, and weapons assembly and disassembly) involving Category I/II quantities of SNM at one or two sites under this alternative. Two options were assessed: (1) The single site option (referred to as the consolidated nuclear production center [CNPC] option); and (2) the two-site option (referred to as the consolidated nuclear centers [CNC] option). Under the CNPC option, a new CNPC could be established at LANL, NTS, Pantex, SRS, or Y–12. Under the CNC option, the plutonium and uranium component manufacturing missions would be separate from the A/D/HE mission. The Consolidated Centers of Excellence Alternative assumed production rates of up to 125 weapons per year for single shift operations and up to 200 weapons annually for multiple shifts and extended work weeks.

Programmatic Alternative 3: Capability-Based Alternative. Under this alternative, NNSA would maintain a basic capability for manufacturing components for all stockpile weapons, as well as laboratory and experimental capabilities to support stockpile stewardship, but would reduce production facilities in-place such that NNSA would produce only a nominal level of replacement components (approximately 50 components per year). Within this alternative, NNSA

[5] The Nuclear Posture Review is a comprehensive analysis that lays out the direction for the United States' nuclear forces.

also evaluated a No Net Production/Capability-Based Alternative, in which NNSA would maintain capabilities to continue surveillance of the weapons stockpile, produce limited life components, and dismantle weapons, but would not add new types or increased numbers of weapons to the stockpile. This alternative involves minimum production (i.e., production of 10 sets of components or assembly of 10 weapons per year) within facilities with a larger manufacturing capability. Both options of this alternative would involve the construction and operation of a CMRR–NF.

Preferred Alternative

The Final SPEIS identified the following preferred alternatives for restructuring facilities that use significant quantities of SNM:

• Plutonium R&D and manufacturing: LANL would provide a consolidated plutonium research, development, and manufacturing capability within TA–55 (the Technical Area at LANL containing plutonium processing facilities) enabled by construction and operation of the CMRR-NF. The CMRR-NF would replace the existing CMR facility (a 50-year-old facility that has significant safety issues that cannot be addressed in the existing structure), to support transfer of plutonium R&D and Category I/II quantities of SNM from LLNL, and consolidation of weapons-related plutonium operations, including plutonium R&D and storage of Category I/II quantities of SNM, at LANL. Until completion of a new Nuclear Posture Review in 2009 or later, the net production at LANL would be limited to a maximum of 20 pits per year. Other national security actinide missions (e.g., emergency response, material disposition, nuclear energy) would continue at TA–55.

• Uranium manufacturing and R&D: Y–12 would continue as the uranium center, producing components and canned subassemblies, and conducting surveillance and dismantlement. NNSA completed construction of the Highly Enriched Uranium Materials Facility (HEUMF) in 2008 and will consolidate HEU storage in that facility.[6] NNSA would build a UPF at Y–12 to provide a smaller and modern highly-enriched uranium production capability, replacing 50-year-old facilities.

• Assembly/disassembly/high explosives production and manufacturing: Pantex would remain the assembly/disassembly/high explosives production and manufacturing center. NNSA would consolidate non-destructive weapons surveillance operations at Pantex.

• Consolidation of Category I/II SNM: NNSA would continue ongoing actions to transfer Category I/II SNM from LLNL under the No Action Alternative and phase out Category I/II operations at LLNL by the end of 2012.

Environmentally Preferable Alternative

Section 101 of NEPA (42 U.S.C. 4331) establishes a policy of federal agencies having a continuing responsibility to improve and coordinate their plans, functions, programs, and resources so that, among other goals, the nation may fulfill its responsibilities as a trustee of the environment for succeeding generations. The CEQ, in its ''Forty Most Asked Questions Concerning CEQ's NEPA Regulations'' (46 FR 18026; Mar. 23, 1981), defines the ''environmentally preferable alternative'' as the alternative ''that will promote the national environmental policy expressed in NEPA's Section 101.''

The analyses in the SPEIS of the environmental impacts associated with the programmatic alternatives indicated that the No Net Production/Capability-Based Alternative is environmentally preferable. This alternative would result in the minimum infrastructure demands (e.g., electricity and water use would be reduced by almost 50 percent at some sites); produce the least amount of wastes (radioactive wastes would be reduced by approximately 33–50 percent compared to the No Action Alternative); reduce worker radiation doses (by approximately 33–50 percent compared to the No Action Alternative); and require the fewest employees (up to 40 percent fewer at some sites). Almost all of these reductions in potential impacts result from the reduced production levels assumed for this alternative.

Alternatives Considered but Eliminated From Detailed Study

NNSA considered programmatic alternatives other than those described above, but concluded that these alternatives were not reasonable and eliminated them from detailed analysis. As discussed in the SPEIS, the following alternatives were considered but eliminated from detailed study: (1) Consolidate the Three Nuclear Weapons Laboratories (LLNL, LANL and SNL); (2) Curatorship Alternative; (3) Smaller CNPC Alternative; (4) New CPC with a Smaller Capacity; (5) Purchase Pits; (6) Upgrade Building 332 at LLNL to enable pit production; (7) Consider Other Sites for the CPC; (8) Redesign Weapons to Require Less or No Plutonium; and (9) Do Not Produce New Pits (see Section 3.15, Volume I of the SPEIS).

Decisions

With respect to the three major SNM functional capabilities (plutonium, uranium, and weapons assembly and disassembly) involving Category I/II quantities of SNM, NNSA has decided to keep these functional capabilities at three separate sites:

• Plutonium manufacturing and R&D will remain at LANL, and NNSA will construct and operate the CMRR-NF there to support these activities;

• Uranium manufacturing and R&D will remain at Y–12 and NNSA will construct and operate a UPF there to support these activities;

• Assembly/disassembly/high explosives production and manufacturing will remain at Pantex.

With respect to SNM consolidation, NNSA will continue ongoing activities[7] to transfer Category I/II SNM from LLNL under the No Action Alternative and phase out Category I/II operations at LLNL by the end of 2012.

Bases for Decisions

Overview

NNSA's decision locates the three major functional capabilities involving Category I/II quantities of SNM at three separate sites where these missions are currently performed. The selected alternative, which is a combination of the Distributed Centers of Excellence and Capability-Based Alternatives, has the least cost and lowest risk. Consolidation or transfer of uranium and plutonium operations to other sites (as analyzed in several options under the Distributed and Consolidated Centers of Excellence Alternatives) could result in lower operational costs and other benefits if and when such an alternative were fully implemented. However, movement of any of these three major capabilities to another site poses unacceptable programmatic risks and would cost far more than the selected alternative for an extended period of time. Moving one or more of these capabilities would take years to achieve and might be unsuccessful; in the interim, NNSA would need to build some new facilities at the sites where these capabilities are currently located

[6] The environmental impacts of HEUMF and its alternatives are analyzed in the *Site-wide Environmental Impact Statement for the Y–12 National Security Complex* (DOE/EIS–0309, 2001); NNSA announced its decision to construct and operate HEUMF on March 13, 2002 (67 FR 11296).

[7] In regard to surplus, non-pit, weapons-usable plutonium currently at LLNL, transfer to SRS for storage pending disposition is being undertaken consistent with decisions announced on September 11, 2007, in an Amended ROD (72 FR 51807) based on the *Storage and Disposition of Weapons-Usable Fissile Materials Programmatic EIS.*

simply to maintain those capabilities during the relocation process.

Similarly, the No Action Alternative is unacceptable because it would require NNSA to continue operations in facilities that are outdated, too costly to operate, and not capable of meeting modern environment, health and safety (ES&H) or security standards. These facilities cannot be relied upon much longer, and must be replaced or closed.

Under NNSA's decision, plutonium operations remain at LANL. It will not construct a new pit manufacturing facility such as a CPC or a CNPC because it appears unlikely there will be a need to produce more than 10–80 pits per year in the future and because constructing these facilities would be very expensive. Instead, NNSA will upgrade the existing plutonium facilities at the laboratory and will construct a CMRR–NF.[8] Construction of this facility is a needed modernization of LANL's plutonium capabilities—continued use of the existing CMR facility is inefficient and poses ES&H and security issues that cannot be addressed by modifying the CMR. Uranium operations remain at Y–12, and NNSA will construct a UPF because the existing uranium production facilities are also beyond their useful lives, inefficient, and present ES&H and security issues similar to those at CMR. CMRR–NF and UPF will be safer, seismically robust, and easier to defend from potential terrorist attacks. Their size will support production rates appropriate for a reasonable range of future stockpile sizes, and would not be much smaller if future production rates were much lower than currently anticipated.[9]

Plutonium Operations

With respect to plutonium manufacturing, NNSA is not making any new decisions regarding production capacity until completion of a new Nuclear Posture Review in 2009 or later. NNSA does not foresee an imminent need to produce more than 20 pits per year to meet national security requirements. This production level was established almost 10 years ago in the ROD (64 FR 50797, Sept. 20, 1999) based on the *Site-wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory* (1999 LANL SWEIS; DOE/EIS–0238). The ROD based on the 2008 LANL SWEIS (DOE/EIS–0380) continued this limit on production (73 FR 55833; Sept. 26, 2008). NNSA will continue design of a CMRR–NF that would support a potential annual production (in LANL's TA–55 facilities) of 20–80 pits. The design activities are sufficiently flexible to account for changing national security requirements that could result from a new Nuclear Posture Review, further changes to the size of stockpile, or future Federal budgets. Furthermore, because NNSA's sensitivity analyses have shown that there is little difference in the size of a facility needed to support production rates between 1 and 80 components per year, the future production capacity is not anticipated to have a significant impact on the size of the CMRR–NF.[10] With a new CMRR–NF providing support, the existing plutonium facility at LANL will have sufficient capability to produce between 1 and 80 pits per year. A new CMRR–NF will also allow NNSA to better support national security missions involving plutonium and other actinides (including, e.g., the plutonium-238 heat source program undertaken for the National Aeronautics and Space Administration (NASA); non-proliferation programs, including the sealed source recovery program; emergency response; nuclear counter-terrorism; nuclear forensics; render safe program (program to disable improvised nuclear devices); material disposition; and nuclear fuel research and development).

Uranium Operations

With respect to uranium manufacturing, NNSA will maintain the current capacity in existing facilities at Y–12 as discussed in Section 3.5 of the SPEIS and within the planning basis discussed in Section 3.1.2 of the 2001 *Site-wide Environmental Impact Statement for the Y–12 National Security Complex* (2001 Y–12 SWEIS; DOE/EIS–0309). NNSA is preparing a new SWEIS for Y–12 (*Site-wide Environmental Impact Statement for the Y–12 National Security Complex, Oak Ridge, Tennessee* (Y–12 SWEIS; DOE/EIS–0387)), which will evaluate site-specific issues associated with continued production operations at Y–12, including issues related to construction and operation of a UPF such as its location and size. The Y–12 SWEIS will consider any new information (such as a new Nuclear Posture Review or further changes to the stockpile) that becomes available during the preparation of that document.

Assembly and Disassembly of Weapons and High Explosives Production

NNSA will continue to conduct these operations at Pantex as announced in the ROD (62 FR 3880; Jan. 27, 1997) for the *Environmental Impact Statement for the Continued Operation of the Pantex Plant and Associated Storage of Nuclear Weapon Components* (DOE/EIS–0225, 1996).

Production Rates and New Facilities

While NNSA is not making any new decisions regarding the production rates of plutonium or uranium components, it has decided that a CMRR–NF and UPF are essential to its ability to meet national security requirements regarding the nation's nuclear deterrent. The existing facilities where these operations are now conducted cannot be used much longer and cannot be renovated in a manner that is either affordable or acceptable (from ES&H, security, and production perspectives). As NNSA continues the design and, in the case of a UPF, NEPA analysis of these facilities, it can modify them to reflect changing requirements such as those resulting from a new Nuclear Posture Review, further changes to stockpile size, and future federal budgets. In short, a CMRR–NF and UPF are needed for NNSA to maintain its basic nuclear weapons capabilities because they would replace outdated and deteriorating facilities. These facilities are needed regardless of how many or what types of weapons may be called for in the future.

National Security Requirements and Stockpile Size

In making these decisions, NNSA considered its statutory responsibilities to support the nuclear weapons stockpile as determined by the President and the Congress. President Bush's goal is to achieve a credible nuclear deterrent with the lowest possible number of nuclear warheads consistent with

[8] NNSA prepared an *Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico* (CMRR EIS) (DOE/EIS–0350). The CMRR EIS evaluates potential impacts of the proposed relocation of analytical chemistry and materials characterization activities and associated R&D to a new CMRR. The proposed CMRR consists of a nuclear facility—CMRR–NF—and a separate radiological laboratory, administrative office, and support building. See also the 2008 *Site-Wide Environmental Impact Statement for Los Alamos National Laboratory* (2008 LANL SWEIS, DOE/EIS–0380). In deciding to construct the CMRR–NF at LANL, NNSA considered the analyses in the CMRR EIS and the 2008 LANL SWEIS, as well as those in the SPEIS.

[9] NNSA evaluated various sizes for facilities analyzed in the SPEIS to determine if smaller facilities should be considered in detail for the Distributed and Consolidated Centers of Excellence Alternatives. NNSA evaluated the programmatic risk, cost effectiveness, and environmental impacts of smaller facilities and concluded that smaller facilities were not reasonable for some of these alternatives (see Section 3.15 of the SPEIS). Smaller facilities were considered for the Capability-Based Alternative.

[10] *See* note 9 *supra*.

national security needs. In 2002, he and Russia's President Putin signed the Moscow Treaty, under which the United States and Russia will each reduce the number of operationally deployed strategic nuclear weapons to 1,700–2,200 by 2012. In 2004, President Bush issued a directive to cut the entire U.S. stockpile—both deployed and reserve warheads—in half by 2012. This goal was later accelerated and achieved in 2007, five years ahead of schedule. At the end of 2007, the total stockpile was almost 50 percent below what it was in 2001. On December 18, 2007, the White House announced the President's decision to reduce the entire nuclear weapons stockpile by another 15 percent by 2012. This means the U.S. nuclear stockpile will be less than one-quarter its size at the end of the Cold War—the smallest stockpile since the Eisenhower Administration.

NNSA's analyses in the SPEIS are based on current national policy regarding stockpile size (1,700–2,200 operationally deployed strategic nuclear warheads by 2012) with flexibility to respond to future Presidential direction to make further changes in the numbers of weapons. Maintaining a stockpile requires the ability to detect aging effects and other changes in weapons (a surveillance program), the ability to fix identified problems without nuclear testing (the stockpile stewardship program), and the ability to produce replacement components and reassemble weapons (a fully capable set of production facilities).

NNSA understands that at least two major reviews of the requirements for the future nuclear weapons program are expected during the next year. These reviews may influence the size and composition of the future nuclear weapons stockpile, and the nuclear infrastructure required to support that stockpile. First, the Congress has established the Congressional Commission on the Strategic Posture of the United States. This commission is to conduct a review of the strategic posture of the United States, including a strategic threat assessment and a detailed review of nuclear weapons policy, strategy, and force structure. Its recommendations, currently scheduled for completion in the spring of 2009, are expected to address the size and nature of the future nuclear weapons stockpile, and the capabilities required to support that stockpile. Second, Congress has directed the Administration to conduct another Nuclear Posture Review in 2009 to clarify the United States' nuclear deterrence policy and strategy for the near term (i.e., the next 5–10 years). A report on this Nuclear Posture Review is due on December 1, 2009.

NNSA has structured its programs and plans in a manner that allows it to continue transforming the complex and to replace antiquated facilities while retaining the flexibility to respond to evolving national security requirements, which is essential for a truly responsive infrastructure. The decisions in this ROD allow NNSA to continue to rely on LANL facilities (with a new CMRR–NF) to provide maximum flexibility to respond to future changes in plutonium requirements.

Costs, Technical Risks, and Other Factors

NNSA prepared detailed business case studies of the programmatic alternatives. These studies are available at *http://www.ComplexTransformationSPEIS.com*. They provide a cost comparison of the alternatives and include costs associated with construction, transition, operations, maintenance, security, decontamination and decommissioning, and other relevant factors.[11] Based on these studies, NNSA determined that the costs through 2030 for the consolidation alternatives would be approximately 20–40 percent greater than for the alternatives that would maintain the three major capabilities—plutonium operations, uranium operations, and A/D/HE operations—at their current sites. Additionally, NNSA's analysis found that, through 2060, the costs for the consolidation alternatives would be greater than those for the alternatives that maintain the three capabilities where they are currently located.

With respect to technical risk, as part of the business case studies, NNSA evaluated five types of risk: (1) Engineering and construction; (2) implementation; (3) program; (4) safety and regulatory; and (5) security. These analyses balance nearer-term risks incurred while transitioning to an alternative with longer-term operational risks. For example, consolidation alternatives would have higher risks during the transition due to the challenges associated with mission relocations, but could have lower long-term operational risks because of reduced safety, regulatory, or security risks. All risk criteria were rated equally (20 percent each); a sensitivity analysis determined that the conclusions were not significantly affected by adjustments of plus or minus five percent in risk rating criteria.

The risk assessment was performed by a group of NNSA and contractor employees who are subject-matter experts, site experts, or both. The least risky options are those where the sites have previous experience with the mission or the nuclear material used in that mission. Alternatives that would locate the plutonium mission at LANL or SRS, the uranium mission at Y–12, and the weapons assembly and disassembly mission at Pantex, were determined to pose the lowest risk. Overall, the consolidation alternatives were judged to have 25–160 percent more technical risk than alternatives that would not consolidate or relocate missions.

With respect to plutonium R&D and manufacturing, the cost and risk analyses showed that keeping this mission at LANL has the least cost and poses the lowest risk. This results primarily from the fact that plutonium facilities are very expensive to construct and LANL has existing facilities, infrastructure, and trained personnel that can be used for this mission.

The CMRR–NF was analyzed in the *Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EIS–0350, Nov. 2003). The CMRR EIS evaluated potential environmental impacts of the proposed relocation of analytical chemistry and materials characterization activities and associated R&D to a new CMRR. Following completion of that EIS, NNSA announced its decision to construct and operate a CMRR consisting of two main buildings, one of which was the CMRR–NF (69 FR 6967; Feb. 12, 2004). The second building—providing laboratory, administrative, and support functions—currently is under construction at LANL. However, NNSA decided to defer a decision regarding construction and operation of the CMRR–NF until it completed the Complex Transformation SPEIS (see Section 1.5.2.1, Volume 1 of the SPEIS).

Analyses of the potential impacts of constructing and operating the CMRR–NF were updated in the *Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico* (2008 LANL SWEIS; DOE/EIS–0380, May 2008) as part of the Expanded Operations and the No Action Alternatives. In a ROD based on the 2008 LANL SWEIS, NNSA announced its decision to continue to implement the No Action Alternative with the

[11] The cost analyses considered both life-cycle costs (i.e., the cumulative costs over an approximately 50-year life) and discounted cash flows (i.e., a net present value in which all future costs are reduced by a common factor (generally the cost of capital)).

addition of some elements of the Expanded Operations Alternative. NNSA did not make any decision related to the CMRR–NF. It explained in the SWEIS ROD that it would not make any decisions regarding proposed actions analyzed in the SPEIS prior to completion of the SPEIS (73 FR 55833; Sept. 26, 2008). NNSA considered the analyses in the CMRR EIS and the 2008 LANL SWEIS, as well as those in the SPEIS in deciding to construct the CMRR–NF.

With respect to uranium manufacturing and R&D, the cost analyses indicated that building a UPF at Y–12, eliminating excess space, and shrinking the security area at the site will significantly reduce annual operational costs. The UPF at Y–12 will replace 50-year-old facilities, providing a smaller and modern production capability. It will enable NNSA to consolidate enriched uranium operations from six facilities at Y–12, and to reduce the size of the protected area at that site by as much as 90 percent. A new UPF will also allow NNSA to better support broader national security missions. These missions include providing fuel for Naval Reactors; processing and down-blending incoming HEU from the Global Threat Reduction Initiative; down-blending HEU for domestic and foreign research reactors in support of nonproliferation objectives; providing material for high-temperature fuels for space reactors (NASA); and supporting nuclear counter-terrorism, nuclear forensics, and the render safe program (program to disable improvised nuclear devices).

The life cycle cost analysis predicts an average annual savings over the 50-year facility life of approximately $200 million in FY 2007 dollars. The risk analysis found that moving the uranium mission to a site other than Y–12 would more than double the technical risks. The site-specific impacts for a UPF, including issues such as its location and size, will be analyzed in a new SWEIS for Y–12 that NNSA is currently preparing.

With respect to weapons assembly and disassembly and high explosives production, NNSA's decision to keep that mission at Pantex will result in the least cost and pose the lowest programmatic risk because the facilities necessary to conduct this work safely and economically already exist. Although no further NEPA analysis is required to continue these missions at Pantex, NNSA will continue to evaluate and update site-specific NEPA documentation as required by DOE regulations (10 CFR Part 1021).

With respect to SNM removal from LLNL, transferring Category I/II SNM to other sites and limiting LLNL operations to Category III/IV SNM will achieve a security savings of approximately $30 million per year at LLNL.

Potential Environmental Impacts

As described in greater detail in the following paragraphs, NNSA considered potential environmental impacts in making these decisions. It analyzed the potential impacts of each alternative on land use; visual resources; site infrastructure; air quality; noise; geology and soils; surface and groundwater quality; ecological resources; cultural and paleontological resources; socioeconomics; human health impacts; environmental justice; and waste management. NNSA also evaluated the impacts of each alternative as to irreversible or irretrievable commitments of resources, the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity, and cumulative impacts. In addition, it evaluated impacts of potential accidents on workers and surrounding populations. The SPEIS includes a classified appendix that assesses the potential environmental impacts of a representative set of credible terrorist scenarios.

The environmental impacts of the alternatives are analyzed in Chapter 5 of the SPEIS. The impacts of the alternatives NNSA has decided to pursue are summarized as follows:

Land Use—Minor land disturbance during construction of new facilities (approximately 6.5 acres at LANL for a CMRR–NF and 35 acres at Y–12 for a UPF); less area would be disturbed after construction is complete. At Y–12, construction of a UPF will allow NNSA to reduce the protected area by as much as 90 percent, which will improve security and reduce costs. At all sites, land uses will remain compatible with surrounding areas and with land use plans. At LANL and Y–12, the land required for operations will be less than 1 percent of the sites' total areas.

Visual Resources—Changes consistent with currently developed areas, with no changes in the Visual Resource Management classification. All sites will remain industrialized.

Infrastructure—Existing infrastructure is adequate to support construction and operating requirements at all sites. During operations, any changes to power requirements would be less than 10 percent of the electrical capacity at each site.

Air Quality—During construction, temporary emissions will result, but National Ambient Air Quality Standards will not be exceeded as a result of this construction. Operations will not introduce any significant new emissions and will not exceed any standards.

Water Resources—Water use will not change significantly compared to existing use and will remain within the amounts of water available at the NNSA sites. Annual water use at each site will increase by less than 5 percent.

Biological Resources—No adverse effects on biota and endangered species. Consultations with the U.S. Fish and Wildlife Service have been completed for the CMRR–NF. Consultations with the Fish and Wildlife Service will be conducted for a UPF during preparation of the Y–12 SWEIS.

Socioeconomics—Short-term employment increases at LANL and Y–12 during construction activities. The selected alternatives will have the least disruptive socioeconomic impacts at all sites. At Y–12, the total workforce will be reduced by approximately 750 workers (approximately 11 percent of the site's workforce) after UPF becomes operational. Employment at all other sites will change by less than 1 percent compared to any changes expected under the No Action Alternative.

Environmental Justice—No disproportionately high and adverse effects on minority or low-income populations will occur at any affected site; therefore, no environmental justice impacts will occur.

Health and Safety—Radiation doses to workers and the public will remain well below regulatory limits at all facilities and at all sites. Doses to the public and workers will cause less than one latent cancer fatality annually at all sites. Conducting future operations in the CMRR–NF and UPF will reduce the dose to workers compared to the doses they receive in existing facilities.

Accidents—The risk of industrial accidents is expected to be low during construction of the new facilities. Radiological accident risks will be low (i.e., probabilities of less than one latent cancer fatality) at all sites. The CMRR–NF and a UPF are expected to reduce the probability and impacts of potential accidents.

Intentional Destructive Acts—Construction of a UPF and CMRR–NF will provide better protection to the activities conducted in these facilities, as it is generally easier and more cost-effective to protect new facilities because modern security features can be incorporated into their design. Although the results of the intentional destructive acts analyses cannot be disclosed, the following general conclusion can be drawn: The potential consequences of intentional destructive acts are highly dependent upon distance to the site boundary and size of the surrounding population—the closer and higher the surrounding population, the higher the potential consequences. Removal of SNM from LLNL will reduce the potential impacts of intentional destructive acts at that site.

Waste Management—Waste generation will remain within existing and planned management capabilities at all sites. Existing waste management facilities are sufficient to manage these wastes and maintain compliance with regulatory requirements.

Cumulative Impacts—The cumulative environmental impacts of the alternatives are analyzed in Chapter 6 of the SPEIS. The impacts of the alternatives when added to past, present, and reasonably foreseeable future actions will be within all regulatory standards and not result in significant new impacts.

Mitigation Measures

As described in the SPEIS, NNSA operates in compliance with environmental laws, regulations, and policies within a framework of contractual requirements; many of these requirements mandate actions to control and mitigate potential adverse environmental effects. Examples include site security and threat protection plans, emergency plans, Integrated Safety Management Systems, pollution prevention and waste minimization programs, cultural resource and protected species programs, and energy and water conservation programs (e.g., the Leadership in Energy and Environmental Design (LEED) Program). Any additional site-specific mitigation actions would be identified in site-specific NEPA documents.

Comments Received on the Final SPEIS Related to the Programmatic Alternatives

During the 30-day period following the EPA's notice of availability for the Final SPEIS (73 FR 63460; Oct. 24, 2008), NNSA received written comments from the following groups: Alliance for Nuclear Accountability, Project on Government Oversight, National Radical Women, Physicians for Social Responsibility, Oak Ridge Environmental Peace Alliance, Tri-Valley CAREs, the Union of Concerned Scientists, Nuclear Watch New Mexico, the Arms and Security Initiative of the New America Foundation, Concerned Citizens for Nuclear Safety, Embudo Valley Environmental Group, Ecology Ministry, Loretto Community, Aqua es Vida Action Team, Citizens for Alternatives to Radioactive Dumping, and Tewa Women United. Written comments were also received from approximately 30 individuals. The comments NNSA received related to the programmatic alternatives and NNSA's responses follow.

Some commenters substantively reiterated comments that they had provided earlier on the Draft SPEIS, including comments that suggested:

1. NNSA should make no decisions on Complex Transformation until a new Nuclear Posture Review has been completed by the newly elected administration and the report issued by the Congressional Commission on the Strategic Posture of the United States.

Response: NNSA believes the SPEIS analysis is consistent with and supports national security requirements and policies. It is unreasonable to assume that nuclear weapons would not be a part of this nation's security requirements over the time period analyzed in the SPEIS and beyond. The range of alternatives analyzed in the SPEIS covers the range of national security requirements that NNSA believes could reasonably evolve from any changes to national policy with regard to the size and number of nuclear weapons in the foreseeable future. Accordingly, there is no reason to delay the decisions announced in this ROD on complex transformation pending a new Nuclear Posture Review or the recommendations of the Bipartisan Panel reevaluating the United States' Nuclear Strategic Posture (see Comment Response 1.C, Volume III, Chapter III of the SPEIS). This ROD fully explains why NNSA is making these programmatic decisions, why it is appropriate to make these decisions at this time, and the flexibility NNSA has to adapt to any changes in national security requirements that may occur in the near term.

2. The United States does not need nuclear weapons or the infrastructure that produces and maintains them and should pursue disarmament consistent with the Nuclear Non-Proliferation Treaty.

Response: Decisions on whether the United States should possess nuclear weapons and the type and number of those weapons are made by the President and the Congress. As long as this nation has nuclear weapons, a Complex must exist to ensure their safety, security and reliability. NNSA believes the SPEIS analysis is consistent with and supports national security requirements and policies (see Comment Responses 1.0, 2.K.12, and 3.0, Volume III, Chapter III of the SPEIS).

3. There is no need to produce new pits (or no need for certain production rates).

Response: While pits may have extremely long lifetimes and there may ultimately be no need to produce many additional ones, prudence requires that the nation have the capability to produce pits should the need arise. NNSA is not proposing to manufacture any pits unless they are needed to meet national security requirements. A need to produce pits could arise due to the effects of aging on existing pits or changes to our national security policies that could require more pits than the few NNSA is currently manufacturing for stockpile surveillance (see Comment Responses 2.K.16, 2.K.22, and 5.C.1, Volume III, Chapter III of the SPEIS). Until completion of a new Nuclear Posture Review in 2009 or later, the net production at LANL will be limited to a maximum of 20 pits per year.

4. NNSA should undertake further efforts at compliance with Article VI of the Nuclear Non-proliferation Treaty (NPT) (or, Complex Transformation violates this treaty).

Response: The United States has made significant progress toward achieving the nuclear disarmament goals set forth in the NPT, and is in compliance with its Article VI obligations. The NPT does not mandate disarmament or specific stockpile reductions by nuclear states, and it does not address actions they take to maintain their stockpiles. NNSA disagrees with the assertion that Complex Transformation violates the NPT (see Comment Response 1.F, Volume III, Chapter III of the SPEIS).

5. NNSA should have included Stockpile Curatorship as a reasonable alternative fully considered in the SPEIS.

Response: The Curatorship Alternative as proposed by comments on the Draft SPEIS would have required NNSA to give up the capabilities to design and develop replacement nuclear components and weapons, forcing it to rely solely on the surveillance and non-nuclear testing program to maintain weapons and identify when they need repairs. NNSA believes it is unreasonable to give up these capabilities in light of the uncertainties concerning the aging of weapons and changing national security requirements. As explained in the SPEIS in Section 3.15, this would impair NNSA's ability to assess and, if necessary, address issues regarding the safety, security, and reliability of nuclear weapons (see Comment

Responses 2.H.2, 5.H.2, and 7.O, Volume III, Chapter III of the SPEIS).

6. The transformed complex should not support design or production of new design or modified nuclear weapons.

Response: NNSA is required to maintain nuclear weapons capabilities, including the capability to design, develop, produce, and certify new warheads. Maintenance of the capability to certify weapons' safety and reliability requires an inherent capability to design and develop new weapons. NNSA has not been directed to produce newly designed weapons (see Comment Responses 1.B, Volume III, Chapter III of the SPEIS).

7. NNSA should provide additional information on epidemiological studies of radiation health of workers and communities.

Response: Many of the workers at DOE's 20 major sites have been studied epidemiologically, some for decades. The National Institute for Occupational Safety and Health continues to update these studies as warranted by public health and scientific considerations. As more powerful epidemiological study designs become available, new studies of these workers may provide better information about health risks associated with radiation exposure (see Comment Responses 14.K.5 and 14.K.6, Volume III, Chapter III of the SPEIS). Many of the epidemiological studies and other related studies are available at *http://cedr.lbl.gov.*

8. NNSA should focus on clean-up of its sites rather than building new facilities to make weapons.

Response: DOE has a large remediation program and is aggressively addressing past contamination issues at each of its sites. This program is conducted in accordance with federal and state regulatory requirements and includes administrative and engineered controls to minimize releases, as well as surveillance monitoring of the environment and reporting of exposure assessments. These remediation activities are directed by federal and state regulators, have their own schedule and funding, and are separate from actions proposed in the SPEIS (see Comment Responses 7.J and 9.B, Volume III, Chapter III of the SPEIS). It is inaccurate to suggest that cleanup and transformation are mutually exclusive.

9. NNSA should consolidate special nuclear material from LLNL faster than its current schedule.

Response: NNSA has begun the removal of Category I/II SNM from LLNL, and plans to complete it by 2012. NNSA will continue to give this action the high priority requested by the commenter. Safety, security, and logistical issues associated with preparing SNM for shipment; shipping the materials; and storage at the receiving sites determine the schedule for completing this removal (see Comment Response 5.N.4, Volume III, Chapter III of the SPEIS).

10. The modernization of the Kansas City Plant should have been included in the SPEIS.

Response: The activities of the Kansas City Plant were not included in the SPEIS because NNSA concluded that decisions regarding the consolidation and modernization of the Kansas City Plant's activities (the production and procurement of electrical and mechanical non-nuclear components) would not affect or limit the programmatic alternatives analyzed in the SPEIS, or the decisions NNSA makes regarding these alternatives (see Comment Response 12.0, Volume III, Chapter III of the SPEIS).

11. The SPEIS is not written in plain language and lacks a clear format.

Response: NNSA prepared the SPEIS in accordance with the requirements of NEPA and the DOE and CEQ NEPA regulations. NNSA believes that the SPEIS is clearly written and organized in light of the highly technical subject matter and complex nature of the alternatives (see Comment Response 2.A, Volume III, Chapter III of the SPEIS).

12. NNSA inadequately addressed the environmental impacts of intentional destructive acts. NNSA must disclose the potential impacts of successfully executed credible terrorist attack scenarios at sites in the nuclear weapons complex and make this information available to the public.

Response: A classified appendix to the Complex Transformation SPEIS evaluates the potential environmental impacts of credible terrorist attacks that NNSA assumed (for purposes of analysis pursuant to NEPA) were successful at specific existing and proposed facilities. The appendix is classified both because the scenarios evaluated contain classified information and because there is a risk that these scenarios and their potential impacts could be exploited by terrorists or others contemplating harmful acts. Therefore, the SPEIS provides limited information about these acts and their potential consequences (see ''Potential Environmental Impacts'' above and Comment Responses 13.B and 13.D, Volume III, Chapter III of the SPEIS).

13. NNSA failed to consider long-acting consequences of nuclear weapons production, including the impacts that result from every year of operation. NNSA also failed to consider the deployment or potential use of the nation's nuclear arsenal.

Response: The SPEIS assesses the direct, indirect, and cumulative environmental impacts of the No Action Alternative and reasonable alternatives for the proposed action. Impacts are assessed for both construction and operations. For operations, the SPEIS focuses on the steady-state impacts of operations. Those annual operational impacts are assumed to occur year-after-year. Now that NNSA has made decisions regarding programmatic alternatives, it may need to prepare additional NEPA documents such as site- or facility-level analyses (e.g., the ongoing Y–12 SWEIS for a UPF now that NNSA has decided to locate it at Y–12) (see Comment Response 11.0, Volume III, Chapter III of the SPEIS). NNSA does not make decisions concerning the size, deployment or potential use of the nation's nuclear arsenal, and therefore the consequences of these decisions are not appropriate for analysis in the SPEIS.

14. NNSA inadequately addressed the cumulative impacts of the alternatives, including a detailed and careful analysis of the cumulative impacts of major nuclear-related facilities in New Mexico. Additionally, Comment Response 14.J.4 incorrectly states that Appendix C and D include information about an analysis of cumulative impacts with an extended region of influence of 100 miles.

Response: NNSA addressed potential cumulative impacts resulting from Complex Transformation and ongoing and reasonably anticipated actions of NNSA, other agencies and private developers. In response to public comments, NNSA added a detailed analysis of the cumulative impacts of major nuclear-related facilities in New Mexico. NNSA thinks that analysis is appropriately detailed. The assessment of cumulative impacts is in Chapter 6 of Volume II of the SPEIS (see Comment Responses 2.I and 14.O, Volume III, Chapter III of the SPEIS). With respect to the analysis of cumulative impacts with an extended region of influence of 100 miles, NNSA agrees that the Final SPEIS incorrectly referred the reader to Appendix C and D. NNSA intended to refer the reader to the LANL SWEIS, which shows that extending the region of influence out another 50 miles increases the affected population by 300 percent, while the population dose increases by only 13 percent. NNSA regrets this error.

15. NNSA inadequately addressed Environmental Justice, including a more detailed analysis of transportation impacts and waste disposal.

Response: Under Executive Order 12898, NNSA is responsible for identifying and addressing potential disproportionately high and adverse human health and environmental impacts on minority or low-income populations. Based on the SPEIS's analyses, NNSA concluded that there would not be any disproportionately high and adverse human health and environmental impacts on minority or low-income populations. In response to public comments received, NNSA also included information regarding a ''special pathways analysis'' for operations at LANL for the purpose of assessing how impacts would change compared to standard modeling results. The special pathway analysis is identified in Volume II, Chapter 5, Section 5.1.10 of the SPEIS, and the results of that analysis are presented in Comment Response 14.J, Volume III, Chapter III of the SPEIS.

16. NNSA inadequately addressed the impacts associated with design and production of Reliable Replacement Warheads.

Response: The continuing transformation of the complex is independent of decisions regarding Reliable Replacement Warheads that the Congress and President may make. At present, the Congress has declined to provide additional funding for development of these warheads (see Comment Responses 2.K.19 and 8.0, Volume III, Chapter III of the SPEIS).

17. NNSA has provided an inadequate basis to decide to locate a UPF at Oak Ridge and there is insufficient information in the SPEIS to select a site for a UPF.

Response: Programmatic alternatives regarding a UPF are analyzed in the SPEIS. The SPEIS is the appropriate document to analyze and support programmatic decisions related to major uranium missions and facilities. The Y–12 SWEIS, currently under preparation, will evaluate site-specific issues associated with continued production operations at Y–12, including issues related to construction and operation of a UPF such as its location and size. NNSA will make decisions regarding the specific location and size based on the more detailed analysis that will be in the Y–12 SWEIS (see Comment Response 5.C.2, Volume III, Chapter III of the SPEIS).

18. Commenters said that NNSA should accelerate consolidation of excess SNM and down-blend hundreds of metric tons of excess HEU, which is highly desirable to nuclear terrorists who could use it to quickly and easily create a crude nuclear device.

Response: Disposal of excess SNM is addressed by the Material Disposition Program. NNSA has an ongoing program to down-blend HEU for disposition, as described in the ROD (61 FR 40619; August 5, 1996) for the *Disposition of Surplus Highly Enriched Uranium Environmental Impact Statement* (DOE/EIS–0240, 1996). The potential environmental impacts of an intentional destructive act, such as terrorism or sabotage, are addressed in a classified appendix to the SPEIS (see Comment Responses 5.M, 5.N, and 13.0, Volume III, Chapter III of the SPEIS).

19. NNSA should not move forward with the construction of the CMRR–NF at LANL because of problems with NNSA construction projects, the federal government's limited economic resources, and adequate existing space at the LANL PF–4. Another commenter asked why the CMRR–NF is needed.

Response: As explained in detail in this ROD, the CMRR–NF is a needed modernization of LANL's plutonium capabilities. Continued use of the existing CMR facility is inefficient and poses ES&H and security concerns that cannot be addressed by modifying the CMR. The CMRR–NF will be safer, seismically robust, and easier to defend from potential terrorist attacks (see Comment Responses 3.0, 5.C.1, 5.C.6, and 9.0, Volume III, Chapter III of the SPEIS).

20. The potential environmental impacts of postulated accidents are not adequately addressed in the SPEIS, including the potential impacts to air, land, and water resulting from postulated accidents.

Response: Accidents are addressed in the Health and Safety Sections for each site and include analyses for a full spectrum of accidents with both high and low probabilities (see Comment Response 14.N, Volume III, Chapter III of the SPEIS). The accident analysis focused on human health impacts, which NNSA decided was a reasonable metric for comparing the programmatic alternatives.

21. A new, more thorough, more transparent cost analysis needs to be done before Complex Transformation plans are allowed to proceed.

Response: The purpose and need for complex transformation result from NNSA's need for a nuclear weapons complex that can be operated less expensively. NNSA prepared business case analyses to provide cost information on the alternatives considered in the SPEIS. NNSA considered these studies, the analyses in the SPEIS, and other information to make these decisions regarding transforming the complex. The business case analyses are available to the public on the project Web site: *http://www.ComplexTransformationSPEIS.com* (see Comment Response 9.0, Volume III, Chapter III of the SPEIS). NNSA believes these studies are adequate for making programmatic and project-specific decisions.

22. NNSA failed to consider an alternative that truly consolidates the nuclear weapons complex.

Response: The SPEIS analyzes alternatives that would make the complex more efficient and responsive than it would be under the No Action Alternative. Consolidation alternatives were formulated with that purpose and need in mind. The SPEIS assesses a range of reasonable alternatives for the future weapons complex that includes alternatives that, if they had been selected, would have eliminated one or more nuclear weapons complex sites (see Comment Responses 7.A.5, 7.A.6, and 7.A.7, Volume III, Chapter III of the SPEIS). As this ROD explains, relocating uranium, plutonium, and A/D/HE capabilities would be too expensive and risky.

23. Complex Transformation endangers human health.

Response: New facilities would be designed and operated to minimize risk to both workers and the general public during normal operations and in the event of an accident. Benefiting from decades of experience, NNSA employs modern processes; manufacturing technologies; and safety, environmental, security, and management procedures to protect against adverse health impacts (see Comment Response 14.K, Volume III, Chapter III of the SPEIS).

24. NNSA has not adequately addressed public comments about water usage, radioactive and toxic air emissions, impacts to humans, and impacts to agricultural lands or prime farmlands surrounding LANL resulting from past, current, and future operations of LANL.

Response: The environmental impacts of operating LANL are described in Chapter 4, Section 4.1 of Volume 1 of the SPEIS. The analysis examined surrounding land uses, water availability and usage, air quality and airborne emissions, surface and groundwater quality and discharges, human health, waste management, visual resources, noise, and other impacts of operating LANL. Chapter 5, Section 5.1 of Volume II of the SPEIS analyzes the potential environmental impacts of the alternatives evaluated in the SPEIS in the same media areas. See Comment Responses 14.E.11 through 14.E.14, Volume III, Chapter III of the SPEIS. For example, comment response

14.E.11 states that ''due to concern expressed for the quality of agriculture in the LANL region, NMED (New Mexico Environment Department) collects and analyzes foodstuff samples as part of its surveillance program to ensure quality standards are met.'' The 2008 LANL SWEIS (DOE/EIS–0380), and the ROD (73 FR 55833; Sept. 26, 2008) based on the analyses in it, presented NNSA's responses to similar comments in more detail. NNSA based its programmatic decisions affecting LANL on both the SPEIS and the SWEIS.

25. Albuquerque will begin drinking water from the Rio Grande on December 5, 2008. The Albuquerque Water Utility Authority (WUA), which oversees the project, has detected long-lived alpha-emitting radionuclides in the river. Although the levels of these radionuclides are below regulatory concern, the research shows that the current EPA standards for long-lived alpha-emitting radionuclides are not protective of the fetus and the young child. The WUA has asked LANL to reveal the extent of the radiation on the plateau and canyons that contribute to the river to no avail.

Response: Water quality and use at LANL are addressed in the SPEIS at Section 4.1.5 of Volume I. Impacts of complex transformation on water resources at LANL are addressed in Section 5.1.5 of Volume II. There is no indication that contamination from LANL is affecting Albuquerque's drinking water supply. According to a 2007 water quality report, gross alpha particle activity, radium-228, radium-226, and uranium were among regulated substances that were monitored but not detected (Albuquerque Bernilillo County Water Utility Authority, 2007 Drinking Water Quality Report). The 2007 water quality report may be accessed at *http://www.abcwua.org/content/view/280/484/* (see Comment Response 14.E, Volume III, Chapter III of the SPEIS).

26. NNSA failed to address comments concerning elevated levels of radionuclides in the Rio Embudo Watershed.

Response: The levels of radionuclides from the fallout produced by atmospheric testing of nuclear weapons (e.g., cesium-137, strontium-90, and plutonium-239) are expected to be elevated at Trampas Lake and in the Sangre de Cristo Mountains in which the Embudo Valley lies. The Trampas Lake data agree with expectations for global fallout at this location and are not a result of LANL activities (see Comment Response 14.K.8, Volume III, Chapter III of the SPEIS).

27. Seismic fasteners, ties, and other protections should be used in the construction of the Radiological Laboratory, Utility, and Office Building (RLUOB) within the CMRR project.

Response: NNSA is building the RLUOB to the highest applicable seismic standards. Even though the structure is a radiological laboratory and would not normally be constructed to the same standards as a high hazard nuclear facility, NNSA is nevertheless constructing it to those higher standards (see Comment Response 14.K.7, Chapter III, Volume III of the SPEIS).

28. NNSA did not respond to the comment that it must expand air monitoring in downwind communities and should no longer hide under the grandfather clause for air emissions from its old facilities at LANL.

Response: Operating permits issued pursuant to Title V of the Clean Air Act at NNSA sites include requirements for monitoring emissions from sources and keeping records concerning those sources and their emissions. Monitoring of the environment in and around NNSA sites generally includes air, water, soil, and foodstuffs, and monitoring results are reported in annual environmental surveillance reports. Chapter 10 of Volume II of the SPEIS describes permits issued by regulatory authorities for NNSA facilities and operations. At LANL, NNSA complies with the Clean Air Act and its emissions are regulated by the New Mexico Environment Department (see Comment Response 14.D.2, Chapter III, Volume III of the SPEIS).

29. Will LANL become the second Waste Isolation Pilot Plant (WIPP) site in New Mexico under the Complex Transformation proposal?

Response: This comment concerns the disposal path for newly generated transuranic waste that could result from decisions made on complex transformation. The alternatives analyzed in the SPEIS could generate transuranic waste after WIPP's scheduled closure in 2035. At this time, DOE is not considering any legislative changes to extend WIPP's operation or to develop a second repository for transuranic waste. Any transuranic waste that is generated without a disposal pathway would be safely stored until disposal capacity becomes available (see Comment Response 14.M.4, Chapter III, Volume III of the SPEIS).

30. LANL has failed to install a reliable network of monitoring wells at the laboratory.

Response: LANL's groundwater monitoring program was discussed in the 2008 LANL SWEIS. Groundwater monitoring at LANL is conducted in compliance with the ''Order on Consent for Los Alamos National Laboratory'' (Consent Order), and consistent with the Interim Facility-wide Groundwater Monitoring Plan that was approved by the New Mexico Environment Department in June 2006. Some of the groundwater data at LANL are being reassessed due to potential residual drilling fluid effects. Drilling fluid effects are quantitatively assessed in LANL's Well-Screen Analysis Report, Rev. 2 (LA–UR–07–2852; May 2007). Fifty-two percent of the well screens evaluated in this report produce samples that are not significantly impacted by drilling fluids. LANL has initiated a program to better evaluate the wells and to rehabilitate wells that may be producing suspect results. LANL is using the results of a pilot study to develop a proposed course of action for approval by the New Mexico Environment Department. The process is established by and in compliance with the Consent Order (see Comment Responses 14.E.2 and 14.E.1, Chapter III, Volume III of the SPEIS).

31. The existing CMR facility is not safe and the seismic hazards at LANL are uncertain. The commenters assert that many of their specific comments concerning seismic issues at LANL were not properly addressed. The commenters also state that due to seismic risks, all plutonium operations at LANL should immediately cease.

Response: Section 4.1.6 of Volume I of the SPEIS addresses seismic issues at LANL and Comment Responses 7.0, 14.F.1, 14.K.12, 14.N.8 and 19.E provide additional information on the seismic issues at LANL and the Justification for Continued Operation under which the laboratory's facilities operate. NNSA decided to construct the CMRR–NF largely because the CMR facility cannot be modified to safely operate for many more years (see the basis for decision for plutonium research and development and operations above).

In addition to the comments that were essentially identical to ones submitted on the Draft SPEIS and to which NNSA responded to in the Final SPEIS, NNSA received the following new comments.

1. Some commenters stated they were unable to identify responses in the Final SPEIS to some of their comments.

Response: NNSA reviewed the comments it received to ensure that responses had been included in the Final SPEIS. Based on this review, NNSA concluded that it had provided appropriate responses for all comments and that responses to these commenters' submissions were included in the Final SPEIS.

2. The April 9, 2008, comments of the New Mexico Conference of Catholic Bishops, in a letter signed by Most Rev. Michael J. Sheehan, Archbishop of Santa Fe, and Most Rev. Ricardo Ramirez, CSB, Bishop of Las Cruces, were omitted from the SPEIS's text and compact disc (CD).

Response: NNSA does not have any record of receiving the letter identified above prior to issuing the Final SPEIS. However, NNSA contacted the commenter and requested a copy of the letter. That letter raised questions and issues related to: Potential violations of treaties; an international arms race; whether transformation of LANL will result in a more responsive infrastructure; whether the proposed transformation of the complex is based on a Nuclear Posture Review conducted before or after September 11, 2001; the type of Congressional support that has been received; and the costs and funding source for decontamination and decommissioning. NNSA reviewed these comments and concluded that the Final SPEIS addresses each of them.

3. A commenter asserted that the Scarboro community, within 5 miles of the Y–12 facility, is disproportionately impacted, historically and currently, by the pollutants released on the Oak Ridge Reservation. This commenter also urged NNSA to refrain from issuing a ROD for the SPEIS until it commissions and receives an independent study of canned subassembly/secondary reliability, indicating whether a UPF is actually necessary; and until NNSA prepares a supplemental EIS considering the nonproliferation impacts of the proposed action.

Response: NNSA conducted its Environmental Justice analysis consistent with the requirements of the applicable Executive Order and related guidance. Section 14.J of Volume III, Chapter III, addresses the Environmental Justice comments received during the comment period. The Scarboro community is identified as the closest developed area to Y–12 (see Volume II, Chapter 4, Section 4.9.2 of the SPEIS). The analysis in the SPEIS did not result in any disproportionately high and adverse impacts on any minority or low-income populations at Y–12 (see Volume II, Chapter 5, Sections 5.9.10, 5.9.11, and 5.9.12 of the SPEIS). The reasons for NNSA's decision to proceed with a UPF are set forth above in the discussion of uranium manufacturing and research and development. Comment Response 1.F, Volume III, Chapter III, addresses the nonproliferation impacts of Complex Transformation.

4. The Comment Response Document does not include several public petitions, including one from members of Santa Clara Pueblo supporting the comments made by the Tribal Council of Santa Clara Pueblo. Another petition circulated by youth in the Espanola Valley by the Community Service Organization del Norte (CSO del Norte) is also omitted. Many of the individual comment letters from people living in the Rio Embudo Watershed are missing as well. There is no listing of the names of these commenters in Tables 1.3–3, 1.3–4, 1.3–5 or 1.3–6. The listing of the ''Campaign Comment Documents'' fails to give any indication of the leaders of the campaigns or any geographic reference, unless one flips through that section of the document.

Response: NNSA received approximately 100,000 comment documents on the Draft SPEIS from federal agencies; state, local, and tribal governments; public and private organizations; and individuals. In addition, during the 20 public hearings that NNSA held, more than 600 speakers made oral comments. NNSA made every effort to include all comment documents in the SPEIS and to identify and to address every comment. Because it would be impractical to list the names of all commenters who submitted campaign e-mails, letters, and postcards, those names are provided electronically in the CD version of the SPEIS and on the project Web site (*http://www.ComplexTransformationSPEIS.com*). In addition, the CD contains additional information on the public comment period and includes meeting transcripts and signatories for campaign documents and petitions. With regard to the petition from members of the Santa Clara Pueblo, NNSA believes this petition was submitted as a comment on the 2008 LANL SWEIS and not as a comment on the SPEIS. NNSA responded to the petition in the ROD it issued in September that was based on the SWEIS. If any comment documents or petitions were omitted from the SPEIS, NNSA regrets that.

5. In Comment Response 14.K.11, Chapter III, Volume III of the SPEIS, NNSA, in response to a comment related to under-reported historic radiation emissions, stated that it was ''unaware of any published CDC [Centers for Disease Control and Prevention] study with findings as described by the commenter.'' The commenter had provided a reference to a Los Alamos Historical Document Retrieval and Assessment Project report for documentation of their claim that ''DOE has grossly under-reported historic radiation emissions by nearly 60-fold.''

Response: NNSA reviewed the Los Alamos Historical Document Retrieval and Assessment Project report, and NNSA stands by Comment Response 14.K.11, Chapter III, Volume III of the SPEIS, which states that, ''Chapter 4, Section 4.6.1, of the LANL SWEIS (LANL 2008) shows the radiation doses received over the past 10 years from LANL operations by the surrounding population and hypothetical maximally exposed individual (MEI). The annual dose to the hypothetical MEI has consistently been smaller than the annual 10-millirem radiation dose limit established for airborne emissions by the U.S. Environmental Protection Agency. The final LANL Public Health Assessment, by the Agency for Toxic Substances and Disease Registry, reports that ''there is no evidence of contamination from LANL that might be expected to result in ill health to the community,'' and that ''overall, cancer rates in the Los Alamos area are similar to cancer rates found in other communities'' (Agency for Toxic Substances and Disease Registry, *Public Health Assessment, Final, Los Alamos National Laboratory,* 2006).

6. A commenter noted that Comment Response 14.J.4, Chapter III, Volume III, of the SPEIS incorrectly refers the reader to Appendix D for a description of the accident analysis.

Response: The reference to Appendix D is incorrect. The correct reference should have been to Appendix C. NNSA regrets the confusion caused by this error.

7. A commenter stated that NNSA made a commitment to refrain from making a siting decision on the UPF until the Y–12 SWEIS is completed.

Response: NNSA did not make such a commitment. This ROD explains NNSA's decision to construct a UPF at Y–12 based on the analysis contained in the SPEIS and other factors. This decision is not a decision as to where at Y–12 the new facility would be located or its size. Those decisions will be made based on the more detailed analysis in the Y–12 SWEIS. Additionally, the Y–12 SWEIS will include one or more alternatives that do not include a UPF. The public will have the opportunity to review and comment on the Draft SWEIS when it is prepared.

8. With respect to the new section (Section 6.4) that NNSA added to the Final SPEIS to provide more information on the potential cumulative impacts of nuclear activities in New Mexico, one commenter stated that Pantex should be added to that cumulative assessment because it is just

as close to WIPP and to LANL as WIPP and LANL are to each other. Another commenter stated that the impacts of the WSMR should be included in that assessment.

Response: NNSA added Section 6.4 in response to public comments on the Draft SPEIS that requested an analysis of cumulative impacts for the three DOE nuclear Facilities in New Mexico, as well as other major planned or proposed nuclear facilities in the state. In part, these comments stated that the regions of influence for LANL and SNL/NM overlap and that all three DOE sites are along the Rio Grande corridor in New Mexico. NNSA believes that Section 6.4 is adequate and responsive to public comments received regarding the cumulative impact assessment of nuclear activities in New Mexico. As Pantex is not located in New Mexico, and its region of influence does not extend into New Mexico, it was not included in Section 6.4. Also, because the WSMR does not conduct nuclear activities, it was not included in Section 6.4.

9. A commenter stated that the socioeconomic impacts described in the SPEIS are ''incomplete and vague,'' and asked for an explanation regarding the economic multiplier used in the analysis.

Response: NNSA reviewed this comment and believes that the socioeconomic analyses contained in the SPEIS are appropriate and comply with NEPA's requirements. The economic multipliers used in the SPEIS vary by location and are consistent with the multipliers estimated by the U.S. Bureau of Labor Statistics and multipliers used in other NEPA documents.

10. The SPEIS failed to address impacts on global warming.

Response: The SPEIS assesses the direct, indirect, and cumulative environmental impacts of the No Action Alternative and reasonable alternatives for the proposed action. The assessment of impacts includes, where appropriate, the direct and indirect contributions to the emission of greenhouse gases resulting from operation and transformation of the nuclear weapons complex. As to the programmatic alternatives analyzed in the SPEIS, the direct impacts would result from the construction and operation of major facilities involved in operations using SNM (e.g., a CPC, CNPC, CMRR–NF, UPF), and from the transportation of components, materials and waste. The emissions of carbon dioxide (CO_2) from construction and operation of proposed major facilities are estimated in Chapter 5 (see Tables 5.1.4–1 and 5.1.4–3 in Section 5.1.4 of Chapter 5, Volume II of the SPEIS). The potential emissions from transportation are a direct function of numbers of trips and their distances. The significant differences among the various programmatic alternatives as to transportation also appear in Chapter 5 (see Section 5.10 of Chapter 5, Volume II of the SPEIS).

The indirect impacts of the programmatic alternatives would result primarily from the use of electricity that is generated from the mix of generating capacities (gas, coal, nuclear, wind, geothermal, etc.) operated by the utilities NNSA purchases power from; these utilities may alter that mix in the future regardless of the decisions NNSA makes regarding transformation of the complex. The use of electricity under the programmatic alternatives is shown in Chapter 5 (see Tables 5.1.3–1 and 5.1.3–2 in Section 5.1.3 of Chapter 5, Volume II of the SPEIS).

Overall, the release of greenhouse gases from the nuclear weapons complex constitutes a miniscule contribution to the release of these gases in the United States and the world. Overall U.S. greenhouse gas emissions in 2007 totaled about 7,282 million metric tons of CO_2 equivalents, including about 6,022 million metric tons of CO_2. These emissions resulted primarily from fossil fuel combustion and industrial processes. About 40 percent of CO_2 emissions come from the generation of electrical power (Energy Information Administration, ''Emissions of Greenhouse Gases in the United States 2007,'' DOE/EIA–0573 [2007]).

As the impacts of greenhouse gas releases on climate change are inherently cumulative, NNSA, and the DOE as a whole, strive to reduce their contributions to this cumulatively significant impact in making decisions regarding their ongoing and proposed actions. DOE's efforts to reduce emissions of greenhouse gases extend from research on carbon sequestration and new energy efficient technologies to making its own operations more efficient in order to reduce energy consumption and thereby decrease its contributions to greenhouse gases.

NNSA considers the potential cumulative impact of climate change in making decisions regarding its activities, including decisions regarding continuing the transformation of the nuclear weapons complex. Many of these decisions are applicable to the broad array of NNSA's activities, and therefore are independent of decisions regarding complex transformation. For example, NNSA (and other elements of the Department) are entering into energy savings performance contracts at its sites, under which a contractor examines all aspects of a site's operation for ways to improve energy use and efficiency. Also, NNSA seeks to reduce its contribution to climate change through decisions regarding individual actions, such as pursuing LEED certification for its new construction and refurbishment of its aging infrastructure. Examples of these decisions include projects that replace aging boilers and chillers with equipment that is more energy efficient. Such projects are underway at Y–12, SNL/NM, and LANL (''DOE Announces Contracts to Achieve $140 Million in Energy Efficiency Improvements to DOE Facilities,'' August 4, 2008, available at: *http://www.energy.gov/6449.htm*).

NNSA considered its contributions to the cumulative impacts that may lead to climate change in making the programmatic decisions announced in this ROD. These decisions will allow NNSA to reduce its greenhouse gas emissions by consolidating operations, modernizing its heating, cooling and production equipment, and replacing old facilities with ones that are more energy efficient. Many of these actions would not be feasible if NNSA had selected the No Action Alternative, which would have required it to maintain the Complex's outdated infrastructure. Federal regulations and DOE Orders require the Department of Energy to follow energy-efficient and sustainable principles in its siting, design, construction, and operation of new facilities, and in major renovations of existing facilities. These principles, which will apply to construction and operation of a UPF at Y–12 and the CMRR–NF at LANL, as well as to other facilities, include features that conserve energy and reduce greenhouse gas emissions.

Issued at Washington, DC, this 15th day of December 2008.

Thomas P. D'Agostino,

Administrator, National Nuclear Administration.

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DEPARTMENT OF ENERGY

National Nuclear Security Administration

Record of Decision: Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, NM

AGENCY: Department of Energy, National Nuclear Security Administration.

ACTION: Record of decision.

SUMMARY: The National Nuclear Security Administration (NNSA) of the U.S. Department of Energy (DOE) is issuing this Record of Decision (ROD) for the continued operation of the Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico. This ROD is based on information and analyses contained in the *Final Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico,* DOE/EIS–0380 (Final SWEIS or 2008 SWEIS) issued on May 16, 2008; comments on the SWEIS; and other factors, including costs, security considerations and the missions of NNSA.

In the 2008 SWEIS, NNSA assessed three alternatives for the continued operation of LANL: (1) No Action, (2) Reduced Operations, and (3) Expanded Operations. The No Action Alternative analyzed in this SWEIS consists of NNSA and LANL continuing to implement earlier decisions based on previous National Environmental Policy Act (NEPA) reviews, including the 1999 LANL SWEIS (DOE/EIS–0238) and its ROD (64 FR 50797, Sept. 20, 1999). The 2008 SWEIS identified the Expanded Operations Alternative as NNSA's Preferred Alternative. The SWEIS includes a classified appendix that assesses the potential environmental

impacts of a representative set of credible terrorist scenarios.

Because NNSA is continuing to evaluate significant technical and national security issues that could affect the operation and missions of LANL, NNSA is making only a few decisions at this time regarding the continued operation of the laboratory. NNSA will not make any decisions regarding nuclear weapons production and other actions analyzed in the Complex Transformation Supplemental Programmatic Environmental Impact Statement (DOE/EIS–0236–S4) (Complex Transformation SPEIS or SPEIS) prior to the completion of the SPEIS. However, NNSA must make some decisions now regarding LANL to support the safe and successful execution of the laboratory's current missions. It is likely that NNSA will issue other RODs regarding the continued operation of LANL based on the 2008 SWEIS, the SPEIS and other NEPA analyses.

NNSA has decided to continue to implement the No Action Alternative with the addition of some elements of the Expanded Operations Alternative. These elements include increases in operation of some existing facilities and new facility projects needed for ongoing programs and protection of workers and the environment. For the most part, NNSA will continue the missions conducted at LANL at current levels at this time. NNSA will also continue to implement actions necessary to comply with the March 2005 Compliance Order on Consent (Consent Order), which requires investigation and remediation of environmental contamination at LANL. NNSA will not change pit production at LANL at this time; the 1999 ROD set pit production at LANL at 20 per year.

FOR FURTHER INFORMATION CONTACT: For further information on the 2008 LANL SWEIS or this ROD, or to receive a copy of this SWEIS or ROD, contact: Ms. Elizabeth Withers, Document Manager, U.S. Department of Energy, National Nuclear Security Administration Service Center, Post Office Box 5400, Albuquerque, NM 87185, (505) 845–4984. Questions about the SWEIS, ROD and other issues regarding the Los Alamos Site Office's NEPA compliance program may also be addressed to Mr. George J. Rael, Assistant Manager Environmental Operations, NEPA Compliance Officer, U.S. Department of Energy, National Nuclear Security Administration, Los Alamos Site Office, 3747 West Jemez Road, Los Alamos, NM 87544. Mr. Rael may be contacted by telephone at (505) 665–0308, or by e-mail at: *LASO.SWEIS@doeal.gov*. For information on the DOE NEPA process, contact: Ms. Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance (GC–20), U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585, (202) 586–4600, or leave a message at (800) 472–2756. Additional information regarding DOE NEPA activities and access to many DOE NEPA documents are available on the Internet through the DOE NEPA Web site at: *http://www.gc.energy.gov/nepa/*.

SUPPLEMENTARY INFORMATION:

Background

NNSA prepared this ROD pursuant to the regulations of the Council on Environmental Quality (CEQ) for implementing NEPA (40 CFR Parts 1500–1508) and DOE's NEPA Implementing Procedures (10 CFR Part 1021). DOE last issued a SWEIS and ROD for the continued operation of LANL in 1999. DOE's NEPA regulations require that the Department evaluate site-wide NEPA analyses every five years to determine their continued applicability; NNSA initiated such an evaluation of the 1999 SWEIS in 2004. It subsequently decided to prepare a new SWEIS. NNSA issued a Draft SWEIS in July 2006 for public review and comment during a 75-day period. It considered the comments received on the Draft SWEIS in preparing the Final SWEIS, which it issued on May 16, 2008.

LANL is a multidisciplinary, multipurpose research institution in north-central New Mexico, about 60 miles (97 kilometers) north-northeast of Albuquerque, and about 25 miles (40 kilometers) northwest of Santa Fe. LANL occupies approximately 25,600 acres (10,360 hectares), or 40 square miles (104 square kilometers). About 2,000 structures, with a total of approximately 8.6 million square feet under roof, house LANL operations and activities, with about one half of the area used as laboratory or production space, and the remainder used for administrative, storage, services, and other purposes.

LANL is one of NNSA's three national security laboratories. Facilities and expertise at LANL are used to perform science and engineering research; the laboratory also manufactures some nuclear weapons components such as plutonium pits. In addition to weapons component manufacturing, LANL performs weapons testing, stockpile assurance, component replacement, surveillance, and maintenance. LANL's research and development activities include high explosives processing, chemical research, nuclear physics research, materials science research, systems analysis and engineering, human genome mapping, biotechnology applications, and remote sensing technologies. The main role of LANL in the fulfillment of NNSA and DOE missions is scientific and technological work that supports nuclear materials handling, processing, and fabrication; stockpile management; materials and manufacturing technologies; nonproliferation programs; and waste management activities. Work at LANL is also conducted for other Federal agencies such as the Departments of Defense and Homeland Security, as well as universities, institutions, and private entities.

Alternatives Considered

The alternatives NNSA evaluated in the SWEIS span a range of operations from minimum levels that would maintain essential mission capabilities (Reduced Operations Alternative) through the highest reasonably foreseeable levels that could be supported by current or new facilities (Expanded Operations Alternative). The No Action Alternative evaluated in the SWEIS consists of the continued implementation of decisions announced in the 1999 SWEIS ROD and decisions based on other completed NEPA reviews. The Reduced Operations Alternative assumes a reduction in the levels of certain operations and activities from the levels evaluated in the No Action Alternative. The Expanded Operations Alternative includes activities evaluated in the No Action Alternative, increases in overall operational levels, and new projects that fall into three categories: (1) Projects to maintain existing operations and capabilities (such as projects to replace aging structures with modern ones, and projects to consolidate operations and eliminate unneeded structures); (2) projects that support environmental remediation at LANL and compliance with the Consent Order, including demolition of excess buildings; and (3) projects that add new infrastructure and expand existing capabilities.

Compliance With the Consent Order

NNSA and LANL will continue to implement actions necessary to comply with the Consent Order, which requires the investigation and remediation of environmental contamination at LANL, regardless of the alternative it selects for the continued operation of the laboratory. The 2008 SWEIS analyzes the environmental impacts of actions required under the Consent Order,[1] and actions proposed by NNSA to facilitate its compliance with the Order (such as replacement of waste management structures, and establishment of waste examination and staging areas) under the Expanded Operations Alternative so that the impacts of these actions can be distinguished from the impacts of other proposed actions.

Preferred Alternative

The preferred alternative is the alternative that NNSA believes would best fulfill its statutory mission responsibilities while giving consideration to economic, budget, environmental, schedule, policy, technical and other information. In both the Draft and the Final SWEIS, NNSA identified the Expanded Operations Alternative as its preferred alternative.

Environmentally Preferable Alternative

NEPA's Section 101 (42 U.S.C. 4331) establishes a policy of federal agencies having a continuing responsibility to improve and coordinate their plans, functions, programs and resources so that, among other goals, the nation may fulfill its responsibilities as a trustee of the environment for succeeding generations. The Council on Environmental Quality (CEQ), in its ''Forty Most Asked Questions Concerning CEQ's NEPA Regulations'' (46 FR 18026, Feb. 23, 1981), defines the ''environmentally preferable alternative'' as the alternative ''that will promote the national environmental policy expressed in NEPA's Section 101.''

The analyses in the SWEIS of the environmental impacts associated with operating LANL identified only minor differences among the three alternatives across natural and cultural resource areas. Within each of the alternatives there are actions that could result in negative impacts, as well as those that would produce positive environmental effects. Considering the many environmental facets of the alternatives analyzed in the SWEIS, and looking out over the long term, NNSA believes that implementation of the Expanded Operations Alternative would allow it to best achieve its environmental trustee responsibilities under Section 101 of NEPA. Facilitating the cleanup of the site with new or expanded waste management facilities, and replacing older laboratory and production facilities with new buildings that incorporate modern safety, security and efficiency standards, would improve LANL's ability to protect human health and the environment while allowing LANL to continue to fulfill its national security missions. Increasing operational levels and performing various demolition activities would use additional resources and generate additional waste, but NNSA would also undertake actions to modernize and replace older facilities with more energy efficient and environmentally-protective facilities and to implement waste control and environmental practices to minimize impacts. Many of these types of actions are not feasible with the outdated infrastructure currently at LANL. Under this alternative, NNSA would be better positioned to minimize the use of electricity and water, streamline operations through consolidation, reduce the ''footprint'' of LANL as a whole, and allow some areas to return to a natural state.

NNSA's Responsibilities to Tribal Governments

NNSA recognizes that the operation of LANL over the last 65 years has affected the people of neighboring communities in northern New Mexico, including Tribal communities. These effects, which vary in nature across communities, include alterations of lifestyles, community, and individual practices. With respect to Tribal communities, NNSA adheres to federal statutes such as the Native American Graves Protection and Repatriation Act, the Archaeological Resources Protection Act, the American Indian Religious Freedom Act, and the National Historic Preservation Act. NNSA follows Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*; Executive Order 13007, *Indian Sacred Sites*; Executive Order 13021, *Tribal Colleges and Universities*; and Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. NNSA also follows the 2004 Presidential Memorandum regarding Government-to-Government Relationships with Native American Tribal Governments, DOE's American Indian and Alaska Native Tribal Government Policy, DOE Order 1230.2 and DOE Notice 144.1, which establish principles and policies for the Department's relations with Tribes. NNSA has established cooperative agreements with Tribal nations that are located near NNSA sites to enhance their involvement in environmental restoration while protecting Tribal rights and resources.

Four Pueblo governments in the vicinity of LANL have signed individual Accord Agreements with NNSA (Santa Clara, San Ildefonso, Cochiti, and Jemez). The Accord Agreements, together with the recently established Environmental Management/NNSA tribal framework, provide a basis for conducting government-to-government relations and serve as a foundation for addressing issues of mutual concern between the Department and the Pueblos. In furtherance of these Accord Agreements, and specifically to address concerns and issues raised by the Santa Clara Pueblo, the implementation of the decisions in this ROD will be undertaken in conjunction with a Mitigation Action Plan (MAP), which will be updated as needed to address specific concerns and issues raised by the Santa Clara and other Tribal communities.

Environmental Impacts of Alternatives

NNSA analyzed the potential impacts of each alternative on land use; visual resources; site infrastructure; air quality; noise; geology and soils; surface and groundwater quality; ecological resources; cultural and paleontological resources; socioeconomics; human health impacts; environmental justice; and waste management and pollution prevention. NNSA also evaluated the impacts of each alternative as to irreversible or irretrievable commitments of resources, and the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. In addition, it evaluated impacts of potential accidents at LANL on workers and surrounding populations. In a classified appendix, NNSA also evaluated the potential impacts of intentional destructive acts that might occur at LANL.

The 2008 SWEIS's impact analyses for normal operations (i.e., operations without accidents or intentional destructive acts) identified the most notable differences in potential environmental impacts among the alternatives in the following resource areas: *geology and soils; radiological air quality; human health; site infrastructure (electric power use, natural gas demand, potable water demand, and waste management demands); and transportation*. It also identified minor differences in potential environmental impacts among the alternatives under normal operations for: *land use; visual environment; surface water resources; groundwater resources; non-radiological air quality; noise levels; ecological resources; cultural resources; and socioeconomics*.

[1] The Consent Order was issued by the New Mexico Environment Department (NMED). As NMED makes the decisions regarding the requirements of the Order, these decisions are not subject to NEPA because they are not ''federal actions.''

These findings are described in the Summary and Chapters 4 and 5 of the SWEIS.

Environmental justice was an impact area of particular concern among those who commented on the SWEIS. NNSA recognizes that the operation of LANL over the last 65 years has affected the people of neighboring communities, including minority and low-income households. These effects, which vary in nature across communities, include alterations of lifestyles, community, and individual practices. Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires every Federal agency to analyze whether its proposed actions and alternatives would have disproportionately high and adverse impacts on minority or low-income populations. Based on the impacts analysis, NNSA expects no disproportionately high and adverse impacts on minority or low-income populations from the continued operation of LANL under any of the alternatives. From the analysis conducted of the alternatives, the radiological dose from emissions from normal operations are slightly lower for members of Hispanic, Native American, total minority, and low-income populations than for members of the population that are not in these groups, mainly because of the locations of these populations relative to the operations at LANL that produce these emissions. The maximum annual dose for the average member of any of the minority or low-income populations is estimated to be 0.092 millirem compared to a dose of 0.10 millirem for a member of the general population, and a dose of 0.11 millirem for a member of the population that does not belong to a minority or low-income group.

NNSA also analyzed human health impacts from exposure through special pathways, including subsistence consumption of native vegetation (piñon nuts and Indian Tea [Cota]), locally grown produce and farm products, groundwater, surface waters, fish (game and nongame), game animals, other foodstuffs and incidental consumption of soils and sediments (on produce, in surface water, and from ingestion of inhaled dust). These special pathways can be important to the environmental justice analyses because some of them may be more important or prevalent as to the traditional and cultural practices of members of minority populations in the area. The analyses conducted for the 2008 SWEIS, however, show that the health impacts associated with these special pathways do not result in disproportionately high and adverse impacts to minority or low-income populations.

The SWEIS analyzed potential accidents at LANL. Bounding accidents for both nuclear materials handling and waste management operations and for chemical handling and waste management operations, were identified as those with the highest potential consequences to the offsite population under median site meteorological conditions. Chemicals of concern were selected from a database based on quantities, chemical properties, and human health effects. In making the decisions announced in this ROD, NNSA considered the potential accidents analyzed in the SWEIS for each of the three alternative levels of LANL operations. For the most part, there are few differences among the alternatives for the maximum potential wildfire, seismic, or facility operational accident at LANL because actions under each alternative do not, for the most part, affect the location, frequency, or material at risk of the analyzed accident scenarios. Potential accidents that could occur under the No Action Alternative could also occur under both the Reduced Operations and the Expanded Operations Alternatives. In general, TA–54 waste management operations dominate the potential radiological accident risks and consequences at LANL under all three alternatives.

Under both the No Action and the Reduced Operations Alternatives, the accident with the highest estimated consequences to offsite populations involving radioactive material or wastes is a lightning-initiated fire at the Radioassay and Nondestructive Testing Facility in TA–54. Such an accident could result in up to 6 additional latent cancer fatalities (LCFs) in the offsite population. A fire at the Plutonium Facility's material staging area located within TA–55 could result in up to 5 additional LCFs in the offsite population. The potential accident expected to result in the highest estimated consequences to the hypothetical maximally exposed individual (MEI) and a non-involved nearby worker would be a fire in a waste storage dome at TA–54. If that accident were to occur, a single LCF to a noninvolved worker located 110 yards (100 meters) away from the site of the accident would be likely, and there could also be a 1 in 2 likelihood (0.50) of a LCF to the MEI, who is assumed to be located at the nearest site boundary for the duration of the accident. The lightning-initiated fire accident at the Radioassay and Nondestructive Testing Facility could also result in a single LCF to a noninvolved worker located 110 yards (100 meters) away from the site of the accident, and could also result in about the same 1 in 2 likelihood (0.49) of a LCF to the MEI assumed to be located at the nearest boundary for the duration of the accident.

Under the Expanded Operations Alternative, there is a potential for a radiological accident unique to this alternative. The radiological accident most likely to result in the highest estimated consequences to the offsite population is a building fire involving radioactive sealed sources stored at the Chemistry and Metallurgy Research Building. Such an accident could result in up to 7 additional LCFs in the offsite population. The potential accident expected to result in the highest estimated consequences to the hypothetical MEI and a non-involved nearby worker would be the same as for the No Action Alternative, namely, a fire in a waste storage dome at TA–54.

DOE evaluates the exposure risks associated with chemicals of concern and the requirements for crisis response personnel to use personal protection to avoid potentially dangerous exposures through its system of Emergency Response Planning Guidelines (ERPG). Chemicals of concern in the analyzed accidents at LANL under both the No Action and Reduced Operations Alternatives include selenium hexafluoride and sulfur dioxide, both from waste cylinder storage at TA–54, and chlorine and helium gases located at TA–55. Annual risks of worker and public exposure in the event of chemical releases are greatest from chlorine and helium gases. The annual risk is estimated to be about one chance in 15 years for workers within 1,181 yards (1,080 meters) of the facility receiving exposures in excess of the ERPG limits for chlorine gas, with the nearest public access located at 1,111 yards (1,016 meters). The annual risk is estimated to be about one chance in 15 years for workers within 203 yards (186 meters) of the facility receiving exposures in excess of ERPG limits for helium gas, with the nearest public access at 1,146 yards (1,048 meters).

Cleanup activities of Material Disposal Areas (MDAs) are analyzed under the Expanded Operations Alternative. These activities pose a risk of accidental releases of toxic chemicals, as there is a degree of uncertainty about how much and what chemicals were disposed of in the MDAs. MDA B is the closest disposal area to the boundary of LANL that will require remediation; remediation by waste removal was assumed for the analysis of a bounding accidental chemical release. Sulfur dioxide gas and beryllium powder were chosen as the bounding chemicals of concern for this area based on their ERPG values. If present at MDA B in the quantities assumed, both of these chemicals would likely dissipate to safe levels very close to the point of their release. However, there is a potential risk to the public due to the short distance between MDA B and the nearest point where a member of the public might be.

Comments on the Final Site-Wide Environmental Impact Statement

NNSA distributed more than 1,030 copies of the Final SWEIS to Congressional members and committees, the State of New Mexico, Tribal governments and organizations, local governments, other Federal agencies, non-governmental organizations, and individuals. NNSA received comments on the Final SWEIS from the Santa Clara Indian Pueblo; the Members and Residents of Santa Clara Pueblo; Concerned Citizens for Nuclear Safety, together with Robert H. Gilkeson and the Embudo Valley Environmental Monitoring Group; Citizen Action New Mexico; Nuclear Watch New Mexico; Citizens for Alternatives to Radioactive Dumping, and from nearby farmers.

Comments on the Final SWEIS included issues already raised during the comment period for the Draft SWEIS. Volume 3 of the Final SWEIS contains all comments received on the Draft SWEIS and NNSA's responses to them; this chapter also describes how these comments resulted in changes to the SWEIS.

The Santa Clara Indian Pueblo identified three main areas of concern: (1) Government-to-government consultation should have taken place before the issuance of the Final SWEIS; (2) environmental justice issues (including cumulative impacts) were not analyzed properly in the Final SWEIS; and (3) going forward with an increase in plutonium pit production at this time would be premature and violate NEPA. In a letter signed by 226 individuals, the Members and Residents of the Santa Clara Pueblo stated their support for comments on the SWEIS submitted by the tribal leaders. They also stated their opposition to increased plutonium pit production and specifically asked ''that (1) proper analysis of environmental justice and accumulative impacts be completed and circulated to the public for comments; (2) that NNSA/DOE honor government-to-government consultation and the process as a trust to Indian Tribes (Santa Clara Pueblo); and (3) that no decision about increasing plutonium pit production be made until review of this issue mandated in a new law (the National Defense Authorization Act for Fiscal Year 2008) is completed.''

To the extent that Santa Clara Pueblo perceived NNSA's action in delaying government-to-government consultation until after the issuance of the Final SWEIS and before the issuance of this ROD to be inconsistent with appropriate protocol for such consultations, this was not intended. NNSA believes that it followed the requirements of DOE Order 1230.2, *U.S. Department of Energy American Indian and Alaska Native Tribal Government Policy*, in consulting through the formal government-to-government process with Santa Clara Pueblo prior to making the decisions announced in this ROD. However, given the two-year time period between the issuance of the Draft SWEIS in 2006 and the issuance of the Final SWEIS in 2008, NNSA acknowledges that it could have been more prompt in engaging in government-to-government consultation with the Santa Clara Pueblo. NNSA will work to improve its consultation process.

With regard to the impact analysis of environmental justice issues (including cumulative impacts) in the Final SWEIS, NNSA believes that it appropriately analyzed the potential for disproportionately high and adverse impacts to minority and low-income populations located within a 50-mile radius of LANL under all alternatives, and that it also appropriately analyzed cumulative impacts to the extent that future actions are known or foreseeable. However, NNSA recognizes that many of the concerns the Santa Clara expressed are rooted in protected cultural and religious practices of its people. With this in mind, NNSA will undertake implementation of the decisions announced in this ROD in conjunction with a MAP. The MAP will be updated as the need arises to identify actions that would address specific concerns and issues raised by the Santa Clara as well as those of other tribal entities in the area of LANL.

NNSA agrees that decisions at this time on proposed actions analyzed in the Complex Transformation SPEIS, including decisions regarding the number of plutonium pits LANL will produce, would be premature. NNSA will not make any decisions on pit production until after it completes the SPEIS.

Concerned Citizens for Nuclear Safety, together with Robert H. Gilkeson and the Embudo Valley Environmental Monitoring Group, raised several concerns with the Final SWEIS: issuance of the Final SWEIS is premature because there could be a future Congressional change in the purpose and need to operate LANL; there is an uncertain seismic hazard at LANL; the Final SWEIS does not comply with NEPA because it omitted an analysis of prime farmland; LANL does not have a reliable network of monitoring wells; radionuclides have been found in the drinking water wells of Los Alamos County, San Ildefonso Pueblo, and Santa Fe; and storm flow and sediment transport are primary mechanisms for potential contaminant transport beyond LANL's boundaries.

NNSA does not agree that issuance of the Final SWEIS and a ROD is premature. Should Congress or the President direct changes regarding the purpose and need to operate LANL, NNSA may need to conduct additional NEPA reviews or amend this ROD. Federal agencies always face the possibility that in the future the Congress or the President may direct changes in their missions and responsibilities. At this time, NNSA is making only a limited set of decisions regarding actions that need to be implemented now. These decisions do not limit or prejudice the decisions NNSA may make regarding the programmatic alternatives it is evaluating in the Complex Transformation SPEIS.

New information about seismic risks at LANL (set forth in the report *Update of the Probabilistic Seismic Hazard Analysis and Development of Seismic Design Ground Motions at the Los Alamos National Laboratory, 2007, LA–UR–07–3965*) may change how hazardous materials are stored, operations are conducted, and facilities are constructed or renovated. NNSA is conducting a systematic review of LANL structures and operations in light of this information. This review, expected to be completed in about one year, will identify any necessary changes to address the new seismic information. NNSA will then implement the necessary changes to LANL facilities and operations based on the review's recommendations.

NNSA contacted the U.S. Department of Agriculture regarding prime farmland designations in northern New Mexico and included that information in Chapter 4 of the Final SWEIS. No farmland designated by that agency as ''prime farmland'' is located within Los Alamos or Santa Fe Counties, and only a limited amount of prime farmland is located within a 50-mile radius of LANL in Sandoval and Rio Arriba Counties. The Farmland Protection Policy Act requires that projects receiving Federal funds that would result in the permanent conversion of prime farmland to non-farmland (or remove its prime rating) must develop and consider alternatives that would not result in the conversion. None of the proposed actions at LANL under any of the alternatives would result in changes to any designated prime farmland or cause it to be re-designated as non-prime farmland.

Information about the network of monitoring wells, including existing and planned wells, is provided in Chapter 4 of the Final SWEIS. NNSA acknowledges that past well installation practices have not produced the desired network, and will continue to install and refurbish wells until adequate information is obtained regarding groundwater conditions and contaminant transport within the aquifers in the LANL area. Contaminants identified in various drinking water wells are being monitored, and drinking water production from these wells may be adjusted or discontinued in compliance with health protection standards. Additional study of aquifer conditions and contaminant transport is needed before long-term corrective actions can be identified and implemented. Contaminant transport via surface water flow and sediment transport is recognized as the primary mechanisms for off-site transport, especially after storms. As the watershed recovers from the effects of the Cerro Grande Fire in 2000, the volumes of storm water runoff are expected to decrease.

Citizen Action New Mexico stated its opposition to the Expanded Operations Alternative, especially expanded nuclear weapons research and production, and asserted that the Final SWEIS did not consider the increased impact of plutonium production on children in compliance with Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*.

NNSA believes it has complied with this Executive Order in the Final SWEIS. NNSA now uses a more conservative dose-to-risk conversion factor in assessing risks of radiation exposures as a result of this Order. Use of the new dose-to-risk conversion factor is one of the changes noted in NNSA's NEPA process since the issuance of the 1999 SWEIS (Chapter 6 and Appendix C of the SWEIS). As noted previously, NNSA is not making any decisions at this time that would result in expansion of nuclear weapons production.

In comments on the Final SWEIS, Nuclear Watch New Mexico (NWNM) stated that: Expanded plutonium pit production is not necessary; potential impacts of the proposed Radiological Science Institute are not adequately analyzed in the Final SWEIS and that a project-specific EIS is necessary for the institute; waste volumes identified in the Final SWEIS do not reconcile with those in NNSA's Draft Complex Transformation Supplemental Programmatic EIS; there is confusion about whether the proposed Advanced Fuel Cycle Facility, which is the subject of another DOE programmatic EIS, *The Global Nuclear Energy Partnership Programmatic EIS* (the GNEP PEIS), would be used for research and development or for full-scale reprocessing (and the number of associated facilities that could be located at LANL); and the Los Alamos Science Complex should be funded through the traditional Congressional budgetary authorization and appropriation process.

NNSA believes that it appropriately analyzed the potential impacts of the Radiological Science Institute in the Final SWEIS to the extent possible at this stage of the project planning process, and acknowledged in the Final SWEIS that additional NEPA analyses may be necessary if NNSA decides to continue with this proposal. NNSA will reconcile and update waste volumes in the Final Complex Transformation SPEIS. DOE has decided to eliminate the Advanced Fuel Cycle Facility from consideration in the GNEP PEIS (for more information, please visit: *http://www.gnep.energy.gov*). NNSA is considering the use of alternative financing for the Los Alamos Science Complex; this is an appropriate financing approach in certain situations although it has been rarely used at LANL.

NWNM also asked for additional clarification of some of NNSA's responses to its comments on the Draft SWEIS and provided additional information regarding some of their previous comments. Specifically, NWNM asked if all current tests using plutonium at the Dual Axis Radiographic Hydrodynamic Test Facility (DARHT) are conducted inside vessels.

At present, NNSA is not conducting any tests at DARHT that use plutonium, and future tests using plutonium at this facility would be conducted inside vessels.

NWNM asked if the Rendija Canyon Fault is the closest fault to the proposed location of the Radiological Science Institute.

As discussed in the Final SWEIS, it is the closest known fault to that location.

NWNM also requested an unclassified appendix that discusses intentional destructive acts at LANL; asserted there should be a citation to information compiled by the U.S. Department of Commerce's Bureau of Economic Analysis; and asked that the Area G Performance Assessment and Composite Analysis and the geotechnical report recently prepared by LANL be posted on the Internet.

NNSA considered the preparation of an unclassified discussion of the potential environmental impacts of intentional destructive acts at LANL, but concluded that such a discussion posed unacceptable security risks. Information used to prepare the economic impacts analysis was not contained within a discrete study, so a citation is not appropriate in this instance. Unclassified documents prepared by LANL are generally placed on its Internet site when completed and approved for distribution. NWNM may access the LANL Internet site for these specific references.

NWNM correctly pointed out that the Environmental Protection Agency (EPA) had designated the Española Basin as a Sole Source Aquifer in early 2008.

Once EPA designates a sole source aquifer under its Sole Source Aquifer Protection Program, the agency can review proposed projects that are to receive Federal funds and that have a potential to contaminate the aquifer. Under this review, EPA can request changes to a Federally-funded project if it poses a threat to public health by contaminating an aquifer to the point where a safe drinking water standard could be violated. Projects conducted entirely by Federal agencies, or their contractors, at sole source aquifer locations are not subject to EPA's review process. NNSA is not proposing any new projects that would cause the Española Basin aquifer to exceed a safe drinking water standard.

Citizens for Alternatives to Radioactive Dumping also commented on the Final SWEIS. It asserted that expanded pit production is not necessary; that contamination has been found in produce samples; that there is prime farm land in the Embudo Valley; that there are radionuclides in the Rio Grande, which is a threat to its use as drinking water by the city of Santa Fe; and that radioactive cesium has been found in soils at the Trampas Lakes, which drain into the Rio Grande.

As NNSA noted in its response to other comments on the Draft SWEIS, a single "false positive" result was returned from a laboratory analyzing fruit specimens grown near LANL. No uptake of radioactive contamination attributed to LANL operations has been found in produce samples obtained from the Embudo Valley. Drinking water supplies for Santa Fe must meet Safe Drinking Water Act and other state and municipal requirements. Elevated radionuclide concentrations in the soils of alpine lake basins within the Rocky Mountain range have been attributed to global fallout concentrated through snowfall and specific geomorphic conditions.

Decisions

With limited additions, NNSA has decided to continue operation of Los Alamos National Laboratory pursuant to the No Action Alternative analyzed in the 2008 SWEIS. The parameters of this alternative are set by the 1999 ROD and other decisions that NNSA has made previously regarding the continued operation of LANL. The additions to the No Action Alternative NNSA has decided to implement at this time consist of elements of the Expanded Operations Alternative. These elements are of two types: (1) Changes in the level of operations for on-going activities within existing facilities, and (2) new facility projects. The changes in operational levels NNSA has decided to implement at this time are:

• Supporting the Global Threat Reduction Initiative and Off-Site Sources Recovery Project by broadening the types and quantities of radioactive sealed sources (Co-60, Ir-192, Cf-252, Ra-226) that LANL can manage and store prior to their disposal;

• Expanding the capabilities and operational level of the Nicholas C. Metropolis Center for Modeling and Simulation to support the Roadrunner Super Computer platform;

• Performing research to improve beryllium detection and to develop mitigation methods for beryllium dispersion to support industrial health and safety initiatives for beryllium workers; and

• Retrieval and disposition of legacy transuranic waste (approximately 3,100 cubic yards of contact-handled and 130 cubic yards of remote-handled) from belowground storage.

New facility projects involve the design, construction, or renovation of facilities and were analyzed as part of the Expanded Operations Alternative. The facility projects that NNSA has decided to pursue at this time are:

• Planning, design, construction and operation of the Waste Management Facilities Transition projects to facilitate actions required by the Consent Order;

• Repair and replacement of mission critical cooling system components for buildings in TA–55 to enable the continued operation of these buildings and to comply with current environmental standards; and

• Final design of a new Radioactive Liquid Waste Treatment Facility, and design and construction of the Zero Liquid Discharge Facility component of this new treatment facility to enable LANL to continue to treat radioactive liquid wastes.

These projects and actions are needed on an immediate basis to maintain existing capabilities, support existing programs, and provide a safe and environmentally protective work environment at LANL. The need for these increases in operations and new facility projects exists regardless of any decisions NNSA may make regarding the programmatic and project-specific alternatives analyzed in the Complex Transformation SPEIS.

In addition, NNSA will continue to implement actions required by the Consent Order, as noted above, these decisions are not subject to NEPA.

Basis for Decision

NNSA's decisions are based on its mission responsibilities and its need to sustain LANL's ability to operate in a manner that allows it to fulfill its existing responsibilities in an environmentally sound, timely and fiscally prudent manner.

National security policies require NNSA to maintain the nation's nuclear weapons stockpile as well as its core competencies in nuclear weapons. Since completion in 1996 of the *Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (SSM PEIS) and associated ROD, NNSA and its predecessor, DOE's Office of Defense Programs, has implemented these policies through the Stockpile Stewardship Program (SSP). The SSP emphasizes development and application of improved scientific and technical capabilities to assess the safety, security, and reliability of existing nuclear warheads without the use of nuclear testing. LANL's operations support a wide range of scientific and technological capabilities for NNSA's national security missions, including the SSP. Most of NNSA's missions require research and development capabilities that currently reside at the LANL site. The nuclear facilities in LANL's TA–55 must maintain the nation's nuclear stockpile. Programmatic risks would be unacceptable if LANL did not continue to operate, or if it failed to implement the new decisions set forth above.

NNSA believes that, at this time, existing national security requirements can be met by continuing to conduct operations at current levels with only a limited number of increases in levels of operations and new facility projects. These increases in operations and new projects are needed because of changes in the SSP program and NNSA's nuclear non-proliferation program. They are also needed to meet new responsibilities that have arisen as a result of changes in our national security requirements since 1999. One of the new facility projects is needed to facilitate NNSA's compliance with the Consent Order. The specific rationales for NNSA's decisions to implement seven elements of the Expanded Operations Alternative are:

1. Supporting the Global Threat Reduction Initiative and Off-Site Sources Recovery Project by broadening the types and quantities of radioactive sealed sources (Co-60, Ir-192, Cf-252, Ra-226) that LANL can manage and store prior to their disposal—This decision will allow NNSA to retrieve and store more of these sources, which, if not adequately secured, could be used in a radiation dispersion device (a "dirty bomb").

2. Expanding the capabilities and operational level of the Nicholas C. Metropolis Center for Modeling and Simulation to support the Roadrunner Super Computer platform—This decision will allow NNSA to perform calculations that improve its ability to certify that the nuclear weapons stockpile is reliable without conducting underground nuclear tests. It will also allow LANL to conduct research on global energy challenges and other scientific issues.

3. Performing research to improve detection and mitigation methods for beryllium—This research will support the continued development of methods to capture and sequester beryllium and to expedite sample analysis needed to implement exposure controls to ensure worker safety.

4. Retrieval and disposition of legacy transuranic waste (approximately 3,100 cubic yards of contact-handled and 130 cubic yards of remote-handled) from belowground storage—Retrieving and dispositioning this waste will allow LANL to complete closure and remediation of TA–54 Material Disposal Area G under the Consent Order. This action will reduce risk by removing approximately 105,000 plutonium-239 equivalent curies from LANL.

5. Planning, design, construction and operation of the Waste Management Facilities Transition projects—These projects will replace LANL's existing facilities for solid waste management. The existing facilities at TA–54 for transuranic waste, low-level waste, mixed low-level waste and hazardous/

chemical waste are scheduled for closure and remediation under the Consent Order.

6. Repair and replacement of mission critical cooling system components for buildings in TA–55—This decision will allow these facilities to continue to operate and for NNSA to install a new cooling system that meets current standards regarding the phase-out of Class 1 ozone-depleting substances.

7. Final design of a new Radioactive Liquid Waste Treatment Facility, and design and construction of the Zero Liquid Discharge Facility component of this new treatment facility—This decision will allow LANL to continue to treat radioactive liquid wastes by replacing a facility that does not meet current standards and that cannot be acceptably renovated. Regardless of any decisions NNSA may make about complex transformation and LANL's role in it, the laboratory will need to treat liquid radioactive wastes for the foreseeable future.

Mitigation Measures

As described in the SWEIS, LANL operates under environmental laws, regulations, and policies within a framework of contractual requirements; many of these requirements mandate actions intended to control and mitigate potential adverse environmental effects. Examples include the Environment, Safety, and Health Manual, emergency plans, Integrated Safety Management System, pollution prevention and waste minimization programs, protected species programs, and energy and conservation programs. A Mitigation Action Plan for this ROD will be issued that includes: Specific habitat conservation measures recommended by the U.S. Fish and Wildlife Service for mitigating effects to potential habitat areas; site- and action-specific commitments related to the Consent Order once the State of New Mexico decides on specific environmental remediation for LANL MDAs; and traffic flow improvements that could involve such measures as installing turn lanes, installing and coordinating traffic lights, and installing new signage. A summary of all prior mitigation commitments for LANL that are either underway or that have yet to be initiated will be included in the MAP. These prior commitments include such actions as continued forest management efforts, continued trail management measures, and implementation of a variety of sampling and monitoring measures, as well as additional measures to reduce potable water use and conserve resources.

In addition, with respect to the concerns raised by the Santa Clara Pueblo, NNSA will continue its efforts to support the Pueblo and other tribal entities in matters of human health, and will participate in various intergovernmental cooperative efforts to protect indigenous practices and locations of concern. NNSA will conduct government-to-government consultation with the Pueblo and other tribal entities to incorporate these matters into the MAP.

Issued at Washington, DC, this 19th day of September 2008.

Thomas P. D'Agostino,

Administrator, National Nuclear Security Administration.

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DEPARTMENT OF ENERGY

National Nuclear Security Administration

Record of Decision: Final Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project, Los Alamos National Laboratory, Los Alamos, NM

AGENCY: National Nuclear Security Administration, Department of Energy.

ACTION: Record of decision.

SUMMARY: The U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) is issuing this record of decision on the proposed replacement of the existing Chemistry and Metallurgy (CMR) Building at Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico. This record of decision is based upon the information contained in the ''Environmental Impact Statement for the Proposed Chemistry and Metallurgy Research Building Replacement Project, Los Alamos National Laboratory, Los Alamos, New Mexico'', DOE/EIS–0350 (CMRR EIS), and other factors, including the programmatic and technical risk, construction requirements, and cost. NNSA has decided to implement the preferred alternative, alternative 1, which is the construction of a new CMR Replacement (CMRR) facility at LANL's Technical Area 55 (TA–55). The new CMRR facility would include a single, above-ground, consolidated special nuclear material-capable, Hazard Category 2 laboratory building (construction option 3) with a separate administrative office and support functions building. The existing CMR building at LANL would be decontaminated, decommissioned, and demolished in its entirety (disposition option 3). The preferred alternative includes the construction of the new CMRR facility, and the movement of operations from the existing CMR

building into the new CMRR facility, with operations expected to continue in the new facility over the next 50 years.

FOR FURTHER INFORMATION CONTACT: For further information on the CMRR EIS or record of decision, or to receive a copy of this EIS or record of decision, contact: Elizabeth Withers, Document Manager, U.S. Department of Energy, Los Alamos Site Office, 528 35th Street, Los Alamos, NM 87544, (505) 667–8690. For information on the DOE National Environmental Policy Act (NEPA) process, contact: Carol M. Borgstrom, Director, Office of NEPA Policy and Compliance (EH–42), U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585, (202) 586–4600, or leave a message at (800) 472–2756.

SUPPLEMENTARY INFORMATION:

Background

The NNSA prepared this record of decision pursuant to the regulations of the Council on Environmental Quality for implementing NEPA (40 CFR parts 1500–1508) and DOE's NEPA implementing procedures (10 CFR part 1021). This record of decision is based, in part, on information provided in the CMRR EIS.

LANL is located in north-central New Mexico, about 60 miles (97 kilometers) north-northeast of Albuquerque, and about 25 miles (40 kilometers) northwest of Santa Fe. LANL occupies an area of approximately 25,600 acres (10,360 hectares), or approximately 40 square miles (104 square kilometers). NNSA is responsible for the administration of LANL as one of three National Security Laboratories. LANL provides both the NNSA and DOE with mission support capabilities through its activities and operations, particularly in the area of national security.

Work at LANL includes operations that focus on the safety and reliability of the nation's nuclear weapons stockpile and on programs that reduce global nuclear proliferation. LANL's main role in NNSA mission objectives includes a wide range of scientific and technological capabilities that support nuclear materials handling, processing and fabrication; stockpile management; materials and manufacturing technologies; nonproliferation programs; and waste management activities. LANL supports actinide (any of a series of elements with atomic numbers ranging from actinium-89 through lawrencium-103) science missions ranging from the plutonium-238 heat source program undertaken for the National Aeronautics and Space Administration (NASA) to arms control and technology development.

The capabilities needed to execute NNSA mission activities require facilities at LANL that can be used to handle actinide and other radioactive materials in a safe and secure manner. Of primary importance are the facilities located within the CMR building and the plutonium facility (located in TAs 3 and 55, respectively). Most of the LANL mission support functions require analytical chemistry (AC) and materials characterization (MC), and actinide research and development support capabilities and capacities that currently exist within facilities at the CMR building and that are not available elsewhere. Other unique capabilities are located within the plutonium facility. Work is sometimes moved between the CMR building and the plutonium facility to make use of the full suite of capabilities they provide.

The CMR building is over 50 years old and many of its utility systems and structural components are deteriorating. Studies conducted in the late 1990s identified a seismic fault trace located beneath one of the wings of the CMR building that increases the level of structural integrity required to meet current structural seismic code requirements for a Hazard Category 2 nuclear facility (a Hazard Category 2 nuclear facility is one in which the hazard analysis identifies the potential for significant onsite consequences). Correcting the CMR building's defects by performing repairs and upgrades would be difficult and costly. NNSA cannot continue to operate the assigned LANL mission-critical CMR support capabilities in the existing CMR building at an acceptable level of risk to public and worker health and safety without operational restrictions. These operational restrictions preclude the full implementation of the level of operation DOE decided upon through its 1999 record of decision for the ''Site-wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory'' (DOE/EIS–0238) (LANL SWEIS). Mission-critical CMR capabilities at LANL support NNSA's stockpile stewardship and management strategic objectives; these capabilities are necessary to support the current and future directed stockpile work and campaign activities conducted at LANL. The CMR building is near the end of its useful life and action is required now by NNSA to assess alternatives for continuing these activities for the next 50 years. NNSA needs to act now to provide the physical means for accommodating continuation of the CMR building's functional, mission-critical CMR capabilities beyond 2010 in a safe, secure, and environmentally sound manner.

Alternatives Considered

NNSA evaluated the environmental impacts associated with the proposed relocation of LANL AC and MC, and associated research and development capabilities that currently exist primarily at the CMR building, to a newly constructed facility, and the continued performance of those operations and activities at the new facility for the next 50 years. The CMRR EIS analyzed four action alternatives: (1) The construction and operation of a complete new CMRR facility at TA–55; (2) the construction of the same at a ''greenfield'' location within TA–6; (3) and a ''hybrid'' alternative maintaining administrative offices and support functions at the existing CMR building with a new Hazard Category 2 laboratory facility built at TA–55, and, (4) a ''hybrid'' alternative with the laboratory facility being constructed at TA–6. The CMRR EIS also analyzed the no action alternative. These alternatives are described in greater detail below.

Alternative 1 is to construct a new CMRR facility consisting of two or three new buildings within TA–55 at LANL to house AC and MC capabilities and their attendant support capabilities that currently reside primarily in the existing CMR building, at the operational level identified by the expanded operations alternative for LANL operations in the 1999 LANL SWEIS. Alternative 1 would also involve construction of a parking areas(s), tunnels, vault area(s), and other infrastructure support needs. AC and MC activities would be conducted in either two separate laboratories (constructed either both above ground (construction option 1) or one above and one below ground (construction option 2)) or in one new laboratory (constructed either above ground (construction option 3) or below ground (construction option 4)). An administrative office and support functions building would be constructed separately.

Alternative 2 would construct the same new CMRR facility within TA–6; the TA–6 site is a relatively undeveloped, forested area with some prior disturbance in limited areas that is referred to as a ''greenfield'' site.

Alternatives 3 and 4 are ''hybrid'' alternatives in which the existing CMR building would continue to house administrative offices and support functions for AC and MC capabilities (including research and development) and no new administrative support building would be constructed. Structural and systems upgrades and repairs to portions of the existing CMR building would need to be performed and some portions of the building might be dispositioned. New laboratory facilities (as described for alternative 1) would be constructed either at TA–55 (alternative 3) or at TA–6 (alternative 4).

Under any of the alternatives, disposition of the existing CMR building could include a range of options from no demolition (disposition option 1), to partial demolition (disposition option 2), to demolition of the entire building (disposition option 3).

The no action alternative would involve the continued use of the existing CMR building with some minimal necessary structural and systems upgrades and repairs. Under this alternative, AC and MC capabilities (including research and development), as well as administrative offices and support activities, would remain in the existing CMR building. No new building construction would be undertaken. AC and MC operational levels would continue to be restricted and would not meet the level of operations determined necessary for the foreseeable future at LANL in the 1999 SWEIS record of decision.

Preferred Alternative

In both the draft and the final CMRR EIS, the preferred alternative for the replacement of the existing CMR building is identified as alternative 1 (construct a new CMRR facility at TA–55). The preferred construction option would be the construction of a single consolidated special nuclear material (SNM) capable, Hazard Category 2 laboratory with a separate administrative offices and support functions building (construction option 3). (Special nuclear materials include actinides such as plutonium, uranium enriched in the isotope 233 or 235, and any other material that the U.S. Nuclear Regulatory Commission determines to be special nuclear material.) NNSA's preferred option for the disposition of the existing CMR building is to decontaminate, decommission and demolish the entire structure (disposition option 3). Based on the CMRR EIS, the environmental impacts of the preferred alternative, although minimal, would be expected to be greater than those of the no action alternative. Construction option 3 would have less impact on the environment that implementing construction options 1 or 2; and disposition option 3 would have the greatest environmental impact of the disposition options analyzed.

Environmentally Preferable Alternative

The Council on Environmental Quality (CEQ), in its ''Forty Most Asked Questions Concerning CEQ's NEPA Regulations'' (46 FR 18026, 2/23/81) with regard to 40 CFR 1505.2, defined the ''environmentally preferable alternative'' as the alternative ''that will promote the national environmental policy as expressed in NEPA's section 101''. Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources. The CMRR EIS impact analysis indicates that there would be very little difference in the environmental impacts among the action alternatives analyzed and also that the impacts of these action alternatives would be small. After considering impacts to each resource area by alternative, NNSA has identified the no action alternative as the environmentally preferable alternative. The no action alternative was identified as having the fewest direct impacts to the physical environment and to cultural and historic resources. This is because no construction-related disturbances would exist and none of the CMR building would be demolished, as would be the case under any of the action alternatives analyzed for the proposed action, including the preferred alternative. Therefore, the no action alternative would have the fewest impacts.

Environmental Impacts of Alternatives

NNSA analyzed the potential impacts that might occur if any of the four action alternatives or the no action alternative were implemented for land use and visual resources; site infrastructure; air quality and noise; geology and soils; surface and groundwater quality; ecological resources; cultural and paleontological resources; socioeconomics; human health impacts; environmental justice; waste management and pollution prevention. NNSA considered the impacts that might occur from potential accidents associated with the four action alternatives, and the no action alternative as well, on LANL worker and area residential populations. NNSA considered the impacts of each alternative regarding the irreversible or irretrievable commitments of resources, and the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. The CMRR EIS analyses identified minor differences in potential environmental impacts among the action alternatives including: Differences in the amount of land disturbed long term for construction and operations, ranging between about 27 and 23 acres disturbed during construction and between 10 and 15 acres disturbed permanently during operations; and differences in the potential to indirectly affect (but not adversely affect) potential habitat for a federally-listed threatened species and the potential to have no affect on sensitive habitat areas; differences in the potential to affect human health during normal operations and during accident events; differences in waste volumes generated and managed; and differences in transportation accident dose possibilities. A comparison of impacts is discussed in the following paragraphs.

Construction Impacts

Alternative 1 (Construct New CMRR Facility at TA–55; Preferred Alternative): The construction of a new SNM-capable Hazard Category 2 laboratory, an administrative offices and support functions building, SNM vaults and other utility and security structures, and a parking lot at TA–55 would affect 26.75 acres (10.8 hectares) of mostly disturbed land, but would not change the area's current land use designation. The existing infrastructure resources (natural gas, water, electricity) would adequately support construction activities. Construction activities would result in temporary increases in air quality impacts, but resulting criteria pollutant concentrations would be below ambient air quality standards. Construction activities would not impact water, visual resources, geology and soils, or cultural and paleontological resources. Minor indirect effects on potential Mexican spotted owl habitat could result from the removal of a small amount of habitat area, increased site activities, and night-time lighting near the remaining Mexican spotted owl habitat areas. The socioeconomic impacts associated with construction would not cause any major changes to employment, housing, or public finance in the region of influence. Waste generated during construction would be adequately managed by the existing LANL management and disposal capabilities.

Alternative 2 (TA–6 Greenfield Alternative): The construction of new SNM-capable Hazard Category 2 and 3 buildings, the construction of an administrative offices and support functions facility, SNM vaults and other utility and security structures, and a parking lot at TA–6 would affect 26.75 acres (10.8 hectares) of undisturbed land, and would change the area's current land use designation to nuclear material research and development, similar to that of TA–55. Infrastructure resources (natural gas, water, electricity) would need to be extended or expanded to TA–6 to support construction activities. Construction activities would result in temporary increases in air quality impacts, but resulting criteria pollutant concentrations would be below ambient air quality standards. It would alter the existing visual character of the central portion of TA–6 from that of a largely natural woodland to an industrial site. Once completed, the new CMRR facility would result in a change in the visual resource contrast rating of TA–6 from Class III (undeveloped land where management activities do not dominate the view) to Class IV (developed land where management activities dominate the view). Construction activities would not impact water, biotic resources (including threatened and endangered species), geology and soils, or cultural and paleontological resources. The socioeconomic impacts associated with construction would not cause any major changes to employment, housing, or public finance in the region of influence. Waste generated during construction would be adequately managed by the existing LANL capabilities for handling waste. In addition, a radioactive liquid waste pipeline might also be constructed across Two Mile Canyon to tie in with an existing pipeline to the Radioactive Liquid Waste Treatment Facility (RLWTF) in TA–50.

Alternative 3 (Hybrid Alternative at TA–55): The construction of new Hazard Category 2 and 3 buildings, the construction of SNM vaults and utility and security structures, and the construction of a parking lot at TA–55 would affect 22.75 acres (9.2 hectares) of mostly disturbed land, but would not change the area's current land use designation. The existing infrastructure would adequately support construction activities. Construction activities would result in temporary increases in air quality impacts, but resulting criteria pollutant concentrations would be below ambient air quality standards. Construction activities would not impact water, visual resources, geology and soils, or cultural and paleontological resources. Minor indirect effects on Mexican spotted owl habitat could result from the removal of a small amount of habitat area, increased site activities, and night-time lighting near the remaining Mexican spotted owl habitat areas. The socioeconomic impacts associated with construction would not cause any major changes to employment, housing, or public finance in the region of influence. Waste generated during construction would be adequately managed by the existing LANL capabilities for handling waste.

Alternative 4 (Hybrid Alternative at TA–6): The construction of new Hazard Category 2 and 3 buildings, the construction of SNM vaults and utility and security structures, and the construction of a parking lot at TA–6 would affect 22.75 acres (9.2 hectares) of undisturbed land, and would change the area's current land use designation to nuclear material research and development, similar to that of TA–55. Infrastructure resources (natural gas, water, electricity) would need to be extended or expanded at TA–6 to support construction activities. Construction activities would result in temporary increases in air quality impacts, but would be below ambient air quality standards. The existing visual character of the central portion of TA–6 would be altered from that of a largely natural woodland to that of an industrial site. Once completed, the new CMRR facility would result in a change in the visual resource contrast rating of TA–6 from Class III to Class IV. Construction activities would not impact water, visual resources, biotic resources (including threatened and endangered species), geology and soils, or cultural and paleontological resources. The socioeconomic impacts associated with construction would not cause any major changes to employment, housing, or public finance in the socioeconomic region of influence. Waste generated during construction would be adequately managed by the existing LANL capabilities for handling waste. In addition, a radioactive liquid waste pipeline may also be constructed across Two Mile Canyon to tie in with an existing pipeline to the RLWTF at TA–50.

Impacts During the Transition From the CMR Building to the New CMRR Facility Under the Action Alternatives

During a 4-year transition period, CMR operations at the existing CMR building would be moved to the new CMRR facility. During this time, both CMR facilities would be operating, although at reduced levels. At the existing CMR building, where restrictions would remain in effect, operations would decrease as CMR operations move to the new CMRR facility. At the new CMRR facility, levels of CMR operations would increase as the facility becomes fully operational. In addition, the transport of routine onsite shipment of AC and MC samples would continue to take place while both facilities are operating. With both facilities operating at reduced levels at the same time, the combined demand for electricity, and manpower to support transition activities during this period might be higher than would be required by the separate facilities. Nevertheless, the combined total impacts during this transition phase from both these facilities would be expected to be less than the impacts attributed to the expanded operations alternative and the level of CMR operations analyzed in the LANL SWEIS.

Also during the transition phase, the risk of accidents would be changing at both the existing CMR building and the new CMRR facility. At the existing CMR building, the radiological material at risk and associated operations and storage would decline as material and equipment are transferred to the new CMRR facility. This material movement would have the positive effect of reducing the risk of accidents at the CMR building. Conversely, at the new CMRR facility, as the amount of radioactive material at risk and associated operations increases to full operations, the risk of accidents would also increase. However, the improvements in design and technology at the new CMRR facility would also have a positive effect of reducing overall accident risks when compared to the accident risks at the existing CMR building. The expected net effect of both of these facilities operating at the same time during the transition period would be for the risk of accidents to be lower than the accident risks at either the existing CMR building or the fully operational new CMRR facility.

Action Alternatives—Operations Impacts

Relocating CMR operations to a new CMRR facility located at either TA–55 or TA–6 within LANL would require similar facilities, infrastructure support procedures, resources, and numbers of workers during operations. For most environmental areas of concern, operational differences would be minor. There would not be any perceivable differences in impact between the action alternatives for land use and visual resources, air and water quality, biotic resources (including threatened and endangered species), geology and soils, cultural and paleontological resources, power usage, and socioeconomics. Additionally, the new CMRR facility would use existing waste management facilities to treat, store, and dispose of waste materials generated by CMR operations. All impacts would be within regulated limits and would comply with Federal, State, and local laws and regulations. Any transuranic (TRU) waste generated by CMRR facility operations would be treated and packaged in accordance with the Waste Isolation Pilot Plant (WIPP) waste acceptance criteria and transported to WIPP or a similar type facility for disposition by DOE.

Routine operations for each of the action alternatives would increase the amount of radiological releases as compared to current restricted CMR building operations. Current operations at the CMR building do not support the levels of activity described for the expanded operations alternative in the LANL SWEIS. There would be small differences in potential radiological impacts to the public, depending on the location of the new CMRR facility. However, radiation exposure to the public would be small and well below regulatory limits and limits imposed by DOE Orders. The maximally exposed offsite individual would receive a dose of less than or equal to 0.35 millirem per year, which translates to 2.1×10^{-7} latent cancer fatalities per year from routine operational activities at the new CMRR facility. Statistically, this translates into a risk of one chance in 5 million of a fatal cancer for the maximally exposed offsite individual due to these operations. The total dose to the population within 50 miles (80 kilometers) would be a maximum of 2.0 person-rem per year, which translates to 0.0012 latent cancer fatalities per year in the entire population from routine operations at the new CMRR facility. Statistically, this would equate to a chance of one additional fatal cancer among the exposed population every 1,000 years.

Using DOE-approved computer models and analysis techniques, estimates were made of worker and public health and safety risks that could result from potential accidents for each alternative. For all CMRR facility alternatives, the results indicate that statistically there would be no chance of a latent cancer fatality for a worker or member of the public. The CMRR facility accident with the highest risk is a facility-wide spill of radioactive material caused by a severe earthquake that exceeds the design capability of the CMRR facility under Alternative 1. The risk for the entire population for this accident was estimated to be 0.0005 latent cancer fatalities per year.

This value is statistically equivalent to stating that there would be no chance of a latent cancer fatality for an average individual in the population during the lifetime of the facility. Continued operation of the CMR building under the no action alternative would carry a higher risk because of the building's location and greater vulnerability to earthquakes. The risk for the entire population associated with an earthquake at the CMR building would be 0.0024 latent cancer fatalities per year, which is also statistically equivalent to no chance of a latent cancer fatality for an average individual during the lifetime of the facility.

As previously noted, overall CMR operational characteristics at LANL would not change regardless of the ultimate location of the replacement facility and the action alternative implemented. Sampling methods and mission operations in support of AC and MC would not change and, therefore, would not result in any additional environmental or health and safety impacts to LANL. Each of the action alternatives would generally have the same amount of operational impacts. All of the action alternatives would produce equivalent amounts of emissions and radioactive releases into the environment, infrastructure requirements would be the same, and each action alternative would generate the same amount of radioactive and non-radioactive waste, regardless of the ultimate location of the new CMRR facility at LANL. Other impacts that would be common to each of the action alternatives include transportation impacts and CMR building and CMRR facility disposition impacts. Transportation impacts could result from: (1) The one-time movement of SNM, equipment, and other materials during the transition from the existing CMR building to the new CMRR facility; and (2) the routine onsite shipment of AC and MC samples between the plutonium facility at TA–55 and the new CMRR facility. Impacts from the disposition of the existing CMR building and the CMRR facility would result from the decontamination and demolition of the buildings and the transport and disposal of radiological and non-radiological waste materials. All action alternatives would require the relocation and one-time transport of SNM equipment and materials. Transport of SNM, equipment, and other materials currently located at the CMR building to the new CMRR facility at TA–55 or TA–6 would occur over a period of two to four years. The public would not be expected to receive any measurable exposure from the one-time movement of radiological materials associated with this action. Impacts of potential handling and transport accidents during the one-time movement of SNM, equipment, and other materials during the transition from the existing CMR building to the new CMRR facility would be bounded by other facility accidents for each alternative. For all alternatives, the environmental impacts and potential risks of transportation would be small.

Under each action alternative, routine onsite shipments of AC and MC samples consisting of small quantities of radioactive materials and SNM samples would be shipped from the plutonium facility at TA–55 to the new CMRR facility at either TA–55 or TA–6. The public would not be expected to receive any additional measurable exposure from the normal movement of small quantities of radioactive materials and SNM samples between these facilities. The potential risk to a maximally exposed individual (MEI) member of the public from a transportation accident involving routine onsite shipments of AC and MC samples between the plutonium facility and CMRR facility was estimated to be very small (3.7x10–10), or approximately 1 chance in 3 billion. For all action alternatives, the overall environmental impacts and potential risks of transporting AC and MC samples would be small.

Action Alternatives—CMR Building and CMRR Facility Disposition Impacts

All action alternatives would require some level of decontamination and demolition of the existing CMR building. Operations experience at the CMR building indicates some surface contamination has resulted from the conduct of various activities over the last 50 years. Impacts associated with decontamination and demolition of the CMR building are expected to be limited to the creation of waste within LANL site waste management capabilities. This would not be a discriminating factor among the alternatives.

Decontamination, and demolition of the new CMRR facility would also be considered at the end of its designed lifetime operation of at least 50 years. Impacts from the disposition of the CMRR facility would be expected to be similar to those for the existing CMR building.

No Action Alternative: Under the no action alternative there would be no new construction and minimal necessary structural and systems upgrades and repairs. Accordingly, there would be no potential environmental impacts resulting from new construction for this alternative. Operational impacts of continuing CMR operations at the CMR building would be less than those identified under the expanded operations alterative analyzed in the 1999 LANL SWEIS due to the operating constraints imposed on radiological operations at the CMR building.

Comments on the Final Environmental Impact Statement

NNSA distributed approximately 400 copies of the final EIS to Congressional members and committees, the State of New Mexico, various American Indian tribal governments and organizations, local governments, other Federal agencies, and the general public. NNSA received one comment letter from the Pueblo of San Ildefonso regarding NNSA's responses to Pueblo concerns related to the draft CMRR EIS that focused primarily on the spread of contamination present in the canyons around LANL onto land owned by the Pueblo. This issue is beyond the scope of the CMRR EIS but will be addressed by NNSA through other means already established for LANL, such as the environmental restoration project, rather than through the NEPA compliance process.

Decision Factors

NNSA's decisions are based on its mission responsibilities and the ability to continue to perform mission-critical AC and MC operations at LANL in an environmentally sound, timely and fiscally prudent manner. Other key factors in the decision-making process include programmatic impacts and overall program risk, and construction and operational costs.

LANL's CMR operations support a wide range of scientific and technological capabilities that support, in turn, NNSA's national security mission assignments. Most of the LANL mission support functions require AC and MC, and actinide research and development support capabilities and capacities that currently exist within the CMR building. NNSA will continue to need CMR capabilities now and into the foreseeable future, much as these capabilities have been needed at LANL over the past 60 years. Programmatic risks are high if LANL CMR operations continue at the curtailed operational level now appropriate at the aging CMR building. CMR operations at LANL need to continue seamlessly in an uninterrupted fashion, and the level of overall CMR operations needs to be flexible enough to accommodate the work load variations inherent in NNSA's mission support assignments and the general increase in the level of operations currently seen as necessary to support future national security requirements.

The CMR building was initially designed and constructed to comply with the Uniform Buildings Codes in effect at the time. The CMR building's wing 4 location over a seismic trace would require very extensive and costly structural changes that would be of marginal operational return. Construction costs are estimated to be less for building and operating a new CMRR facility over the long term than the cost estimated for making changes to the aging CMR building so that the building could be operated as a nuclear facility at the level of operations required by the expanded operations alternative selected for LANL in the 1999 LANL SWEIS ROD over the next 50 years. Life cycle costs of operating a new CMRR facility at TA–55 are less than the costs would be of operating a totally upgraded CMR building over the next 50 years. Reduced general occupation costs of maintaining the new CMRR facility (such as heating and cooling the building to maintain comfortable personnel working conditions) given the reduction in occupied building square footage over that of the existing CMR building, and reduced security costs (for maintaining Perimeter Intrusion Detection Alarm Systems (PIDAS) and guard personnel) due to the co-location of the CMRR facility within the existing security perimeter of the plutonium facility thereby eliminating the need for maintaining a separate duplicative security system at the CMR building both would significantly reduce general operating costs for the new facility.

Mitigation Measures

Based on the analyses of impacts provided in the CMRR EIS, no mitigation measures were identified as being necessary since all potential environmental impacts would be substantially below acceptable levels of promulgated standards. Activities associated with the proposed construction of the new CMRR facility would follow standard procedures for minimizing construction impacts, as would demolition activities.

Decisions

NNSA has decided to implement the preferred alternative, alternative 1, which is the construction and operation of a new CMRR facility within TA–55 at LANL. The new CMRR facility would include two buildings (one building for administrative and support functions, and one building for Hazard Category 2 SNM laboratory operations), both of which would be constructed at above ground locations (construction option 3). The existing CMR building would be decontaminated, decommissioned and demolished in its entirety (disposition option 3). However, the actual implementation of these decisions is dependent on DOE funding levels and allocations of the DOE budget across competing priorities.

Issued in Washington, DC, this 3rd day of February, 2004.

Linton Brooks,

Administrator, National Nuclear Security Administration.

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APPENDIX B
ENVIRONMENTAL IMPACTS METHODOLOGIES

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ENVIRONMENTAL IMPACTS METHODOLOGIES

This appendix briefly describes the methods used to assess the potential direct, indirect, and cumulative effects of the alternatives in this *Final 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 (CMRR-NF SEIS)*. Included are impact assessment methods for land use and visual resources, site infrastructure, air quality, noise, geology and soils, surface-water and groundwater quality, ecological resources, cultural and paleontological resources, socioeconomics, environmental justice, human health, waste management and pollution prevention, transportation and traffic, and cumulative impacts. Each section includes descriptions of the affected resources, region of influence (ROI), and impact assessment methods.

The methods described in this appendix are also used to assess the effects of operating the Radiological Laboratory/Utility/Office Building (RLUOB). RLUOB is complete and was built to provide administrative and support functions to the Chemistry and Metallurgy Research Building Replacement (CMRR) Nuclear Facility (CMRR-NF).

Impact analyses vary for each resource area. For air quality, for example, estimated pollutant emissions from the candidate facilities were compared with appropriate regulatory standards or guidelines. Comparison with regulatory standards is a commonly used method for benchmarking environmental impacts, and is done here to provide perspective on the magnitude of identified impacts. For waste management, waste generation rates were compared with the capacities of waste management facilities. Impacts within each resource area were analyzed consistently; that is, the impact values were estimated using a consistent set of input variables and computations. Moreover, calculations in all resource areas used accepted protocols and up-to-date models.

The baseline conditions assessed in this *CMRR-NF SEIS* are consistent with conditions under the No Action Alternative described in the 2008 *Final Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory, Los Alamos, New Mexico* (*LANL SWEIS*) (DOE 2008), and updated in the SWEIS Yearbooks (most recently in 2010) and site environmental reports (most recently in 2009). These decisions include the programmatic level of operations at Los Alamos National Laboratory (LANL) facilities (including the CMRR Facility, which comprises both the CMRR-NF and RLUOB) for at least the next 5 years, as well as project-specific decisions for individual projects at LANL, including those at Technical Area 55 and within surrounding and nearby technical areas along the Pajarito Road corridor. The No Action Alternative was used as the basis for the comparison of impacts that would occur under implementation of the other alternatives.

B.1 Land Use and Visual Resources

B.1.1 Land Use

B.1.1.1 Description of Affected Resources and Region of Influence

Land use is defined in terms of the kinds of anthropogenic activities (for example, agriculture, residential, industrial) for which land is developed (EPA 2006). Natural resources and other environmentally characteristic attributes make a site more suitable for some land uses than for others. Changes in land use may have beneficial or adverse ecological, cultural, geologic, and atmospheric effects on other resources. The ROI for land use varies due to the extent of land ownership, adjacent land use patterns and trends, and other geographic or safety considerations, but generally includes the site and areas immediately adjacent to the site.

B.1.1.2 Description of Impact Assessment

The amount of land disturbed and conformity with existing land use were considered for the purpose of evaluating the impacts of construction and operation at each candidate site (see **Table B–1**). Both factors were considered for each of the action alternatives. However, because new construction would not take place under the Continued Use of CMR Building Alternative, only conformity with existing land use was evaluated under this alternative. Land use impacts could vary considerably from site to site, depending on the extent of construction activities and the location(s) (that is, undeveloped or developed land) where they would take place.

Table B–1 Impact Assessment Protocol for Land Resources

	Required Data		
Resource	***Affected Environment***	***Alternative***	***Measure of Impact***
Land area used	Site acreage	CMRR Project activity location and acreage requirement	Acreage converted to CMRR Project use
Compatibility with existing or future land use	Existing land use configurations	Location of CMRR Project activity on the site and expected modifications of current activities and missions to accommodate the alternatives	Incompatibility with existing or future land use
Visual resources	Current Visual Resource Management classification	Location of CMRR Project activity on the site and activity dimensions and appearance	Change in Visual Resource Management classification

CMRR = Chemistry and Metallurgy Research Building Replacement.

B.1.2 Visual Resources

B.1.2.1 Description of Affected Resources and Region of Influence

Visual resources are the natural and manmade features that give a particular landscape its character and aesthetic quality. Landscape character is determined by the visual elements of form, line, color, and texture. All four elements are present in every landscape; however, they exert varying degrees of influence. The stronger the influence exerted by these elements in a landscape, the more interesting the landscape. The ROI for visual resources includes the geographic area from which the candidate facilities may be seen.

B.1.2.2 Description of Impact Assessment

Impacts on visual resources from construction of the CMRR-NF and operation of the CMRR-NF and RLUOB at LANL may be determined by evaluating whether the U.S. Bureau of Land Management Visual Resource Management classifications of the candidate sites would change as a result of the proposed alternatives (DOI 1986) (see Table B–1). Existing classifications were derived from an inventory of scenic qualities, sensitivity levels, and distance zones for particular areas. For those alternatives involving existing facilities at LANL, alterations to visual features may be readily evaluated and the impact on the current Visual Resource Management classification may be determined. To determine the range of potential visual effects from new CMRR Project activities, the analysis considered the potential impacts of construction and operation on the aesthetic quality of surrounding areas, as well as the visibility of such activities from public vantage points.

B.2 Site Infrastructure

B.2.1 Description of Affected Resources and Region of Influence

Site infrastructure includes the utility systems required to support construction and/or modification and operation of the candidate facility. It includes the capacities of the electric power transmission and distribution system, natural gas and liquid fuel (fuel oil, diesel fuel, and gasoline) supply systems, and the water supply system. The ROI for utility infrastructure resources includes the LANL site, including the affected technical areas and the individual facilities, and the surrounding area to include non-LANL users who rely on the same utility systems (electric power, natural gas, and water) that serve LANL.

B.2.2 Description of Impact Assessment

In general, infrastructure impacts were assessed by evaluating the requirements under each alternative against the site capacity and/or the system capacity. An impact assessment was made for each resource (electricity, fuel, and water) under the various alternatives (see **Table B–2**). Tables reflecting site availability and infrastructure requirements were developed for each alternative. Data for these tables were obtained from reports describing the existing site and regional infrastructure and from the data reports for each alternative. If necessary, design mitigation considerations conducive to reduction of the infrastructure demand were also identified.

Table B–2 Impact Assessment Protocol for Infrastructure

Resource	*Required Data*		*Measure of Impact*
	Affected Environment	*Alternative*	
Electricity			
Energy consumption (megawatt-hours per year) Peak load (megawatts)	Site and system capacity and current usage	Facility requirements	Additional requirement (with added facilities) exceeding site/system capacity
Fuel			
Natural gas (cubic meters per year)	System capacity and current usage	Facility requirements	Additional requirement (with added facilities) exceeding system capacity
Water (liters per year)	Site and system capacity and current usage	Facility requirements	Additional requirement (with added facilities) exceeding site/system capacity

Any projected demand for infrastructure resources exceeding site or system availability can be regarded as an indicator of environmental impact. Whenever projected demand approaches or exceeds capacity, further analysis of that resource is warranted. Often, design changes can mitigate the impact of additional demand for a given resource. For example, substituting fuel oil for natural gas (or vice versa) for heating or industrial processes can be accomplished at little cost during the design of a facility if the potential for impact is identified early. Similarly, a dramatic spike or surge in peak demand for electricity can sometimes be mitigated by upgrading the existing infrastructure.

B.2.3 Sustainable Building

Executive Orders 13423 and 13514 require Federal agencies to meet specific sustainability goals in terms of conserving non-renewable resources and reducing emissions of pollutants. Several U.S. Department of Energy (DOE) orders define requirements to meet these goals. DOE Order 413.3B addresses the internal management processes for acquisition of high-performing facilities. This order also lays out a series of critical decision points that develop project goals and objectives and refine project parameters, including goals for sustainability. Through this process, design development progresses in tandem with decisions about cost and budget during the project life cycle. DOE Order 430.2B defines the specific benchmarks for measuring progress toward achieving the sustainability goals, including reductions in greenhouse gas emissions and energy and water use, established in Executive Order 13423. DOE Order 436.1, *Departmental Sustainability* (May 2, 2011), has the broader purpose of providing requirements and responsibilities for managing sustainability within DOE to: (1) ensure DOE carries out its mission to balance national energy security and environmental challenges while advancing sustainable, efficient, and reliable energy for the future, (2) institute a wholesale cultural change to factor sustainability and greenhouse gas reductions into all DOE management decisions, and (3) ensure DOE achieves its sustainability goals as defined in its Strategic Sustainability Performance Plan. This order cancels DOE 450.1A, *Environmental Protection Program* (June 4, 2008) and 430.2B, *Departmental Energy, Renewable Energy and Transportation Management* (February 27, 2008), but does not cancel the contractual or regulatory obligations of these orders. It also adheres to the requirements of Executive Orders 13423 and 13514. In addition, it makes it necessary for sites (such as LANL) to include site-wide objectives and targets in their environmental management system that align with DOE Order 430.2B. These orders pave the way toward making sustainability an active principle for DOE sites and facilities. For additional information on applicable laws, regulations, and other requirements, see Chapter 5.

Sustainability requires implementation of a comprehensive plan of action. One strategy is to design, construct, and operate more-efficient and environmentally responsible buildings. To this end, the U.S. Green Building Council developed the Leadership in Energy and Environmental Design® (LEED) building certification system to provide independent, third-party verification that a building or community is designed and built using strategies aimed at improving performance across metrics such as energy savings, water efficiency, carbon dioxide emissions reduction, improved indoor environmental quality, resource stewardship, and sensitivity to the impacts of construction and operation. The LEED system certifies building performance via a voluntary rating system based on a consensus-based national standard derived from technical criteria and professional knowledge.

The LEED system uses various rating criteria for new construction (including homes, schools, commercial and industrial facilities), renovations to existing buildings (residential, commercial, and industrial), and neighborhood design. The LEED system uses the following six areas to rate a project's sustainable design proficiency:

- Sustainable sites
- Water efficiency and quality
- Energy and atmosphere
- Materials and resources
- Indoor environmental quality
- Innovative design

Within these areas, a project is scored on specific measures to earn "credits." The sum of the earned credits determines the total score and certification level achieved by the project (Certified, Silver, Gold, or Platinum levels). The advantage of project certification is not only demonstrable energy and environmental consideration, but also recognition and status in a value-driven market (for commercial endeavors) and long-term cost savings for operating and maintaining a sustainable facility.

The LEED certification process starts in the design phase and drives decisions regarding the six key areas above. LEED rating criteria, for example, address material and product selection, construction methods, and waste management, as well as post-construction commissioning of the building to ensure lifetime optimal performance. Previously, DOE Order 430.2B[1] required all DOE projects to incorporate LEED certification measures into the design/build process. DOE Order 430.2B specified that LEED Gold certification applies to all new buildings and major renovations that were in the Critical Decision-1 (CD-1) stage or lower (CD-0) of project development on October 1, 2008. Because the CD-1 decision for the CMRR-NF was made on May 18, 2005, Gold-level certification was not yet a formulating criterion for this project. Notwithstanding, other DOE orders and directives made sustainability and high building performance a key factor. As such, LEED certification was included as a contractual requirement during the design phase for the CMRR-NF. Since then, DOE Order 436.1 no longer requires LEED certification specifically, but makes sustainability and energy efficiency essential parameters for all DOE undertakings. It also supports ongoing contractual requirements that meet the purpose of sustainability and the requirements of Executive Orders 13423 and 13514. LEED construction continues to be one method for DOE to progress toward the sustainable goals required by these two executive orders.

The LEED system assessment for this *CMRR-NF SEIS* considers whether proposed construction projects incorporate LEED strategies to minimize potential use of energy and water. Because LEED offers six areas of achievement, certification may result from a combination of factors, not just reduced energy and water use. LEED construction is one method for DOE to achieve the sustainable goals required under Executive Orders 13423 and 13514. Implementation of the proposed project, in combination with other actions and sustainability initiatives at LANL, is considered in the cumulative impacts analysis in this *CMRR-NF SEIS*. The assessment describes qualitatively how LEED certification of the CMRR-NF would factor into site-wide progress toward meeting sustainability goals (see Chapter 4, Section 4.6).

RLUOB, which has already been built and will provide administrative and support functions to the CMRR-NF, is anticipated to be awarded LEED Silver Certification for new construction.

B.3 Air Quality

B.3.1 Description of Affected Resources and Region of Influence

Air pollution refers to the direct or indirect introduction of any substance into the air that could endanger human health, harm living resources and ecosystems, damage material property, or impair or interfere with the comfortable enjoyment of life and other legitimate uses of the environment.

For the purpose of this *CMRR-NF SEIS*, only outdoor air pollutants were addressed. These outdoor air pollutants may be in the form of solid particles, liquid droplets, gases, or a combination of these forms. Generally, they can be categorized as primary pollutants (those emitted directly from identifiable sources) and secondary pollutants (those produced in the air by interaction between two or more primary pollutants or by reaction with normal atmospheric constituents that may be influenced by sunlight). Air pollutants are transported, dispersed, or concentrated by meteorological and topographical conditions. Thus, air quality is affected by air pollutant emission characteristics, meteorology, and topography.

Ambient air quality in a given location can be described by comparing the concentrations of various pollutants in the atmosphere to the appropriate standards established by Federal and state agencies. These ambient air quality standards allow an adequate margin of safety for the protection of public health and welfare from the adverse effects of pollutants in ambient air. Pollutant concentrations higher than the

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[1] *LEED requirement from DOE Order 430.2B: "The installation of sustainable building materials and practices throughout the Department's existing building assets and the attainment of the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) Gold certification for all new construction and major building renovations in excess of $5 million. All buildings falling below this threshold are required to comply with the Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings (Guiding Principles)."*

corresponding standards are considered unhealthy; concentrations below such standards are considered acceptable.

The pollutants of concern are primarily those for which Federal and state ambient air quality standards have been established, including criteria air pollutants, hazardous air pollutants, and other toxic air compounds. Criteria air pollutants are those listed in Title 40 of the *Code of Federal Regulations* (CFR), Part 50 (40 CFR Part 50), "National Primary and Secondary Ambient Air Quality Standards." Hazardous air pollutants and other toxic compounds are those listed in Title I of the Clean Air Act, as amended (40 *United States Code* [U.S.C.] 7401 et seq.), those regulated by the National Emissions Standards for Hazardous Air Pollutants (40 CFR Part 61), and those that have been proposed or adopted for regulation by the applicable states or listed in state guidelines. States may set ambient standards that are more stringent than the National Ambient Air Quality Standards (NAAQS). The more stringent of the Federal or state standards for each pollutant are discussed in this document.

Areas with air quality better than the NAAQS for criteria air pollutants are designated as "attainment," while areas with air quality worse than the NAAQS for such pollutants are designated as "nonattainment." Areas may be designated as "unclassified" when there are insufficient data for attainment status designation. Attainment status designations are assigned by county; metropolitan statistical area; consolidated metropolitan statistical area, or portions thereof; or air quality control regions. Air quality control regions designated by the U.S. Environmental Protection Agency (EPA) are listed in 40 CFR Part 81, "Designation of Areas for Air Quality Planning Purposes." LANL is located in an attainment area (40 CFR 81.332).

For locations that are in an attainment area for criteria air pollutants, Prevention of Significant Deterioration regulations limit pollutant emissions from new or modified sources and establish allowable increments of pollutant concentrations. Three Prevention of Significant Deterioration classifications are specified according to the criteria established in the Clean Air Act. Class I areas include national wilderness areas and memorial parks larger than 5,000 acres (2,020 hectares), national parks larger than 6,000 acres (2,430 hectares), and areas that have been redesignated as Class I. Class II areas are all areas that are not designated as Class I (42 U.S.C. 7472, Title I, Section 162). LANL is in a Class II area; it is adjacent to the Bandelier National Monument and Wilderness Area Class I area (DOE 2008).

The ROI for air quality encompasses the area surrounding a candidate site that is potentially affected by air pollutant emissions caused by the alternatives. The air quality impact area normally evaluated is the area in a Class II area in which concentrations of criteria pollutants would increase more than a significant amount. This determination is based on averaging periods and acceptable concentrations established for specific pollutants: 1 microgram per cubic meter for the annual average for sulfur dioxide, nitrogen dioxide, and particulate matter less than or equal to 10 microns in aerodynamic diameter (PM_{10}); 5 micrograms per cubic meter for the 24-hour average for sulfur dioxide and PM_{10}; 500 micrograms per cubic meter for the 8-hour average for carbon monoxide; 25 micrograms per cubic meter for the 3-hour average for sulfur dioxide; and 2,000 micrograms for the 1-hour average for carbon monoxide (40 CFR 51.165). Averaging periods are the average rate or rates at which a source emits a pollutant during the stated period of 1 hour, 3 hours, 8 hours, 24 hours, or a year. Generally, this area covers a few kilometers downwind from the source. For sources within 60 miles (100 kilometers) of a Class I area, the air quality impact area evaluated would include the Class I area if the increase in concentration were greater than 1 microgram per cubic meter (24-hour average). The area of the ROI depends on the emission source characteristics, pollutant types, emission rates, and meteorological and topographical conditions. For analysis purposes, the impacts were evaluated at the site boundary and along roads within the site to which the public has access, plus any additional area in which contributions to pollutant concentrations are expected to exceed significance levels.

Baseline air quality is typically described in terms of the pollutant concentrations modeled for existing sources at each candidate site and the background air pollutant concentrations measured near the sites. For this analysis, concentration estimates for existing sources were obtained from the 2008 *LANL SWEIS* and from concentrations models using recent emissions inventories and the AERMOD Version 09292 screening model AERSCREEN. The AERSCREEN model produces concentration estimates that are equal to or greater than the estimates produced by AERMOD, which provides a "worst-case" scenario (EPA 2010a). As of December 9, 2006, EPA's promulgated AERMOD package replaced the ISC3 (Industrial Source Complex) dispersion model (EPA 2010b). Thus, the most recent model was used to determine air emissions.

B.3.2 Description of Impact Assessment

Potential air quality impacts of pollutant emissions from construction and normal operations under each alternative were evaluated. This assessment included a comparison of pollutant concentrations under each alternative with applicable Federal and state ambient air quality standards (see **Table B–3**). If both Federal and state standards exist for a given pollutant and averaging period, compliance was evaluated using the more stringent standard. Operational air pollutant emissions data for each alternative were based on conservative engineering analyses.

Table B–3 Impact Assessment Protocol for Air Quality

	Required Data		
Resource	***Affected Environment***	***Alternative***	***Measure of Impact***
Criteria air pollutants and other regulated pollutants [a]	Measured and modeled ambient concentrations (micrograms per cubic meter) from existing sources at the site	Emission rates (kilograms per year) of air pollutants from facility; source characteristics (stack height and diameter, exit temperature and velocity)	Concentration under the alternatives and total site concentration of each pollutant at or beyond the site boundary or within the boundary on public roads, as compared to applicable standards
Toxic and hazardous air pollutants [b]	Measured and modeled ambient concentrations (micrograms per cubic meter) from existing sources at the site	Emission rates (kilograms per year) of air pollutants from facility; source characteristics (stack height and diameter, exit temperature and velocity)	Concentration under the alternatives and total site concentration of each pollutant at or beyond the site boundary or within the boundary on public roads, which were used to calculate the hazard quotient or cancer risk

[a] Carbon monoxide; hydrogen fluoride; lead; nitrogen oxides; ozone; particulate matter less than or equal to 10 microns in aerodynamic diameter; sulfur dioxide; total suspended particulates.
[b] Clean Air Act (40 U.S.C. 7401 et seq.), Section 112(d), hazardous air pollutant: pollutants regulated under the National Emissions Standard for Hazardous Air Pollutants and other state-regulated pollutants.

Contributions to offsite air pollutant concentrations under each alternative were modeled based on guidance provided in EPA's "Guidelines on Air Quality Models" (40 CFR Part 51, Appendix W). EPA's recommended model AERSCREEN (EPA 2010a) was selected as an appropriate model for air dispersion modeling because it is designed to support the EPA regulatory modeling program and it predicts conservative, worst-case impacts.

The modeling analysis incorporated conservative assumptions, which tended to overestimate pollutant concentrations. The maximum modeled concentration for each pollutant and averaging period was selected for comparison with the applicable standard. The concentrations evaluated were the maximum concentrations occurring at or beyond the site boundary and at a public access road or other publicly accessible area within the site. Available monitoring data, which reflect both onsite and offsite sources, were also taken into consideration. Concentrations of the criteria air pollutants were presented for each alternative. Concentrations of hazardous and toxic air pollutants were evaluated in the public and occupational health effects analysis. At least 1 year of representative hourly meteorological data was used.

Ozone is typically formed as a secondary pollutant in the ambient air (troposphere). It is formed in the presence of sunlight from the mixing of primary pollutants, such as nitrogen oxides, and volatile organic compounds that emanate from vehicular (mobile) sources and natural and other stationary sources. Ozone is not emitted directly as a pollutant from the candidate sites. Although ozone may be regarded as a regional issue, specific ozone precursors, notably nitrogen dioxide and volatile organic compounds, were analyzed because they are applicable to the alternatives under consideration.

The Clean Air Act, as amended, requires that Federal actions conform to the host state's "state implementation plan." A state implementation plan provides for implementation, maintenance, and enforcement of the NAAQS for the six criteria pollutants: sulfur dioxide, PM_{10}, carbon monoxide, ozone, nitrogen dioxide, and lead. Its purpose is to eliminate or reduce the severity and number of violations of the NAAQS and to expedite attainment of these standards. "No department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit, or approve any activity that does not conform to an applicable implementation plan" (42 U.S.C. 7506). The final rule for "Determining Conformity of General Federal Actions to State or Federal Implementation Plans" (58 *Federal Register* [FR] 63214) took effect on January 31, 1994. LANL is within an area currently designated as in attainment for criteria air pollutants. Therefore, the alternatives being considered in this *CMRR-NF SEIS* are not affected by the provisions of the conformity rule.

Emissions of potential stratospheric ozone-depleting compounds, such as chlorofluorocarbons, were not evaluated because no emissions of these pollutants were identified in the conceptual engineering design reports.

B.3.3 Greenhouse Gases

On February 18, 2010, the Council on Environmental Quality (CEQ) released its *Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions* (CEQ 2010), which suggests that proposed alternatives that are reasonably anticipated to emit 25,000 metric tons or more of direct carbon dioxide equivalent air emissions should be evaluated by quantitative and qualitative assessments. This is not a threshold of significance, but an indicator that a quantitative and qualitative assessment may be meaningful to decisionmakers and the public, and should be considered in documentation required by the National Environmental Policy Act (NEPA), as amended (42 U.S.C. 4321 et seq.). Quantitative analysis of greenhouse gas emissions (carbon-dioxide equivalent air emissions) in this *CMRR-NF SEIS* may be useful in making reasoned choices among the alternatives. Neither the CEQ nor EPA has issued final guidance regarding how to address greenhouse gas/climate change impacts under NEPA.

The greenhouse gas analysis assessed the impacts, where applicable, of four of the six primary greenhouse gases; carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons, as defined in accordance with Section 19(i) of Executive Order 13514. The two primary greenhouse gases that were excluded from analysis are perfluorocarbons and sulfur hexafluoride, as there were no measureable sources from construction or operation of the facility under any alternative.

The predominant source of anthropogenic carbon dioxide emissions is combustion of fossil fuels. Forest clearing, other biomass burning, and some non-energy-production processes (for example, cement production) also emit notable quantities of carbon dioxide. Another greenhouse gas, methane, comes from landfills, coal mines, oil and gas operations, and agriculture. Anthropogenic sources of nitrous oxide emissions include burning fossil fuels and the use of certain fertilizers and industrial processes. Hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are powerful, synthetic greenhouse gases that are released as byproducts of industrial processes and through leakage.

The following section describes the methodology used for the quantitative greenhouse gas analysis in this *CMRR-NF SEIS*.

B.3.3.1 Description of Impact Assessment

The potential impacts of greenhouse gas emissions of carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons from construction and operation under each alternative were evaluated, where applicable. The annual and total greenhouse gas emissions that would result from construction and operation of the proposed CMRR-NF, including emissions from onsite construction equipment, construction material transport, use of propane heaters in the winter months during construction, worker commutes, occasional use of emergency generators, and refrigerant usage during operation of the facility, were calculated. Cement for construction purposes would be produced at an electric cement batch plant. Emissions from electricity consumption during cement production and the CMRR facility operation are not under the direct control of LANL, and do not occur directly on site, but have been included under environmental consequences. Under the analysis of operations, the impacts from the normal operation of RLUOB were also analyzed.

B.3.3.1.1 Summary of Calculations

All calculations follow the guidance provided by EPA for greenhouse gas inventory calculations (EPA 2008, 2009). Emission factors (**Table B–4**) and global warming potentials (**Table B–5**) were chosen based on this guidance.

Table B–4 Emission Factors Used in the Construction and Operations Analysis of the Alternatives

Emission Factors (diesel) [a]		
Pounds Carbon Dioxide per Gallon	**Pounds Methane per Gallon**	**Pounds Nitrous Oxide per Gallon**
22.4	0.000097354	0.00010344
Emission Factors (gasoline) [a]		
Pounds Carbon Dioxide per Gallon	**Pounds Methane per Gallon**	**Pounds Nitrous Oxide per Gallon**
19.5	0. 0016152	0. 001466
Electricity Generation Emission Factors [b]		
Pounds Carbon Dioxide per Megawatt-Hour	**Pounds Methane per Megawatt-Hour**	**Pounds Nitrous Oxide per Megawatt-Hour**
1,311.05	0.01745	0.01794

[a] EPA 2003.
[b] EPA 2010c.

Table B–5 Global Warming Potential for Major Greenhouse Gases

Chemical Name	***Global Warming Potential*** [a]
Carbon dioxide	1
Methane [b]	21
Nitrous oxide	310
Hydrofluorocarbons	1,300

[a] 100-year time horizon.
[b] The global warming potential of methane includes the direct effects and those indirect effects due to the production of tropospheric ozone and stratospheric water vapor. The indirect effect due to the production of carbon dioxide is not included.
Source: IPCC 2007.

Construction Equipment

Construction of the CMRR-NF requires various types of construction equipment or nonroad vehicles. The following data were required to calculate the emissions for contractor-owned (nonroad) highway vehicles:

- Vehicle class
- Vehicle hours of operation
- Fuel type
- Average fuel consumption rate
- Emission factor
- Global warming potentials

Specific data were given on the types of equipment, fuel type, and hours of operation (LANL 2011a:Greenhouse Gases, 016). Emissions factors and global warming potentials are shown in Table B–4 and Table B–5. A fuel consumption rate of 4 gallons (15 liters) per hour was assumed.

Materials Transport

The following data were required to calculate the emissions for delivery trucks:

- Vehicle class
- Vehicle miles traveled
- Fuel type
- Average fuel efficiency
- Emission factor
- Global warming potentials

Specific information on the type of vehicle class for the delivery trucks was not available; therefore, it was assumed that they are hybrid diesel vehicles with an average fuel efficiency of 7.8 miles per gallon (3.3 kilometers per liter) (EPA 2003). Section B.14 describes the methodology used to estimate the number of trips made and distance traveled by each truck evaluated in this analysis.

Privately Owned Vehicles

Greenhouse gas emissions from privately owned vehicles (POVs) were calculated assuming one vehicle per construction worker. Data similar to those used for delivery trucks emissions were used to calculate emissions from construction worker commutes. Specific information on the type of vehicle classes was not available; therefore, it was assumed that light-duty gasoline vehicles with an average fuel efficiency of 22.1 miles per gallon (9.4 kilometers per liter) are the only POVs used. This is an average of the fuel efficiency of light-duty gasoline cars (24.1 miles per gallon [10.2 kilometers per liter]) and light-duty trucks (16.4 miles per gallon [7.0 kilometers per liter]) (EPA 2003). It was also assumed that workers had a 30-mile (48-kilometer) round-trip commute to the central parking area, where they board transport buses. This section also includes the bus transport to the construction site from the parking area and back.

Electricity Consumption

Greenhouse gas emissions from cement batch plant electricity use were calculated using the electricity consumption data given in Section B.2, "Site Infrastructure." The electricity generation emission factors are shown in Table B–4. Emissions of greenhouse gases were calculated by taking the amount of electricity consumed and multiplying it by the emissions factor and the appropriate global warming potential.

Propane Heaters

During construction, propane heaters will be used during the winter months. The emissions factors for propane are listed in **Table B–6**.

Table B–6 Greenhouse Gas Emissions Factors for Propane

Chemical Name	*Emissions Factors*
Carbon dioxide	12.7739 pounds per gallon
Methane	1.217×10^{-4} pounds per gallon
Nitrous oxide	1.217×10^{-4} pounds per gallon

Source: USEPA 2009:Table C-1.

Data on the annual amount of propane consumed was provided by LANL (2011a:Infrastructure, 026).

Operations

Emissions of greenhouse gases (carbon dioxide, methane, nitrous oxide, and fluorinated gases) that would be associated with normal operation of the proposed CMRR-NF and RLUOB were quantified. This included offsite emissions associated with production of the electricity used on site.

The only direct greenhouse gas emissions from operation of the CMRR-NF and RLUOB are from occasional use of emergency generators and refrigerants on site to cool the buildings.

Emergency Backup Generators

Greenhouse gas emissions for the occasional operation of emergency backup diesel generators were calculated. Three 1,500-kilowatt diesel generators would operate at RLUOB. The following emergency generators would operate at the Modified CMRR-NF:

- Two 1,780-kilovolt-ampere
- One 3,000-kilovolt-ampere
- One 800-kilovolt-ampere

It was assumed that these emergency generators would potentially operate only 36 hours per year (once a month for 1 hour and once a year for 24 hours). It was also assumed that they would operate at 74 percent load (USAF 2003).

Refrigerants

Emissions from the refrigerants were calculated by taking the amount of material used multiplied by the appropriate global warming potential (Table B–5). Data on the refrigerants used in the CMR Building (which would also be used in the proposed CMRR-NF and RLUOB) show that HFC-134a [1,1,1,2-tetrafluoroethane] is the only refrigerant currently in use (LANL 2011a:Greenhouse Gases, 017).

Electricity Consumption

Greenhouse gas emissions from electricity generation were calculated using the electricity consumption data given in Section B.2, Site Infrastructure. The electricity generation emission factors are shown in Table B–4. Emissions of greenhouse gases were calculated by taking the amount of electricity consumed and multiplying it by the emissions factor and the appropriate global warming potential.

The various greenhouse gas emissions were added together and are presented as carbon-dioxide equivalent emissions—a sum that describes the quantity of each greenhouse gas weighted by a factor of its effectiveness as a greenhouse gas, using carbon dioxide as a reference. This is achieved by multiplying the quantity of each greenhouse gas emitted by a factor called the global warming potential. The global warming potential accounts for the lifetime and the radiative forcing of each gas over a period of 100 years (for example, carbon dioxide has a much shorter atmospheric lifetime than sulfur hexafluoride; therefore, it has a much lower global warming potential). The global warming potentials for the main greenhouse gases discussed are presented in Table B–5.

B.4 Noise

B.4.1 Description of Affected Resources and Region of Influence

Sound results from the compression and expansion of air or some other medium when an impulse is transmitted through it. Sound requires a source of energy and a medium for transmitting the sound wave. Propagation of sound is affected by various factors, including meteorology, topography, and barriers. Noise is undesirable sound that interferes or interacts negatively with the human or natural environment. Noise may disrupt normal activities (hearing and sleep), damage hearing, or diminish the quality of the environment.

Sound-level measurements used to evaluate the effects of nonimpulsive sound on humans are compensated by an A-weighting scale that accounts for the hearing response characteristics (frequency) of the human ear. Sound levels are expressed in decibels, or in the case of A-weighted measurements, decibels A-weighted. EPA has developed noise level guidelines for different land use classifications. Some states and localities have established noise control regulations or zoning ordinances that specify acceptable noise levels by land use category.

Noise from facility operations and associated traffic could affect human and animal populations. The ROI for each candidate site includes the site, nearby offsite areas, and transportation corridors where proposed activities might increase noise levels. Transportation corridors most likely to experience increased noise levels are those roads within a few miles of the site boundary that carry most of the site's employee and shipping traffic.

Sound-level data representative of site environs were obtained from existing reports. The acoustic environment was further described in terms of existing noise sources for each candidate site.

B.4.2 Description of Impact Assessment

Construction noise was evaluated using the Roadway Construction Noise Model, version 1.00, the U.S. Federal Highway Administration's standard model for prediction of construction noise (DOT 2006). The Roadway Construction Noise Model has the capability to model the types of construction equipment that are expected to be the dominant construction-related noise sources associated with this action. All construction noise analyses were assumed to make use of a standard set of construction equipment.

Noise impacts associated with the alternatives may result from construction and operation of facilities and increased traffic (see **Table B–7**). The impacts of facility construction and operation were assessed according to the types of noise sources and the locations of the candidate facilities relative to the site boundary. Potential traffic noise impacts were based on the likely increase in traffic volume. Possible impacts on wildlife were evaluated based on the possibility of sudden loud noises occurring during facility construction or modification and operation.

Table B–7 Impact Assessment Protocol for Noise

Resource	*Required Data*		*Measure of Impact*
	Affected Environment	*Alternative*	
Noise	Identification of sensitive offsite receptors (nearby residences); description of sound levels in the vicinity of the technical area/site	Description of major construction, modification, and operational noise sources; shipment and workforce traffic estimates	Increase in day–night average sound level at sensitive receptors

B.5 Geology and Soils

B.5.1 Description of Affected Resources and Region of Influence

Geologic resources include consolidated and unconsolidated earth materials, including mineral assets such as ore and aggregate materials and fossil fuels such as coal, oil, and natural gas. Geologic conditions include hazards such as earthquakes, faults, volcanoes, landslides, sinkholes, and other conditions leading to land subsidence and unstable soils. Soil resources include the loose surface materials of the earth in which plants grow, usually consisting of mineral particles from disintegrating rock, organic matter, and soluble salts. Certain soils are considered important to farmlands, as designated by the U.S. Department of Agriculture Natural Resources Conservation Service. Important farmlands include prime farmland, unique farmland, and other farmland of statewide or local importance, as defined in 7 CFR 657.5, and may be subject to the Farmland Protection Policy Act (7 U.S.C. 4201 et seq.).

Geology and soils were considered with respect to those attributes that could be affected under the alternatives, as well as those geologic and soil conditions that could affect each alternative. Thus, the ROI for geology and soils includes the CMRR Project site and nearby offsite areas that would be subject to disturbance by facility construction, modification, and operations under the alternatives, as well as those areas beneath existing or new facilities that would remain inaccessible for the life of the facilities. Geologic conditions that could affect the integrity and safety of facilities under the alternatives include large-scale geologic hazards (for example, earthquakes, volcanic activity, landslides, and land subsidence) and local hazards associated with the site-specific attributes of the soil and bedrock beneath site facilities.

B.5.2 Description of Impact Assessment

Facility construction and operations under the alternatives in this *CMRR-NF SEIS* were considered from the perspective of impacts on specific geologic resources and soil attributes. Construction and facility modification activities were the focus of the impacts assessment for geologic and soil resources; hence, one of the key factors considered in the analysis was the land area that would be disturbed during construction and occupied during operations (see **Table B–8**). The assessment included an analysis of the constraints on siting the proposed CMRR-NF over unstable soils that are prone to subsidence, liquefaction, shrink-swell, or erosion.

Table B–8 Impact Assessment Protocol for Geology and Soils

	Required Data		
Resource	***Affected Environment***	***Alternative***	***Measure of Impact***
Geologic hazards	Presence of geologic hazards within the ROI	Location of facility on the site	Potential for damage to facilities
Valuable mineral and energy resources	Presence of any valuable mineral or energy resources within the ROI	Location of facility on the site	Potential to destroy or render resources inaccessible
Important farmland soils	Presence of prime or other important farmland soils within the ROI	Location of facility on the site	Conversion of important farmland soils to nonagricultural use

ROI = region of influence.

The geology and soils impact analysis (see Table B–8) also considered the risks to existing and new facilities from large-scale geologic hazards, such as faulting and earthquakes, lava extrusions and other volcanic activity, landslides, and sinkholes (conditions that tend to affect broad expanses of land). This element of the assessment included collection of site-specific information concerning the potential for impacts on site facilities from local and large-scale geologic conditions.

Probabilistic earthquake ground motions, expressed in terms of peak ground acceleration and spectral (response) acceleration, were determined to provide a comparative assessment of seismic hazards. The U.S. Geological Survey National Seismic Mapping Project uses both parameters. The U.S. Geological Survey's latest National Earthquake Hazards Reduction Program maps are based on spectral acceleration and have been adapted for use in the International Building Code (ICC 2000). These maps depict anticipated peak ground accelerations at 0.2- and 1.0-second spectral acceleration, based on a 2 percent probability of exceedance in 50 years (corresponding to an annual probability of occurrence of about 1 in 2,500). Available site-specific seismic hazard analyses were also reviewed and compared, including the 2007 and 2009 Probabilistic Seismic Hazard Analyses (LANL 2007, 2009), as well as geotechnical reports completed for the CMRR-NF site, with respect to both the shallow and deep excavation options (Kleinfelder 2007a, 2007b, 2010a, 2010b). Potential geohazard impacts, including faulting, seismicity, soil bearing capacity, and slope stability, were evaluated with respect to the information presented in these reports. In addition, recent studies regarding the potential for volcanic activity in the vicinity of LANL (LANL 2010) were summarized and evaluated with respect to the proposed alternatives.

An evaluation also determined whether construction or operation of proposed facilities at a specific site could destroy or preclude the use of valuable mineral or energy resources.

Pursuant to the Farmland Protection Policy Act of 1981 (7 U.S.C. 4201 et seq.) and its implementing regulations (7 CFR Part 658), the presence of important farmland, including prime farmland, was also evaluated. This act requires agencies to make Farmland Protection Policy Act evaluations part of their NEPA process, primarily to reduce the conversion of farmland to nonagricultural uses by Federal projects and programs. However, otherwise qualifying farmlands in or already committed to urban development, land acquired for a project on or prior to August 4, 1984, and lands acquired or used by a Federal agency for national defense purposes are exempt from the act's provisions (7 CFR 658.2 and 658.3).

B.6 Surface and Groundwater Quality

B.6.1 Description of Affected Resources and Region of Influence

Water resources are surface water and groundwater suitable for human consumption, traditional and ceremonial uses by Native Americans, aquatic or wildlife propagation, agricultural purposes, irrigation, or industrial/commercial purposes. The ROI used for water resources encompasses those onsite and adjacent surface-water and groundwater systems that could be affected by effluent discharges, and releases (that is, spills) or stormwater runoff associated with facility construction and operational activities under the proposed CMRR Project alternatives and the operation of the CMRR-NF and RLUOB. Water use is addressed in Section B.2.

B.6.2 Description of Impact Assessment

Assessment of the impacts of the proposed CMRR Project alternatives on surface-water and groundwater quality consisted of a comparison of site-generated data and professional estimates regarding effluent discharge with applicable regulatory standards, design parameters, and standards commonly used in the water and wastewater engineering fields, as well as recognized measures of environmental impacts. Certain assumptions were made to facilitate the impacts assessment: (1) all effluent treatment facilities would be approved by the appropriate permitting authority; (2) the effluent treatment facilities would meet effluent limitations imposed by the relevant National Pollutant Discharge Elimination System permits; (3) any stormwater runoff from construction and operation activities would be handled in accordance with the regulations of the appropriate permitting authority; (4) during construction, sediment fencing or other erosion control devices would be used to mitigate the short-term adverse impacts of sedimentation; and (5) as appropriate, stormwater holding ponds would be constructed to reduce the impacts of runoff on surface-water quality.

B.6.2.1 Water Quality

The water quality impacts assessment analyzed how effluent discharges to surface water, as well as discharges reaching groundwater, from facilities under each alternative would directly affect current water quality. The determination of the impacts of the alternatives (summarized in **Table B–9**) consisted of a comparison of the projected effluent quality with relevant regulatory standards and implementing regulations under the Clean Water Act (33 U.S.C. 1251 et seq.), Safe Drinking Water Act (42 U.S.C. 300 (f) et seq.), state laws, and existing site permit conditions. The impacts analysis evaluated the potential for contaminants to affect receiving waters as a result of spills, stormwater discharges, and other releases under the alternatives. Separate analyses were conducted for surface-water and groundwater impacts.

Table B–9 Impact Assessment Protocol for Water Quality

Resource	*Required Data*		*Measure of Impact*
	Affected Environment	*Facility Design*	
Surface-water quality	Surface water near the facilities in terms of stream classifications and changes in water quality	Expected contaminants and contaminant concentrations in discharges to surface water	Exceedance of relevant surface-water quality criteria or standards established in accordance with the Clean Water Act or state regulations and existing permits
Groundwater quality	Groundwater near the facilities in terms of classification, presence of designated sole-source aquifers, and changes in groundwater quality	Expected contaminants and contaminant concentrations in discharges that could reach groundwater	Contaminant concentrations in groundwater exceeding relevant standards or criteria established in accordance with the Safe Drinking Water Act or state regulations and existing permits

Surface-Water Quality—The evaluation of impacts on surface-water quality focused on the quality and quantity of any effluents (including stormwater) that would be discharged and the quality of the receiving stream resulting from the discharges. The evaluation of effluent quality featured a review of the expected parameters, such as the design average and maximum flows, as well as the effluent parameters reflected in the existing (or expected) National Pollutant Discharge Elimination System permits or applicable state discharge permits. Parameters of concern include total suspended solids, metals, organic and inorganic chemicals, and any other constituents that could affect the local environment. Proposed water quality management practices were reviewed to ensure that any applicable permit limitations and conditions would be met. Factors that currently degrade water quality were also identified.

During facility construction, ground-disturbing activities could affect surface water through increased runoff and sedimentation. Such impacts relate to the amount of land disturbed, type of soil at the site, topography, and weather conditions. These impacts would be minimized by applying standard best management practices for stormwater and erosion control (for example, construction of sediment fences and mulching of disturbed areas).

During operations, surface water could be affected by increased sheet flow runoff from parking lots, buildings, or other cleared areas. Stormwater from these areas could be contaminated with materials deposited by airborne pollutants, automobile exhaust and residues, materials handling releases such as spills, and process effluents. Impacts of stormwater discharges could be highly variable and site-specific, and mitigation would depend on best management practices, holding facility designs, topography, and adjacent land use. Data from existing water quality monitoring sampling results were compared with expected discharges from the facilities to determine the potential impacts on surface water.

Groundwater Quality—Potential groundwater quality impacts associated with any effluent discharges and other contaminant releases during facility construction and operation activities were examined. Available engineering estimates of contaminant concentrations were weighed against applicable Federal and state groundwater quality standards, effluent limitations, and drinking water standards to determine the impacts under each alternative. The consequences of groundwater use and effluent discharge on groundwater conditions were also evaluated.

B.6.2.2 Waterways and Floodplains

The locations of waterways (that is, ponds, lakes, and streams) and the delineated floodplains were identified from maps and other existing documents to assess the potential impacts of facility construction and operations activities, including direct effects on hydrologic characteristics or secondary effects such as sedimentation (see the discussion above on surface-water quality). All activities would be conducted to avoid delineated floodplains and to ensure compliance with Executive Order 11988, *Floodplain Management*.

B.7 Ecological Resources

B.7.1 Description of Affected Resources and Region of Influence

Ecological resources include terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. The ROI for the ecological resource analysis encompassed the site and adjacent areas potentially affected by construction and operation activities associated with the proposed alternatives.

Terrestrial resources are defined as those plant and animal species and communities that are most closely associated with the land, or for aquatic resources, a water environment. Wetlands are defined by the U.S. Army Corps of Engineers and EPA as "… those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (33 CFR 328.3).

Federally endangered species are defined under the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.) as those in danger of extinction throughout all or a large portion of their range. Threatened species are defined as those species likely to become endangered within the foreseeable future. The U.S. Fish and Wildlife Service and the National Marine Fisheries Service propose species to be added to the lists of federally threatened and federally endangered species. These agencies also maintain a list of "candidate" species for which they have evidence that listing may be warranted, but are currently precluded by the need to list species that are more in need of Endangered Species Act protection. Such candidate species do not receive legal protection under the Endangered Species Act, but should be considered in project planning in case they are listed in the future. The LANL *Threatened and Endangered Species Habitat Management Plan* (LANL 2011b) identifies areas of environmental interest for various federally listed threatened or endangered species for the purpose of managing and protecting these areas because of their significance to biological or other resources. In general, an area of environmental interest consists of a core area that contains important breeding or wintering habitat for a specific species, as well as a buffer area around the core area to protect it from disturbances that would degrade its value. The *Threatened and Endangered Species Habitat Management Plan* defines the types and levels of activities that may be conducted within these areas. The State of New Mexico also designates species as endangered, threatened, or sensitive. The *Sensitive Species Best Management Practices Source Document, Version 1* (LANL 2010), was developed as a site-wide mitigation plan to reduce risks to special status species protected at the state or local level. The categories of special status species addressed in this plan include Federal candidate species and species of concern, as well as New Mexico endangered, threatened, sensitive, and critically imperiled species. Best management practices assist in making recommendations for project activities at LANL and provide mitigation measures for the reduction of risks to sensitive species. When LANL contractor personnel perform surveys, they look for and record the occurrence of these special status species.

B.7.2 Description of Impact Assessment

Impacts on ecological resources may occur as a result of land disturbance, water use, air and water emissions, human activity, and noise associated with CMRR Project implementation (see **Table B–10**). Each of these factors was considered when evaluating the potential impacts of the proposed alternatives. For those activities involving the construction of a new facility or placement of laydown or spoils disposal areas, assessment of direct impacts on ecological resources was based on the acreage of land disturbed by construction. The indirect impacts of factors such as human disturbance and noise were evaluated qualitatively. Indirect impacts on ecological resources due to erosion and sedimentation also were evaluated qualitatively, recognizing that standard erosion and sediment control practices would be followed. Impacts on terrestrial and aquatic ecosystems and wetlands from water use and air and water emissions were evaluated based on the results of the analyses conducted for air quality and water resources. Determination of the impacts on threatened and endangered species was based on factors similar to those noted above for terrestrial resources, wetlands, and aquatic resources, in addition to biological assessments and annual species surveys conducted for this project.

Table B–10 Impact Assessment Protocol for Ecological Resources

Resource	*Required Data*		*Measure of Impact*
	Affected Environment	*Alternative*	
Terrestrial resources	Vegetation and wildlife within the vicinity of CMRR Project activity	CMRR Project activity location and acreage requirements, air and water emissions, and noise	Loss or disturbance of terrestrial habitat, emissions and noise values above levels shown to cause impacts on terrestrial resources
Wetlands	Wetlands within the vicinity of CMRR Project activity	CMRR Project activity location and acreage requirements, air and water emissions, and wastewater discharge quantity and location	Loss or disturbance of wetlands, discharge to wetlands
Aquatic resources	Aquatic resources within the vicinity of CMRR Project activity	CMRR Project activity air and water emissions, water source and quantity, and wastewater discharge location and quantity	Discharges above levels shown to cause impacts on aquatic resources, changes in water withdrawals and discharges
Threatened and endangered species	Threatened and endangered species and areas of environmental interest within the vicinity of CMRR Project activity	CMRR Project activity location and acreage requirements, air and water emissions, noise, water source and quantity, and wastewater discharge location and quantity	Measures similar to those noted above for terrestrial and aquatic resources

CMRR = Chemistry and Metallurgy Research Building Replacement.

B.8 Cultural and Paleontological Resources

B.8.1 Description of Affected Resources and Region of Influence

Cultural resources are indications of human occupation and use of the landscape as defined and protected by a series of Federal laws, regulations, and guidelines. For this *CMRR-NF SEIS*, potential impacts were assessed separately for each of the three general categories of cultural resources: archaeological resources, historic buildings and structures, and traditional cultural properties. Paleontological resources are the physical remains, impressions, or traces of plants or animals from a former geological age, and may be sources of information on ancient environments and the evolutionary development of plants and animals. Although not governed by the same historic preservation laws as cultural resources, they could be affected by the proposed alternatives in much the same manner.

Archaeological resources include any material remains of past human life or activities that are of archaeological interest, including items such as pottery, basketry, bottles, weapons, rock art and carvings, graves, and human skeletal materials. The term also applies to sites that can provide information about past human lifeways. Historic buildings and structures include buildings or other structures constructed after 1942 that have been evaluated for eligibility for the National Register of Historic Places. Traditional cultural properties are defined as a place of special heritage value to contemporary communities (often, but not necessarily, Native American groups) because of their association with the cultural practices or beliefs that are rooted in the histories of those communities and their importance in maintaining the cultural identity of those communities (LANL 2006).

B.8.2 Description of Impact Assessment

The analysis of impacts on cultural and paleontological resources addressed potential direct and indirect impacts at each candidate site from construction and operation (see **Table B–11**). Direct impacts include those resulting from groundbreaking activities associated with new construction and spoils disposal. Indirect impacts include those associated with reduced access to a resource site, as well as impacts associated with increased stormwater runoff, increased traffic, and visitation to sensitive areas.

Table B–11 Impact Assessment Protocol for Cultural and Paleontological Resources

	Required Data		
Resource	***Affected Environment***	***Alternative***	***Measure of Impact***
Archaeological resources	Archaeological resources within the vicinity of CMRR Project activities	CMRR Project activity location and acreage requirement	Potential for loss, isolation, or alteration of the character of archaeological resources; introduction of visual, audible, or atmospheric elements out of character
Historic buildings and structures	Buildings and structures within the vicinity of CMRR Project activities	CMRR Project activity location and acreage requirement	Potential for loss, isolation, or alteration of the character of historic buildings and structures; introduction of visual, audible, or atmospheric elements out of character
Traditional cultural properties	Traditional cultural properties within the vicinity of CMRR Project activities	CMRR Project activity location and acreage requirement	Potential for loss, isolation, or alteration of the character of traditional cultural properties; introduction of visual, audible, or atmospheric elements out of character
Paleontological resources	Paleontological resources within the vicinity of CMRR Project activities	CMRR Project activity location and acreage requirement	Potential for loss, isolation, or alteration of paleontological resources

CMRR = Chemistry and Metallurgy Research Building Replacement.

B.9 Socioeconomics

B.9.1 Description of Affected Resources and Region of Influence

Socioeconomic impacts are defined in terms of changes to the demographic and economic characteristics of a region. The number of jobs created by the proposed alternatives could affect regional employment, income, and expenditures. Job creation is characterized by two types: (1) construction-related jobs, which are transient in nature and short in duration, and, thus, less likely to affect public services; and (2) operation-related jobs, which would last for the duration of the proposed CMRR Project and, thus, could create additional service requirements within the ROI.

The ROI for the socioeconomic environment represents a geographic area where site employees and their families reside, spend their income, and use their benefits, thereby affecting the economic conditions of the region. Site-specific ROIs were identified as those counties in which approximately 90 percent or more of the site's workforce resides. This distribution reflects an existing residential preference for people currently employed at LANL and was used to estimate the distribution of workers associated with facility construction and operation under the proposed alternatives.

B.9.2 Description of Impact Assessment

Data were compiled on the current socioeconomic conditions near LANL, including unemployment rates, economic area industrial and service sector activities, and the civilian labor force. The workforce requirements of each alternative were determined to measure their possible effect on these socioeconomic conditions. Although workforce requirements might be met by employees already working at LANL, it was assumed that new employees would be hired to ensure assessment of the maximum impact. Census statistics were also compiled on the local population and housing demand. U.S. Census Bureau population forecasts for the ROI were combined with overall projected workforce requirements for each of the alternatives being considered to determine the extent of the potential impacts on the local economy, population, and housing demand (see **Table B–12**).

Table B–12 Impact Assessment Protocol for Socioeconomics

Resource	***Required Data***		***Measure of Impact***
	Affected Environment	***Alternative***	
Regional Economic Characteristics			
Workforce requirements	Site workforce projections	Estimated construction and operating staff requirements and timeframes	Workforce requirements added to site workforce projections
Region of influence civilian labor force	Labor force estimates	Estimated construction and operating staff requirements and timeframes	Workforce requirements as a percentage of the civilian labor force
Employment	Latest available employment estimates in counties surrounding the site	Estimated construction and operating staff requirements	Potential change in employment
Demographic Characteristics			
Population and demographics of race, ethnicity, and income	Latest available estimates by county from the U.S. Census Bureau	Estimated effect on population	Potential effects on population
Housing Characteristics			
Housing – home owner and renter vacancy rates	Latest available data from the U.S. Census Bureau	Estimated housing unit requirements	Potential change in housing unit availability

B.10 Environmental Justice

B.10.1 Description of Affected Resources and Region of Influence

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health and environmental effects of their programs, policies, and activities on minority populations and low-income populations.

The CEQ has oversight responsibility for documentation prepared in compliance with NEPA. In December 1997, the CEQ released its guidance for analyzing environmental justice issues under NEPA (CEQ 1997). The CEQ guidance was adopted as the basis for analysis of environmental justice in this *CMRR-NF SEIS*.

Environmental justice requires assessment of the potential for disproportionately high and adverse human health or environmental impacts on minority and low-income populations as a result of implementing any of the alternatives analyzed in this *CMRR-NF SEIS*. In assessing these impacts, the following definitions of minority individuals and populations and low-income population were used:

- *Minority individuals:* These individuals are members of one or more of the following population groups: Hispanic or Latino, American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, or two or more races.
- *Minority populations:* Minority populations are identified where either (1) the minority population of the affected area exceeds 50 percent or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. "Meaningfully greater" is defined here as 20 percentage points.
- *Low-income population:* Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Census Bureau's Current Population Reports, Series P-60 on Income and Poverty. In identifying low-income populations, agencies may

> consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect (CEQ 1997). The most recent poverty estimates were supplied from the Census Bureau's Small Area Income and Poverty Estimates (DOC 2010).

Consistent with the impact analysis for the public and occupational health and safety, the affected populations are defined as those minority and low-income populations that are projected to reside within 50 miles (80 kilometers) of Technical Area 3 and Technical Area 55 in the year 2030. To estimate the potential impacts specific to populations in close proximity to LANL, additional radial distances of 5 miles, 10 miles, and 20 miles (8, 16, and 32 kilometers) were analyzed.

Block group data from the 2010 Decennial Census Redistricting Data File (Public Law [P.L.] 94-171), Table PL2, "Hispanic or Latino or not Hispanic or Latino by Race," (DOC 2011) were used as a baseline for projecting populations to the year 2030. Since different population groups in different locations experience different patterns of growth, separate projections were calculated based on race, ethnicity, and location. Data on race and ethnicity were compiled from the 1990, 2000, and 2010 censuses for each county in the ROI, and the trends of the individual subpopulations across this time were used to estimate the likely percentage change each population would experience by the year 2030. Specifically, a separate projection was calculated for the American Indian or Alaska Native population, the Total Hispanic or Latino population, the White non-Hispanic population, and the Other Minority population for each of the counties that lie at least partially within the potentially affected area. The "Other Minority" category consists of all minority populations that are not American Indian or Alaska Native, including the Hispanic or Latino Population. The 2010 populations of each block group were then projected using the percentages calculated for the county in which each block group is located. The projected Total Minority population was calculated by summing the projected American Indian and Alaska Native population with the projected Other Minority population. The projected total population was calculated by summing the projected Total Minority population and the projected White non-Hispanic population.

Block-level data were substituted for block-group-level data for Los Alamos County because the block geography offers the finest spatial resolution for which the Census Bureau compiles data. As adverse impacts on human health are often inversely proportional to proximity, the finer spatial resolution in this area allows a more-accurate representation of the composition of the population within the first several miles of LANL. Population projections for block levels were performed in the same manner as described above for block groups. There would be no advantage to using block-level data for the other counties in the potentially affected area because their location is a sufficient distance away, where the finer spatial resolution would not be necessary.

The 2010 Decennial Census did not contain any sample questions. Sample data that traditionally have been supplied as Summary File-3 have been transferred to the Census Bureau's American Community Survey. Therefore, there are no income data available from the 2010 Census. The American Community Survey offers block group data in the 5-Year Estimates dataset; however, that data set would not be directly comparable to the 1-year data set used to calculate the total population and does not offer finer spatial resolution in close proximity to LANL. To provide a reasonably comparable representation of the potentially affected low-income population, a slightly different approach was adopted. The most up-to-date data from the Census Bureau's Small Area Income and Poverty Estimates (DOC 2010) were compiled for each county in the potentially impacted area. The county-level percentage of the low-income population was then applied to the total population previously projected for each block group that lies within its respective county.

B.10.2 Description of Impact Assessment

Adverse impacts on offsite populations were measured using the methods presented for the various resource areas described in this appendix and analyzed throughout Chapter 4 of this *CMRR-NF SEIS*. Disproportionately high and adverse impacts occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant and exceeds the risk or exposure rate for the general population or another appropriate comparison group. Therefore, estimates of environmental justice impacts were determined using the impacts analysis presented throughout Chapter 4 for the various resource areas to assess the potential for a minority or low-income population to disproportionately bear any adverse impacts.

A special pathways receptor analysis was performed in support of the 2008 *LANL SWEIS* (see Appendix C, Section C.1.4, of the 2008 *LANL SWEIS* [DOE 2008]). Doses associated with normal operations for the alternatives being considered in the *CMRR-NF SEIS* will be compared to the analysis presented in the 2008 *LANL SWEIS*, and an assessment of these impacts on a special pathways receptor will be included in Chapter 4 of this SEIS.

B.11 Human Health

B.11.1 Description of Affected Resources

Public and occupational health and safety analysis examines the potential adverse human health effects of exposure to ionizing radiation and hazardous chemicals from facility operation. In addition, occupational health and safety analysis examines work-related industrial safety issues that determine potential death, illness, or injury resulting from construction and operation activities. Human health effects for transportation of radioactive materials are discussed in Section B.13.

B.11.1.1 Facility Operation

For facility operation, health effects were determined by identifying the types and quantities of additional radioactive materials and toxic chemicals to which individuals may be exposed and estimating the doses or exposures and resulting indicators of health effects (latent cancer fatalities [LCFs]). The impacts of various releases during both normal activities (facility operations and disposition) and postulated accidents on the health of workers and the public residing within an ROI of 50 miles (80 kilometers) were assessed using site-specific factors such as meteorology, population distribution, and distance to nearby receptors.

B.11.1.2 Industrial Safety

Work-related accidents were evaluated in terms of total recordable cases (TRCs), injuries, and deaths resulting from facility construction, operation, and disposition using LANL, other DOE facility, and U.S. Bureau of Labor Statistics historical accidents databases. Two categories of industrial safety impacts, TRCs and fatalities, were analyzed. In addition to fatalities, TRCs include work-related illnesses or injuries that result in loss of consciousness, restriction of work or motion, or transfer to another job, as well as injuries that require medical treatment beyond first aid.

B.11.2 Description of Impact Assessment

B.11.2.1 Facility Operation

Health effects, in terms of incremental doses or exposures and related risks (LCFs), were assessed based on the types and quantities of materials released. Impacts on involved workers were estimated based on operational experience, engineering estimates, and administrative control levels. Models were used to estimate impacts on the health of noninvolved workers and the public resulting from releases during both normal (incident-free) operations and accident conditions. The models used were GENII [Hanford Environmental Radiation Dosimetry Software System (Generation II)] for radioactive air emissions during normal operation (PNNL 2007) and MACCS2 [MELCOR Accident Consequences Code System] for accidental releases of radioactive materials (NRC 1998).

B.11.2.2 Industrial Safety

DOE and contractor TRC and fatality incident rates were obtained from DOE's Computerized Accident/Incident Reporting System database. The database was used to collect and analyze DOE and DOE contractor reports of injuries, illnesses, and other accidents that have occurred during DOE operations. General industry data were obtained from information maintained by the Bureau of Labor Statistics. In addition, LANL site-specific TRCs were obtained from the 2008 *LANL SWEIS* and the SWEIS Yearbooks.

A number of occupational incidence rates are available for use in estimating the industrial safety impacts. The rates vary between 1.6 and 4.0 incidents per 200,000 labor hours (see **Table B–13**). This table provides the three most relevant sources of data for this *CMRR-NF SEIS*: LANL site-specific data, DOE and contractor data, and private industry data maintained by the Bureau of Labor Statistics.

The LANL site-specific injury and illness data are summarized in the 2008 *LANL SWEIS* (DOE 2008) as follows: 2.40 and 1.18 for TRCs and days away, restricted, or transferred (DART) rates, respectively. In addition, the similar information for the activities at DOE facilities is projected to result in 1.6 TRCs and 0.7 DART cases, based on the accident cases from 2004 through 2008 (DOE 2011). These rates are well below industry averages, which in 2006 through 2009 were 4.0 TRCs and 2.0 DART cases as a result of an occupational injury or illness (BLS 2010a).

Table B–13 Total Recordable Cases and Fatality Incident Rates

	Total Recordable Cases (rate [a])	*Fatalities (rate [b])*	*DART (rate [a])*
DOE and contractor	1.6	0.0008	0.7
LANL site-specific	2.4	0.0	1.18
Private industry (BLS)	4.0	0.0038	2.0

BLS = Bureau of Labor Statistics; DART = days away, restricted, or transferred; LANL = Los Alamos National Laboratory.

[a] Average illness and injury cases per 200,000 labor hours from 2004 through 2008 for DOE and 2006 through 2009 for BLS. Days away, restricted, or transferred –DART rate per 200,000 labor hours.

[b] Average fatality rate per 200,000 labor hours from 2004 through 2008 for DOE and 2006 through 2009 for BLS.

Source: BLS 2010a, 2010b; DOE 2011.

B.12 Waste Management and Pollution Prevention

B.12.1 Description of Affected Resources and Region of Influence

Construction of the CMRR-NF is expected to principally generate nonhazardous waste, such as construction and disposition debris. However, because some of the activities associated with construction could occur in the vicinity of potential release sites that require or could potentially require remediation, it is possible that small quantities of other wastes could be generated, including low-level radioactive waste and mixed low-level radioactive waste and/or chemical waste. Operation of the CMRR-NF and RLUOB is expected to generate transuranic and mixed transuranic wastes, low-level radioactive waste, mixed low-level radioactive waste, chemical waste, and nonhazardous waste. Decommissioning, decontamination, and demolition of the CMRR-NF are expected to generate transuranic and mixed transuranic waste, low-level radioactive waste, mixed low-level radioactive waste, chemical waste, and nonhazardous waste.

All of these wastes are defined as follows:

- *Transuranic waste:* Radioactive waste not classified as high-level radioactive waste and containing more than 100 nanocuries per gram of alpha-emitting transuranic isotopes with half-lives greater than 20 years.
- *Mixed transuranic waste:* Transuranic waste that also contains hazardous components regulated under the Resource Conservation and Recovery Act (42 U.S.C. 6901 et seq.).
- *Low-level radioactive waste:* Waste that contains radioactive material and is not classified as high-level radioactive waste, transuranic waste, or spent nuclear fuel, or the tailings or wastes produced by extraction or concentration of uranium or thorium from ore processed primarily for its source material. Test specimens of fissionable material irradiated for research and development purposes only (not for the production of power or plutonium) may be classified as low-level radioactive waste, provided the transuranic concentration is less than 100 nanocuries per gram of waste.
- *Mixed low-level radioactive waste:* Low-level radioactive waste that also contains hazardous components regulated under the Resource Conservation and Recovery Act.
- *Chemical waste:* Defined as hazardous waste under Resource Conservation and Recovery Act regulations; toxic waste (asbestos and polychlorinated biphenyls) under the Toxic Substances Control Act; and special waste (including industrial waste, infectious waste, and petroleum contaminated soils) under New Mexico's Solid Waste Regulations.
- *Nonhazardous waste:* Discarded material including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations or from community activities. This category does not include source, special nuclear, or byproduct material as defined by the Atomic Energy Act (42 U.S.C. 2011 et. seq.).

Waste management activities in support of the proposed alternatives would be contingent on Records of Decision (RODs) issued for the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE 1997a). In its ROD for transuranic waste (63 FR 3629) and subsequent revisions to this ROD (65 FR 82985, 66 FR 38646, and 67 FR 56989), DOE decided (with one exception) that each DOE site that currently has or will generate transuranic waste would prepare its transuranic waste for disposal and store the waste on site until it could be shipped to the Waste Isolation Pilot Plant in Carlsbad, New Mexico, for disposal. In the ROD for hazardous waste released on August 5, 1998 (63 FR 41810), DOE decided that DOE sites will continue to use offsite facilities for treatment and disposal of major portions of their nonwastewater hazardous waste. Based on the ROD for low-level radioactive waste and mixed low-level radioactive waste issued on February 18, 2000 (65 FR 10061), minimal treatment of low-level radioactive waste will be performed and, to the extent practicable, onsite disposal of low-level radioactive waste will continue. DOE's Hanford Site and Nevada National Security Site (formerly called the Nevada Test Site) will be made available to all DOE sites for disposal of low-level radioactive waste. Mixed low-level radioactive waste analyzed in the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* will be treated at the Hanford Site, Idaho National Laboratory, the Oak Ridge Reservation, and the Savannah River Site and will be disposed of at the Hanford Site and the Nevada National Security Site. This decision does not preclude use of a commercial capability for treatment and/or disposal of low-level radioactive waste and mixed low-level radioactive waste.

B.12.2 Description of Waste Management Impacts Assessment

Waste management impacts were assessed by comparing projected waste stream volumes generated from the proposed activities with LANL's waste management capacities and generation rates (see **Table B–14**). Only impacts relative to the capacities of waste management facilities are considered here; other environmental impacts of waste management facility operations (for example, human health effects) are evaluated in other sections of this *CMRR-NF SEIS* or in other facility-specific or site-wide NEPA documents. Projected waste generation rates for the proposed activities were compared with the site processing rates and capacities of those storage, treatment, and disposal facilities likely to be involved in managing the additional waste.

Table B–14 Impact Assessment Protocol for Waste Management

Resource	Required Data: Affected Environment	Required Data: Alternative	Measure of Impact
Waste management capacity - Transuranic waste - Mixed transuranic waste - Low-level radioactive waste - Mixed low-level radioactive waste - Chemical waste - Nonhazardous waste	Site generation rates for each waste type Management capabilities of potentially affected storage, treatment, and disposal facilities for each waste type	Generation rates from facility construction, operations, and DD&D for each waste type	Waste generation rates in comparison to the capabilities of applicable waste management facilities

DD&D = decommissioning, decontamination, and demolition.

B.13 Transportation

B.13.1 Description of Affected Resources and Region of Influence

Transportation of any commodity involves a risk to both transportation crewmembers and members of the public. This risk results directly from transportation-related accidents and indirectly from increased levels of pollution from vehicle emissions, regardless of the cargo. Transportation of certain materials, such as hazardous or radioactive waste, can pose an additional risk due to the unique nature of the materials themselves. Two types of transportation impacts were analyzed: the impacts of incident-free (routine) transportation and the impacts of transportation accidents. The impacts of incident-free transportation and transportation accidents may be either nonradiological or radiological, or both. Incident-free transportation impacts include radiological impacts on the public and the workers due to the radiation field surrounding the transportation package. Nonradiological impacts of potential transportation accidents include traffic accident fatalities.

For incident-free transportation, the ROI for the affected population includes individuals living within 0.5 miles (800 meters) of each side of the road or rail. For transportation accidents, the ROI for the affected population includes individuals residing within 50 miles (80 kilometers) of the accident; the maximally exposed individual would be an individual located 330 feet (100 meters) directly downwind from the accident.

B.13.2 Impact Assessment

The impact of a specific radiological accident is expressed in terms of probabilistic risk, which is defined as the accident probability (that is, accident frequency) multiplied by the accident consequences. The overall risk is obtained by summing the individual risks from all reasonably conceivable accidents. In addition to calculating the radiological risks that would result from all reasonably conceivable accidents during transportation of radioactive waste, the consequences of maximum reasonably foreseeable accidents (events with a probability greater than 1×10^{-7} [1 chance in 10 million] per year) were assessed.

The models used to estimate impacts on the health of the general public resulting from releases during transportation accidents were the Transportation Routing Analysis Geographic Information System (TRAGIS) computer program for route selection and population estimates along the routes, the RADTRAN 6 [Radioactive Material Transportation] risk assessment computer code for incident-free and accident conditions, and the RISKIND [Risks and Consequences of Radioactive Material Transport] computer code for maximum reasonably foreseeable accidents.

The risk from transportation of radioactive materials can be affected by a number of factors. These factors are predominantly categorized as either radiological or nonradiological impacts. Radiological impacts are those associated with the accidental release of radioactive materials and the effects of low levels of radiation emitted during normal, or incident-free, transportation. Nonradiological impacts are those associated with transportation, regardless of the nature of the cargo, such as accidents resulting in death or injury when there is no release of radioactive material.

Shipping packages containing radioactive materials emit low levels of radiation during incident-free transportation. The amount of radiation emitted depends on the kind and amount of material being transported. U.S. Department of Transportation regulations require that shipping packages containing radioactive materials have sufficient radiation shielding to limit the radiation to an acceptable level of 10 millirem per hour at 6.6 feet (2 meters) from the transporter. For incident-free transportation, the potential human health impacts from the radiation field surrounding the transportation packages were estimated for transportation workers and the general population along the route (off traffic, or off-link), people sharing the route (in traffic, or on-link), people at rest areas, and at stops along the route. RADTRAN 6 (SNL 2009) was used to estimate the impacts for transportation workers and populations, as well as the impact on a maximally exposed individual (a person stuck in traffic, a gas station attendee, an inspector, etc.) who could be a worker or a member of the public.

Transportation accidents involving radioactive materials present both nonradiological and radiological risks to workers and the public. Nonradiological impacts of potential transportation accidents include traffic accident fatalities. A release of radioactive material during transportation accidents would occur only when the package carrying the material is subjected to accident forces that exceed the package design standard. The impact of a specific radiological accident is expressed in terms of probabilistic risk, which is defined as the accident probability (that is, accident frequency) multiplied by the accident consequences. The overall risk is obtained by summing the individual risks from all reasonably conceivable accidents. The analysis of accident risks takes into account a spectrum of accident severities ranging from high-probability accidents of low severity (for example, a fender bender) to hypothetical high-severity accidents that have a correspondingly low probability of occurrence. Only as a result of a severe fire and/or a powerful collision, which are of extremely low probability, could a transportation package of the type used to transport radioactive material under the alternatives of this *CMRR-NF SEIS* be damaged to the extent that there could be a release of radioactivity to the environment with significant consequences.

In addition to calculating the radiological risks that would result from all reasonably conceivable accidents during transportation of radioactive wastes, DOE assessed the highest consequences of a maximum reasonably foreseeable accident with a radioactive release frequency greater than 1×10^{-7} (1 chance in 10 million) per year along the route. The latter consequences were determined for atmospheric conditions that would prevail during accidents. The analysis used RISKIND to estimate doses to individuals and populations (Yuan et al. 1995).

Incident-free health impacts are expressed in terms of additional LCFs. Radiological accident health impacts are also expressed as additional LCFs, and nonradiological accident risk as additional immediate (traffic) fatalities. LCFs associated with radiological exposure were estimated by multiplying the occupational (worker) and public dose by 6.0×10^{-4} LCFs per person-rem of exposure (DOE 2003a).

To determine transportation risks, per-shipment risk factors were calculated for the incident-free and accident conditions using RADTRAN 6 (SNL 2009) in conjunction with TRAGIS (Johnson and Michelhaugh 2003) to choose transportation routes in accordance with U.S. Department of Transportation regulations. TRAGIS calculates transportation routes in terms of distances traveled in rural, urban, and suburban areas. It provides population density estimates based on the 2000 Census for each area along the routes to determine population radiological risk factors. For incident-free operations, the affected population includes individuals living within 0.5 miles (800 meters) of each side of the road or rail line. For accident conditions, the affected population includes individuals living within 50 miles (80 kilometers) of the accident, and the maximally exposed individual is assumed to be an individual located 330 feet (100 meters) directly downwind from the accident.

For determining traffic accident fatalities from offsite commercial truck transportation, separate accident rates and accident fatality risks were used for rural, suburban, and urban population zones. These accident and fatality rates were taken from data provided in *State-Level Accident Rates for Surface Freight Transportation: A Reexamination (Accident Rates Report)* (Saricks and Tompkins 1999). The values selected were the mean accident and fatality rates given in the *Accident Rates Report* for "interstate," "total," and "primary." These values were assigned to rural, suburban, and urban population zones, respectively. Accident rates are generically defined as the number of accident involvements (or fatalities) in a given year per unit of travel in that same year. Therefore, the rate is a fractional value, with accident involvement count as the numerator of the fraction and vehicular activity (total travel distance in truck-kilometers) as its denominator. The accident rates for rural, suburban, and urban zones were 3.15, 3.52, and 3.66 per 10 million truck-kilometers, respectively; and the fatality rates were 0.88, 1.49, and 2.32 per 100 million truck-kilometers, respectively.

A review of the truck accidents and fatalities reports by the Federal Carrier Safety Administration indicated that state-level accidents and fatalities were underreported. For the years 1994 through 1996, which were the basis for the analysis in the *Accident Rates Report*, the review found that accidents were underreported by about 39 percent and fatalities were underreported by about 36 percent (UMTRI 2003). Therefore, truck accident and fatality rates in the *Accident Rates Report* were increased by factors of 1.64 and 1.57, respectively, to account for the underreporting.

For determining traffic accident fatalities from local and regional transportation of industrial and hazardous waste, New Mexico state accident and fatality rates, which are also given in the *Accident Rates Report*, were used. The rates used were 1.13 accidents per 10 million truck-kilometers and 1.18 fatalities per 100 million truck-kilometers. For assessment purposes, the total number of expected accidents or fatalities was calculated by multiplying the total shipment distance for a specific waste by the accident or fatality rate.

Radiological consequences were calculated by assigning radionuclide release fractions on the basis of the type of waste, the type of shipping container, and the accident severity category. The release fraction is defined as the fraction of the radioactivity in the container that could be released to the atmosphere in an accident with a given level of severity. Release fractions vary according to waste type and the physical or chemical properties of the radioisotopes. Most solid radionuclides are nonvolatile and are, therefore, relatively nondispersible.

Representative release fractions were developed for each waste and container type on the basis of DOE and U.S. Nuclear Regulatory Commission reports (DOE 1994, 1997b, 2002, 2003b; NRC 1977, 2000). The severity categories and corresponding release fractions provided in these documents cover a range of accidents from no impact (zero speed) to impacts with speeds in excess of 120 miles (193 kilometers) per hour onto an unyielding surface. Traffic accidents that could occur at the site would be of minor impact due to lower local speed, with no release potential.

As stated earlier, offsite route characteristics were determined using TRAGIS, which determines routes for shipment of radioactive materials that conform to U.S. Department of Transportation regulations as specified in 49 CFR Part 397. The TRAGIS-generated population densities along the routes were extrapolated to the year 2030, based on state population growths from the 2000 Census and 2010 Census. The specific route selected determines both the total potentially exposed population and the expected frequency of transportation-related accidents. Route characteristics are expressed in terms of travel distances and population densities in rural, suburban, and urban areas according to the following breakdown:

- Rural population densities range from 0 to 139 persons per square mile (0 to 54 persons per square kilometer).
- Suburban population densities range from 140 to 3,326 persons per square mile (55 to 1,284 persons per square kilometer).
- Urban population densities include all population densities greater than 3,326 persons per square mile (1,284 persons per square kilometer).

Route characteristics were determined for offsite shipments from the LANL site to the following sites:

- Nevada National Security Site in Mercury, Nevada
- Energy*Solutions* Clive Facility in Clive, Utah, as a representative of a commercial disposal site
- Waste Isolation Pilot Plant in Carlsbad, New Mexico

In addition, route characteristics for local routes, that is, LANL to Pojoaque (along Route 502), and Pojoaque to Interstate 25 (south of Santa Fe), were also determined. **Table B–15** summarizes the route characteristics for these sites.

Table B–15 Offsite Transport Truck Route Characteristics

Origin	*Destination*	*Nominal Distance (miles)*	*Distance Traveled in Zones (miles)*			*Population Density in Zone (persons per square mile)*			*Number of Affected Persons* [a]
			Rural	*Suburban*	*Urban*	*Rural*	*Suburban*	*Urban*	
Truck Routes									
LANL	NNSS	777	664	88	25	37.0	1,541.6	10,951.0	427,304
	Commercial [b]	669	583	70	16	30.8	1,790.4	11,743.8	333,612
	WIPP	376	353	22	1.2	22.3	943.5	7,106.7	37,050
Truck Routes (local from Interstate 25 to LANL)									
LANL to Pojoaque		19	17	2.4	0.1	21.8	1,362.3	9,048.9	4,681.0
Pojoaque to Santa Fe [c]		32	27	5	0	71.0	670.3	0	5,169.0

LANL = Los Alamos National Laboratory, NNSS = Nevada National Security Site, WIPP = Waste Isolation Pilot Plant.
[a] The estimated number of persons residing within 0.5 miles along the transportation route.
[b] Energy*Solutions* Clive Facility is a representative commercial disposal facility.
[c] Pass through Santa Fe bypass (New Mexico 599) to Interstate 25.
Note: To convert miles to kilometers multiply by 1.6093; persons per square mile to persons per square kilometer, multiply by 0.3861.

Figure B–1 shows the analyzed truck routes for shipments of radioactive waste materials in this *CMRR-NF SEIS*.

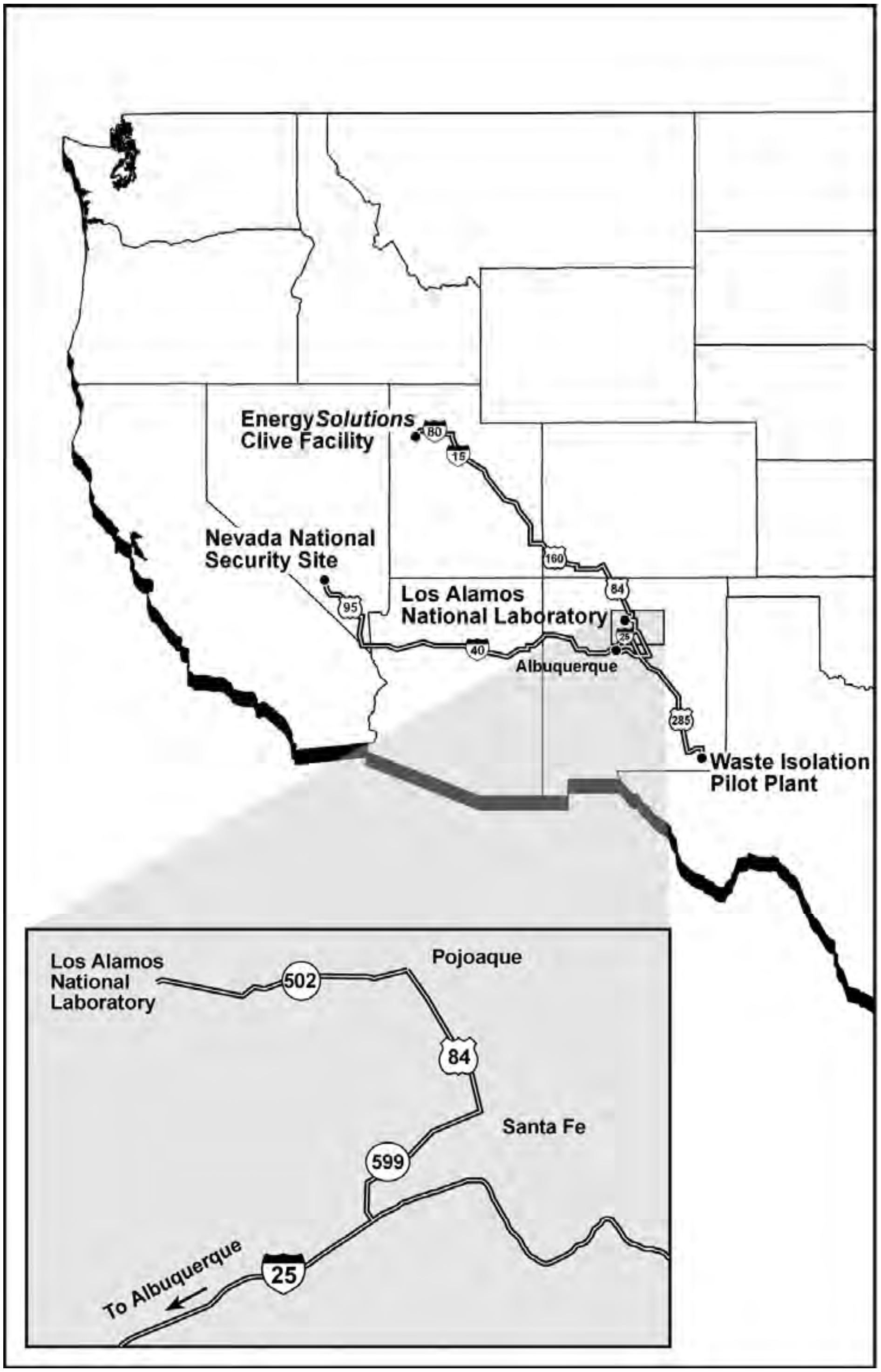

Figure B–1 Analyzed Truck Routes

B.14 Traffic

B.14.1 Description of Affected Resources

This analysis involved a review of engineering estimates or the calculation of engineering estimates of transportation and traffic associated with construction of the CMRR-NF and operation of the CMRR-NF and RLUOB. The impacts of the proposed alternatives were evaluated with respect to internal LANL roadways, access control points, and public roadway network near LANL under both existing and future conditions. Potential shifts in traffic created by the proposed alternatives and corresponding trip generation were estimated. The expected trips were then assigned to road segments. Based on these assumptions, net changes in vehicle volumes were developed and analyzed for each alternative.

The traffic generated by the proposed CMRR-NF construction and operation of the CMRR-NF and RLUOB was estimated, and the impact of that traffic was evaluated for the affected roadway segments. That traffic was added to the expected traffic volume on the respective roadways and the level of service (LOS) was determined for each segment. The LOSs determined for the proposed alternatives were then compared to determine the impacts on the roadways in question.

Increases in peak hour traffic of fewer than 100 vehicles per hour are generally considered not to be significant by transportation engineers in determining LOSs. The operation of the CMRR-NF and RLUOB is not anticipated to generate more trips than the existing facilities. The impacts of the construction of the proposed CMRR-NF are addressed separately. In addition to the impacts on traffic volume, the possible impacts on the existing roadways of the construction traffic are evaluated.

B.14.2 Methodology Used to Analyze Traffic Volume Impacts

Analysis of traffic volume impacts focused on assessing the ability of the existing roadway system to accommodate increased utilization of particular road segments. The number of trips that would be generated by the proposed alternatives was estimated. The level of traffic on each roadway analyzed was estimated using publicly available information from the New Mexico Department of Transportation (Valencia 2010) and from prior traffic studies on LANL. The level of traffic was escalated by an assumed rate of growth on public roadways. Traffic impacts were evaluated for the year construction is expected to begin and for the year construction is expected to be completed. The LOSs for selected roadways were then determined using the methods and tables contained in the 2000 *Highway Capacity Manual* (National Research Council 2000). Construction was considered to occur between 2012 and 2015 under the No Action Alternative, between 2012 and 2020 under the Modified CMRR-NF Alternative Deep Excavation Option, and between 2012 and 2020 under the Modified CMRR-NF Alternative Shallow Excavation Option.

Traffic volumes are typically based on the number of expected vehicles in a 1-hour period, also called the peak hourly volume, which is defined by traffic engineers as the 30^{th} highest traffic volume expected in any 60-minute period of a calendar year. To understand the function of the roadway under its peak traffic loading, the LOS is determined based on the peak hourly volume.

The number of peak-hour trips expected to be gained or lost due to CMRR-NF construction was estimated using methods contained in *Trip Generation, 7^{th} Edition* (ITE 2003). For each alternative, the expected traffic was added to the traffic volumes forecast for the affected roadway for the year when construction begins and the year when construction is anticipated to end. The expected change in LOS under each alternative was then determined using the 2000 *Highway Capacity Manual* (National Research Council 2000).

According to the traffic-count information provided by the New Mexico Department of Transportation, the roadways surrounding LANL have experienced an average annual growth in total vehicles/trips of between 0 percent and 0.8 percent (Valencia 2010). This analysis assumed the transportation growth rates for the road segments analyzed would continue at the same rates as those of past years.

Traffic on roadways is measured by their LOS, as generally defined below.

- **LOS A** describes the highest quality of traffic service, with drivers able to travel at their desired speed. Drivers find driving on LOS A roadways to be stress-free.
- **LOS B** describes a condition where drivers have some restrictions on their speed of travel. Most drivers find LOS B roadways slightly stressful.
- **LOS C** describes a condition of stable traffic flow, but with significant restrictions on drivers' ability to travel at desired speeds. Most drivers find LOS C roadways somewhat stressful.
- **LOS D** describes unstable traffic flow. Drivers are restricted into slow-moving platoons, and disruptions in the traffic flow can cause significant congestion. There is little or no opportunity to pass slower-moving traffic. Most drivers find LOS D roadways stressful.
- **LOS E** represents the highest volume of traffic that can move on the roadway without a complete shutdown. Most drivers find LOS E roadways very stressful.
- **LOS F** represents heavily congested flow with traffic demand exceeding capacity. Traffic flows are slow and discontinuous. Most drivers find LOS F roadways extremely stressful.

Traffic volumes on existing roadways are expected to increase over time and the LOSs of those roadways are expected to decrease unless roadway improvements are made. As LOSs deteriorate, roadway improvements become more likely. Significant impacts on traffic LOSs are generally considered to occur when the LOSs on the studied roadway segments fall below the acceptable LOSs for those roadways. Each roadway segment has an acceptable LOS determined by local authorities responsible for that segment. Generally, in urban areas, an acceptable LOS is LOS D, or sometimes LOS E. In rural areas, an acceptable LOS is LOS C or better. It is significant if the LOS falls below the expected LOS at an earlier time. For example, it would be significant if a roadway segment were projected to reach LOS E in 2020 and impacts under the proposed alternatives were to cause the LOS to fall to LOS E in 2015.

LOS changes that are not considered significant typically include any LOS changes caused by changes in peak-hour trips of less than 100 vehicles per hour. The LOS designations are a continuum based on motorists perceptions, and it is unlikely that changes of less than 100 vehicles per hour would greatly inconvenience motorists even if that change results in a change in the LOS letter assignment. It is also not considered a significant change if the LOS changes from one acceptable LOS to another acceptable LOS. For example, a change from LOS A to LOS B would not be considered a significant change. Any changes that are not significant would be considered acceptable changes.

B.14.3 Vehicle Access Portal

A Vehicle Access Portal (VAP) is a facility entrance/exit where the identities of vehicle occupants are verified prior to their being allowed to proceed inside or outside the bounds of the secured facility. Typical security checks include inspections of vehicle decals, driver and passenger identifications, and the contents of vehicles. The capacity of a VAP is limited and depends on the type of security check being used. If the volume of traffic attempting to utilize a VAP exceeds the capacity of the VAP to process that traffic, roadway backups will occur. Traffic impacts on VAPs were determined by estimating the number of trips generated, using the methodology found in the Institute of Transportation Engineers *Trip Generation* 2003 report (similar to the methodology used to analyze impacts on roadways). The abilities of VAPs to function adequately at the levels of traffic estimated were evaluated using the methods contained in *Traffic and Safety Engineering for Better Entry Control Facilities* (SDDCTEA 2006).

B.14.4 Structural Impacts on Internal Roadways at Los Alamos National Laboratory

Some of the material deliveries would need to pass over internal LANL roadways. The existing roadways at LANL are constructed using asphaltic concrete. These roadways were originally constructed as part of an industrial facility, so it is expected that they were constructed for some level of truck traffic. However, the trucks in common usage today are much heavier than those anticipated for use in the 1950s and 1960s, the timeframe of the LANL roadways' construction.

Analysis using methods contained in the *American Association of State Highway and Transportation Officials Guide for Design of Pavement Structures* (AASHTO 1993), and assuming "fair" soil conditions, indicates that an asphaltic concrete pavement structure would need to have a minimum pavement structure of a 2-inch (5-centimeter) asphaltic concrete surface course, a 4-inch (10-centimeter) asphaltic concrete base course, and a 6-inch (15-centimeter) aggregate base over a prepared subgrade to support the expected truck traffic without significant damage to the roadways. If the LANL roadways are of a lesser thickness, or are already significantly deteriorated, then the expected construction traffic is expected to affect the roadways. Any public roadways utilized by construction traffic are expected to be substantially thicker than the minimum described above and structural impacts are not anticipated.

B.15 Cumulative Impacts

Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time (40 CFR 1508.7). The cumulative impact analysis for this *CMRR-NF SEIS* involved combining the impacts of the alternatives with the impacts of other past, present, and reasonably foreseeable activities in the ROI. The key resources are identified in **Table B–16**.

Table B–16 Key Resources and Associated Regions of Influence

Resources	***Region of Influence***
Infrastructure use	The site and Los Alamos County
Air quality	The site, nearby offsite areas within local air quality control regions where significant air quality impacts may occur, and Class I areas within 62 miles
Transportation	Transportation corridors to offsite disposal locations and population centers along the transportation routes
Radiological	Persons residing within 50 miles of Los Alamos National Laboratory
Waste management	The site

Note: To convert miles to kilometers, multiply by 1.6093.

In general, the cumulative impacts were determined by collectively considering the baseline affected environment (conditions attributable to present actions by DOE and other public and private entities), the proposed alternatives, and other future actions. Quantifiable information was incorporated to the degree it was available. Factors were weighed against the appropriate impact indicators (site capacity or number of fatalities) to determine the potential for impacts (see **Table B–17**).

Table B–17 Selected Indicators of Cumulative Impact

Category	*Indicator*
Infrastructure use	- Electricity use compared with site and county capacity - Water use compared with site and county capacity - Natural gas use compared with site and county capacity
Air quality	Criteria pollutant concentrations and comparisons with standards or guidelines
Transportation	Accidents
Radiological	Radiological emissions and exposure compared with standards or guidelines
Waste management	Waste generated compared to previous site estimates

The analysis focused on the potential for cumulative impacts at LANL from DOE actions under detailed consideration at the time of this *CMRR-NF SEIS*, as well as cumulative impacts associated with transportation. The 2008 *LANL SWEIS* was used to establish the baseline conditions against which the incremental cumulative impacts were assessed and later information was collected on future actions where available.

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APPENDIX C
EVALUATION OF HUMAN HEALTH IMPACTS FROM FACILITY ACCIDENTS

APPENDIX C
EVALUATION OF HUMAN HEALTH IMPACTS FROM FACILITY ACCIDENTS

C.1 Introduction

Accident analyses were performed to estimate the impacts on workers and the public from reasonably foreseeable accidents for the alternatives in this *Final 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 (CMRR-NF SEIS)*. The analyses were performed in accordance with U.S. Department of Energy (DOE) National Environmental Policy Act (NEPA) guidelines, including the process followed for the selection of accidents, definition of accident scenarios, and estimation of potential impacts. The sections that follow describe the methodology and assumptions, accident selection process, selected accident scenarios, and consequences and risks of the accidents evaluated.

C.2 Overview of Methodology and Basic Assumptions

The radiological impacts from accidental releases from the facilities used to perform chemistry and metallurgy research (CMR) operations were calculated using the MACCS [MELCOR Accident Consequences Code System] computer code, Version 1.13.1 (MACCS2). A detailed description of the MACCS model is provided in NUREG/CR-6613 (NRC 1990). The enhancements incorporated in MACCS2 are described in the *MACCS2 Users Guide* (Chanin and Young 1998). This section presents the MACCS2 data specific to the accident analyses. Additional information on the MACCS2 code is provided in Section C.10.

As implemented, the MACCS2 model evaluates doses due to inhalation of airborne material, as well as external exposure to the passing plume. This represents the major portion of the dose that an individual would receive because of a facility accident. The longer-term effects of radioactive material deposited on the ground after a postulated accident, including the resuspension and subsequent inhalation of radioactive material and the ingestion of contaminated crops, were not modeled for this *CMRR-NF SEIS*. These pathways have been studied and found to contribute less significantly to the radiation dose than the inhalation of radioactive material in the passing plume; they are also controllable through interdiction. Instead, the deposition velocity of the radioactive material was set to zero, so that material that might otherwise be deposited on surfaces remained airborne and available for inhalation. Thus, the method used in this *CMRR-NF SEIS* is conservative compared with dose results that would be obtained if deposition and resuspension were taken into account.

The impacts were assessed for the offsite populations surrounding the proposed site of the Chemistry and Metallurgy Research Building Replacement (CMRR) Nuclear Facility (CMRR-NF) and the existing CMR Building, as well as a maximally exposed individual (MEI), and noninvolved worker at each of these locations. The impacts on involved workers, those working in the facility where the accident occurs, were addressed qualitatively because no adequate method exists for calculating meaningful consequences at or near the location where the accident could occur. The impacts on involved workers are very dependent on the type of accident, the severity of the accident, the location of workers, and protective actions taken. Workers in the same room as a severe accident could suffer fatalities whereas workers in adjacent rooms or elsewhere in the building may suffer no or only minor injury. Involved workers are also fully trained in emergency procedures, including evacuation and personal protective actions in the event of an accident.

The offsite population is defined as the general public residing within 50 miles (80 kilometers) of each site. The population distribution for each proposed site is based on U.S. Department of Commerce (Census Bureau) population data at the block or block group level (DOC 2000, 2010). These data were fitted to a polar coordinate grid with 16 angular sectors aligned with the 16 compass directions, with radial intervals that extend outward to 50 miles (80 kilometers). The population data were extrapolated based on the population growth over the 1990–2010 period to estimate the projected population for the year 2030. The offsite population within 50 miles (80 kilometers) was estimated to be about 511,000 persons for Technical Area 55 (TA-55) (for the No Action Alternative and Modified CMRR-NF Alternative) and about 502,000 persons for TA-3 (for the Continued Use of CMR Building Alternative). (The 2030 population estimates were updated in this *Final CMRR-NF SEIS* to reflect 2010 census data.) For this analysis, no credit was taken for emergency response evacuations and other mitigative actions, such as temporary relocation of the public.

The MEI is defined as a hypothetical individual member of the public who would receive the maximum dose from an accident. This individual is usually assumed to be located at a site boundary. The MEI location was determined for each alternative. The MEI location can vary at Los Alamos National Laboratory (LANL) based on accident conditions. For this analysis, the MEI was located 0.75 miles (1.2 kilometers) north-northeast of TA-55, and 0.42 miles (0.7 kilometers) north-northeast of TA-3.

A noninvolved worker is defined as an onsite worker who is not directly involved in facility activities where the accident occurs. The noninvolved worker was conservatively assumed to be exposed to the full release, without any protection, located at the technical area boundaries, a distance of about 300 yards (about 280 meters) for TA-3, and about 240 yards (about 220 meters) for TA-55. Workers at nearby facilities within the same technical area as the CMRR-NF or CMR Building could also be affected by releases from an accident. The impacts on these workers would be higher than those to a noninvolved worker if radioactive material was released and dispersed at ground level; conversely, if the radioactive material was released from an elevation or was lifted by the heat of a fire, the impact on these workers likely would be less than the impact to the noninvolved worker at the technical area boundary. All workers would respond to a site emergency alarm in accordance with their training and evacuate to a designated shelter area, reducing their exposure potential. For purposes of the analyses, however, no credit was taken for any reduced impacts afforded by evacuation.

Doses to the offsite population, the MEI, and a noninvolved worker were calculated based on site-specific meteorological conditions. Site-specific meteorology is described by 1 year of hourly windspeed, atmospheric stability, and rainfall recorded at the site. The MACCS2 calculations produce distributions based on the meteorological conditions. For these analyses, the results presented are based on mean meteorological conditions. The mean produces more-realistic consequences than a 95th percentile condition, which is sometimes used in safety analysis reports. The 95th percentile condition represents low-probability meteorological conditions that are not exceeded more than 5 percent of the time.

The probability coefficient for determining the likelihood of a latent cancer fatality (LCF) for low doses or dose rates is 0.0006 fatal cancers per person-rem for populations, or 0.0006 fatal cancers per rem when applied to individual workers and the MEI (DOE 2003a). For high doses or dose rates, the probability coefficient is 0.0012 fatal cancers per rem applied to any individual. The higher-probability coefficients apply where individual doses are above 20 rem (NCRP 1993).

The preceding discussion focuses on radiological accidents. Chemical accident scenarios were not evaluated, since inventories of hazardous chemicals to support CMR operations do not exceed the Threshold Planning Quantities as stipulated on the Extremely Hazardous Substances List provided in Section 3.02 of the Emergency Planning and Community Right-to-Know Act (EPA 1998) (refer also to 40 CFR 68.130).

C.3 Accident Scenario Selection Process

In accordance with DOE NEPA guidelines, this *CMRR-NF SEIS* considers a representative set of accidents that includes various types, such as fire, explosion, mechanical impact, criticality, spill, human error, natural phenomena, and external events. DOE's Office of NEPA Policy and Compliance, in the *Recommendations for Analyzing Accidents under the National Environmental Policy Act* (DOE 2002a), provides guidance for preparing accident analyses in environmental impact statements. The guidance supplements *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements, Second Edition* (DOE 2004).

The accident scenario selection was based on evaluation of accidents reported in the hazard analysis documentation provided for the CMR Building (LANL 2011a) and the CMRR-NF (LANL 2011b). The selection and evaluation of accidents was based on a process described in the *DOE Standard: Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses (Nonreactor SAR Preparation Guide)* (DOE 2006a). The accident selection process for this *CMRR-NF SEIS* is described in Sections C.3.1 and C.3.2 for Steps 1 and 2, respectively. For additional details on this process, see the documents referenced above.

C.3.1 Hazard Identification – Step 1

Hazard identification, or hazards analysis, is the process of identifying the material, system, process, and plant characteristics that can potentially endanger the health and safety of workers and the public and analyzing the potential human health and safety consequences of accidents associated with the identified hazards. The hazards analysis examines the complete spectrum of accidents that could expose members of the public, onsite workers, facility workers, and the environment to hazardous materials. Hazards that could be present in the CMRR Facility were identified by reviewing data in source documents, assessing their applicability to the CMR Building and the proposed CMRR-NF, and identifying the potential hazards posed by the CMR activities that would be carried out in these facilities.

C.3.2 Accidents Selected for this Evaluation – Step 2

Major hazards were reviewed using a hazards analysis process based on guidance provided by the *Nonreactor SAR Preparation Guide* (DOE 2006a). The process ranks the risk of each hazard based on estimated frequency of occurrence and potential consequences to screen out low-risk hazards. Based on this process, a spectrum of accidents was selected. The selection process included, but was not limited to: (1) consideration of the impacts on the public and workers of high-frequency/low-consequence accidents and low-frequency/high-consequence accidents; (2) selection of the highest-impact accident in each accident category to envelope the impacts of all potential accidents; and (3) consideration of reasonably foreseeable accidents (consistent with item 1, this *CMRR-NF SEIS* includes evaluation of low-frequency/high-consequence accidents that are considered beyond design-basis accidents). In addition, hazards and accident analyses for the alternatives were reviewed to determine the potential for accidents initiated by external events (for example, aircraft crash, and explosions in collocated facilities) and natural phenomena (for example, external flooding, earthquake, extreme winds, and missiles). Accident scenarios initiated by human error were also evaluated.

The results of the Step 2 selection process are presented below.

Fire—Fires that occur in the facility could lead to the release of radioactive materials with potential impacts on workers and the public. Initiating events may include internal process and human error events; natural phenomena, such as an earthquake; or external events, such as an airplane crash into the facility. Combustibles near an ignition source could be ignited in a laboratory room containing the largest amounts of radioactive material. The fire may be confined to the laboratory room, propagate uncontrolled and without suppression to adjacent laboratory areas, or lead to a facility-wide fire. A fire or deflagration in a high-efficiency particulate air (HEPA) filter could also occur due to an exothermic reaction involving reactive salts and other materials. External fires (that is wildfires) are also considered. Though unlikely, a wildfire could directly affect the facility in which case the scenario would be similar to fires initiated by other means as discussed above. A wildfire could also affect the infrastructure in the vicinity of LANL. Wildfires are discussed in more detail in Section C.4.1.

Explosion—Explosions that could occur in the facility could lead to the release of radioactive materials with potential impacts on workers and the public. Initiating events may include internal process and human error events; natural phenomena, such as an earthquake; or external events, such as an explosive gas transportation accident. Explosions could disperse nuclear material as well as initiate fires that could propagate throughout the facility. An explosion of methane gas followed by a fire in a laboratory area could potentially propagate to other laboratory areas and affect the entire facility.

Spills—Spills of radioactive and/or chemical materials could be initiated by failure of process equipment and/or human error, natural phenomena, or external events. Radioactive and chemical material spills typically involve laboratory room quantities of materials that are relatively small compared to releases caused by fires and explosions. Laboratory room spills could affect members of the public, but may be a more serious risk to the laboratory room workers. Larger spills involving vault-size quantities are also possible.

Criticality—The potential for a criticality exists whenever there is a sufficient quantity of nuclear material in an unsafe configuration. Although a criticality could affect the public, its effects are primarily associated with workers near the accident.

Operations at the CMR Building and the proposed CMRR-NF would mostly involve fissile material handling below the minimum critical mass. Only a few operations would involve fissile materials in excess of critical masses. These operations have been reviewed by NNSA and the LANL contractor and it was concluded that existing procedures, limits, and controls would make a criticality accident an incredible event (an event with an annual likelihood of occurrence less than 1 in 1 million). Even for a beyond-design-basis accident, an extreme earthquake-driven accident with sufficient reflector material (water), whereby the entire vault inventory ends up on the floor, NNSA's evaluations concluded that the size and volume of the vault would maintain subcriticality. If a criticality accident were assumed to occur, its consequences and risks to the public and workers would be small in comparison to the consequences and risks from the low-frequency accidents analyzed in this *CMRR-NF SEIS*. Since a criticality accident was found to be a low-consequence and low-frequency event, it was not included among the accidents analyzed in detail.

Natural Phenomena—The potential accidents associated with natural phenomena include earthquakes, high winds, flooding, and similar naturally occurring events. For *CMRR-NF SEIS* alternatives, a severe earthquake could lead to the release of radioactive materials and exposure of workers and the public. A severe earthquake could cause the collapse of facility structures, falling debris, and failure of gloveboxes and nuclear materials storage facilities. An earthquake could also initiate a fire that propagates throughout the facility and results in an unfiltered release of radioactive material to the environment. In addition to the potential exposure of workers and the public to radioactive and chemical materials, an accident could also cause human injuries and fatalities from the force of the event, such as falling debris during an earthquake or the thermal effects of a fire.

Chemical—The analytical and research nature of CMR operations requires the use, handling, and storage of a large variety of chemicals, but in relatively small quantities (for example, liter or gram quantities). As such, there is an extensive list of chemicals that may be present for programmatic purposes, with quantities of regulated chemicals far below the threshold quantities set by the U.S. Environmental Protection Agency (40 CFR 68.130). The hazards associated with these chemicals are well understood and, because of the small quantities, can be managed using standard hazardous material and/or chemical handling programs. They pose minimal potential hazards to public health and the environment in an accident condition. Activity level probabilistic hazards analyses would be performed to ensure that no onsite inventory exceeds the screening criterion of DOE-STD-1189, Appendix B (DOE 2008a). Accidents involving small laboratory quantities of chemicals would primarily present a risk to the involved worker in the immediate vicinity of the accident. There would be no bulk quantities of chemicals stored at the CMR Building or the proposed CMRR-NF.

Airplane Crash—The potential release of radioactive materials from an unintentional airplane crash into a building was considered in this *CMRR-NF SEIS*. In accordance with DOE Standard 3014, an aircraft impact analysis was performed for the CMRR-NF (LANL 2011c). This analysis concluded that the largest aircraft that would exceed the DOE Standard 3014 evaluation guideline of 10^{-6} (1 chance in 1 million) per year for an aircraft crash into the CMRR-NF was a general aviation aircraft (U.S. registered aircraft that are not conducting air carrier revenue operations) (DOE 2006b, LANL 2011c). Large aircraft (commercial air carrier or large military aircraft) were determined to have a probability of accidentally crashing into the CMRR-NF of less than 10^{-7} (1 chance in 10 million) per year and were not considered further in this *CMRR-NF SEIS*. The impacts of a general aviation aircraft crash into the facility have been evaluated and accounted for in the design of the Modified CMRR-NF and are bounded by other accidents addressed in this *CMRR-NF SEIS*.

C.4 Accident Scenario Descriptions and Source Terms

This section describes the accident scenarios and corresponding source terms developed for the *CMRR-NF SEIS* alternatives. The spectrum of accidents described in this section was used to determine, for workers and the public, the consequences and associated risks of each alternative. Assumptions were made when further information was required to clarify the accident condition, update parameters, or facilitate the evaluation process; these are referenced in each accident description.

The source term is the amount of respirable radioactive material released to the air, in terms of curies or grams, assuming the occurrence of a postulated accident. The airborne source term is typically estimated by the following equation:

$$\text{Source term (ST)} = \text{MAR} \times \text{DR} \times \text{ARF} \times \text{RF} \times \text{LPF}$$

where:

MAR	=	material at risk
DR	=	damage ratio
ARF	=	airborne release fraction
RF	=	respirable fraction
LPF	=	leak path factor

The material at risk is the amount of radionuclides (in curies of activity or grams of each radionuclide) available for release when acted upon by a given physical stress or accident. The material at risk is specific to a given process in the facility of interest. It is not necessarily the total quantity of material present, but is that amount of material in the scenario of interest postulated to be available for release.

The damage ratio is the fraction of material exposed to the effects of the energy, force, or stress generated by the postulated event. For the accident scenarios discussed in this analysis, the value of the damage ratio varies from 0.1 to 1.0.

The airborne release fraction is the fraction of material that becomes airborne due to the accident. In this analysis, airborne release fractions were obtained from the hazard analysis information for the CMR Building and CMRR-NF (LANL 2011a, 2011b), or the *DOE Handbook* on airborne release fractions (DOE 1994).

The respirable fraction is the fraction of the particulate matter with an aerodynamic diameter of 10 microns (0.0004 inches) or less that could be retained in the respiratory system following inhalation. The respirable fraction values are also taken from the hazard analysis information for the CMR Building and CMRR-NF (LANL 2011a, 2011b), or the *DOE Handbook* on airborne release fractions (DOE 1994).

The leak path factor accounts for the action of removal mechanisms, for example, containment systems, filtration, and deposition, to reduce the amount of airborne radioactivity ultimately released to occupied spaces in the facility or the environment. Leak path factors are assigned in accident scenarios involving a major failure of confinement barriers; these leak path factors are 1.0 (no reduction) or 0.1 for a more realistic evaluation of the transport of material out of storage containers and enclosures, such as gloveboxes, through the building equipment, damaged structures, and rubble to the environment. Leak path factors were assumed based on information included in the hazard analysis information for the CMR Building and the CMRR-NF (LANL 2011a, 2011b) and site-specific evaluations.

Since the isotopic composition and shape of some of the nuclear materials are classified, the material inventory has been converted to equivalent amounts of plutonium-239. The conversion was on a constant-consequence basis, so that the consequences calculated in the accident analyses are equivalent to what they would be if actual material inventories were used. The following sections describe the selected accident scenarios and corresponding source terms for the alternatives.

C.4.1 Accident Scenario Selection for This *CMRR-NF SEIS*

The safety documents for the CMR Building, the proposed CMRR-NF, and the other plutonium facilities at LANL start with hazard evaluations that systematically consider a wide range of potential hazards and identify the controls needed to prevent the incident from occurring or to mitigate the potential consequences should an incident occur. Incidents that could result in higher consequences or accident risks are further evaluated to identify the potential radiological consequences if the accident were to occur and identify controls to reduce the likelihood of the accident occurring and to reduce the potential radiological consequences to the extent practicable.

For facilities like the CMR Building, the proposed CMRR-NF, and the other plutonium facilities at LANL, the general safety strategy requires the following:

- plutonium materials be contained at all times with multiple layers of confinement that prevent the materials from reaching the environment
- energy sources that are large enough to disperse the plutonium and threaten confinement be minimized

This basic strategy means that operational accidents, including spills, impacts, fires, and operator errors never have sufficient energy available to threaten the multiple levels of confinement that are always present within a plutonium facility. For plutonium facilities, such as the proposed CMRR-NF, the final layer of confinement is the reinforced concrete structure and the system of barriers and multiple stages of HEPA filters that limit the amount of material that could be released to the environment even in the worst realistic internal events.

The operational events that present the greatest threats to confinement in facilities like the proposed CMRR-NF are large-scale internal fires, which, if they did occur, could present heat and smoke loads that threaten the building's HEPA filter systems. For modern plutonium facilities, the safety strategy is to prevent large internal fires by limiting the energy sources, such as flammable gases, and other combustible materials to the point that a wide-scale, propagating fire is not physically possible, and to defeat smaller internal fires with fire suppression systems.

Modern plutonium operations, such as the proposed CMRR-NF, are designed and operated such that the estimated frequency of any large fire within the facility would fall into the "extremely unlikely" category and would require multiple violations of safety procedures to introduce sufficient flammable materials into the facility to support such a fire. Any postulated large-scale fire in a modern plutonium facility would be categorized as a "beyond-design-basis" event and is not expected to occur during the life of the facility.

Earthquakes present the greatest design challenges for these facilities due to the requirement to prevent substantial releases of radioactive materials to the environment during and after a severe earthquake. For safety analysis purposes, it is often assumed that after a very severe earthquake, one that exceeds the design loading levels of the facility equipment, enclosures, and building structure and confinement, a substantial release of radioactive material within the facility occurs. This allows designers and safety analysts to determine what additional design features may be needed to ensure greater containment and confinement of the radioactive materials at risk even in an earthquake so severe that major damage to a new, reinforced concrete facility could occur. In these safety analyses, it is often assumed that major safety systems are not in place such that estimates of the mitigation effectiveness of each of the safety systems (or controls) can be estimated.

The accident scenarios selected for inclusion in this *CMRR-NF SEIS* are the ones that would present the greatest risk of radiological exposure to members of the public. Because of the reinforced nature of these plutonium facilities, these scenarios all require substantial additions of energy, either from a widespread internal fire, or through a severe natural disaster such as an earthquake so severe that building safety systems exceed their design limits and confinement of the plutonium materials within the building is lost. Thus for any new plutonium facility such as the proposed CMRR-NF, all of the accidents presented in this *CMRR-NF SEIS* with frequencies of 1 in 10,000 per year or less would clearly fall into the "beyond-design-basis" category and have probabilities that would fall in the "extremely unlikely" or lower category. None of these postulated events is expected to occur during the life of the facility.

Volcanism—A preliminary evaluation of volcanic hazards at LANL was reported in the *Preliminary LANL Volcanic Hazard Evaluation* (Keating et al. 2010) (see Chapter 3, Section 3.5.5). Based on an evaluation of information on the volcanic history of the region surrounding LANL, the report described the potential volcanic hazards to LANL from future eruptions in the region. The preliminary calculation of the recurrence rate for silicic eruptions is about 1×10^{-5} per year in the Valles caldera study region. Similarly, the preliminary calculation of the recurrence rate for basaltic eruptions along the Rio Grande rift is 2×10^{-5} per year. These recurrence rates were calculated by dividing the number of eruptive events by the active eruption period. The estimates of past recurrences rate are not the same as the probability of future eruptions that might affect a given facility. Although it cannot be ruled out, volcanism in the vicinity of TA-55 within the lifetime of the CMRR-NF (50 to 100 years) is unlikely (LANL 2011d).

DOE Standard: Natural Phenomena Hazards Site Characterization (DOE-STD-1022-2002) identifies the potential hazards associated volcanoes to include lava flows, ballistic projections, ash falls, pyroclastic flows and debris avalanches, mud flows and flooding, seismic activity, ground deformation, tsunami, atmospheric effects, and acid rains and gases (DOE 2002b). The primary hazard to the proposed CMRR-NF from a silicic eruption would likely be fallout of volcanic ash and pumice from a silicic volcanic eruption plume. Based on the areal distribution of the deposits from past eruptions, the high terrain of the caldera rim to the west of LANL is expected to limit the eastward extent of lava flows and pyroclastic flows. Hazards from ballistic projections, ground deformation, and volcanic gases are also expected to be limited to a similar area within the topographic rim of the Valles caldera to the west of LANL. In the absence of local bodies of surface water, tsunamis are not expected to pose a hazard to TA-55. Atmospheric effects (volcanogenic thunderstorms with lightning) and acid rains may affect facilities at TA-55, but are not expected to result in acute effects on operations and materials with the confines of the CMRR-NF.

Ash fall may produce roof loading; loadings associated with ash fall may be sufficient to exceed design load limits for the TA-55 facilities. In that event, structural failure could occur. Vaults and interior rooms should be relatively intact. A related hazard would be secondary mobilization of ash fall by rain forming mudflows. This possible hazard would be naturally mitigated by the relatively low slopes at TA-55 and the presence of deep canyons that would channel flows from the Jemez Mountains west of Los Alamos.

Lava flows may engulf or bury surface infrastructure and buildings. Basaltic lava flows may extend several kilometers from a vent and be up to several meters thick and 900 to 1,200 degrees Celsius. Explosions and surges may damage surface and subsurface facilities within several hundred meters of a vent. Because ash falls have the potential to affect large areas, the probability of volcanism that would produce an eruptive vent, explosions and surges, or lava flows near the area of TA-55 likely would be lower than the probability of ash fall affecting TA-55.

Based on the expected similarities between the facility impacts of a seismically induced spill and fire event and the volcanic ash fall event, it is expected that the seismically induced event results in consequences and risks that are similar to or greater than those for the volcanic ash fall event. The *CMRR-NF SEIS* seismic scenarios conservatively assume that several mechanisms are available for release: powder spills as with the seismically initiated building collapse, localized fire-induced pressurized releases of powder from storage containers, and localized fires as with the facility-wide fire scenario. Localized fire-induced pressurized releases of powder are assumed to occur with a limited number of storage containers. Typical temperatures of ash falls, as indicated by the Pinatubo and Mount St. Helens eruptions are relatively cool (less than 30 degrees Celsius) (LANL 2011d) and should not significantly impact the probability of fires associated with structural failures.

Since the release associated with structural failure resulting from ash fall loads is driven by the same physical phenomena, the material at risk and the release mechanisms should be similar to those for the analyzed seismic events. Thus conservative damage ratios and respirable release fractions applied to the material released as a result of impact or thermal stress for seismic events are applicable to the volcanic ash fall event. The building leak path factor conservatively assumed for the seismic analysis is expected to be the same as or higher than the leak path factor associated with volcanic ash fall events because the ash would contribute to the tortuousness of the leak path.

The frequency of the earthquake that results in wide-scale damage and loss of confinement for the building, coupled with a widespread seismically initiated fire, is conservatively assumed to be 0.00001 per year (on the order of once every 100,000 years) for risk calculation purposes. This is expected to be the same order of magnitude as the upper limit for the volcanic events described above.

Wildfires—The potential impacts of wildfires on LANL were evaluated in Appendix D of the 2008 *Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico (*2008 *LANL SWEIS)* (DOE 2008b). Wildfires are a reasonably expected event in the region; in the 2008 *LANL SWEIS*, the annual frequency of occurrence was estimated to be 0.05 (once every 20 years). The evaluation included in the 2008 *LANL SWEIS* identified the facilities most at risk of radiological release in the event of a wildfire and did not include the CMR Building or any buildings in TA-55. Wildfires such as the Las Conchas fire of June 2011 and Cerro Grande fire of May 2000 are not expected to threaten these facilities or the proposed Modified CMRR-NF because the shells of these facilities are constructed of non-combustible materials and a buffer area free of combustible materials is maintained around them. Recognizing the hazards of wildfire, forests are thinned as part of an ongoing wildfire mitigation program at LANL as indicated in Chapter 3, Section 3.7.1. The purpose of the thinning is to reduce the fuel load available in the event of a fire.

A wildfire in the LANL region, could indirectly affect operations at LANL by interrupting electrical services and limiting access to roadways. In the event of a wildfire, the LANL emergency operations center would be activated and, as with the Las Conchas fire, if determined to be necessary LANL and the townsite would be preemptively evacuated. If a regional wildfire disrupted the power provided to the CMR Building or at the proposed CMRR-NF, emergency backup power would be provided locally to maintain the most important systems. Emergency backup power would be provided to the CMR Building by the TA-3 power plant. Emergency backup generators dedicated to the CMRR-NF would provide power to that facility. As discussed Section C.9, plutonium materials stored within LANL plutonium facilities or in ongoing operations are generally stable in their configuration and would not require active cooling systems to keep them stable. Therefore, maintenance of power is not necessary to prevent significant releases to the environment.

C.4.2 New CMRR Facility Alternatives

Four accidents are included in this *CMRR-NF SEIS* to represent a wide range of possible accidents and risks. The four accident scenarios are common to all three alternatives being analyzed in this *CMRR-NF SEIS*. They are a facility-wide fire, a loading dock spill/fire, a seismically induced spill, and a seismically induced fire.

C.4.2.1 No Action Alternative (2004 CMRR-NF)

The accident analysis performed for this *CMRR-NF SEIS* incorporates current knowledge of the threat associated with a design-basis earthquake at LANL and is new compared to the analysis presented in the *Final Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico (CMRR EIS)* (DOE 2003b). The accidents described in this section pertain to the 2004 CMRR-NF at TA-55. For these accidents, two sets of source terms are presented. First, the conservative, bounding source term estimates developed in the safety-basis process[1] at LANL for the purposes of identifying the controls necessary to protect the public are presented. In general, these source term estimates take little if any credit for the integrity of containers or building confinement under severe accidents and assume a damage ratio of 1, meaning that all similar containers or other material at risk would be subjected to the similar, near-worst-case conditions. Furthermore, these safety evaluations generally assume a leak path factor of 1, meaning that all of the

[1] *This* CMRR-NF SEIS *uses the term Safety-Basis Scenario to identify accident scenarios that use very conservative assumptions regarding the potential release of radioactive material to the environment, for example not taking any credit for some containers surviving an accident or for some airborne material being captured by an air filtration system. The safety-basis process is used to identify controls that would mitigate the impacts of accidents to meet established guidelines for protection of the public and workers.*

material that is made airborne and respirable within the building or process enclosure is released to the environment.

For purposes of this *CMRR-NF SEIS*, a second set of source terms has been developed that attempts to present reasonable, but still conservative, estimates of source terms. These source terms take into account a range of responses of facility features and materials containers and typical operating practices at plutonium facilities at LANL and elsewhere. Therefore, for design-basis-type accidents, a damage ratio of 1 would not normally be realistic if the containers, process enclosures, limits on combustibles, and similar types of safety systems were expected to function during the accident. Similarly, the building confinement, including HEPA filters, is expected to continue functioning, although perhaps at a degraded level, during and after the accident.

Facility-Wide Fire—The accident scenario postulates that combustible materials near an ignition source are ignited in a laboratory area. This fire is a widespread fire involving the entire laboratory area. The fire could be initiated by natural phenomena, human error, or equipment failure.

Safety-Basis Scenario: The fire is assumed to propagate uncontrolled and without suppression to adjacent laboratory areas and the entire facility. The material at risk is estimated to be approximately 660 pounds (300 kilograms) of plutonium-239 equivalent in the form of metal (90 percent), oxide (8.3 percent), and liquid (1.7 percent). The scenario conservatively assumes the damage ratio and leak path factors are 1.0. No credit is taken for equipment and facility features and mitigating factors that could cause the damage ratio and leak path factors to be less than 1.0. The released respirable fraction (airborne release fraction times respirable fraction) is estimated to be 0.00025 for metal, 0.00006 for oxide, and 0.002 for liquid. The source term for radioactive material released to the environment is about 2.8 ounces (80 grams). The annual frequency of the accident is estimated to range from 0.000001 to 0.0001 or once every 10,000 to 1,000,000 years. The frequency is conservatively assumed to be 0.0001 per year for risk calculation purposes.

SEIS Scenario**:** Typical building construction for a reinforced concrete structure and normal limits on combustible materials would make a fire that propagates beyond the immediate vicinity of a glovebox or a room extremely unlikely without an additional source of fuel to support a propagating fire. Normal design standards for plutonium facilities would ensure that rooms were isolated with appropriate fire walls and barriers. Thus, a fire that propagates to the extent that it becomes a facility-wide fire would be considered a beyond-design-basis fire and the estimated frequency would be less than once every 1,000,000 years. The frequency is conservatively assumed to be 1×10^{-6} per year for risk calculation purposes.

The fire is assumed to propagate uncontrolled and without suppression to adjacent laboratory areas and the entire facility. The materials at risk and release mechanisms are conservatively assumed to be the same as those for the Safety-Basis Scenario. Thus, the material at risk is estimated to be approximately 660 pounds (300 kilograms) of plutonium-239 equivalent in the form of metal (90 percent), oxide (8.3 percent), and liquid (1.7 percent). The scenario conservatively assumes the damage ratio is 0.1, taking credit for equipment and facility features and mitigating factors that should prevent most of the material from being out and vulnerable even in a facility-wide fire. The released respirable fraction (airborne release fraction times respirable fraction) is estimated to be 0.00025 for metal, 0.00006 for oxide, and 0.002 for liquid. The building leak path factor is unknown, but it is expected that in an event this severe, the performance of the HEPA filters would be degraded. For a design-basis fire, the efficiency of a bank of HEPA filters in an air-handling system is expected to be 99 to 99.5 percent. For this beyond-design-basis, facility-wide fire, the filters are assumed to be partially bypassed and a leak path factor of 0.1 is assumed. The source term for radioactive material released to the environment is about 0.028 ounces (0.80 grams).

Loading Dock Spill/Fire—This accident scenario was selected to represent a wide range of spills and fires that might occur outside the CMRR-NF associated with the loading dock. This scenario is postulated to involve waste containers being shipped from the loading dock or a large vessel being delivered to the facility for processing or cleanup. Many engineered controls should prevent or mitigate both the likelihood of this type of accident or the damage that might occur, including design of the loading dock to prevent or minimize the risk of impacts to multiple containers and use of shipping packages designed to withstand shipping accidents. It is very conservatively assumed that a vehicle impacts waste drums containing the entire material at risk of 13.2 pounds (6.0 kilograms) of plutonium-239 equivalent with a subsequent spill or fire involving the containers. Since this accident would occur outside, any material would be released directly to the environment. For safety basis purposes, it is assumed that the damage ratio is 0.1 for mechanical insults associated with vehicles moving in and around a loading dock per DOE-STD-5506-2007 (DOE 2007).

<u>Safety Basis Scenario</u>: The leak path factor is assumed to be 1.0. The released respirable fraction (airborne release fraction times respirable fraction) is very conservatively estimated at 0.001 for the spill. The resulting source term of radioactive material released to the environment is estimated at 0.0212 ounces (0.60 grams). The annual frequency of the initiating accident is estimated to range from 0.0001 to 0.01 or once every 100 to 10,000 years. The frequency of a spill accident of this magnitude is conservatively assumed to be 0.01 per year for risk calculation purposes. A loading dock spill and subsequent fire was also considered but found, with reasonable assumptions regarding the airborne release fraction, respirable fraction, and the source term, that the consequences would not be higher than those predicted with the spill source term. (With a damage ratio of 0.1 and a leak path factor of 1.0, and assuming that some of the drum contents are ejected and subject to unconfined burning and some are subject to confined burning, a source term of 0.0198 ounces [0.56 grams] was estimated.)

<u>SEIS Scenario</u>: The descriptions of the scenario and releases fractions are the same as those described under the safety basis scenario. For this scenario, the annual frequency of the initiating accident is estimated to range from 0.000001 to 0.0001 or once every 10,000 to 1,000,000 years. The frequency for this scenario is conservatively assumed to be 0.0001 per year for risk calculation purposes.

Seismically Induced Events—Subsequent to the issuance of the *CMRR EIS*, it was concluded that the proposed 2004 CMRR-NF structure would not perform as originally intended during a LANL design-basis earthquake. Based on an updated probabilistic seismic hazards analysis, it was concluded that a design-basis earthquake, with a return interval of about 2,500 years, an estimated peak horizontal ground acceleration of 0.47 *g* and an estimated peak vertical ground acceleration of 0.51 *g* (LANL 2007, 2009) could cause the structure to fail and confinement could not be ensured.[2] The 2004 CMRR-NF confinement function was estimated to fail with a peak horizontal ground acceleration exceeding about 0.31 *g* and a peak vertical ground acceleration of about 0.27 *g*.[3] For earthquakes less severe than that, the building structure and confinement systems would be expected to continue to provide their safety functions. Many other safety systems that are not directly dependent on the complete integrity of the

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[2] *In the 2007 update of the probabilistic seismic hazard of the LANL site, the peak horizontal ground acceleration was estimated to be 0.52 g and the peak vertical ground acceleration was estimated to be 0.6 (LANL 2007); they were subsequently revised to 0.47* g *and 0. 51* g, *respectively, for TA-55 (LANL 2009). The CMRR-NF would be constructed as a Performance Category 3 (PC-3) facility that would survive the specified design-basis earthquake. PC-3 structures, systems, and components are those for which failure to perform their safety function could pose a potential hazard to public health, safety, and the environment from release of radioactive or toxic materials. Design considerations for this category are to limit facility damage as a result of design-basis natural phenomena events (for example, an earthquake) so that hazardous materials can be controlled and confined, occupants are protected, and the functioning of the facility is not interrupted (DOE 2002b).*

[3] *The return interval for a seismic event with these previously used peak ground accelerations was 2,000 years rather than 2,500 years as used for the current design-basis earthquake.*

building structure for their safety function, such as process containers, would also be expected to remain intact during this lower magnitude earthquake, as well as during more-severe earthquakes.

Seismically Induced Spill—This accident scenario postulates an earthquake that causes internal enclosures to topple and become damaged by falling debris.

Safety-Basis Scenario: The material at risk is estimated to be 6.6 tons (6.0 metric tons) of plutonium-239 equivalent (all of the material at risk in the facility) in powder form. The scenario conservatively assumes the damage ratio and leak path factors are 1.0 indicating that the building structure has failed and is providing an open pathway to the environment. No credit is taken for equipment and facility features and mitigating factors that could cause the damage ratio and leak path factors to be less than 1.0. The released respirable fraction (airborne release fraction times respirable fraction) is estimated at 0.002 for powder. The source term for radioactive material released to the environment is about 26 pounds (12 kilograms). The frequency of the accident is estimated to be in the range of 0.0001 to 0.01 per year or once every 100 to 10,000 years. The frequency is conservatively assumed to be 0.01 per year for risk calculation purposes.

SEIS Scenario: This accident scenario postulates an earthquake that causes many of the internal enclosures to topple and become damaged by falling debris. Much of the material in strong containers and in the vault is expected to survive the vibrations and impacts from falling equipment and falling debris. The materials at risk and release mechanisms are conservatively assumed to be similar to those for the Safety-Basis Scenario. Thus, the material at risk is estimated to be 6.6 tons (6.0 metric tons) of plutonium-239 equivalent in powder form. The scenario assumes the damage ratio is 0.1, taking credit for equipment and facility features and mitigating factors that should prevent most of the material from being out and vulnerable to release due to impacts, vibrations, or pressurized venting from cans. It is very conservatively assumed that all of this material is powder and subject to pressurized release. The released respirable fraction (airborne release fraction times respirable fraction) for the material at risk is estimated to be conservatively represented by an airborne release fraction of 0.005 and respirable fraction of 0.4, or 0.002 for the venting of powders or confinement failure to pressures of approximately 25 pounds per square inch or less (DOE 1994).

The building leak path factor is unknown, but it is expected that in an event this severe, building confinement would fail and pathways would exist for material that becomes airborne to be released directly to the environment. Thus, a leak path factor of 0.1 is assumed for transport of the material out of storage containers and enclosures, such as gloveboxes, and through the building equipment, damaged structures, and rubble to the environment. The source term for radioactive material released to the environment is about 4.2 ounces (120 grams). The annual frequency of the accident is estimated to be on the order of 0.001 or once every 1,000 years, based on the seismic studies that indicate that this 2004 CMRR-NF design would not perform its structural and safety confinement functions adequately in the event of an earthquake of the intensity currently estimated for a LANL design-basis earthquake. This frequency is a factor of 10 higher than that expected for a similar but more seismically resistant facility, such as the Modified CMRR-NF, that would meet current design standards. The frequency is conservatively assumed to be 0.001 per year for risk calculation purposes.

Seismically Induced Spill and Fire—This accident scenario postulates an earthquake that causes internal enclosures to topple and become damaged by falling debris. Combustibles in the facility are ignited and the fire engulfs radioactive material.

Safety-Basis Scenario: The material at risk is estimated to be 6.6 tons (6.0 metric tons) of plutonium-239 equivalent (all of the material in the facility) in powder form. The scenario conservatively assumes the damage ratio and leak path factors are 1.0. No credit is taken for equipment and facility features and mitigating factors that could cause the damage ratio and leak path factors to be less than 1.0. The released respirable fraction (airborne release fraction times respirable fraction) is estimated at 0.07 for powder, which is a highly conservative estimate for a very high pressurized release from a storage can subjected to a long-burning fire. The source term for radioactive material released to the environment is about 926 pounds (420 kilograms). The frequency of the accident is estimated to be in the range of 0.000001 to 0.0001 per year or once every 10,000 to 1,000,000 years. The frequency is conservatively assumed to be 0.0001 per year for risk calculation purposes.

SEIS Scenario: This accident scenario postulates an earthquake that causes many of the internal enclosures to topple and become damaged by falling debris. Much of the material in strong containers and in the vault is expected to survive the vibrations and impacts from falling equipment and falling debris. Multiple local fires are assumed to occur within the debris, although this seems very unlikely due to the limited quantities of combustible materials that would be available within the building. Material that is out and close to the fires is expected to be vulnerable to release. Material away from the fires and in strong containers is not expected to be released by the fires. Normal limits on combustible materials in a facility such as the CMRR-NF would make a fire that propagates beyond the immediate vicinity of the localized fires extremely unlikely without an additional source of fuel to support a propagating fire.

The material at risk and release mechanisms are conservatively assumed to be similar to those for the Safety-Basis Scenario. Thus, the material at risk is estimated to be 6.6 tons (6.0 metric tons) of plutonium-239 equivalent in powder form and to include that stored in the vaults. The SEIS scenario conservatively assumes that several mechanisms are available for release: powder spills as with the seismically initiated building collapse, localized fire-induced pressurized releases of powder from storage containers, and localized fires as with the facility-wide fire scenario.

The seismically initiated building collapse SEIS scenario is assumed to result in powder spills as discussed above in the safety-basis scenario. The same seismically induced spill source term is assumed with a release of about 4.2 ounces (120 grams).

Pressurized releases of powder caused by localized fires are assumed to affect a limited number of storage containers. The scenario assumes the damage ratio is 0.01, taking credit for equipment and facility features and mitigating factors that should prevent most of the material from being out and vulnerable. It is likely that even with a collapse scenario, material in the vaults would not be subject to release either through impacts or the thermal stress of fires. The released respirable fraction (airborne release fraction times respirable fraction) for the material at risk is estimated to be conservatively represented by an airborne release fraction of 0.005 and respirable fraction of 0.4, or 0.002, for the venting of powders or confinement failure from pressures of approximately 25 pounds per square inch or less (DOE 1994).

In addition to the release due to spills, some of the material is also vulnerable to release due to fires as with the facility-wide fire scenario. As with that scenario, it is conservatively assumed that the material at risk in the fire is estimated to be approximately 660 pounds (300 kilograms) of plutonium-239 equivalent in the form of metal (90 percent), oxide (8.3 percent), and liquid (1.7 percent). The fire release portion of the scenario conservatively assumes the damage ratio is 0.1, taking credit for equipment and facility features and mitigating factors that should prevent most of the material from being out and vulnerable even in a seismically initiated facility-wide fire. The released respirable fraction (airborne release fraction times respirable fraction) is estimated to be 0.00025 for metal, 0.00006 for oxide, and 0.002 for liquid. The overall effective released respirable fraction for the fire release is 0.000267.

The building leak path factor is unknown, but it is expected that in an event this severe, building confinement would fail and pathways would exist for the material that does become airborne to be released directly to the environment. Thus, a leak path factor of 0.1 is assumed for transport of the material out of storage containers and enclosures, such as gloveboxes, and through the building equipment, damaged structures, and rubble to the environment. The source term for radioactive material released to the environment is about 4.2 ounces (120 grams) from the spill release, 0.42 ounces (12 grams) from the venting of pressurized powders from heated containers, and 0.028 ounces (0.80 grams) from the fire, for a total of about 4.68 ounces (132.8 grams). The frequency of the earthquake that results in wide-scale damage and loss of confinement for the building, coupled with a widespread seismically initiated fire, is estimated to be in the range of 0.000001 to 0.0001 per year or once every 10,000 to 1,000,000 years. The frequency is conservatively assumed to be 0.0001 per year for risk calculation purposes.

C.4.2.2 Modified CMRR-NF Alternative

The accidents described in this section pertain to the Modified CMRR-NF at TA-55. These accidents apply to the Modified CMRR-NF regardless of whether it was constructed under the Deep or Shallow Excavation Option. The two construction options would not affect the performance of the building once it was constructed. Under either construction option, the resulting building would meet the current standards required for a Performance Category 3 (PC-3) facility so it would perform the same in the event of a seismic accident.

The four accident scenarios analyzed for the 2004 CMRR-NF as described in Section C.4.2.1 would be applicable to the Modified CMRR-NF. Both the facility-wide fire and loading dock spill/fire accidents associated with the 2004 CMRR-NF would be directly applicable to the Modified CMRR-NF and accident scenarios and source terms should be similar. Because the Modified CMRR-NF would be stronger and could withstand higher peak ground accelerations than the 2004 CMRR-NF, the seismically induced spill and fire scenario would have a lower likelihood (would require higher seismic accelerations to fail, for example), and would likely release lower quantities of radioactive material to the environment. These safety-basis and NEPA accidents have been included for the Modified CMRR-NF because this facility is being designed to survive a design-basis earthquake accident (expected to occur once every 2,500 years), with an estimated peak horizontal ground acceleration of 0.47 *g*, and a peak vertical ground acceleration of 0.51 *g* (LANL 2009), and thus, the releases from such an earthquake would be mitigated, whereas the 2004 CMRR-NF was not designed to survive an earthquake of this magnitude. The Modified CMRR-NF would be a stronger structure and would include safety-class and safety-significant structures, systems, and components, collectively known as safety structures, systems, and components. As a result, mitigated releases were evaluated for the seismically induced spill accident and seismically induced fire accident, as described below:

Seismically Induced Spill—This accident scenario postulates an earthquake, of greater intensity than the LANL design-basis earthquake. The earthquake causes internal enclosures to topple and become damaged by falling debris.

<u>Safety-Basis Scenario</u>: The material at risk is reduced from 6.6 tons (6.0 metric tons) to 660 pounds (300 kilograms) of plutonium-239 equivalent in powder form because it is assumed that the vaults would survive this earthquake in the Modified CMRR-NF. The scenario assumes that the damage ratio and leak path factors are 1.0. Credit is taken for equipment and facility features and mitigating factors that could

cause the airborne release fraction and respirable fraction to be reduced from those assumed for the 2004 CMRR-NF (unmitigated) accident. The released respirable fraction (airborne release fraction times respirable fraction) is estimated at 0.0001, compared to 0.002 for the 2004 CMRR-NF accident. The source term for radioactive material released to the environment is about 1.1 ounces (30 grams) compared to 26 pounds (12 kilograms) for the 2004 CMRR-NF accident. The frequency of the accident is estimated to be in the range of 0.000001 to 0.0001 per year or once every 10,000 to 1,000,000 years. The frequency is conservatively assumed to be 0.0001 per year, or once every 10,000 years, for risk calculation purposes.

SEIS Scenario: This accident scenario postulates an earthquake that causes many of the internal enclosures to topple and become damaged by falling debris. Much of the material in strong containers and in the vault is expected to survive the vibrations and impacts from falling equipment and falling debris. The materials at risk and release mechanisms are conservatively assumed to be similar to those for the Safety-Basis Scenario. The material at risk is reduced from 6.6 tons (6.0 metric tons) to 660 pounds (300 kilograms) of plutonium-239 equivalent in powder form because it is assumed that the vaults in the Modified CMRR-NF would survive this earthquake. The scenario assumes the damage ratio is 0.1, taking credit for equipment and facility features and mitigating factors that should prevent most of the material from being out and vulnerable to release due to impacts, vibrations, or pressurized venting from cans. It is very conservatively assumed that all of this material is powder and subject to pressurized release. The released respirable fraction (airborne release fraction times respirable fraction) for the material at risk is estimated to be conservatively represented by an airborne release fraction of 0.005 and respirable fraction of 0.4, or 0.002, for the venting of powders or confinement failure to pressures of approximately 25 pounds per square inch gauge or less (DOE 1994).

The building leak path factor is unknown, but it is expected that in an event this severe, building confinement would fail and pathways would exist for the material that becomes airborne to be released directly to the environment. Thus, a leak path factor of 0.1 is assumed for transport of the material out of storage containers and enclosures, such as gloveboxes, and through the building equipment, damaged structures, and rubble to the environment. The source term for radioactive material released to the environment is about 0.21 ounces (6.0 grams). The annual frequency of the accident is estimated to be in the range of 0.000001 to 0.0001 or once every 10,000 to 1,000,000 years, based on the fact that this facility would be designed to meet current seismic standards and would perform its structural and safety confinement functions adequately in the LANL design-basis earthquake (estimated peak horizontal and vertical ground accelerations of 0.47 *g* and 0.51 *g* (LANL 2009), respectively, with a return interval of about 2,500 year). This frequency is a factor of 10 lower than is expected for a similar but less seismically resistant facility, such as the original 2004 CMRR-NF design that would not meet current design standards. The frequency is conservatively assumed to be 0.0001 per year for risk calculation purposes.

Seismically Induced Spill and Fire—This accident scenario postulates that an earthquake, of greater intensity than the LANL design-basis earthquake, causes internal enclosures to topple and become damaged by falling debris. Combustibles in the facility are ignited and the fire engulfs radioactive material.

Safety-Basis Scenario: The material at risk is 6.6 tons (6.0 metric tons) of plutonium-239 equivalent including metal, oxides, contained waste, and unconfined waste, in the form of contaminated combustible paper and trash located in the long-term vault, short-term vault, or in use in gloveboxes. Credit is taken for equipment and facility features and mitigating factors that could cause the damage ratio, airborne release fraction, and respirable fraction to be reduced from those assumed for an unmitigated accident. A range of released respirable fractions (airborne release fraction times respirable fraction) are estimated depending on the form of the material at risk. The source term for radioactive material released to the environment is about 1.1 ounces (30 grams) from the spill release and 1.9 ounces (53 grams) from the fire, for a total of about 2.9 ounces (83 grams), compared to 926 pounds (420 kilograms) for the unmitigated accident. The frequency of the accident is estimated to be in the range of 0.000001 to 0.0001 per year or once every 10,000 to 1,000,000 years. The frequency is conservatively assumed to be 0.0001 per year for risk calculation purposes.

SEIS Scenario: This accident scenario postulates an earthquake that causes many of the internal enclosures to topple and become damaged by falling debris. Much of the material in strong containers and in the vault is expected to survive the vibrations and impacts from falling equipment and falling debris. Multiple, local fires are assumed to occur within the debris, although this seems very unlikely due to the limited quantities of combustible materials that would be available within the building. Material that is out and close to the fires is expected to be vulnerable to release. Material away from the fires and in strong containers is not expected to be released by the fires. Normal limits on combustible materials would make a fire that propagates beyond the immediate vicinity of the localized fires extremely unlikely without an additional source of fuel to support a propagating fire.

The release mechanisms are assumed to be similar to those for the Safety-Basis Scenario. The material at risk is reduced from 6.6 tons (6.0 metric tons) to 660 pounds (300 kilograms) of plutonium-239 equivalent in powder form because it is assumed that the vaults in the Modified CMRR-NF would not be vulnerable to fires in this earthquake. The SEIS scenario conservatively assumes that several mechanisms contribute to the release: powder spills as with the seismically initiated building collapse, pressurized releases of powder from storage containers due to localized fires, and localized fires as with the facility-wide fire scenario. The seismically initiated building collapse is assumed to result in powder spills as discussed above under the seismically induced spill SEIS scenario (that is, a release of about 0.21 ounces [6.0 grams]).

Pressurized releases of powder due to localized fires are assumed to occur with a limited number of storage containers. The scenario conservatively assumes the damage ratio is 0.01, taking credit for equipment and facility features and mitigating factors that should prevent most of the material from being out and vulnerable. It is likely that even with a collapse scenario, material in the vaults would not be subject to release either through impacts or the thermal stress of fires. The released respirable fraction (airborne release fraction times respirable fraction) for the material at risk is estimated to be conservatively represented by an airborne release fraction of 0.005 and respirable fraction of 0.4, or 0.002, for the venting of powders or confinement failure to pressures of approximately 25 pounds per square inch or less (DOE 1994).

In addition to the release due to spills, some of the material is also vulnerable to release due to fires as with the facility-wide fire scenario. As with that scenario, it is conservatively assumed that the material at risk in the fire is estimated to be approximately 660 pounds (300 kilograms) of plutonium-239 equivalent in the form of metal (90 percent), oxide (8.3 percent), and liquid (1.7 percent). The fire release portion of the scenario conservatively assumes the damage ratio is 1.0, taking no credit for equipment and facility features and mitigating factors that should prevent most of the material from being out and vulnerable even in a seismically initiated facility-wide fire. The released respirable fraction (airborne release fraction times respirable fraction) is estimated to be 0.00025 for metal, 0.00006 for oxide, and 0.002 for liquid. The overall effective released respirable fraction for the fire release is 0.000267.

The building leak path factor is unknown, but it is expected that in an event this severe, building confinement would fail and pathways would exist for the material that does become airborne to be released directly to the environment. Thus, a leak path factor of 0.1 is assumed for transport of the material out of storage containers and enclosures, such as gloveboxes, and through the building equipment, damaged structures, and rubble to the environment. The source term for radioactive material released to the environment is about 0.21 ounces (6.0 grams) from the spill release, 0.021 ounces (0.60 grams) from the venting of pressurized powders from heated containers, and 0.028 ounces (0.80 grams) from the fire, for a total of about 0.26 ounces (7.4 grams). The frequency of the earthquake that results in wide-scale damage and loss of confinement for the building (on the order of once in 100,000 years), coupled with a widespread seismically initiated fire, is estimated to be in the range of 0.000001 to 0.00001 per year or once every 100,000 to 1,000,000 years. The frequency is conservatively assumed to be 0.00001 per year for risk calculation purposes.

C.4.3 Continued Use of CMR Building Alternative

The accidents described in this section pertain to the CMR Building. For this existing building, the safety-basis scenarios and the NEPA scenarios are similar since they are based on the existing facility and the existing safety analyses. The principal differences in the safety-basis approach and the NEPA approach is the degree of conservatism in the estimation of the material at risk, release mechanisms, damage ratios, fractions made airborne and respirable, and leak path factors. The safety-basis scenarios assume damage ratios of 1.0. The fractions made airborne and respirable by the real-world stresses implied by these scenarios are also conservative. Because of the age and construction of the building, the NEPA scenarios would assume similar damage ratios and leak path factors as the safety-basis scenarios and no separate analyses are provided. It is estimated that real-world releases for any of these CMR Building accident scenarios would be somewhat lower than these conservative safety-basis estimates. Operational practices and limits at the CMR Building limit the potential consequences of these accidents by limiting the material at risk within the building.

Wing-Wide Fire—This accident scenario postulates that combustible materials near an ignition source are ignited in a laboratory area and the fire spreads to a second wing, engulfing both wings. The fire could be initiated by natural phenomena, human error, or equipment failure. The fire is assumed to propagate uncontrolled and without suppression to adjacent laboratory areas. The material at risk is estimated to be approximately 22 pounds (10 kilograms) of plutonium-239 equivalent in any form (for example, metals, solutions, oxides, powders). The scenario conservatively assumes the damage ratio and leak path factors are 1.0. No credit is taken for equipment and facility features and mitigating factors that could cause the damage ratio and leak path factors to be less than 1.0. A range of released respirable fractions (airborne release fraction times respirable fraction) are estimated depending on the form of the material at risk. The source term for radioactive material released to the environment is about 0.4 ounces (12 grams). The annual frequency of the accident is estimated to range from 0.0001 to 0.01 or once every 100 to 10,000 years. The frequency is conservatively assumed to be 0.01 per year for risk calculation purposes.

Loading Dock Spill/Fire—This scenario was selected to represent a wide range of spills and fires that might occur outside the CMR Building associated with the loading dock. This scenario is postulated to involve waste containers being shipped from the loading dock or a large vessel being delivered to the facility for processing or cleanup. Many engineered controls should prevent or mitigate both the likelihood of this type of accident or the damage that might occur, including design of the loading dock to minimize the risk of impacts to multiple containers and use of shipping packages designed to withstand shipping accidents. It is very conservatively assumed that a vehicle impacts waste drums containing the entire material at risk of 13.2 pounds (6.0 kilograms) of plutonium-239 equivalent with a subsequent spill or fire involving the containers. Since this would occur outside, any release would be directly to the environment. For safety basis purposes, it is assumed that the damage ratio is 0.1 for mechanical insults associated with vehicles moving in and around a loading dock per DOE-STD-5506-2007 (DOE 2007).

The leak path factor is assumed to be 1.0. The released respirable fraction (airborne release fraction times respirable fraction) is very conservatively estimated at 0.001 for the spill. The resulting source term of radioactive material released to the environment is estimated at 0.0212 ounces (0.60 grams). The annual frequency of the initiating accident is estimated to range from 0.0001 to 0.01 or once every 100 to

10,000 years. The frequency of a spill accident of this magnitude is conservatively assumed to be 0.01 per year for risk calculation purposes. A loading dock spill and subsequent fire was also considered but found to be with reasonable assumptions, ARFs, and RF, the source term and consequences would not be higher than those predicted with the bounding spill source term. With a damage ratio of 0.1 and a leak path factor of 1.0, and assuming that some of the drum contents are ejected and subject to unconfined burning, and some subject to confined burning, a source term of 0.0198 ounces (0.56 grams) was estimated.

Seismically Induced Spill—This accident scenario postulates that an earthquake of lower magnitude than the current design-basis earthquake causes internal enclosures to topple and become damaged by falling debris. The material at risk is estimated to be about 33 pounds (15 kilograms) of plutonium-239 equivalent. The reduced material at risk in this scenario compared to the CMRR-NF accident scenarios is a result of changes made in CMR operations due to safety concerns associated with the performance of the CMR Building in an earthquake such as the one postulated in this accident scenario. Material at risk that is released as a result of the seismic event may be in any form, including powders, solutions, and metals. The scenario conservatively assumes the damage ratio and leak path factors are 1.0 indicating that the building structure has failed and is providing an open pathway to the environment. No credit is taken for equipment and facility features and mitigating factors that could cause the damage ratio and leak path factors to be less than 1.0. A range of released respirable fractions (airborne release fraction times respirable fraction) are estimated depending on the form of the material at risk. The source term for radioactive material released to the environment is about 1.1 ounces (30 grams). The frequency of the accident is estimated to be in the range of 0.0001 to 0.01 per year or once every 100 to 10,000 years. The frequency is conservatively assumed to be 0.01 per year for risk calculation purposes.

Seismically Induced Fire—This accident scenario postulates an earthquake causes internal enclosures to topple and become damaged by falling debris. Combustibles in the facility are ignited and the fire engulfs radioactive material. The material at risk is estimated to be about 33 pounds (15 kilograms) of plutonium-239 equivalent. The reduced material at risk for this scenario compared to the CMRR-NF accident scenarios is a result of changes made in CMR operations due to safety concerns associated with the performance of the CMR Building in an earthquake such as the one postulated in this accident scenario. Material at risk that is released as a result of the seismic event may be in any form, including powders, solutions, and metals. The scenario conservatively assumes the damage ratio and leak path factors are 1.0. No credit is taken for equipment and facility features and mitigating factors that could cause the damage ratio and leak path factors to be less than 1.0. A range of released respirable fractions (airborne release fraction times respirable fraction) are estimated depending on the form of the material at risk. The source term for radioactive material released to the environment is about 2.1 ounces (61 grams). The frequency of the accident is estimated to be in the range of 0.000001 to 0.0001 per year or once every 10,000 to 1,000,000 years. The frequency is conservatively assumed to be 0.0001 per year for risk calculation purposes.

C.5 Accident Analyses Consequences and Risk Results

The potential impacts of a radiological accident on workers and the public can be measured in a number of ways depending on the application. Three measures are used in this *CMRR-NF SEIS*. The first measure of consequences is individual dose, expressed in terms of rem or millirem for a member of the public or worker, and collective dose, expressed in terms of person-rem for members of the public or a population of workers. The second measure is a post-exposure effect that reflects the likelihood of an LCF for an exposed individual or the expected number of LCFs in a population of exposed individuals. Individual or public exposure to radiation can only occur if there is an accident involving radioactive materials, which leads to the third measure. The third measure of potential accident impacts is referred to as risk that takes into account the probability (or frequency) of the accident's occurrence. Risk is the mathematical product of the probability or frequency of accident occurrence and the LCF consequences. Risk is calculated as follows:

For an individual

$R_i = D_i \times F \times P$ where:

- R_i is the risk of an LCF for an individual receiving a dose D_i in LCFs per year
- D_i is the dose in rem to an individual
- F is the dose-to-LCF conversion factor, which is 0.0006 LCFs per rem for individuals.
- P is the probability or frequency of the accident, usually expressed on a per-year basis.

For a population

$R_p = D_p \times F \times P$ where:

- R_p is the risk for a population receiving a dose D_p in LCFs per year
- D_p is the dose in person-rem to a population
- F is the dose-to-LCF conversion factor, which is 0.0006 LCFs per person-rem for a population of workers for members of the public.
- P is the probability or frequency of the accident, usually expressed on a per-year basis.

Once the source term, the amount of radioactive material released to the environment for each accident scenario, is determined, the radiological consequences are calculated. The calculations and resulting impacts vary depending on how the radioactive material release is dispersed, what materials are involved, and which receptors are being considered.

For example, if the dose to an individual (the MEI or a noninvolved worker) is 10 rem, the probability of an LCF for an individual is $10 \times 0.0006 = 0.006$, where 0.0006 is the dose-to-LCF conversion factor. If the individual receives a dose exceeding 20 rem, the dose-to-LCF conversion factor is doubled, to 0.0012. Thus, if the MEI receives a dose of 30 rem, the probability of an LCF is $30 \times 0.0012 = 0.036$. For an individual, the calculated probability of an LCF is in addition to the probability of cancer from all other causes.

For the population, the same dose-to-LCF conversion factors are used to determine the estimated number of LCFs. The calculated number of LCFs in the population is in addition to the number of cancer fatalities that would result from all other causes. The MACCS2 computer code calculates the dose to each individual in the exposed population and applies the appropriate dose-to-LCF conversion factor to estimate the LCF consequences, 0.0006 for doses less than 20 rem or 0.0012 for doses greater than or equal to 20 rem. Therefore, for some accidents, the estimated number of LCFs will involve both dose-to-LCF conversion factors. This indicates that some members of the population are estimated to receive doses in excess of 20 rem.

After any accident that had the potential for a release of concern, the standard emergency procedures require survey of the nearby areas to check for potential contamination and identify areas where radioactive particles had been deposited. With modern radiation survey techniques, plutonium particles in the environment can be detected at very low levels.

Tables C–1 through **C–6** present the facility accident impacts under the alternatives. For each alternative, there are two tables showing the impacts. The first table presents the consequences (doses and LCFs) assuming the accident occurs, that is, not reflecting the frequency of accident occurrence. The second table shows the accident risks that are obtained by multiplying the LCF values in the first table by the annual frequency of each accident listed in the first table.

Table C–1 Accident Frequency and Consequences Under the No Action Alternative

Accident	*Frequency (per year)*	*Maximally Exposed Individual*		*Offsite Population* [a]		*Noninvolved Worker at Technical Area Boundary*	
		Dose (rem)	*Latent Cancer Fatality* [b]	*Dose (person-rem)*	*Latent Cancer Fatalities* [c]	*Dose (rem)*	*Latent Cancer Fatality* [b]
Safety-Basis Scenarios							
Facility-wide fire	0.0001	1.1	0.0007	700	0 (0.4)	5.9	0.004
Seismically induced spill	0.01	600	0.7	140,000	84	20,000	1
Seismically induced spill and fire [d]	0.0001	5,600	1	3,900,000	2,300	47,000	1
Loading dock spill/fire	0.01	0.028	0.00002	6.6	0 (0.004)	1.0	0.0006
SEIS Scenarios							
Facility-wide fire	0.000001	0.011	0.000007	7.1	0 (0.004)	0.059	0.00004
Seismically induced spill	0.001	6.0	0.004	1,400	1 (0.8)	200	0.2
Seismically induced spill and fire [d]	0.0001	6.2	0.004	1,500	1 (0.9)	200	0.2
Loading dock spill/fire	0.0001	0.028	0.00002	6.6	0 (0.004)	1.0	0.0006

SEIS = supplemental environmental impact statement.
[a] Based on a projected 2030 population estimate of approximately 511,000 persons residing within 50 miles (80 kilometers) of TA-55.
[b] Increased likelihood of an LCF for an individual, assuming the accident occurs.
[c] Increased number of LCFs in the offsite population, assuming the accident occurs (results rounded to one significant figure). When the reported value is zero, the result calculated by multiplying the collective dose to the population by the risk factor (0.0006 LCFs per person-rem) is shown in parentheses.
[d] In the seismically induced spill and fire accident scenario, two sequential events are considered: first the seismic spill occurs and then releases due to the fire occur.

Table C–2 Annual Accident Risks Under the No Action Alternative

Accident	*Risk of Latent Cancer Fatality*		
	Maximally Exposed Individual [a]	*Offsite Population* [b, c]	*Noninvolved Worker at Technical Area Boundary* [a]
Safety-Basis Scenarios			
Facility-wide fire	7×10^{-8}	4×10^{-5}	4×10^{-7}
Seismically induced spill	7×10^{-3}	8×10^{-1}	1×10^{-2}
Seismically induced spill and fire [d]	1×10^{-4}	2×10^{-1}	1×10^{-4}
Loading dock spill/fire	2×10^{-7}	4×10^{-5}	6×10^{-6}
SEIS Scenarios			
Facility-wide fire	7×10^{-12}	4×10^{-9}	4×10^{-11}
Seismically induced spill	4×10^{-6}	8×10^{-4}	2×10^{-4}
Seismically induced spill and fire [d]	4×10^{-7}	9×10^{-5}	2×10^{-5}
Loading dock spill/fire	2×10^{-9}	4×10^{-7}	6×10^{-8}

SEIS = supplemental environmental impact statement.
[a] Risk of a LCF to the individual.
[b] Risk of an additional LCF in the offsite population.
[c] Based on a projected 2030 population estimate of approximately 511,000 persons residing within 50 miles (80 kilometers) of TA-55.
[d] In the seismically induced spill and fire accident scenario, two sequential events are considered: first the seismic spill occurs and then releases due to the fire occur.

Table C–3 Accident Frequency and Consequences Under the Modified CMRR-NF Alternative

Accident	Frequency (per year)	Maximally Exposed Individual		Offsite Population [a]		Noninvolved Worker at Technical Area Boundary	
		Dose (rem)	Latent Cancer Fatality [b]	Dose (person-rem)	Latent Cancer Fatalities [c]	Dose (rem)	Latent Cancer Fatality [b]
Safety-Basis Scenarios							
Facility-wide fire	0.0001	1.1	0.0007	700	0 (0.4)	5.9	0.004
Seismically induced spill with mitigation	0.0001	1.5	0.0009	350	0 (0.2)	51	0.06
Seismically induced spill and fire with mitigation [d]	0.0001	2.1	0.001	820	0 (0.5)	54	0.07
Loading dock spill/fire	0.01	0.028	0.00002	6.6	0 (0.004)	1.0	0.0006
SEIS Scenarios							
Facility-wide fire	0.000001	0.011	0.000007	7.1	0 (0.004)	0.059	0.00004
Seismically induced spill with mitigation	0.0001	0.30	0.0002	71	0 (0.04)	10	0.006
Seismically induced spill and fire with mitigation [d]	0.00001	0.32	0.0002	83	0 (0.05)	10	0.006
Loading dock spill/fire	0.0001	0.028	0.00002	6.6	0 (0.004)	1.0	0.0006

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility, SEIS = supplemental environmental impact statement.

[a] Based on a projected 2030 population estimate of approximately 511,000 persons residing within 50 miles (80 kilometers) of TA-55.

[b] Increased likelihood of an LCF for an individual, assuming the accident occurs.

[c] Increased number of LCFs in the offsite population, assuming the accident occurs (results rounded to one significant figure). When the reported value is zero, the result calculated by multiplying the collective dose to the population by the risk factor (0.0006 LCFs per person-rem) is shown in parentheses.

[d] In the seismically induced spill and fire accident scenario, two sequential events are considered: first the seismic spill occurs and then releases due to the fire occur.

Table C–4 Annual Accident Risks Under the Modified CMRR-NF Alternative

Accident	Risk of Latent Cancer Fatality		
	Maximally Exposed Individual [a]	Offsite Population [b, c]	Noninvolved Worker at Technical Area Boundary [a]
Safety-Basis Scenarios			
Facility-wide fire	7×10^{-8}	4×10^{-5}	4×10^{-7}
Seismically induced spill with mitigation	9×10^{-8}	2×10^{-5}	6×10^{-6}
Seismically induced spill and fire with mitigation [d]	1×10^{-7}	5×10^{-5}	7×10^{-6}
Loading dock spill/fire	2×10^{-7}	4×10^{-5}	6×10^{-6}
SEIS Scenarios			
Facility-wide fire	7×10^{-12}	4×10^{-9}	4×10^{-11}
Seismically induced spill with mitigation	2×10^{-8}	4×10^{-6}	6×10^{-7}
Seismically induced spill and fire with mitigation [d]	2×10^{-9}	5×10^{-7}	6×10^{-8}
Loading dock spill/fire	2×10^{-9}	4×10^{-7}	6×10^{-8}

CMRR-NF = Chemistry and Metallurgy Research Building Replacement Nuclear Facility, SEIS = supplemental environmental impact statement.

[a] Risk of a LCF to the individual.

[b] Risk of an additional LCF in the offsite population.

[c] Based on a projected 2030 population estimate of approximately 511,000 persons residing within 50 miles (80 kilometers) of TA-55.

[d] In the seismically induced spill and fire accident scenario, two sequential events are considered: first the seismic spill occurs and then releases due to the fire occur.

Table C–5 Accident Frequency and Consequences Under the Continued Use of CMR Building Alternative

Accident	Frequency (per year)	Maximally Exposed Individual		Offsite Population [a]		Noninvolved Worker at Technical Area Boundary	
		Dose (rem)	Latent Cancer Fatality [b]	Dose (person-rem)	Latent Cancer Fatalities [c]	Dose (rem)	Latent Cancer Fatality [b]
Wing-wide fire [d]	0.01	0.26	0.0002	140	0 (0.09)	0.65	0.0004
Seismically induced spill	0.01	2.2	0.001	580	0 (0.4)	21	0.03
Seismically induced spill and fire [e]	0.0001	4.3	0.003	1,200	1 (0.7)	42	0.05
Loading dock spill/fire	0.01	0.07	0.00004	11	0 (0.007)	0.69	0.0004

CMR = chemistry and metallurgy research.
[a] Based on a projected 2030 population estimate of approximately 502,000 persons residing within 50 miles (80 kilometers) of TA-3.
[b] Increased likelihood of an LCF for an individual, assuming the accident occurs.
[c] Increased number of LCFs for the offsite population, assuming the accident occurs (results rounded to one significant figure). When the reported value is zero, the result calculated by multiplying the collective dose to the population by the risk factor (0.0006 LCFs per person-rem) is shown in parentheses.
[d] A major fire was assumed to involve two wings.
[e] In the seismically induced spill and fire accident scenario, two sequential events are considered: first the seismic spill occurs and then releases due to the fire occur.

Table C–6 Annual Accident Risks Under the Continued Use of CMR Building Alternative

Accident	Risk of Latent Cancer Fatality		
	Maximally Exposed Individual [a]	Offsite Population [b, c]	Noninvolved Worker at Technical Area Boundary [a]
Wing-wide fire	2×10^{-6}	9×10^{-4}	4×10^{-6}
Seismically induced spill	1×10^{-5}	4×10^{-3}	3×10^{-4}
Seismically induced spill and fire[d]	3×10^{-7}	7×10^{-5}	5×10^{-6}
Loading dock spill/fire	4×10^{-7}	7×10^{-5}	4×10^{-6}

CMR = chemistry and metallurgy research.
[a] Risk of a LCF to the individual.
[b] Risk of an additional LCF in the offsite population.
[c] Based on a projected 2030 population estimate of approximately 502,000 persons residing within 50 miles (80 kilometers) of TA-3.
[d] In the seismically induced spill and fire accident scenario, two sequential events are considered: first the seismic spill occurs and then releases due to the fire occur.

C.6 Potential Land Contamination Following Severe Earthquakes

Seismic events that result in failure of building containment of plutonium facilities have the potential to release sufficient quantities of plutonium, leading to concerns regarding surface contamination in the immediate vicinity of the facility. Even for the severe earthquakes that could lead to major damage within the facility and the building structure and failure of confinement systems, there should not be large energy sources to drive the materials that would typically be used in the proposed CMRR-NF, such as plutonium metal and oxides, out of the damaged building and rubble. Seismic collapse scenarios that result primarily in spills could release plutonium materials through the rubble, but that material would not generally go far from the building site. Seismic collapse scenarios that involve large fires have the potential to loft materials such that transport of radioactive materials downwind might result in land contamination at levels that could require monitoring or additional actions.

The seismically induced spill and seismically induced spill with fire SEIS scenarios discussed in Sections C.4.2.1, C.4.2.2, and C.4.3 were modeled using the HotSpot code (LLNL 2011) to evaluate the potential land area that might be contaminated above certain levels as a result of these extremely unlikely accidents. This *CMRR-NF SEIS* uses a plutonium areal concentration of 0.2 microcuries per square meter as a screening level for determining the lateral extent of contamination that might require cleanup actions (Chanin 1996). This screening level was first proposed by EPA in the late 1970s but never formally adopted. It has been used in many environmental impact statements to indicate land areas that would not likely require remedial actions. Land contaminated with transuranic material at levels above the screening level would likely require additional monitoring and evaluations to determine if cleanup were appropriate. Estimations of land areas that might be contaminated are highly dependent on specific accident source terms and metrological modeling assumptions. This is because the amount of radioactive material that may accumulate on the ground is highly dependent on the size of the particles that get through the building rubble and released to the environment (which determines how fast they settle back to the ground), the specific accident conditions (for example, including a fire or not), and specific meteorological conditions during the earthquake. In general, unless there is a fire that can effectively loft the plutonium particles into the air, most of the particles would return to the ground within a few hundred meters of the building location.

If a large fire is assumed to follow the seismically induced spill at the 2004 CMRR-NF, then the heat energy could effectively raise the release height such that ground contamination at the screening level could extend out to approximately 10 miles (16 kilometers) from TA-55 depending in large part on the meteorological conditions at the time of the earthquake. A similar scenario involving the Modified CMRR-NF has a much lower expected source term (0.26 ounces [7.4 grams] of plutonium-239 equivalent compared to 4.68 ounces [132.8 grams]) (see Section C.4). If this accident were to occur at the Modified CMRR-NF, no land outside of TA-55 is projected to be contaminated above the screening level. A similar seismically induced spill and fire at the existing CMR Building with its reduced material at risk would result in an estimated release of 2.1 ounces (61 grams) of plutonium-239 equivalent (see Section C.4). If this accident were to occur at the CMR Building, it could contaminate downwind areas extending out to approximately 6.2 miles (10 kilometers) from TA-3, depending in large part on the meteorological conditions at the time of the earthquake as discussed above for the 2004 CMRR-NF.

As stated earlier, contaminated areas at levels above 0.2 microcuries per square meter would potentially need further action, such as radiation surveys or cleanup. Costs associated with these efforts, as well as continued monitoring activities, could vary widely depending upon the characteristics of the contaminated area and could range in the hundreds of million dollars per square kilometer for land decontamination (NASA 2006). In addition to the potential direct costs of radiological surveys, potential cleanup, and monitoring following an accident, there are potential secondary societal costs associated with the mitigation from high consequence accidents. Those costs could include, but may not be limited to the following:

- temporary or longer-term relocation of residents
- temporary or longer-term loss of employment
- destruction or quarantine of agricultural products
- land-use restrictions (which could affect real estate values, businesses, and recreational activities);
- public health effects and medical care

C.7 Combined Impacts from TA-55 Building Collapses and Fires Resulting from a Beyond-Design-Basis Earthquake

If a severe earthquake were to occur in the Los Alamos area, nearby individuals could receive impacts from several facilities that might be damaged. Individuals close to and downwind from TA-55 might receive exposure from radioactive material releases at the existing TA-55 Plutonium Facility as well as the proposed Modified CMRR-NF should it be built. The Modified CMRR-NF would be designed to withstand an earthquake with a peak horizontal ground acceleration of 0.47 *g* and a peak vertical ground acceleration of 0.51 *g* (with a return period of 2500 years) with limited releases. The TA-55 Plutonium Facility was originally designed to a lower seismic standard, but NNSA is in the process of upgrading it to withstand higher seismic loadings. By the time the proposed Modified CMRR-NF would be operational, the TA-55 Plutonium Facility is expected to be able to survive the current design-basis earthquake (peak horizontal ground acceleration of 0.47 *g*, peak vertical ground acceleration of 0.51 *g*) with limited releases. Both the Modified CMRR-NF and the upgraded TA-55 Plutonium Facility would have multi-layered defenses to limit releases from storage containers, gloveboxes, equipment, vaults, and the building. Even with limited failures of containers, gloveboxes, equipment, and the building structures, the releases would be limited as discussed earlier for the Modified CMRR-NF Alternative. The release mechanisms for either the Modified CMRR-NF or the TA-55 Plutonium Facility would be similar and the total amount of radioactive material that could be released would be more or less proportional to the amounts and forms of materials that might be at risk in either facility. As proposed, the Modified CMRR-NF would likely have much less material at risk in a severe seismic event than the TA-55 Plutonium Facility.

The potential impacts due to releases from the TA-55 Plutonium Facility from severe earthquakes were evaluated in the 2008 *LANL SWEIS* (DOE 2008b). For a site-wide seismic event, which corresponded to approximately a PC-3 earthquake[4] the estimated doses from the Plutonium Facility (TA-55-4), the Storage Facility (TA-55-185), and the Safe, Secure Transport Facility (TA-55-355) totaled about 160 rem to the MEI and 14,880 person-rem to the population residing within 50 miles (80 kilometers) of TA-55. About 150 rem of the dose to the MEI was estimated to be from the TA-55 Plutonium Facility. These doses represent a probability of the MEI developing a fatal cancer of 0.19 or approximately 1 chance in 5, and are expected to result in about 9 LCFs in the population surrounding the site, if the accident occurred.

DOE has committed to seismic upgrades to the TA-55 Plutonium Facility that would result in an updated safety-basis estimate (NNSA 2011) of mitigated consequences less than the 25 rem to the MEI (the DOE Evaluation Guideline described in DOE Standard 3009) for a seismically induced fire. Proposed future improvements that will be incorporated into the TA-55 Plutonium Facility include fire-rated containers, seismically qualified fire suppression systems, and seismically qualified portions of the confinement ventilation system. The 2011 safety basis analysis prepared in support of NNSA's response to the Defense Nuclear Facilities Safety Board (DNFSB) concluded that seismically upgrading the fire suppression system would further reduce calculated offsite consequences to the MEI to the level estimated for the seismically induced spill without fire, which is about 9 rem (NNSA 2011).

The upgrades to the TA-55 Plutonium Facility are ongoing and would be complete prior to the proposed Modified CMRR-NF becoming operational. However, under the No Action Alternative, the 2004 CMRR-NF, could be completed prior to completing the TA-55 Plutonium Facility upgrades. The 2004

[4] *The estimated dose consequences included in the LANL SWEIS (DOE 2008b) were based on a PC-3 seismic event with a return period of 2,000 years and a peak horizontal ground acceleration of approximately 0.31 g (the current PC-3 seismic event return period is 2,500 years). The 2007 Update of the Probabilistic Seismic Hazard Analysis and Development of Seismic Design Ground Motions at the Los Alamos National Laboratory (LANL 2007) had been recently issued and an evaluation of the effects of the new data on LANL facilities was just getting underway. The consequences of a current PC-3 seismic event likely would be higher than estimated in the LANL SWEIS.*

CMRR-NF would be located at TA-55 and would also be vulnerable to releases during severe earthquakes. For the 2004 *CMRR-NF SEIS* scenarios, Table C-1 indicates that the MEI doses from the seismically induced spill or seismically induced spill plus fire are estimated to be about 6 rem. For the MEI closest to the TA-55 area, the doses from the 2004 CMRR-NF would add directly to those from the other TA-55 facilities. The dose from the TA-55 Plutonium Facility, with its larger inventory, is still expected to be the major contributor to the offsite doses. When the updated TA-55 facility doses are combined with the projected doses from the 2004 CMRR-NF in the event of a severe earthquake, prior to completion of the TA-55 Plutonium Facility upgrades, the dose to the MEI would be about 166 rem, and the 2030 estimated population dose within 50 miles (80 kilometers) of LANL would be about 16,400 person-rem. These doses correspond to a probability of the MEI developing a fatal cancer of 0.2 (1 chance in 5) and the likelihood of up to 10 LCFs in the 50-mile (80-kilometer) population. After completion of the TA-55 Plutonium Facility upgrades, the dose to the MEI would be about 25 rem, and the 2030 estimated population dose within 50 miles (80 kilometers) of LANL would be about 6,000 person-rem. For the MEI, this analysis takes into account the revised MEI dose of 19 rem (9 rem from the revised 2011 safety basis for the TA-55 Plutonium Facility and 10 rem for releases from other facilities at TA-55 from the 2008 *LANL SWEIS*). Note that the MEI dose is independent of the changes in the population, since it focuses on the maximum dose to an individual at the nearest site boundary. Given a severe seismic event, these doses represent a probability of the MEI developing a fatal cancer of 0.03 or approximately 1 chance in 33, and the likelihood of up to 4 LCFs in the exposed population surrounding the site.

The proposed Modified CMRR-NF would be located at TA-55 and would also be vulnerable to releases during severe earthquakes, although these releases are expected to be much smaller than those estimated for the 2004 CMRR-NF due to the increased structural integrity of the Modified CMRR-NF. For the SEIS scenario, Table C–3 indicates that the MEI doses for the seismically induced spill or seismically induced spill plus fire are estimated to be about 0.3 rem. For the MEI closest to TA-55, the doses from the Modified CMRR-NF would add directly to those from the other TA-55 facilities. The dose from the Plutonium Facility, with its larger inventory, is still expected to be the major contributor to the MEI dose. When the updated TA-55 facility doses are combined with the projected doses from the Modified CMRR-NF in the event of a severe earthquake, the dose to the MEI would be about 19 rem (19 rem from the TA-55 Plutonium Facility and other facilities at TA-55 as discussed above and 0.3 rem from the Modified CMRR-NF) and the 2030 estimated population dose within 50 miles (80 kilometers) of LANL would be about 4,500 person-rem. Given a severe seismic event, these doses represent a probability of the MEI developing a fatal cancer of 0.023 or approximately 1 chance in 44, and the likelihood of up to 3 LCFs in the population surrounding the site.

C.8 Analysis Conservatism and Uncertainty

The analysis of accidents is based on calculations relevant to postulated sequences of accident events and models used to calculate the accident's consequences. The models provide estimates of the frequencies, source terms, pathways for dispersion, exposures, and the effects on human health and the environment that are as realistic as possible within the scope of the analysis. In many cases, the rare occurrence of postulated accidents leads to uncertainty in the calculation of the consequences and frequencies. This fact has promoted the use of models or input values that yield conservative estimates of consequences and frequency.

Due to the layers of conservatism built into the accident analysis for the spectrum of postulated accidents, the estimated consequences and risks to the public represent the upper limit for the individual classes of accidents. The uncertainties associated with the accident frequency estimates are enveloped by the conservatism in the analysis.

The numerical estimates of LCFs presented in this *CMRR-NF SEIS* were obtained using a linear extrapolation from the nominal risk estimated for lifetime total cancer mortality that results from a dose of 10 rad. Other methods of extrapolation to the low-dose region could yield higher or lower numerical estimates of LCFs. Studies of human populations exposed to low doses are inadequate to demonstrate the actual level of risk. There is scientific uncertainty about cancer risk in the low-dose region below the range of epidemiologic observation. However, comprehensive review of available biological and biophysical data supports a "linear-no-threshold" risk model—in which the risk of cancer proceeds in a linear fashion at lower doses without a threshold—and that the smallest dose has the potential to cause a small increase in risk to humans (National Research Council 2006). Because the health risk estimators are multiplied by conservatively calculated radiological doses to predict fatal cancer risks, the fatal cancer values presented in this *CMRR-NF SEIS* are expected to be conservative estimates.

C.9 Fukushima Daiichi Nuclear Power Plant Accident Implications

Beyond-design-basis earthquakes have the potential to result in loss of offsite power and the potential to disrupt emergency or backup power as was the case in the Fukushima Daiichi Nuclear Power Plant. Except for the fire suppression system, the safety-class structures, systems, and components at the CMRR-NF are passive engineered features. The fire suppression system is independent of the regional electrical power system for providing its safety-class function. As discussed in Section C.4, severe seismic events have the potential to result in substantial damage to storage containers and enclosures, such as gloveboxes, and result in the release of radioactive material through the building equipment, damaged structures, and rubble to the environment. In such severe events, it is expected that all power, including backup power, could be unavailable for hours or days. This could cause operational problems and hinder damage assessment and cleanup, but is not expected to result in additional release of radioactive material to the environment.

Unlike the Fukushima Daiichi Nuclear Power Plant reactors and spent fuel pools, plutonium materials stored within LANL plutonium facilities or in ongoing operations are generally stable in their configuration and would not require active cooling systems to keep them stable and prevent additional releases to the environment. These materials would require a large energy source, such as an external, fuel-fed fire or a large plane crash into the facility, to disperse them into the environment. Plutonium oxides behave much like sand and would require additional energy, such as high-pressure air or an explosion, to disperse them into the environment. The stability of plutonium metal varies depending on the size of the piece. Fine metal turnings from a lathe oxidize immediately, much like iron does in sparklers. Larger pieces of plutonium metal oxidize slowly and form an oxide crust. The rapid oxidation of plutonium metal requires a large energy source, such as an external, fuel-fed fire. Otherwise, the oxidation is slow and self limiting. Plutonium in liquid form would typically be a plutonium nitrate. This would also be stable and require an external energy source to disperse the liquid.

The only forms of plutonium that generate enough heat to require long-term cooling are plutonium-238 heat sources. No plutonium-238 is stored in the CMR Building or would be stored in the proposed CMRR-NF.

C.10 MACCS2 Code Description

The MACCS2 computer code is used to estimate the radiological doses and health effects that could result from postulated accidental releases of radioactive materials to the atmosphere. The specification of the release characteristics, designated a "source term," can consist of up to four Gaussian plumes that are often referred to simply as "plumes."

The radioactive materials released are modeled as being dispersed in the atmosphere while being transported by the prevailing wind. During transport, whether or not there is precipitation, particulate material can be modeled as being deposited on the ground. If contamination levels exceed a user-specified criterion, mitigating actions can be triggered to limit radiation exposures.

There are two aspects of the code's structure basic to understanding its calculations: (1) the calculations are divided into modules and phases, and (2) the region surrounding the facility is divided into a polar-coordinate grid. These concepts are described in the following sections.

MACCS is divided into three primary modules: ATMOS, EARLY, and CHRONC. The three modules correspond to three phases of exposure from an accident, defined as the emergency, intermediate, and long-term phases. The relationship among the code's three modules and the three phases of exposure are summarized below.

The ATMOS module performs all of the calculations pertaining to atmospheric transport, dispersion, and deposition, as well as the radioactive decay that occurs before release and while the material is in the atmosphere. It uses a Gaussian plume model with Pasquill-Gifford dispersion parameters. The phenomena treated include building wake effects, buoyant plume rise, plume dispersion during transport, wet and dry deposition, and radioactive decay and in-growth. The results of the calculations are stored for use by EARLY and CHRONC. In addition to the air and ground concentrations, ATMOS stores information on wind direction, plume arrival and departure times, and plume dimensions.

The EARLY module models the period immediately following a radioactive release. This period is commonly referred to as the "emergency phase." The emergency phase begins at each successive downwind distance point when the first plume of the release arrives. The duration of the emergency phase is specified by the user and can range between 1 and 7 days. The exposure pathways considered during this period are direct external exposure to radioactive material in the plume (cloud shine); exposure from inhalation of radionuclides in the plume (cloud inhalation); exposure to radioactive material deposited on the ground (ground shine); inhalation of resuspended material (resuspension inhalation); and skin dose from material deposited on the skin. Mitigating actions that can be specified for the emergency phase include evacuation, sheltering, and dose-dependent relocation.

The CHRONC module performs all of the calculations pertaining to the intermediate and long-term phases (not used in the current analysis). CHRONC calculates the individual health effects that result from both direct exposure to contaminated ground and from inhalation of resuspended materials, as well as indirect health effects caused by the consumption of contaminated food and water by individuals who could reside both on and off the computational grid.

The intermediate phase begins at each successive downwind distance point upon the conclusion of the emergency phase. The user can configure the calculations with an intermediate phase that has a duration as short as zero or as long as 1 year. In the zero-duration case, there is essentially no intermediate phase and a long-term phase begins immediately upon conclusion of the emergency phase.

Intermediate models are implemented on the assumption that the radioactive plume has passed and the only exposure sources (ground shine and resuspension inhalation) are from ground-deposited material. It is for this reason that MACCS2 requires the total duration of a radioactive release be limited to no more than four days. Potential doses from food and water during this period are not considered.

The mitigating action model for the intermediate phase is very simple. If the intermediate phase dose criterion is satisfied, the resident population is assumed to be present and subject to radiation exposure from ground shine and resuspension for the entire intermediate phase. If the intermediate phase exposure exceeds the dose criterion, then the population is assumed to be relocated to uncontaminated areas for the entire intermediate phase.

The long-term phase begins at each successive downwind distance point upon the conclusion of the intermediate phase. The exposure pathways considered during this period are ground shine, resuspension inhalation, and food and water ingestion.

The exposure pathways considered are those resulting from ground-deposited material. A number of protective measures, such as decontamination, temporary interdiction, and condemnation, can be modeled in the long-term phase to reduce doses to user-specified levels. The decisions on mitigating action in the long-term phase are based on two sets of independent actions: (1) decisions relating to whether land at a specific location and time is suitable for human habitation (habitability), and (2) decisions relating to whether land at a specific location and time is suitable for agricultural production (ability to farm).

All of the calculations of MACCS2 are stored based on a polar-coordinate spatial grid with a treatment that differs somewhat between calculations of the emergency phase and calculations of the intermediate and long-term phases. The region potentially affected by a release is represented with a (r, θ) grid system centered on the location of the release. The radius, r, represents downwind distance. The angle, θ, is the angular offset from north, going clockwise.

The user specifies the number of radial divisions as well as their endpoint distances. The angular divisions used to define the spatial grid are fixed in the code. They correspond to the 16 points of the compass, each being 22.5 degrees wide. The 16 points of the compass are used in the United States to express wind direction. The compass sectors are referred to as the "coarse grid."

Since emergency phase calculations use dose-response models for early fatalities and early injuries that can be highly nonlinear, these calculations are performed on a finer grid basis than the calculations of the intermediate and long-term phases. For this reason, the calculations of the emergency phase are performed with the 16 compass sectors divided into three, five, or seven equal, angular subdivisions. The subdivided compass sectors are referred to as the "fine grid."

Two types of doses may be calculated by the code, "acute" and "lifetime." Acute doses are calculated to estimate deterministic health effects that can result from high doses delivered at high dose rates. Such conditions may occur in the immediate vicinity of a nuclear facility following hypothetical severe accidents where confinement and/or containment failure has been assumed to occur. Examples of the health effects based on acute doses are early fatality, prodromal vomiting, and hypothyroidism.

Lifetime doses are the conventional measure of detriment used for radiological protection. These are 50-year dose commitments to either specific tissues (for example, red marrow and lungs) or a weighted sum of tissue doses defined by the International Commission on Radiological Protection and referred to as "effective dose." Lifetime doses may be used to calculate the stochastic health effect risk resulting from exposure to radiation. MACCS2 uses the calculated lifetime dose in cancer risk calculations.

C.11 References

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APPENDIX D
CONTRACTOR DISCLOSURE STATEMENTS

NEPA DISCLOSURE STATEMENT FOR PREPARATION OF A 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 (CMRR-NF SEIS)

CEQ regulations at 40 CFR 1506.5(c), which have been adopted by DOE (10 CFR 1021), require contractors who will prepare an EIS to execute a disclosure specifying that they have no financial or other interest in the outcome of the project. The term "financial interest or other interest in the outcome of the project," for the purposes of this disclosure, is defined in the March 23, 1981 guidance "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," 46 FR 18026-18038 at Question 17a and b.

"Financial or other interest in the outcome of the project 'includes' any financial benefit such as a promise of future construction or design work in the project, as well as indirect benefits the contractor is aware of (e.g., if the project would aid proposals sponsored by the firm's other clients)," 46 FR 18026-18038 at 18031.

In accordance with these requirements, the offeror and any proposed subcontractors hereby certify as follows: (check either (a) or (b))

(a) ____X____ Offeror and any proposed subcontractor have no financial interest in the outcome of the project.

(b) __________ Offeror and any proposed subcontractor have the following financial or other interest in the outcome of the project and hereby agree to divest themselves of such interest prior to award of this contract.

Financial or Other Interests:

1.
2.
3.

Certified by:

Science Applications International Corporation

Signature

Patricia Garcia
Patricia Garcia, Contracts Representative

10 Feb 2011
Date

W91278-09-D-0099, Task Order No. 0009

NEPA DISCLOSURE STATEMENT FOR PREPARATION OF A 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 (CMRR-NF SEIS)

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(a) ____X____ Offeror and any proposed subcontractor have no financial interest in the outcome of the project.

(b) ____________ Offeror and any proposed subcontractor have the following financial or other interest in the outcome of the project and hereby agree to divest themselves of such interest prior to award of this contract.

Financial or Other Interests:

1.
2.
3.

Certified by: Los Alamos Technical Associates, Inc.

Daniel B. Carlson
Executive Vice President

Signature

____
Name

2/11/11
____
Date