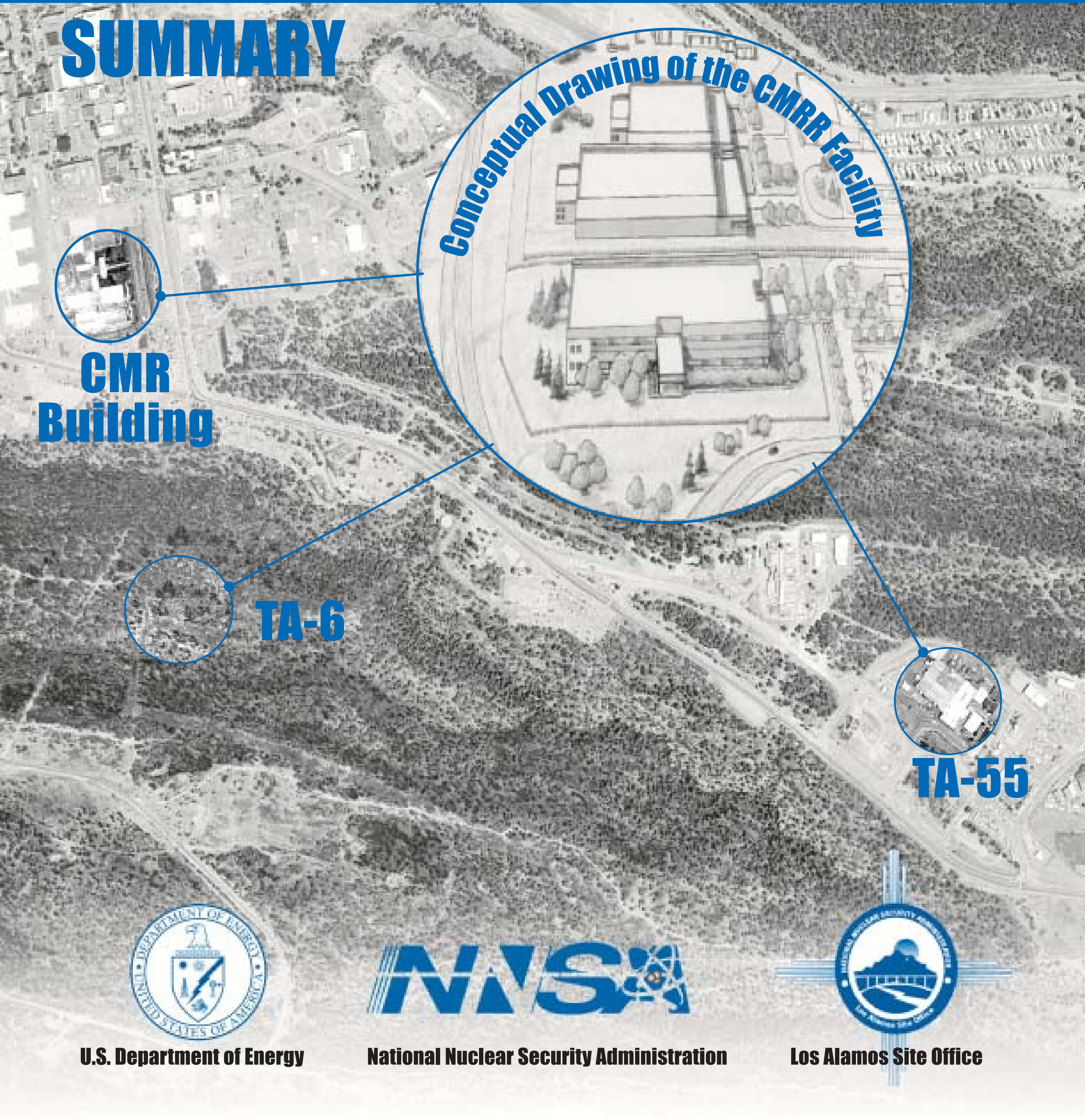
Draft Environmental Impact Statement For the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico

DOE/EIS-0350D
May 2003

SUMMARY



U.S. Department of Energy

National Nuclear Security Administration

Los Alamos Site Office

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COVER SHEET

Responsible Agency: United States Department of Energy (DOE), National Nuclear Security Administration (NNSA)

Title: *Draft Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory (CMRR EIS)*

Location: Los Alamos, New Mexico

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***Abstract*:** NNSA, an agency within DOE, proposes to replace the Chemistry and Metallurgy Research (CMR) Building at Los Alamos National Laboratory (LANL). The *CMRR EIS* will examine the potential environmental impacts associated with the proposed action of consolidating and relocating the mission-critical CMR capabilities from a degraded building to a new modern building(s).

The existing CMR Building, constructed in the early 1950s, houses most of LANL's analytical chemistry and materials characterization capabilities (AC and MC). Other capabilities at the CMR Building include actinide processing, waste characterization, and nondestructive analysis 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 that the extensive upgrades originally planned would be much more expensive and time consuming and of only marginal effectiveness. As a result, DOE decided to perform only the upgrades necessary to ensure the safe and reliable operation of the CMR Building through 2010 and to seek an alternative path for long-term reliability.

The *CMRR EIS* evaluates the potential direct, indirect, and cumulative environmental impacts associated with the proposed action. The Proposed Action is to replace the CMR Building. The Preferred Alternative is to construct a new CMRR Facility at Technical Area (TA) 55, consisting of two or three buildings. One of the new buildings would provide space for administrative offices and support functions. The other building(s) would provide secure laboratory spaces for

research and analytical support activities. The buildings would be expected to operate for a minimum of 50 years. Tunnels may be constructed to connect the buildings. Alternative 2 would be to construct the new CMRR Facility within an undeveloped "greenfield" area near TA-55 at TA-6. Alternatives 3 and 4 would be to continue using the existing CMR Building for administrative offices and support functions with the implementation of minimal necessary structural and system upgrades and repairs, together with the construction of new nuclear laboratory building(s) at either TA-55 or TA-6. The EIS also presents an analysis of impacts associated with the dispositioning of all or portions of the existing CMR Building.

Public Comments: In preparing this draft EIS, NNSA considered comments received from the public during the scoping period (July 23, 2002 to August 31, 2002). Locations and times of public hearings on this document will be announced in the *Federal Register* in May 2003. Comments on this draft EIS will be accepted at the address listed above for a period of 45 days following its issuance and will be considered for the preparation of the final EIS. Any comments received after the 45-day period will be considered to the extent practicable for the preparation of the final EIS.

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ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

AC	analytical chemistry
CMR	Chemistry and Metallurgy Research
CMRR EIS	*Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory*
DOE	U.S. Department of Energy
DSW	Directed Stockpile Work
EIS	environmental impact statement
INP	Integrated Nuclear Planning
LANL	Los Alamos National Laboratory
LANL SWEIS	*Site-Wide Environmental Impact Statement for the Continued Operation of the Los Alamos National Laboratory*
MC	materials characterization
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Administration
RLWTF	Radioactive Liquid Waste Treatment Facility
SNM	special nuclear material
TA	Technical Area
UC at LANL	University of California, current LANL Management and Operating Contractor
WR	War Reserve

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/million	Parts/million	1[a]	Milligrams/liter
Micrograms/liter	1[a]	Parts/billion	Parts/billion	1[a]	Micrograms/liter
Micrograms/cubic meter	1[a]	Parts/trillion	Parts/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 C + 17.78	1.8	Degrees F	Degrees F - 32	0.55556	Degrees C
Relative					
Degrees C	1.8	Degrees F	Degrees F	0.55556	Degrees C
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}

SUMMARY

This summarizes the U.S. Department of Energy (DOE), National Nuclear Security Administration's (NNSA's) *Draft Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory* (*CMRR EIS*). It describes the background, purpose of, and need for the Proposed Action; results of the scoping process; alternatives considered; and results of the analysis of environmental consequences. It also provides a comparison of potential environmental impacts among the alternatives.

S.1 Introduction and Background

NNSA, a separately organized agency within DOE, is responsible for providing the nation with nuclear weapons, ensuring the safety and reliability of those nuclear weapons, and supporting programs that reduce global nuclear proliferation. The NNSA mission is to: "(1) enhance U.S. national security through the military application of nuclear energy; (2) maintain and enhance the safety, reliability, and performance of the U.S. nuclear weapons stockpile, including the ability to design, produce, and test, in order to meet national security requirements; (3) provide the U.S. Navy with safe, militarily effective nuclear propulsion plants and ensure the safe and reliable operation of those plants; (4) promote international nuclear safety and nonproliferation; (5) reduce global danger from weapons of mass destruction; and (6) support U.S. leadership in science and technology" (50 USC Chapter 41, § 2401(b)). NNSA is also responsible for administration of the Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico. The University of California (UC) is the current LANL Management and Operating Contractor and has served in this capacity since the laboratory's inception.

In the mid-1990s, in response to direction from the President and Congress, DOE developed the Stockpile Stewardship and Management Program to provide a single, highly integrated technical program for maintaining the continued safety and reliability of the nuclear weapons stockpile. Stockpile stewardship comprises the activities associated with research, design, development, and testing of nuclear weapons, and the assessment and certification of their safety and reliability. Stockpile management comprises operations associated with production, maintenance, refurbishment, surveillance, and dismantlement of the nuclear weapons stockpile. Work conducted at LANL provides science, research and development, and production support to these NNSA missions.

Under the direction of DOE, UC at LANL has developed facilities, capabilities, and expertise at LANL in the following:

- Theoretical research, including analysis, mathematical modeling, and high-performance computing; experimental science and engineering ranging from bench-scale to multi-site, multi-technology facilities (including accelerators and radiographic facilities); and

CMRR EIS Terminology

Missions: In this EIS, "missions" refers to the major responsibilities assigned to DOE and NNSA. DOE and NNSA accomplish their missions by assigning groups or types of activities to their national laboratories, production facilities, and other sites.

Programs: DOE and NNSA have program offices, each of which has primary responsibilities within the set of Administration and Department missions. Funding and direction for activities at DOE and NNSA facilities are provided through these program offices, and similar or coordinated sets of activities conducted to meet the mission responsibilities are often referred to as "programs." Programs generally are long-term efforts with broad goals or requirements.

Capabilities: "Capabilities" refers to the combination of facilities, equipment, infrastructure, and expertise necessary to undertake types or groups of activities and to implement mission assignments. Capabilities at LANL have been established over time, principally through mission-support work assignments and activities directed by program offices.

Projects: The term "projects" is used to describe activities with a clear beginning and end that are undertaken to meet a specific goal or need. Projects are usually relatively short-term efforts, and they can cross multiple programs and missions. Projects can range from very small efforts to major undertakings.

Campaign: "Campaigns" are composed of activities focused on science and engineering that address critical capabilities, tools, computations, and experiments needed to achieve certification, manufacturing, and refurbishment.

- Advanced nuclear materials research, development, and applications, including weapons components testing, fabrication, stockpile assurance, replacement, surveillance, and maintenance (including theoretical and experimental activities).

These capabilities developed under DOE (or its predecessor agencies) now allow UC at LANL to conduct research and development assignments for the new NNSA that include continued production of War-Reserve (WR) products, assessment and certification of the nuclear weapons stockpile, surveillance of the WR components and weapon systems, safe and secure storage of strategic materials, and management of excess plutonium inventories. These LANL assignments are all conducted in support of the NNSA Stockpile Stewardship Program and funded as either Directed Stockpile Work (DSW), campaigns, or Readiness in Technical Base Facilities work activities. In addition, LANL also supports actinide[1] 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.

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. Additional information regarding DOE and NNSA work assignments at LANL is presented in the 1999 LANL *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory (LANL SWEIS)* (DOE/EIS-0238). This document and other related documents can be found in the DOE Reading Rooms in Albuquerque, New Mexico (at the Government Information Department, Zimmerman Library, University of New Mexico), and in Los Alamos (at the Community Relations Office located at 1619 Central Avenue).

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 Chemistry and Metallurgy Research (CMR) Building and the Plutonium Facility (located at Technical Areas

[1] *Actinides are any of a series of elements with atomic numbers ranging from actinium-89 through lawrencium-103.*

[TAs] 3 and 55, respectively), which are used for processing, characterizing, and storing special nuclear material (SNM).[2] Most of the LANL mission support functions require analytical chemistry, material characterization, and actinide research and development support capabilities and capacities that currently exist at facilities within the CMR Building and are not available elsewhere. Other unique capabilities are located at 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.

CMR Building

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[3] nuclear facility. 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 Record of Decision for the *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.

S.1.1 Purpose of and Need for Agency Action

Analytical chemistry and materials characterization (AC and MC) are fundamental capabilities required for the research and development support of DOE and NNSA mission assignments at LANL. CMR capabilities have been present at LANL for the entire history of the site and are critical for future work conducted there.

[2] *Special nuclear material: plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material that the U.S. Nuclear Regulatory Commission determines to be special nuclear material.*

[3] *A Hazard Category 2 nuclear facility is one in which the hazard analysis identifies the potential for significant onsite consequences. See text box on Nuclear Facilities Hazards Classification for additional information.*

Nuclear Facilities Hazards Classification (DOE Order 411.1)

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.

SNM Safeguards and Security (DOE Order 474.1-1A)

DOE uses a cost-effective, graded approach to provide SNM safeguards and security. Quantities of SNM stored at each DOE site are categorized into Security Categories I, II, III, and 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 alphabetically by their "attractiveness" to saboteurs, with the most attractive materials for conversion into nuclear explosive devices being identified by the letter "A," and lesser attractive materials being designated progressively by the letters "B" through "E."

CMR Building operations and capabilities are currently being restricted in scope due to safety constraints; the building is not being operated to the full extent needed to meet the DOE NNSA operational requirements established in 1999 for the foreseeable future. In addition, continued support of LANL's existing and evolving missions is anticipated to require modification of some capabilities such as the ability to physically handle larger containment vessels (as compared to existing capabilities) in support of dynamic experimentation and subsequent clean out. The facilitation and consolidation of like activities at LANL would enhance operational efficiency in terms of security, support, and risk reduction in handling and transportation of nuclear materials.

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. At the same time, NNSA should also take advantage of the opportunity to consolidate like activities for the purpose of operational efficiency, and it may be prudent to provide extra space for future modifications or additions to existing capabilities.

S.1.2 Proposed Action and Scope of the *CMRR EIS*

NNSA proposes to relocate LANL AC and MC, and associated research and development capabilities that currently exist primarily at the CMR Building, to a newly constructed facility, and to continue to perform those operations and activities at the new facility for the reasonably foreseeable future (for the purposes of this environmental impact statement [EIS], the operations are assessed for a 50-year operating period). The *CMRR EIS* evaluates construction of a new CMRR Facility at TA-55, a "Greenfield" Site Alternative at TA-6, two "Hybrid" Alternatives, and the No Action Alternative.

Alternative 1 is to construct two to three new buildings within TA-55 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 area(s); tunnels, vault area(s), and other infrastructure support needs. AC and MC activities would be conducted in either two separate laboratories (either both above ground or one above and one below ground) or in one new laboratory (either above or below ground). The configuration of the laboratories has not been determined at this stage of the project but will be driven by safety, security, cost, and operational efficiency parameters to be evaluated during the conceptual design.

An alternative site for the new CMRR Facility will also be analyzed in the *CMRR EIS* – namely, constructing the new CMRR Facility (as described in Alternative 1) within TA-6; this alternative is referred to as the "Greenfield" Site Alternative (Alternative 2). The TA-6 site is a relatively undeveloped, forested area with some prior disturbance in limited areas. The above ground or below ground construction options are the same as those described for Alternative 1.

Two "Hybrid" Alternatives are analyzed in the *CMRR EIS*, 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 decommissioned, decontaminated, or demolished. New laboratory facilities (as described for Alternative 1) would be constructed in either TA-55 (Hybrid Alternative 3) or TA-6 (Hybrid Alternative 4) with the same above ground and below ground construction options.

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.

The *CMRR EIS* provides an evaluation of potential direct, indirect, and cumulative environmental impacts that could result from relocating existing AC and MC capabilities currently residing in the CMR Building to TA-55 (the Proposed Action). The *CMRR EIS* also analyzes potential direct and indirect impacts that could result from implementing the various other action alternatives and the No Action Alternative. In addition, the *CMRR EIS* addresses monitoring and mitigation, unavoidable impacts and irreversible and irretrievable commitment of resources, and impacts of long-term productivity.

The alternatives analyzed in the *CMRR EIS* were developed by a team of NNSA and LANL staff who evaluated various criteria and site locations at LANL. The selection criteria for siting considered security issues, infrastructure availability, environmental issues, safety and health infrastructure, and compatibility between sites and CMR capabilities. The alternatives analyzed in this *CMRR EIS* are described in greater detail in Section S.2.1.

S.1.3 Decisions to be Supported by the *CMRR EIS*

The analyses of environmental impacts that could occur if NNSA implemented the Proposed Action described in this *CMRR EIS* will provide NNSA's decision maker (in this case the Administrator of NNSA) with important environmental information for use in the overall decision-making process. The decisions to be made by the NNSA decision maker regarding the CMRR project are:

- Whether to construct a new CMRR Facility to house AC and MC capabilities at LANL

- Whether to construct a new building to house administrative offices and support functions in conjunction with the new laboratory facilities

- Whether to locate the new CMRR Facility building(s) at TA-55 next to the existing structures that house LANL plutonium capabilities, or to locate the CMRR Facility building(s) within TA-6 at LANL, which is a "greenfield" site

- Whether to construct the new CMRR Facility with one large laboratory that would serve to house both the Hazard Category 2 and 3 capabilities, or with two separate laboratory buildings, one to house Hazard Category 2 capabilities and one to house Hazard Category 3 capabilities

- Whether to construct the new Hazard Category 2 laboratory as an above ground structure or a below ground structure

- What to do with the existing CMR Building if new CMRR Facility laboratories are constructed

Other considerations, in addition to the environmental impact information provided by this *CMRR EIS*, that are not evaluated in this EIS, will also influence NNSA's final CMRR project decisions. These considerations include cost estimate information, schedule considerations, safeguards and security concerns, and programmatic considerations. In accordance with the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA) (40 CFR 1500 through 1508): "1500.1 Purpose. …(c) Ultimately, of course, it is not better documents but better decisions that count. NEPA's purpose is not to generate paperwork – even excellent paperwork – but to foster excellent action. The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment. These regulations provide the direction to achieve this purpose."

There are decisions related to the CMR capabilities and activities at LANL that the NNSA Administrator will not make based on the Final *CMRR EIS* analysis. These include the following:

NNSA will not make a decision to remove mission support assignments of CMR capabilities from LANL or to alter the operational level of these capabilities. CMR capabilities were a fundamental component of Project Y during the Manhattan Project era, and the decision to facilitate 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 supporting and to expand CMR capabilities at LANL after World War II and 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 and Management Program and made programmatic decisions at that time that required the retention of CMR capabilities at LANL. In

1999, DOE, through its *LANL SWEIS* analyses, concluded that specific decisions regarding the replacement of the CMR Building for its continued operations and capabilities support were not then ready to be made because of lack of information regarding the proposal(s). With the support of the *LANL SWEIS* impact analyses, however, DOE made a decision on the level of operations at LANL that included the level of operational capabilities housed by the CMR Building. Having made these critical decisions within the past 7 years, NNSA will not revisit decisions at this time related to the maintenance of CMR capabilities at LANL to support critical NNSA missions.

NNSA will not make a decision on other elements or activities that have been recently undertaken associated with the LANL "Integrated Nuclear Planning" initiative. During 2000 to 2001, NNSA initiated planning activities associated with the CMRR project to address long-term AC and MC mission support beyond the year 2010, consistent with the strategy for managing the operation of the CMR Building. During this same time frame, UC at LANL was implementing or initiating other activities, including identification of potential upgrades to the existing Plutonium Facility, campaigns for pit[4] manufacturing and certification, planned safeguards and security system upgrades, and the proposed relocation of TA-18 capabilities. Such actions were undertaken to address safeguards and security upgrades, operational inefficiencies, and long-term facilities infrastructure requirements related to or affecting LANL nuclear facilities. Recognizing the need for CMRR to be integrated with other contemplated actions, near and long term, affecting the nuclear mission capabilities at LANL, NNSA and UC at LANL developed the Integrated Nuclear Planning (INP) process. INP is intended to provide an integrated, coordinated plan for the consolidation of LANL nuclear facility construction, refurbishment and upgrade, and retirement activities. As such, INP is a planning process, not an overarching construction project, and is a tool used by NNSA and UC at LANL to ensure effective, efficient integration of multiple, distinct stand-alone projects and activities related to or affecting LANL nuclear facilities capabilities. As individual elements or activities associated with INP become mature for decision and implementation, each element and activity moves ahead in the planning, budgeting, and NEPA compliance process on its own merits.

NNSA's overall concept for TA-55 would have it contain all or at least most of the Security Category I nuclear operations needed for LANL operations. To that end, however, are the following considerations: the various potential LANL Security Category I nuclear facilities are independent of one another in terms of their programmatic utility to DOE and NNSA; these Security Category I nuclear facilities are also independent of one another in terms of their individual operations and the capabilities they house; the existing structures are of differing ages and therefore replacement of the aging structures would become necessary at different times; the construction of major facilities within a relatively tight area would require they be staggered so that the area can physically accommodate the necessary construction laydown sites and needed storage areas; the additional security elements required for the construction and startup of operations in Hazard Category 2 nuclear facilities predicates the need for their separate construction in terms of scheduling.

NNSA recently completed an EIS for relocating LANL's TA-18 capabilities and materials and made a decision to move Security Category I and II capabilities and materials to another DOE

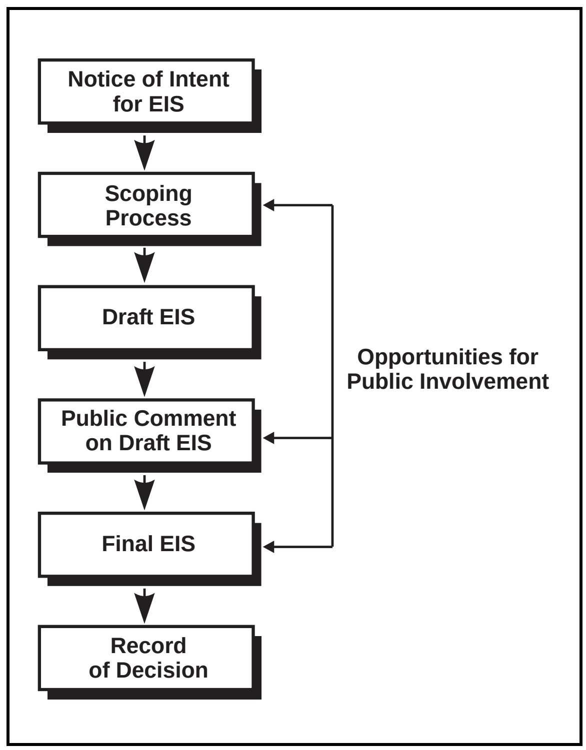
[4] *The central core of a primary assembly in a nuclear weapon typically composed of plutonium-239 and/or highly enriched uranium and other materials.*

site away from LANL (the *Final Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory*). The Record of Decision was published in the *Federal Register* on December 31, 2002 (67 FR 251). NNSA is separately considering the construction and operation of a pit manufacturing facility on a scale greater than can currently be accommodated by LANL's existing facilities and is considering LANL's TA-55 as a possible site (though it is not currently identified as the preferred site location).

S.1.4 The Scoping Process and Issues of Public Concern

On July 23, 2002, NNSA published a Notice of Intent to prepare the *CMRR EIS* (67 FR 48160). In this Notice of Intent, NNSA invited public comment on the *CMRR EIS* proposal. The Notice of Intent informed the public that comments on the proposed action could be communicated via the U.S. Postal Service, a special DOE website on the Internet, a toll-free phone line, a toll-free fax line, or in person at public meetings to be held in the vicinity of LANL.

Public scoping meetings were held on August 13, 2002 in Pojoaque, New Mexico and on August 15, 2002 in Los Alamos, New Mexico. As a result of previous experience and positive responses from attendees of other DOE NEPA public meetings and hearings, NNSA chose an interactive format for the scoping meetings. Each meeting began with a presentation by NNSA representatives who explained the proposed CMRR Facility project. Afterwards, the floor was opened to questions, comments, and concerns from the audience. NNSA representatives were available to respond to questions and comments. The proceedings and formal comments presented at each meeting were recorded verbatim, and a transcript for each meeting was produced. The public was also encouraged to submit written or verbal comments during the meetings, or to submit comments via letters, the DOE Internet website, toll-free phone line, or toll-free fax line, until the end of the scoping period. All comments received during the scoping period were reviewed for consideration by NNSA in preparing the *CMRR EIS*.



NEPA Process

Summary of Scoping Comments

Approximately 75 comments were received during the public scoping period from citizens, interested groups, and local officials. Many of the verbal and written comments received addressed the need to identify decontamination and decommissioning of the existing CMR Building, including expected waste streams and volumes, its impact upon the Low-Level

Radioactive Solid Waste Disposal Facility (TA-54), and the transportation and security risks that would be associated with transferring any existing inventories of SNM. Additional waste management concerns expressed by commentors included the need to identify the types and volumes of waste generated by the proposed action; the facilities available at each site to treat, store, or dispose of the waste; and compatibility of the proposed action with state and Federal regulations.

Many of the comments also addressed the need for NNSA to describe in detail the existing CMR Building capabilities and processes versus those of the proposed replacement building, as well as the specific NNSA mission requirements supporting the purpose and need for the proposed action. Several comments addressed the need for NNSA to describe the relationship of the proposed action to the Stockpile Stewardship Program, other existing DOE NEPA documentation, and proposed new plutonium pit production facilities.

Major issues identified by NNSA during the scoping process were addressed in the *CMRR EIS* in the following areas:

- Land use and visual resources
- Site infrastructure
- Air quality and noise
- Water resources
- Geology and soils
- Ecological resources
- Cultural and paleontological resources
- Socioeconomics
- Environmental justice
- Radiological and hazardous chemical impacts
- Waste management and pollution prevention
- Emergency preparedness and security

Commentors also expressed concern about environmental, health, and safety risks associated with the new CMRR Facility operations, and requested that NNSA evaluate the potential consequences of the proposed action on the health and safety of area residents and address environmental justice issues, including the potential impacts to environmental, aesthetic, and cultural resources of adjacent Pueblo lands. Other comments suggested that the *CMRR EIS* quantify all radionuclides and chemicals used and emitted from the proposed replacement building. Concerns were also raised about safety and security at the facilities.

S.1.5 Relationships to Other Actions and Programs

There are a number of NEPA and other DOE program planning documents that are related to the *CMRR EIS*. These documents were important in developing the *CMRR EIS* proposed action and alternatives and the assumptions for analyses, as well as providing input into the descriptions of affected environments. These documents are listed in the text box below in two categories: completed NEPA compliance analyses and ongoing NEPA compliance analyses. A detailed description of these documents and their relationship to the *CMRR EIS* can be found in Section 1.6 of the *CMRR EIS*. Two NEPA actions closely related to the CMRR EIS are the *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory (LANL SWEIS)* and the *Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility (Modern Pit EIS)*. They are summarized below.

Completed NEPA Compliance Analyses

- *Environmental Assessment for the Proposed CMR Building Upgrades at the Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EA-1101)
- *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement* (DOE/EIS-0240)
- *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (DOE/EIS-0236)
- *Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE/EIS-0200-F)
- *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory* (DOE/EIS-0238)
- *Surplus Plutonium Disposition Final Environmental Impact Statement* (DOE/EIS-0283)
- *Special Environmental Analysis for the Department of Energy, National Nuclear Security Administration: Actions Taken in Response to the Cerro Grande Fire at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/SEA-03)
- *Environmental Assessment for the Proposed Construction and Operation of a New Interagency Emergency Operations Center at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EA-1376)
- *Environmental Assessment of the Proposed Disposition of the Omega West Facility at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EA-1410)
- *Environmental Assessment for the Proposed Future Disposition of Certain Cerro Grande Fire Flood and Sediment Retention Structures at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EA-1408)
- *Environmental Assessment for Proposed Access Control and Traffic Improvements at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EA-1429)
- *Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory* (DOE/EIS-319)
- *Environmental Assessment for the Installation and Operation of Combustion Turbine Generators at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EA-1430)

Ongoing NEPA Compliance Actions

- *Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility* (DOE/EIS-0236-S2)
- *Environmental Assessment for the Proposed Issuance of a Special Use Permit to the Incorporated County of Los Alamos for the Development and Operation of a New Solid Waste Landfill at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EA-1460)
- *Environmental Assessment for Conversion of an Existing Building into a Proposed Radiography Facility at TA-55 at Los Alamos National Laboratory, Los Alamos, New Mexico*

Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory (DOE/EIS-0238)

In January 1999, DOE issued the *LANL SWEIS* (DOE 1999b). This document assessed four alternatives for the operation of LANL: (1) No Action, (2) Expanded Operations, (3) Reduced Operations, and (4) Greener Alternative. The Record of Decision for the *LANL SWEIS* was published in the *Federal Register* on September 20, 1999 (64 FR 50797). In the Record of Decision, DOE selected the Expanded Operations Alternative with reductions to certain weapons-related work. The Expanded Operations Alternative described in the *LANL SWEIS* analyzed the impacts from the continuation of all activities presently undertaken at LANL, at the highest level of activity. In the Record of Decision, operations at the CMR Building would continue, and activities would increase by approximately 25 percent over past No Action operational levels. The effects from the Expanded Operations Alternative level of activity at LANL are discussed in Chapter 4, Environmental Consequences of the *LANL SWEIS*, and have been included in the assessment of baseline conditions at LANL for the proposed action alternatives presented in this EIS.

The No Action Alternative assessed in this EIS is consistent with the Preferred Alternative identified through the *LANL SWEIS* and its associated Record of Decision. However, as a result of continued reductions in the CMR Building's operational capacity due to the structural deterioration as a result of aging and the need to ensure compliance with safety requirements for that building, the No Action Alternative no longer allows UC at LANL to fully meet NNSA's CMR mission requirements at LANL. The No Action Alternative analyzed in the *CMRR EIS* reflects the current reduced level of operations at the CMR Building.

***Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility* (DOE/EIS-0236-S2)**

In September 2002, NNSA issued a Notice of Intent on September 23, 2002 in the *Federal Register* (67 FR 59577) to prepare a *Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility* (MPF) in order to decide: (1) whether to proceed with the MPF; and (2) if so, where to locate the MPF.

Consistent with the 1996 *SSM PEIS* Record of Decision (61 FR 68014) and the 1999 *LANL SWEIS* Record of Decision (64 FR 50797), NNSA has been reestablishing a small pit manufacturing capability at LANL. The establishment of the interim pit production capacity is expected to be completed in 2007. However, classified analyses indicate that the capability being established at LANL will not support either the projected capacity requirements (number of pits to be produced over a period of time), or the agility (ability to rapidly change from production of one pit type to another, ability to simultaneously produce multiple pit types, or the flexibility to produce pits of a new design in a timely manner) necessary for long-term support of the stockpile. In particular, any systemic problems that might be identified in an existing pit type or class of pits (particularly any aging phenomenon) could not be adequately addressed today, nor could it be with the capability being established at LANL. Although no such problems have been identified, the potential for such problems increases as pits age.

The CMRR Facility would provide AC and MC capabilities for existing mission support assignments at LANL that are expected to continue for the long-term. Such AC and MC capabilities are needed independent of the proposed action that will be analyzed in the Modern Pit Facility (MPF) EIS for constructing and operating a new MPF at one of five DOE and NNSA sites across the county. The CMRR Facility could provide AC and MC support capabilities for pit manufacturing at LANL if a decision were made to not construct a new MPF and, instead, to continue to use LANL's existing capabilities and facilities for pit manufacturing (this possibility for pit manufacturing was explicitly analyzed in the *LANL SWEIS* Expanded Operations Alternative and is implicitly analyzed in this *CMRR EIS*). However, should a decision be made to construct a new MPF at LANL, the level of AC and MC support capabilities required for pit production capacities associated with the new MPF would be beyond LANL's pit production level capacity as described in the LANL SWEIS Expanded Operations Alternative and would also be beyond the level of pit manufacturing AC and MC support that would be provided by the new CMRR Facility. The conceptual design for a new MPF includes locating necessary support capabilities for AC and MC work within the MPF itself – the MPF would be a self-contained facility in that respect. The MPF EIS will, accordingly, analyze the direct environmental impacts of AC and MC capabilities for pit manufacturing associated with a new MPF for the various operational level options under consideration for that facility. The cumulative impact section (Section 4.8 of the *CMRR EIS*) provides an assessment of the environmental impacts of constructing and operating both the CMRR Facility and a new MPF at LANL to the extent those impacts are known or can be currently estimated.

S.2 DESCRIPTION OF THE ALTERNATIVES

S.2.1 Alternatives Evaluated

The *CMRR EIS* analyzes five main alternatives for the CMRR project, as shown in **Figure S–1**. While the No Action Alternative does not meet the NNSA's purpose and need for actions, the other four action alternatives analyzed were identified as reasonable alternatives for NNSA's proposed action.

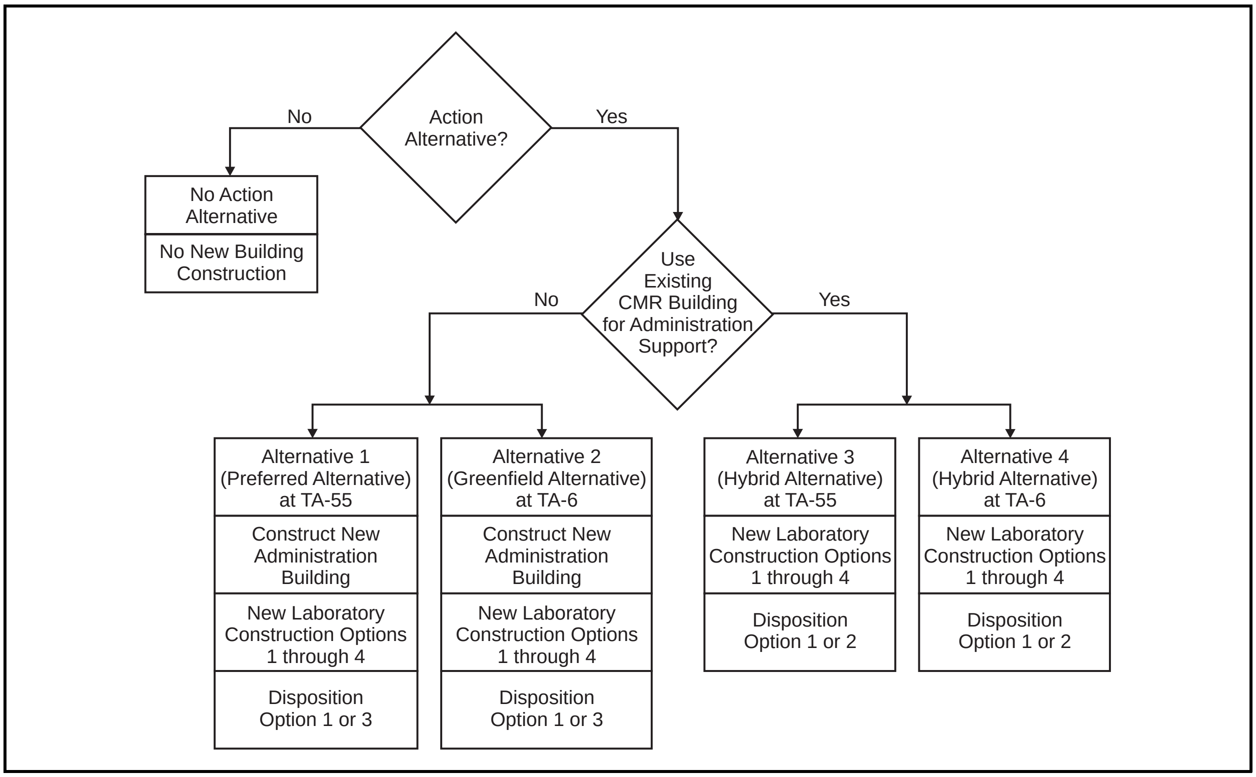
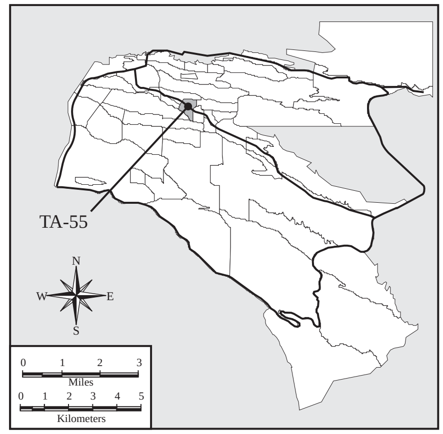


Figure S–1 Alternatives and Options Evaluated in Detail in the *CMRR EIS*

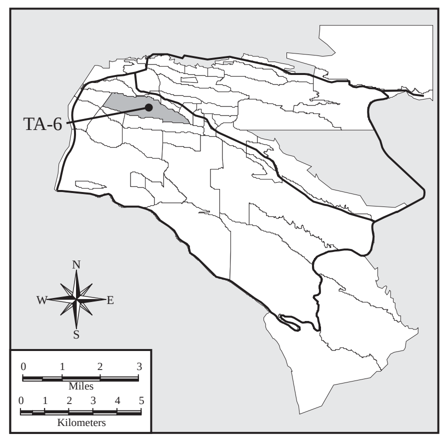
No Action Alternative: Continue use of the existing CMR Building at TA-3 with minimal routine maintenance and component replacements and repairs to allow continued operations, although CMR operations would be restricted. No new buildings to support LANL AC and MC capabilities would be constructed.

Alternative 1 (NNSA's Preferred Alternative): Construct two or three buildings at the LANL TA-55 site for the new CMRR Facility. AC and MC capabilities would be moved from the existing CMR Building into the new building(s) using a phased approach and operations would resume there in a staged manner (there would be a period of operational overlap between the old CMR Building and the new CMRR Facility), and the existing CMR Building would be dispositioned. One of the new buildings in TA-55 would provide administrative offices and support activities and would include cafeteria space and lite[5] laboratory space used for such activities as glovebox mockup, process testing, chemical experimentation, training, and general research and development. The lite laboratory area(s) would contain only small quantities of nuclear materials.



TA-55 Site

Alternative 2: Construct two or three buildings for the new CMRR Facility (as described for Alternative 1) within a "greenfield" site at LANL TA-6. While laboratory space requirements would be the same as in Alternative 1, under this alternative, facility support space requirements such as shipping and receiving capabilities would be larger by about one percent of the total square footage due to the physical separation between the Plutonium Facility at TA-55 and the TA-6 proposed CMRR Facility site location. The transfer of CMR operations to the new CMRR Facility would be the same as for Alternative 1, as would the disposition of the existing CMR Building.



TA-6 Site

Alternative 3: Hybrid Alternative involving construction of a new CMRR Facility for SNM Laboratory(s) at LANL TA-55 with continued use of the existing CMR Building at TA-3 for administrative offices and support functions (including lite laboratories and other general activities). Repairs and upgrades to the existing CMR Building would be required to meet minimal structural and life safety code requirements.

Alternative 4: Hybrid Alternative involving construction of a new CMRR Facility for SNM Laboratory(s) at LANL TA-6 with continued use of existing CMR Building at TA-3 for

[5]The term "lite" is an informal, simplified spelling of the word "light." In this context the term "light" refers to occurring in small amounts, force, or intensity; specifically, the CMRR Facility lite laboratories would contain very small amounts of radioactive materials and nonradioactive materials and chemicals.

administrative offices and support functions (including lite laboratories and other general activities). Repairs and upgrades to the existing CMR Building would be required to meet minimal structural and life safety code requirements.

For each of the alternatives involving new construction, there are four different construction options considered with respect to the CMRR Facility. These construction options are driven by the Security and Hazard Categorization for the portion of CMRR facilities that would house operations involving SNM.

Operations that use relatively large amounts (several grams per sample) of SNM, such as sample management and plutonium assay, require a designated Hazard Category 2 facility(ies), which has structures, systems, and components appropriate for such operations. Operations that use smaller amounts of SNM (gram to microgram per sample) require designated Hazard Category 3 facility(ies), which use structures, systems and components appropriate for this kind of facility. Safeguards and security issues may require that any building designated as a Hazard Category 2 facility be located below ground (specifically, below the elevation level of the surrounding land). These facility hazard categorization and safeguards and security requirements drivers have resulted in the identification of the following construction options for the four action alternatives listed above:

Construction Option 1: Construct a separate nuclear SNM-capable Hazard Category 2 laboratory building and a separate Hazard Category 3 laboratory building above ground with a separate building to house administrative offices and support functions (total of three buildings).

Disposition Analyses for the existing CMR Building under each of the action alternatives would include:

Disposition Option 1: reuse of the Building for administrative and other activities appropriate to the physical conditions of the structure with the performance of necessary structural and systems upgrades and repairs.

Disposition Option 2: decontamination, decommissioning, and demolition of selected parts of the existing CMR Building with some portions of the Building being reused.

Disposition Option 3: decontamination, decommissioning, and demolition of the entire existing CMR Building.

Construction Option 2: Construct a separate nuclear SNM-capable Hazard Category 2 laboratory building below ground, construct a Hazard Category 3 laboratory building above ground with a separate building to house administrative offices and support functions (total of three buildings).

Construction Option 3: Construct a consolidated nuclear SNM-capable Hazard Category 2 laboratory above ground with a separate building to house administrative offices and support functions (total of two buildings).

Construction Option 4: Construct a consolidated nuclear SNM-capable Hazard Category 2 laboratory below ground with a separate building to house administrative offices and support functions (total of two buildings).

S.2.2 Alternatives Considered but Not Analyzed in Detail

A number of alternatives were considered but were not analyzed in detail in the *CMRR EIS*. As required in the Council on Environmental Quality's NEPA regulations (40 CFR 1502.14[a]), the reasons for elimination from detailed study are discussed in this section. Alternatives may have been eliminated from further consideration because of technical immaturity, prohibitive cost, regulatory unacceptability, failure to meet siting criteria, or because they do not support the purpose and need of the EIS.

Removing CMR Capabilities from LANL or Altering the Operational Level of Capabilities: The alternative of removing CMR capabilities from LANL or altering the operational level of these capabilities was considered and dismissed. DOE considered maintaining CMR capabilities (along with other capabilities at LANL) in 1996 as part of the review of the Stockpile Stewardship and Management Program and made programmatic decisions at that time that required the retention of CMR capabilities at LANL. In 1999, DOE, through its *LANL SWEIS* analyses, concluded that specific decisions regarding the replacement of the CMR Building for its continued operations and capabilities support were not then mature because of lack of information regarding the proposal(s). With the support of the *LANL SWEIS* impact analysis, however, DOE made a decision on the level of operations at LANL that included the level of operational capabilities housed by the CMR Building. Having made these critical decisions related to the maintenance of CMR capabilities at LANL to support critical NNSA missions within the past 7 years, NNSA will not revisit them.

Considering the CMRR Project as Part of the "Integrated Nuclear Planning" Initiative at TA-55: The option of including the CMRR project environmental review as part of the INP initiative for TA-55 was considered and dismissed. The various potential LANL Security Category I nuclear facilities are independent of one another in terms of their individual operations and the capabilities they house; the existing structures are of differing ages and therefore replacement of the aging structures would become necessary at different times; the construction of major facilities within a relatively tight geographic area would require that they be staggered so that the area can physically accommodate the necessary construction laydown sites and storage areas needed; and the additional security elements required for the construction and startup of operations in Hazard Category 2 nuclear facilities also predicates the need for their separate construction in terms of schedule. Based on the recent TA-18 EIS, NNSA has made a decision to move the TA-18 capabilities and materials to another DOE site away from LANL and TA-55. NNSA is separately considering the construction and operation of a pit manufacturing facility on a scale greater than can currently be accommodated at LANL in its existing facilities and is considering TA-55 as a possible site. In the future, NNSA will eventually need to consider decisions on relocating or upgrading the aging TA-55 LANL Plutonium Facility, which is about 30 years old; however, any proposal for such a project is very speculative and not ready for decision at this time.

Alternative LANL Sites: The sites at TA-55 reflect NNSA's goal to bring all nuclear facilities within a nuclear core area. Siting of the CMRR Facility at TA-55 would co-locate the AC and MC capabilities near the existing Plutonium Facility where the programs operations that require these capabilities are located.

The greenfield site at TA-6 was chosen using data and maps from the *2000 Comprehensive Site Plan*, the *Core Area Development Plan* and the *Anchor Ranch Area Development Plan*. These documents contain detailed development opportunity maps, which were developed using a set of siting criteria, or constraints. Using geographical information system (GIS) processing software, a set of physical constraints and operational constraints were scored, combined, and used to identify sitewide development opportunities. The physical constraints contained information regarding various topographic features, seismic fault lines, Federally-protected threatened and endangered species habitat information, floodplains, and wetlands locations. Also considered were surface hydrology, cultural resources, climate, vegetation, soils, and geology of LANL. The operational constraints considered locations of radiological sources, the White Rock Canyon Reserve, solid waste landfill, hazardous waste sites, range of radio frequencies, and airspace and blast buffer zones. The screening results are documented on a set of sitewide development opportunities maps found within these three documents. These documents also contain summary planning maps that reflect existing land uses as well as undeveloped (so called “greenfield”) lands. Combining the development opportunities maps and summary maps allows identification of potential greenfield sites that would be suitable for siting CMRR Facility building(s). The final siting step for locating the CMRR Facility outside of TA-55 was to consider NNSA’s desire to bring all nuclear facilities within a nuclear core area; TA-6 is the only greenfield site available for consideration in the general area of TA-55.

Extensive Major Upgrade to the Existing CMR Building for Use Beyond 2010: The proposal to complete upgrades to the existing CMR Building’s structural and safety systems necessary to meet current mission support requirements for the suite of capabilities that exist in the building today for another 20 to 30 years of operations was considered and evaluated by DOE and UC at LANL in the 1998 to 1999 timeframe. This approach to maintaining these mission-critical nuclear support capabilities would require a capital investment in excess of several hundred million dollars for just two of the eight CMR Building’s wings. The costs of upgrading the entire structure would be the same or more for constructing the proposed CMRR Facility. Implementing this alternative would not reduce the overall footprint of the CMR Building, which is costly to maintain and operate in part due to the amount of wasted space incorporated into its design, nor would it change the underpinning seismic condition of the CMR Building. Additionally, implementing this alternative would not allow for the consolidation of like activities presently located within the Plutonium Facility into one facility. This alternative was not considered to be reasonable to meet the NNSA’s purpose and need for action.

S.3 THE PREFERRED ALTERNATIVE

The Council on Environmental Quality NEPA regulations require an agency to identify its preferred alternative, if one or more exists, in the draft EIS (40 CFR 1502.14(e)). The preferred alternative is the alternative that the agency believes would fulfill its statutory mission, giving consideration to environmental, economic, technical, and other factors. In the draft stage of this *CMRR EIS*, Alternative 1, as described in Section S.2.1, is NNSA’s preferred alternative for the replacement of the CMR capabilities. At the draft stage, NNSA has not identified a preferred construction option or a preferred option for the disposition of the CMR Building.

S.4 AFFECTED ENVIRONMENT

LANL is located on approximately 25,600 acres (10,360 hectares) of land in north central New Mexico (see **Figure S–2**). 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. Portions of LANL are located in Los Alamos and Santa Fe Counties. LANL is owned by the Federal Government and administered by NNSA. It is operated by UC under contract to DOE.

LANL is divided into 49 separate TA's (with locations and spacing that reflect the site's historical development patterns, regional topography, and functional relationships (see **Figure S–3**). While the exact number of structures changes somewhat with time (for example, as a result of large fires such as the Cerro Grande Fire), in 1999 there were 944 permanent structures, 512 temporary structures, and 806 miscellaneous buildings with approximately 5 million square feet (465,000 square meters) that could be occupied. In addition to onsite office space, 213,262 square feet (19,833 square meters) of space was leased within the Los Alamos town site and White Rock community.

TA-3 is situated in the west-central portion of LANL. It is separated from the Los Alamos townsite by Los Alamos Canyon. TA-3 is LANL's main technical area that houses approximately one-half of LANL's employees and total floor space. It covers 357 acres (144 hectares) of which 69 percent has been developed. Site facilities are located on the top of a mesa between the upper reaches of Sandia and Mortandad Canyons. It is the administration complex within LANL and contains the Director's office, administrative offices, and support facilities. Major facilities within the area include the existing CMR Building, the Sigma Complex, the Main Shops, and the Materials Science Laboratory. Other buildings house central computing facilities, chemistry and materials science laboratories, earth and space science laboratories, physics laboratories, technical shops, cryogenics laboratories, the main cafeteria, badge office, and the study center.

TA-6 is a candidate site for the CMRR Facility. It is adjacent to and south of TA-3 and is located on a mesa between Two Mile and Pajarito Canyons. TA-6 is situated about 0.6 miles (1 kilometer) south of the Los Alamos townsite. It covers 500 acres (202 hectares), of which 1 percent has been developed. It contains gas-cylinder-staging and vacant buildings pending authorization for disposal. A meteorological tower was recently erected in TA-6. None of the buildings currently located in TA-6 are categorized as nuclear hazard facilities.

TA-55 is also a candidate location for the CMRR Facility. It is situated in the west-central portion of LANL approximately 1.1 miles (1.8 kilometers) south of the Los Alamos townsite. TA-55 encompasses 40 acres (16 hectares) of which 43 percent is developed. The main complex has five connected buildings including the Administration Building, Support Office Building, Support Building, Plutonium Facility, and Warehouse. The Nuclear Materials Storage Facility is separate from the main complex. TA-55 facilities provide research and applications in 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

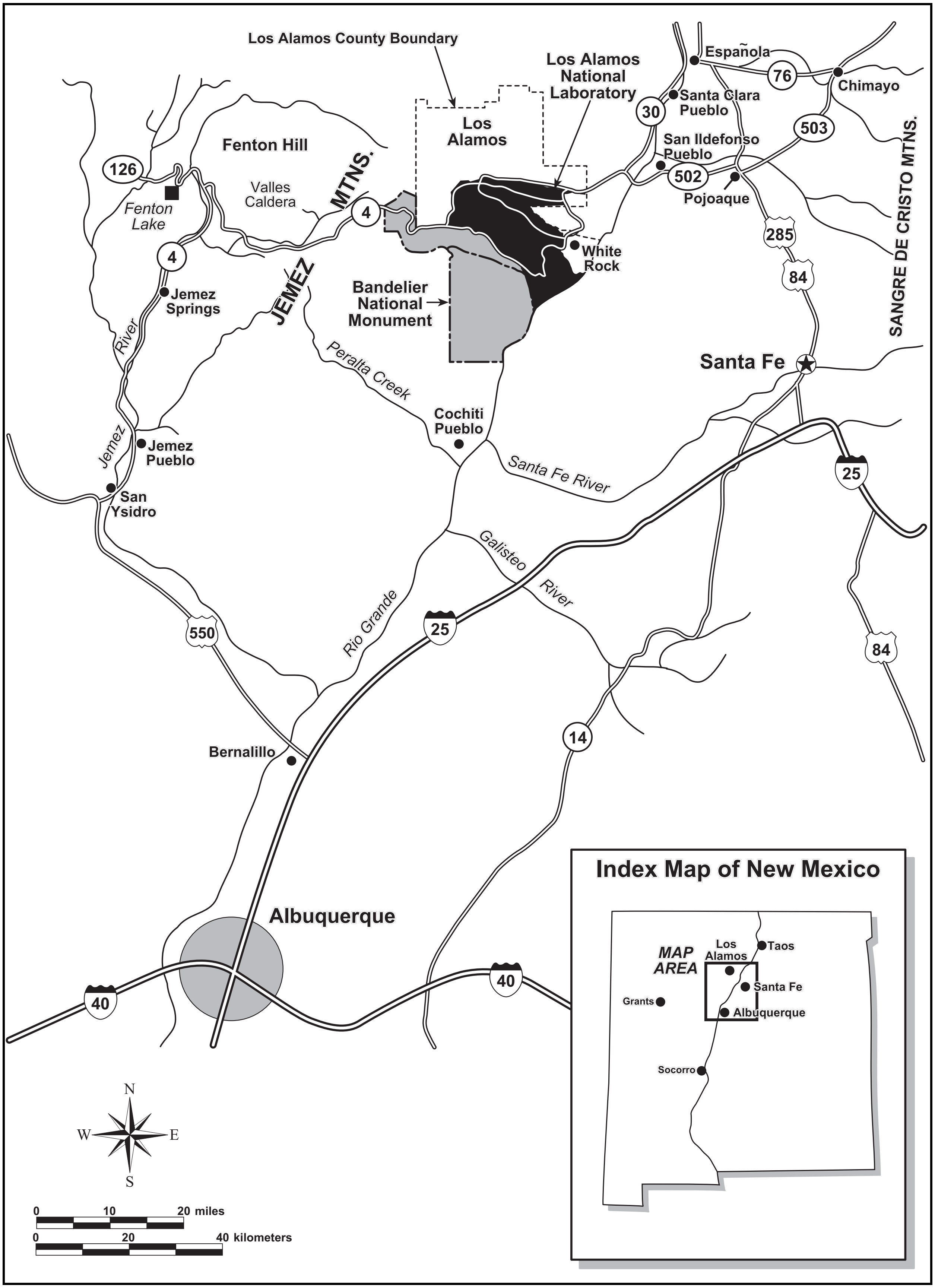


Figure S–2 Location of LANL

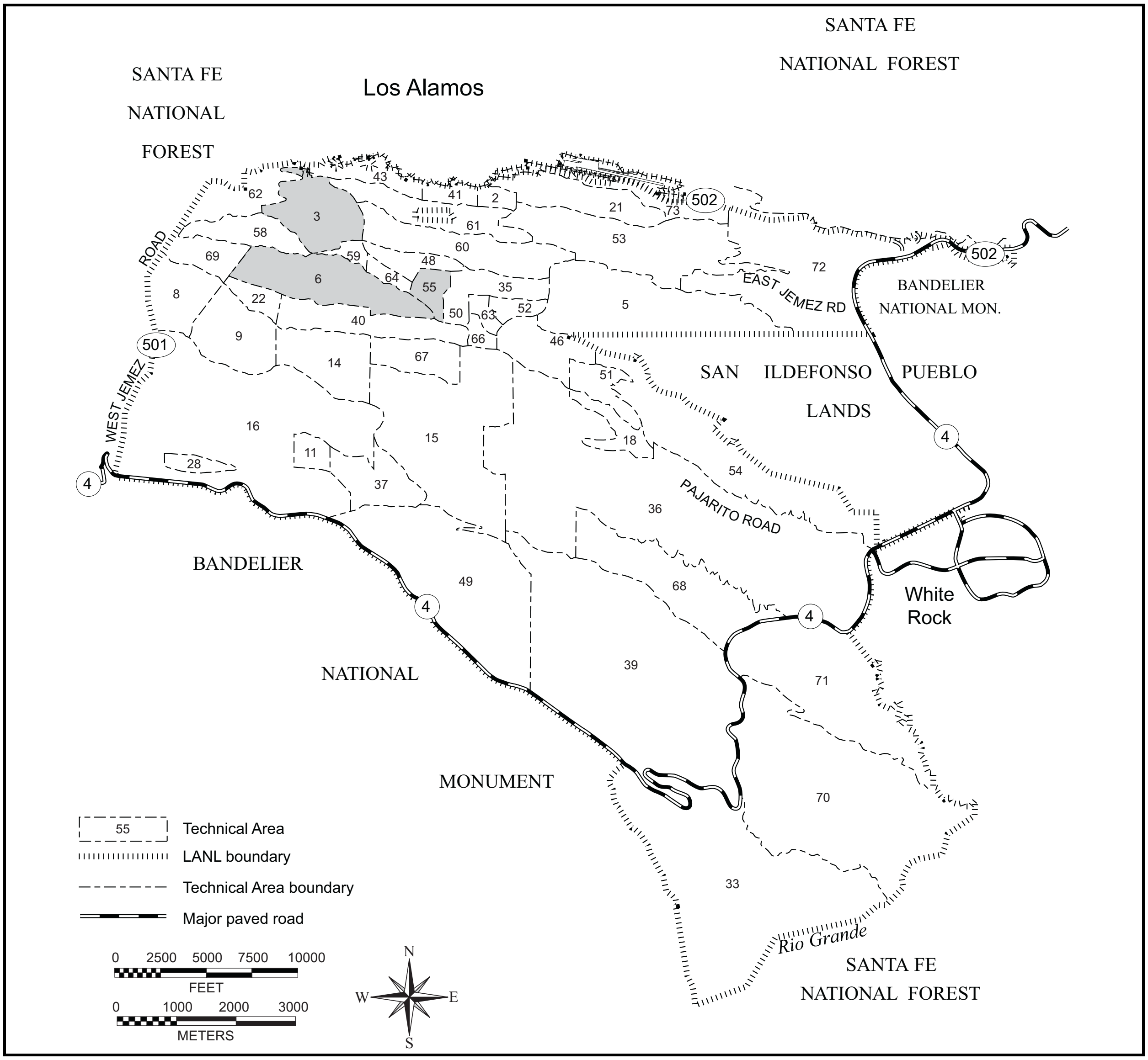


Figure S–3 Technical Areas of LANL

fabrication of parts for research and stockpile applications. A security fence bounds all nuclear hazard facilities in TA-55.

S.5 PROJECT FACILITIES AND CAPABILITIES

S.5.1 The Existing CMR Building and Capabilities

Description of the Existing CMR Building

The CMR Building (Building 3-29) was designed and built within TA-3 as an actinide chemistry and metallurgy research facility (see **Figure S–4**). The main corridor with seven wings was constructed between 1949 and 1952. In 1960, a new wing (Wing 9) was added for activities that

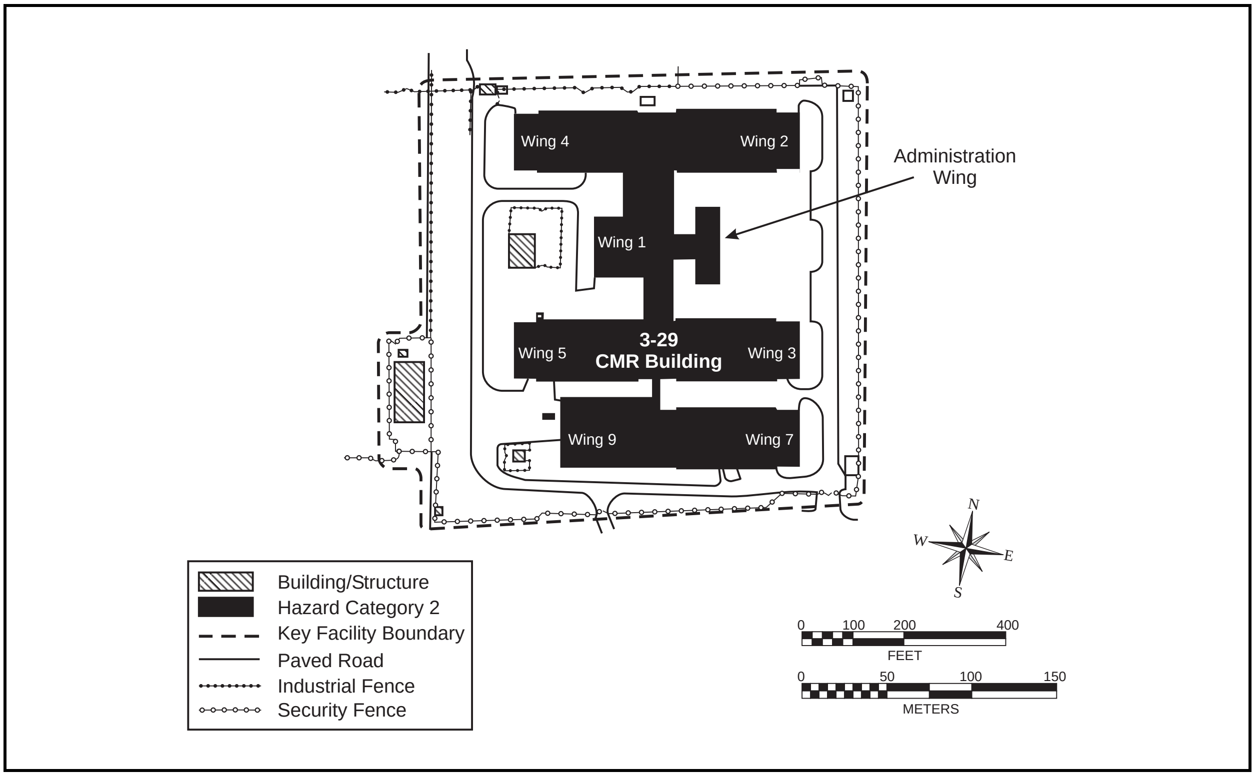


Figure S–4 TA-3 Chemistry and Metallurgy Research Building

must be performed in hot cells. The planned Wings 6 and 8 were never constructed. In July 1986, an SNM storage vault was added underground. The three-story building now has eight wings connected by a spinal corridor and contains a total of 550,000 square feet (51,097 square meters) of space. It is a multiple-user facility in which specific wings are associated with different activities. It is now the only LANL facility with full capabilities for performing SNM analytical chemistry and materials science. The Plutonium Facility at TA-55 provides support to CMR in the areas of materials control and accountability, waste management, and SNM storage.

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

The CMR Building infrastructure is designed with air, temperature, and power systems that are operational nearly 100 percent of the time. Power to these systems is backed up with an uninterruptible power supply.

Existing CMR Capabilities

Analytical Chemistry and Materials Characterization: Analytical chemistry and materials characterization capabilities in the CMR Building involve the study, evaluation, and analysis of radioactive materials. In general terms, analytical chemistry is that branch of chemistry that deals with the separation, identification, and determination of the components in a sample. Materials characterization relates to the measurement of basic material properties and the change in those properties as a function of temperature, pressure, or other factors. These 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, NNSA complex (such as the Hanford Reservation, Savannah River Site, and Sandia National Laboratories). Sample characterization activities include assay and determination of isotopic ratios of plutonium, uranium, and other radioactive elements; identification of major and trace elements in materials; the content of gases; constituents at the surface of various materials; and methods to characterize waste constituents in hazardous and radioactive materials.

Destructive and Nondestructive Analysis: Destructive and nondestructive analysis employs analytical chemistry, metallographic analysis, measurement on the basis of neutron or gamma radiation from an item, and other measurement techniques. These activities are used in support of weapons quality, component surveillance, nuclear materials control and accountability, SNM standards development, research and development, environmental restoration, and waste treatment and disposal.

Actinide Research and Processing: Actinide research and processing at the CMR Building typically involves 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, 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.

Fabrication and Metallography: Fabrication and metallography at the CMR Building involves a variety of materials, including hazardous and nuclear materials. Much of this work is done with metallic uranium. A variety of parts, including targets, weapons components, and parts used for research and experimental tasks are fabricated and analyzed.

S.5.2 Proposed CMRR Capabilities

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 “cold” laboratory space for staging and testing equipment and experimental work with stable (nonradioactive) materials. Most of these capabilities currently are found at the existing CMR Building, although a subset of AC and MC capabilities currently resides in the Plutonium Facility and other locations at LANL. This proposed project element includes relocating all mission-essential CMR AC and MC capabilities and consolidation of AC and MC capabilities where possible to provide efficient mission support.

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

Special Nuclear Materials Storage Capability: An SNM storage capability would be provided and sized to support operations at the CMRR Facility. The CMRR Facility storage capability would be designed to replace the current storage vault at the CMR Building. The SNM storage requirements would be developed in conjunction with, and integrated into, a long-term LANL SNM storage strategy.

Large Containment Vessel Handling Capability: The CMRR Facility would provide large containment vessel support for the Dynamic Experiments Program, including vessel loading and unloading operations, material recovery, and purification of materials. These capabilities would be selected to complement the AC and MC capabilities that already exist at the CMR Building, and the floor space occupied by these capabilities would be sized consistent with the mission capacity requirements.

Mission Contingency Space: The CMRR Facility would be sized to include mission contingency space of approximately 30 percent net floor space for AC and MC operations. This mission contingency space would be available to accommodate future growth, expansion, or changes to existing capabilities. Hazard Category 2 or 3 nuclear facility construction typically requires large, long-duration, high-cost projects that are not conducted on a regular, routine basis by NNSA. Because new nuclear facility construction is not a routine process, mission contingency space is planned for CMRR to address minor changes in requirements that may occur over the duration of design and construction and to accommodate future growth. Mission contingency space would not be equipped and made operational until required and would be subject to additional NEPA review.

Nuclear Materials Operational Capabilities and Space for non-LANL Users: This capability would provide research laboratory space for non-LANL users to allow other NNSA and DOE nuclear sites to support Defense Program related missions at LANL. Of particular interest are options for relocating and consolidating some of the Lawrence Livermore National Laboratory Hazard Category 2 operations to LANL to support long-term Defense Program missions.

S.5.3 Existing CMR Capabilities and Activities Not Proposed for Inclusion within the New CMRR Facility

Not all capabilities either previously or currently performed within the existing CMR Building at LANL would be transferred into 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 elsewhere at DOE sites other than LANL. These capabilities would cease to exist at LANL.

S.6 COMPARISON OF ALTERNATIVES

S.6.1 Planning Information and Basis for Analysis

The *CMRR EIS* evaluates the potential direct, indirect, and cumulative environmental impacts that could result from relocating existing AC and MC capabilities currently residing in the CMR Building to new facilities at different locations at LANL. This involves: (1) construction of new facilities with several construction options, (2) relocation of materials and equipment from the existing CMR Building to the new facilities, (3) operation of the new facilities for the design lifetime of the new facilities, following a transition period during which operations would be gradually transferred to the new facilities, (4) transportation of SNM (namely samples coming in and residues/wastes returning) between the Plutonium Facility at TA-55 and the new Facilities, and (5) the disposition of the existing CMR Building. The operational characteristics for the CMRR Facility are based on the level of CMR Building operations identified by the Expanded Operations Alternative in the 1999 *LANL SWEIS*. Some of the information and considerations that form the basis of the analyses and impact assessments in the *CMRR EIS* are presented below.

No Action Alternative: The No Action Alternative reflects the decisions reached by DOE for operations within the CMR Building described in the Record of Decision for the *LANL SWEIS*.

Construction Options: The new building(s) proposed for the CMRR Facility are currently in the conceptual design stage and, as a result, are not described in great detail in the *CMRR EIS*. However, to support the EIS analysis, conservative assumptions have been used such that construction requirements and operational characteristics of these buildings bound the environmental impacts. For each alternative involving new construction, four different construction options were considered. These options are driven by facility hazard and security categorizations for the portion of CMRR Facilities that will conduct operations involving SNM. Construction Option 1, as described in Section S.2.1, was considered to potentially have the most severe impacts and was chosen as the reference case for analysis in the *CMRR EIS*.

Construction methods and materials employed on the CMRR project would be typical conventional light[6] industrial for the administrative offices and support functions building, and heavy-industrial, nuclear facility construction for the CMRR nuclear laboratory elements. **Table S–1** provides a summary of construction requirements.

[6] *Light industry refers to the use of small-scale construction machinery.*

Table S–1 Summary of CMRR Construction Requirements

Building/Material Usage	*Hazard Category 2 Building*	*Hazard Category 3 Building*	*Administrative Offices and Support Functions Building*	*Other Construction Elements*
Land (acres)	2.5	2.25	4.0	18 [a]
Water (gallons)	757,300	670,500	1,354,500	963,000
Electricity (megawatt-hours)	88.75	88.75	135	Not applicable
Concrete (cubic meters)	1,375	1,067	2,340	Not applicable
Steel (metric tons)	136	106	265	Not applicable
Peak construction workers	300			
Waste (non-hazardous) (metric tons)	130	99	295	10
Construction period (months)	17	17	26	6

[a] The land affected by other construction elements would include: parking (5 acres), laydown area (2 acres), concrete batch plant (5 acres) at either TA-55 or TA-6. Additionally 6 acres of land would be affected at TA-55 due to road realignment. An equal area (6 acres) at TA-6 would be affected for extensive trenching for utilities (1.5 acres), radioactive liquid waste pipeline (3 acres), and new road (1.5 acres).

Project Schedule: For the purpose of the analysis in the *CMRR EIS*, it was estimated that construction under any of the alternatives would start late in 2004 and would last approximately 5 years. The new facilities would be designed for a lifetime performance of 50 years; therefore, operations are projected to range from 2010 to 2060. It is also anticipated that simultaneous operation of the existing CMR Building and the new CMRR Facility would last a maximum of 4 years, between about 2010 and 2014.

Operational Characteristics: The operational characteristics of the CMRR Facility are based on the level of operations identified by the Expanded Operations Alternative in the 1999 *LANL SWEIS* and are presented in **Table S–2**.

Transportation: Radioactive and SNM shipments would be conducted within the LANL site. Transport distances would vary across alternatives, from a very short distance [about 100 to 300 feet (30 to 90 meters)] in Alternative 1, at TA-55, to about 3 to 5 miles (5 to 8 kilometers) in Alternative 2, at TA-6. Movement of materials would occur on DOE-controlled roads. DOE procedures and U.S. Nuclear Regulatory Commission regulations would not require the use of certified Type B casks within DOE sites. However, DOE procedures require closing the roads and stopping traffic for shipment of material (fissile or SNM) in noncertified packages. Shipment using certified packages, or smaller quantities of radioactive materials and SNM, could be performed while site roads are open. As part of current security implementation at LANL, the roads to be used to transport the radioactive and SNM materials under the *CMRR EIS* would have limited public access capabilities. Material transport under the proposed action would include a one-time transport of some or all of the equipment at the CMR Building to the new CMRR Facility at TA-55 or TA-6. This movement would occur over a period of 2 to 4 years over open or closed roads.

Table S–2 Operational Characteristics of the CMRR Facility (per year)

Electricity usage (megawatt hours)	19,272
Water usage (million gallons)	10.4
Nonradiological gaseous effluent	very small [a]
Radiological gaseous/airborne effluent (curies)	Pu-239 = 0.00076; Kr-85 = 100; Xe-131m = 45; Xe-133 = 1500; H-3 (water vapor) = 750; and H-3 (elemental) = 250
Nonradiological liquid effluent (gallons)	530,000
Radiological liquid effluent	None[b]
Workforce	550
Worker average dose and cumulative dose	100 millirem, and 30 person-rem
Waste generation:	
Transuranic waste (cubic yards)	61
Low-level radioactive waste (cubic yards)	2,433
Mixed low-level radioactive waste (cubic yards)	25.6
Mixed transuranic waste (cubic yards)	26.7
Chemical waste (RCRA/TSCA) (pounds)	24,700
Sanitary waste (million gallons)	7.15 [c]

Pu = plutonium; Kr = krypton; Xe = xenon; H-3 = tritium; RCRA = Resource Conservation and Recovery Act; TSCA = Toxic Substance Control Act.

[a] The chemical effluents through the facility stack is very small, well below the screening levels used to determine the need for additional analysis.

[b] No direct discharge to the environment. Radiological liquid waste would be collected and transported to TA-50 for treatment.

[c] This estimate is based on the assumption of 300 workers generating 50 gallons per day and 260 working days per year.

Disposition of the CMR Building

The disposition options for the existing CMR Building include:

Disposition Option 1: Reuse of the Building for administrative and other activities appropriate to the physical conditions of the structure with the performance of necessary structural and systems upgrades and repairs.

Disposition Option 2: Decontamination, decommission, and demolition of selected parts of the existing CMR Building with some portions of the Building being reused.

Disposition Option 3: Decontamination, decommission, and demolition of the entire existing CMR Building.

Over the past 50 years of operation, certain areas within the existing CMR Building, pieces of equipment, and building systems have become contaminated with radioactive material and by operations involving SNM. These areas include about 3,100 square feet (290 square meters) of contaminated conveyors, gloveboxes, hoods and other equipment items; 760 cubic feet (20 cubic meters) of contaminated ducts; 580 square feet (50 square meters) of contaminated hot cell floor space; and 40,320 square feet (3,750 square meters) of laboratory floor space.

At this time, 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. Additional NEPA compliance would be required when the disposition of the CMR Building actually becomes mature for decision in about 15 years.

Detailed project-specific work plans for the decontamination and demolition of the CMR Building would be developed and approved by NNSA before any actual work began. These plans would include those required for environmental compliance (such as a Storm Water Pollution Prevention Plan) and monitoring activities (such as using a real-time gamma radiation monitor). Some of the work could involve technologies and equipment that have been used in similar operations, and some could use newly developed technologies and equipment. All work would be carefully planned in accordance with established state and Federal laws and regulations (such as National Emissions Standards for Hazardous Air Pollutants [NESHAPs]), DOE Orders, and LANL procedures and best management practices.

S.6.2 Summary of Environmental Consequences for the CMR Building Replacement Project

This section comparatively summarizes the alternatives analyzed in this EIS 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. In addition, environmental impacts common to all alternatives are also summarized. These include transportation risks and CMR Building and CMRR Facility disposition impacts.

Table S–3 presents a comparison of the environmental impacts for each of the alternatives discussed in detail in Chapter 4, including facility construction and operations impacts. For the most part, environmental impacts would be small and would be similar among the alternatives analyzed.

S.6.2.1 Construction Impacts

In evaluating construction impacts, Construction Option 1 was considered to be the option that would bound the potential environmental impacts from construction activities. The results therefore, in Table S–3 represent Construction Option 1 for all alternatives.

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 construction for this alternative.

Alternative 1 (Preferred Alternative): The construction of new Hazard Category 2 and 3 buildings, the construction of 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 adverse effects to 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 socioeconomic region of influence. Waste generated during construction would be adequately managed by the existing LANL management and disposal capabilities.

Alternative 2 (Greenfield Alternative): The construction of new 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 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 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 adverse effects to 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 socioeconomic 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. 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 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.

S.6.2.2 Operations Impacts

Relocating CMR operations to either TA-55 or TA-6 at LANL would require similar facilities, infrastructure support procedures, resources, and numbers of workers during operations. For most environmental areas of concern, differences would be minor. There would not be any perceivable differences in impact between the 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 TRU waste generated by CMRR Facility operations would be treated and packaged in accordance with the WIPP Waste Acceptance Criteria and transported to WIPP or a similar type facility for DOE disposition.

Routine normal operations for each of the action alternatives would increase the amount of radiological releases as compared to current CMR Building operations. Current operations at the CMR Building are restricted, and 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 0.3 millirem per year which translates to 1.5×10^{-7} latent cancer fatalities per year from routine normal 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 0.001 latent cancer fatalities per year in the entire population from routine normal operational at the new

CMRR Facility. Statistically, this would equate to a chance of one additional fatal cancer among the exposed population in 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 there would statistically 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 0.00042 latent cancer fatalities per year. This 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 0.002 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.

S.6.2.3 Environmental Impacts Common to All Alternatives

As previously noted, overall CMR operational characteristics at LANL would not change regardless of the ultimate location of the replacement facility and the alternative implemented. Sampling methods and mission operations in support of analytical chemistry and materials characterization (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 alternatives would generally have the same amount of operational impacts. In other words, all of the alternatives would produce equivalent amounts of emissions and radioactive releases into the environment, infrastructure requirements would be the same, and each alternative would generate the same amount of radioactive and nonradioactive 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 special nuclear material(s) (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 CMRR Facility would result from the decontamination and demolition of the building and the transport and disposal of radiological and nonradiological waste materials.

Transportation Risks

All alternatives except the No Action Alternative, would require the relocation and one-time transport of SNM equipment and materials. Transport of SNM, equipment, and other materials currently located at CMR Building to the new CMRR Facility at TA-55 or TA-6 would occur over a period of 2 to 4 years. The public would not be expected to receive any measurable

Radiological Health Effects Risk Factors Used in This EIS

Radiation can cause a variety of adverse health effects in people. Whether from external or internal sources, health impacts of radiation exposure can be "somatic" (affecting the exposed individual) or "genetic" (affecting descendants of the exposed individual). Somatic effects include the inducement of both fatal and nonfatal cancers. It may take years after the radiation exposure for a fatal cancer to develop, so these are referred to as "latent" cancers.

The International Commission on Radiological Protection has developed estimates of the risk of somatic and genetic effects as shown below.

Risk of Health Effects from Exposure to 1 Rem of Radiation [a]

Individual [b]	***Latent Cancer Fatalities***	***Nonfatal Cancers***	***Genetic Effects***	***Total Detriment***
Worker	0.0004	0.00008	0.00008	0.00056
Public	0.0005	0.0001	0.00013	0.00073

[a] When applied to an individual, units are lifetime probability of a latent cancer fatality per rem (1,000 millirem) radiation dose. When applied to a population, units are the excess number of cancers per person-rem of radiation dose. Genetic effects as used here apply to populations, not individuals.
[b] The general public risk is greater than the worker risk due to the presence in the general public of individuals less than 18 years old who are more sensitive to radiation effects.

These risk factors represent the probability that an individual would incur the indicated health effect during his or her lifetime as a result of being exposed to a unit of radiation dose (1 rem). For purposes of comparison, this EIS presents estimated doses and the associated potential latent cancer fatalities. The risk factors used are 0.0004 potential latent cancer fatalities per rem for workers and 0.0005 potential latent cancer fatalities per rem for individuals in the general public. The risk factor for the general public is slightly higher because the public includes children who are more sensitive to radiation than adults.

Examples:

The latent cancer fatality risk for an individual (nonworker) receiving a dose of 0.1 rem would be 0.00005 (0.1 rem × 0.0005 latent cancer fatalities per rem). This risk can also be expressed as 0.005 percent chance or 1 chance in 20,000 of developing a latent cancer.

The same concept is used to calculate the latent cancer fatality risk from exposing a group of individuals to radiation. The latent cancer fatality risk for individuals in a group of 100,000, each receiving a dose of 0.1 rem, would be 0.00005, as indicated above. This individual risk, multiplied by the number of individuals in the group, expresses the number of potential latent cancer fatalities that could occur among the individuals in the group as a result of the radiation dose. In this example, the number would be 5 potential latent cancer fatalities (100,000 × 0.00005).

A number of potential latent cancer fatalities less than 1 means that the radiation exposure is not sufficient to conclude that a latent cancer fatality is likely to occur among the members of the group. In this case, the risk is expressed as a probability that a single latent cancer fatality would occur among the members of the group. For example, 0.05 potential latent cancer fatalities can be stated as a 5 percent chance or 1 chance in 20 that 1 latent cancer fatality would occur among the members of the group.

The EIS provides estimates of the probability of a latent cancer fatality occurring for the general population, an average individual, the maximally exposed offsite individual, involved, and noninvolved workers. These categories are defined as follows:

Population—Members of the public residing within a 50-mile (80-kilometer) radius of the facility
Average individual—A member of the public receiving an average dose of radiation or exposure to hazardous chemicals
Maximally exposed offsite individual—A hypothetical member of the public residing at the site boundary who could receive the maximum dose of radiation or exposure to hazardous chemicals
Involved worker—An individual worker participating in the operation of the facilities
Noninvolved worker—An individual worker at the site other than the involved worker

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 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 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 (3.1×10^{-10}). For all alternatives, the overall environmental impacts and potential risks of transporting AC and MC samples would be small.

Impacts During the Transition from the CMR Building to the New CMRR Facility

During a four-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, 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 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 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.

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 that 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.

Table S–3 Summary of Environmental Consequences for the CMR Replacement Project

<table>
<tr><th>Resource/Material Categories</th><th colspan="2">No Action Alternative</th><th colspan="2">Alternative 1 (relocate CMR AC and MC operations to TA-55) [a]</th><th colspan="2">Alternative 2 (relocate CMR AC and MC operations to TA-6) [a]</th><th colspan="2">Alternative 3 (relocate CMR AC and MC operations to TA-55) [b]</th><th colspan="2">Alternative 4 (relocate CMR AC and MC operations to TA-6) [b]</th></tr>
<tr><td colspan="11">Land Resource</td></tr>
<tr><td>Construction [c]/ Operations [d]</td><td colspan="2">No impact</td><td colspan="2">26.75 acres/
13.75 acres</td><td colspan="2">26.75 acres/
15.25 acres</td><td colspan="2">22.75 acres/
9.75 acres</td><td colspan="2">22.75 acres/
11.25 acres</td></tr>
<tr><td colspan="11">Air Quality</td></tr>
<tr><td>Construction [c]</td><td colspan="2">No impact</td><td colspan="2">Small temporary impact</td><td colspan="2">Small temporary impact</td><td colspan="2">Small temporary impact</td><td colspan="2">Small temporary impact</td></tr>
<tr><td>Operations</td><td colspan="2">0.00003 curies of actinides</td><td colspan="2">- 0.00076 curies of actinides
- 2,645 curies of tritium and noble fission gases</td><td colspan="2">- 0.00076 curies of actinides
- 2,645 curies of tritium and noble fission gases</td><td colspan="2">- 0.00076 curies of actinides
- 2,645 curies of tritium and noble fission gases</td><td colspan="2">- 0.00076 curies of actinides
- 2,645 curies of tritium and noble fission gases</td></tr>
<tr><td colspan="11">Water Resource</td></tr>
<tr><td>Construction [c]</td><td colspan="2">No impact</td><td colspan="2">Small temporary impact</td><td colspan="2">Small temporary impact</td><td colspan="2">Small temporary impact</td><td colspan="2">Small temporary impact</td></tr>
<tr><td>Operations</td><td colspan="2">Small impact</td><td colspan="2">Small impact</td><td colspan="2">Small impact</td><td colspan="2">Small impact</td><td colspan="2">Small impact</td></tr>
<tr><td colspan="11">Ecological Resources</td></tr>
<tr><td>Construction [c]</td><td colspan="2">No impact</td><td colspan="2">Indirect adverse effect to Mexican spotted owl habitat</td><td colspan="2">No impact</td><td colspan="2">Indirect adverse effect to Mexican spotted owl habitat</td><td colspan="2">No impact</td></tr>
<tr><td>Operations</td><td colspan="2">No impact</td><td colspan="2">Indirect adverse effect to Mexican spotted owl habitat</td><td colspan="2">No impact</td><td colspan="2">Indirect adverse effect to Mexican spotted owl habitat</td><td colspan="2">No impact</td></tr>
<tr><td colspan="11">Socioeconomics</td></tr>
<tr><td>Construction [c]</td><td colspan="2">No impact</td><td colspan="2">No noticeable changes;
300 workers (peak)
1,152 jobs</td><td colspan="2">No noticeable changes;
300 workers (peak),
1,152 jobs</td><td colspan="2">No noticeable changes;
300 workers (peak); 1,152 jobs</td><td colspan="2">No noticeable changes;
300 workers (peak),
152 jobs</td></tr>
<tr><td>Operations</td><td colspan="2">No impact</td><td colspan="2">No increase in workforce [e]</td><td colspan="2">No increase in workforce [e]</td><td colspan="2">No increase in workforce [e]</td><td colspan="2">No increase in workforce [e]</td></tr>
<tr><td colspan="11">Public and Occupational Health and Safety</td></tr>
<tr><td>Normal Operations</td><td>Dose</td><td>LCF</td><td>Dose</td><td>LCF</td><td>Dose</td><td>LCF</td><td>Dose</td><td>LCF</td><td>Dose</td><td>LCF</td></tr>
<tr><td>Population dose (person-rem per year)</td><td>0.04</td><td>0.00002</td><td>1.9</td><td>0.001</td><td>2.0</td><td>0.001</td><td>1.9</td><td>0.001</td><td>2.0</td><td>0.001</td></tr>
<tr><td>MEI (millirem per year)</td><td>0.006</td><td>3.0×10^{-9}</td><td>0.33</td><td>1.7×10^{-7}</td><td>0.35</td><td>1.8×10^{-7}</td><td>0.33</td><td>1.7×10^{-7}</td><td>0.35</td><td>1.8×10^{-7}</td></tr>
<tr><td>Average individual dose (millirem per year)</td><td>0.0001</td><td>6.6×10^{-11}</td><td>0.006</td><td>3.1×10^{-9}</td><td>0.006</td><td>3.2×10^{-9}</td><td>0.006</td><td>3.1×10^{-9}</td><td>0.006</td><td>3.2×10^{-9}</td></tr>
<tr><td>Total worker dose (person-rem per year)</td><td>22</td><td>0.009</td><td>61</td><td>0.02</td><td>61</td><td>0.02</td><td>61</td><td>0.02</td><td>61</td><td>0.02</td></tr>
<tr><td>Average worker dose (millirem per year)</td><td>110</td><td>0.00004</td><td>110</td><td>0.00004</td><td>110</td><td>0.00004</td><td>110</td><td>0.00004</td><td>110</td><td>0.00004</td></tr>
<tr><td>Hazardous chemicals</td><td colspan="2">None</td><td colspan="2">None</td><td colspan="2">None</td><td colspan="2">None</td><td colspan="2">None</td></tr>
<tr><td colspan="11">Accidents (Maximum Annual Cancer Risk, LCF)</td></tr>
<tr><td>Population</td><td colspan="2">0.002</td><td colspan="2">0.00042</td><td colspan="2">0.0004</td><td colspan="2">0.00042</td><td colspan="2">0.0004</td></tr>
<tr><td>MEI</td><td colspan="2">3.5×10^{-6}</td><td colspan="2">1.2×10^{-6}</td><td colspan="2">5.6×10^{-7}</td><td colspan="2">1.2×10^{-6}</td><td colspan="2">5.6×10^{-7}</td></tr>
<tr><td>Noninvolved worker</td><td colspan="2">0.00013</td><td colspan="2">3.8×10^{-5}</td><td colspan="2">3.6×10^{-5}</td><td colspan="2">3.8×10^{-5}</td><td colspan="2">3.6×10^{-5}</td></tr>
</table>

Resource/Material Categories	***No Action Alternative***	***Alternative 1 (relocate CMR AC and MC operations to TA-55)*** [a]	***Alternative 2 (relocate CMR AC and MC operations to TA-6)*** [a]	***Alternative 3 (relocate CMR AC and MC operations to TA-55)*** [b]	***Alternative 4 (relocate CMR AC and MC operations to TA-6)*** [b]
Environmental Justice	No disproportionally high and adverse impacts on minority or low-income populations				
Waste Management (cubic yards of solid waste per year unless otherwise indicated): Waste would be disposed of properly with small impact					
Transuranic waste	19.5	61	61	61	61
Mixed transuranic waste	8.5	27	27	27	27
Low-level radioactive waste	1,021	2,433	2,433	2,433	2,433
Mixed low-level radioactive waste	6.7	26	26	26	26
Hazardous waste (pounds per year)	10,494	24,692	24,692	24,692	24,692
Transportation					
Accidents [f]	***Dose***	***Dose***	***Dose***	***Dose***	***Dose***
MEI (rem per year)	7.7×10^{-7}	0	0.00015	0	0.00015

LCF = latent cancer fatality; MEI = maximally exposed individual member of the public.

[a] Relocate CMR AC and MC and actinide research and development activities to a new CMRR Facility consisting of an administrative offices and support functions building and Hazard Category 2 and 3 buildings.

[b] Relocate CMR AC and MC and actinide research and development activities to a new CMRR Facility consisting of only Hazard Category 2 and 3 buildings.

[c] Construction impacts are based on Construction Option 1 which is bounding.

[d] Acreage reflects building footprints, parking lot, and new roads as applicable.

[e] CMR operations would require no additional workers beyond what was projected by the Expanded Operations Alternative analyzed in the *LANL SWEIS*. Increased CMRR Facility operations at LANL would require up to 550 workers. This would be an increase of 346 workers over current requirements. The Expanded Operations Alternative presented in the *LANL SWEIS* addressed the impact of this increase in employment.

[f] Population transportation impacts would be bounded by the normal operation and accident impacts evaluated for the various alternatives.

S.7 GLOSSARY

***absorbed dose* —** For ionizing radiation, the energy imparted to matter by ionizing radiation per unit mass of the irradiated material (e.g., biological tissue). The units of absorbed dose are the rad and the gray. (See *rad* and *gray*.)

***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.

***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.

***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 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.

***analytical chemistry* —** The branch of chemistry that deals with the separation, identification, and determination of the components of a sample.

***atomic number* —** The number of positively charged protons in the nucleus of an atom or the number of electrons on an electrically neutral atom.

***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.

***cask* —** A heavily shielded container used to store or ship radioactive materials.

***cell* —** See *hot cell*.

***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.

***committed effective dose equivalent* —** The dose value obtained by (1) multiplying the committed dose equivalents for the organs or tissues that are irradiated and the weighting factors applicable to those organs or tissues, and (2) summing all the resulting products. Committed effective dose equivalent is expressed in units of rem or sieverts. (See *committed dose equivalent* and *weighting factor*.)

***committed equivalent dose* —** The committed dose in a particular organ or tissue accumulated in a specific period after intake of a radionuclide.

***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 are exposed to industry that stimulates unwanted noise, smell, industrial traffic, particulate matter, or other nonaesthetic impacts.

***contamination* —** The deposition of undesirable radioactive material on the surfaces of structures, areas, objects, or personnel.

***cultural resources* —** Archaeological sites, historical sites, architectural features, traditional use areas, and Native American sacred sites.

***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.

***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.

***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.

***dose (radiological)* —**A generic term meaning absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or committed equivalent dose, as defined elsewhere in this glossary. It is a measure of the energy imparted to matter by ionizing radiation. The unit of dose is the rem or rad.

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. (See *committed dose equivalent* and *committed effective dose equivalent*.)

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.

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 424).

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*, *natural uranium*, and *highly enriched uranium.*)

environmental impact statement (EIS) — The detailed written statement required by Section 102(2)(C) of the National Environmental Policy Act for a proposed major Federal action significantly affecting the quality of the human environment. A DOE EIS is prepared in accordance with applicable requirements of the Council on Environmental Quality National Environmental Policy Act regulations in 40 CFR 1500–1508 and the DOE National Environmental Policy Act regulations in 10 CFR 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.

***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.

***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.

***hazardous chemical* —** Under 29 CFR 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 employees. 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, which poses a risk to health, safety, and property when transported or handled.

***hazardous waste* —** A category of waste regulated under the Resource Conservation and Recovery Act. To be considered hazardous, a waste must be a solid waste under the Resource Conservation and Recovery Act and must exhibit at least one of four characteristics described in 40 CFR 261.20 through 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.

***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 *natural uranium*, *enriched uranium*, and *depleted uranium*.)

***hot cell* —** A shielded facility that requires the use of remote manipulators for handling radioactive materials.

***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.

***latent cancer fatalities* —** Deaths from cancer occurring some time after, and postulated to be due to, exposure to ionizing radiation or other carcinogens.

***low-income population* —** Low-income populations, defined in terms of U.S. Bureau of the Census 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 waste, transuranic waste, spent nuclear fuel, or by-product tailings from processing of uranium or thorium ore. Low-level waste is generated in many physical and chemical forms and levels of contamination.

***material 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 (transportation analysis)* —** A hypothetical (transportation analysis) 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.

***maximally exposed offsite 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).

***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.

***millirem* —** One-thousandth of 1 rem.

***natural uranium* —** Uranium with the naturally occurring distribution of uranium isotopes (approximately 0.7-weight percent uranium-235 with the remainder essentially uranium-238). (See *uranium*, *depleted uranium, enriched uranium, highly enriched uranium*, and *low-enriched uranium*.)

***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.

***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.

***nonproliferation* —** Preventing the spread of nuclear weapons, nuclear weapons materials, and nuclear weapons 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 will be prepared and considered. The notice is intended to briefly: (1) describe the proposed action and possible alternatives; (2) describe the agency's proposed scoping process including whether, when, and where any scoping meeting will be held; and (3) state the name and address of a person within the agency who can answer questions about the proposed action and the environmental impact statement.

***nuclear facility* —** A facility subject to requirements intended to control potential nuclear hazards. Defined in DOE 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 to the employees or the general public.

***nuclear material* —** Composite term applied to: (1) special nuclear material; (2) source material such as uranium, thorium, or ores containing uranium or thorium; and (3) 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, either fission, fusion, or both.

***Nuclear Regulatory Commission* —** The Federal agency that regulates the civilian nuclear power industry in the United States.

***offsite* —** The term denotes a location, facility, or activity occurring outside of the boundary of a DOE complex site.

***onsite* —** The term denotes a location or activity occurring within the boundary of a DOE complex site.

***package* —** For radioactive materials, the packaging, together with its radioactive contents, as presented for transport (the packaging plus the radioactive contents equals the package).

***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.

***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 (Sv).

***pit* —** The central core of a primary assembly in a nuclear weapon typically composed of plutonium-239 and/or highly-enriched uranium and other materials.

***plutonium* —** A heavy, radioactive, metallic element with the atomic number 94. It is produced artificially by neutron bombardment of uranium. Plutonium has 15 isotopes with atomic masses ranging from 232 to 246 and half-lives from 20 minutes to 76 million years.

***population dose* —** See *collective dose*.

***process* —** Any method or technique designed to change the physical or chemical character of the product.

***rad* —** See *radiation absorbed dose*.

***radiation absorbed dose (rad)* —** The basic unit of absorbed dose equal to the absorption of 0.01 joules per kilogram (100 ergs per gram) of absorbing material.

***radioisotope or radionuclide* —** An unstable isotope that undergoes spontaneous transformation, emitting radiation. (See *isotope*.)

***Record of Decision* —** A document prepared in accordance with the requirements of 40 CFR 1505.2 and 10 CFR 1021.315 that provides a concise public record of DOE's decision on a proposed action for which an EIS was prepared. A Record of Decision identifies the alternatives considered in reaching the decision; the environmentally preferable alternative; factors balanced by DOE in making the decision; and whether all practicable means to avoid or minimize environmental harm have been adopted, and, if not, the reasons they were not.

***region of influence* —** 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 *absorbed dose* and *dose equivalent*.)

***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.

***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.

***sanitary waste* —** Waste generated by normal housekeeping activities, liquid or solid (includes sludge), which are not hazardous or radioactive.

***scope* —** In a document prepared pursuant to the National Environmental Policy Act of 1969, 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 EIS 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. The public scoping process is that portion of the process where the public is invited to participate, and includes holding at least one public meeting and requesting written comments on issues and environmental concerns that an EIS should address. DOE also conducts an early internal scoping process for environmental assessments or EISs. For EISs, 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 DOE contractor facilities, property, and equipment.

***seismic* —** Earth vibration caused by an earthquake or an explosion.

***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.

***special nuclear materials* —** 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 Nuclear Regulatory Commission determines to be special nuclear material, but it does not include source material.

***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 by the appropriate balance of surveillance, experiments, and simulations.

***total effective dose equivalent* —** The sum of the effective dose equivalent from external exposures and the committed effective dose equivalent from internal exposures.

***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.

***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 424). (See *endangered species*.)

***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 require Type B packaging for shipping highly radioactive material. Type B packagings 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 U.S. Nuclear Regulatory Commission testing criteria for Type B packaging designs (10 CFR 71) are intended to simulate severe accident conditions, including impact, puncture, fire, and immersion in water. The most widely recognized Type B packagings 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.

***uranium* —** A radioactive, metallic element with the atomic number 92; one of the heaviest naturally occurring elements. 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 *natural uranium*, *enriched uranium*, *highly enriched uranium*, and *depleted uranium*.)

***vault (special nuclear material)* —** A penetration-resistant, windowless enclosure having an intrusion alarm system activated by opening the door and which also has: (1) walls, floor, and ceiling substantially constructed of materials that afford forced-penetration resistance at least equivalent to that of 20-centimeter- (8-inch-) thick reinforced concrete; and (2) 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.

***waste management* —** The planning, coordination, and direction of those functions related to the generation, handling, treatment, storage, transportation, and disposal of waste, as well as associated surveillance and maintenance activities.

Draft Environmental Impact Statement For the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, New Mexico

DOE/EIS-0350D
May 2003

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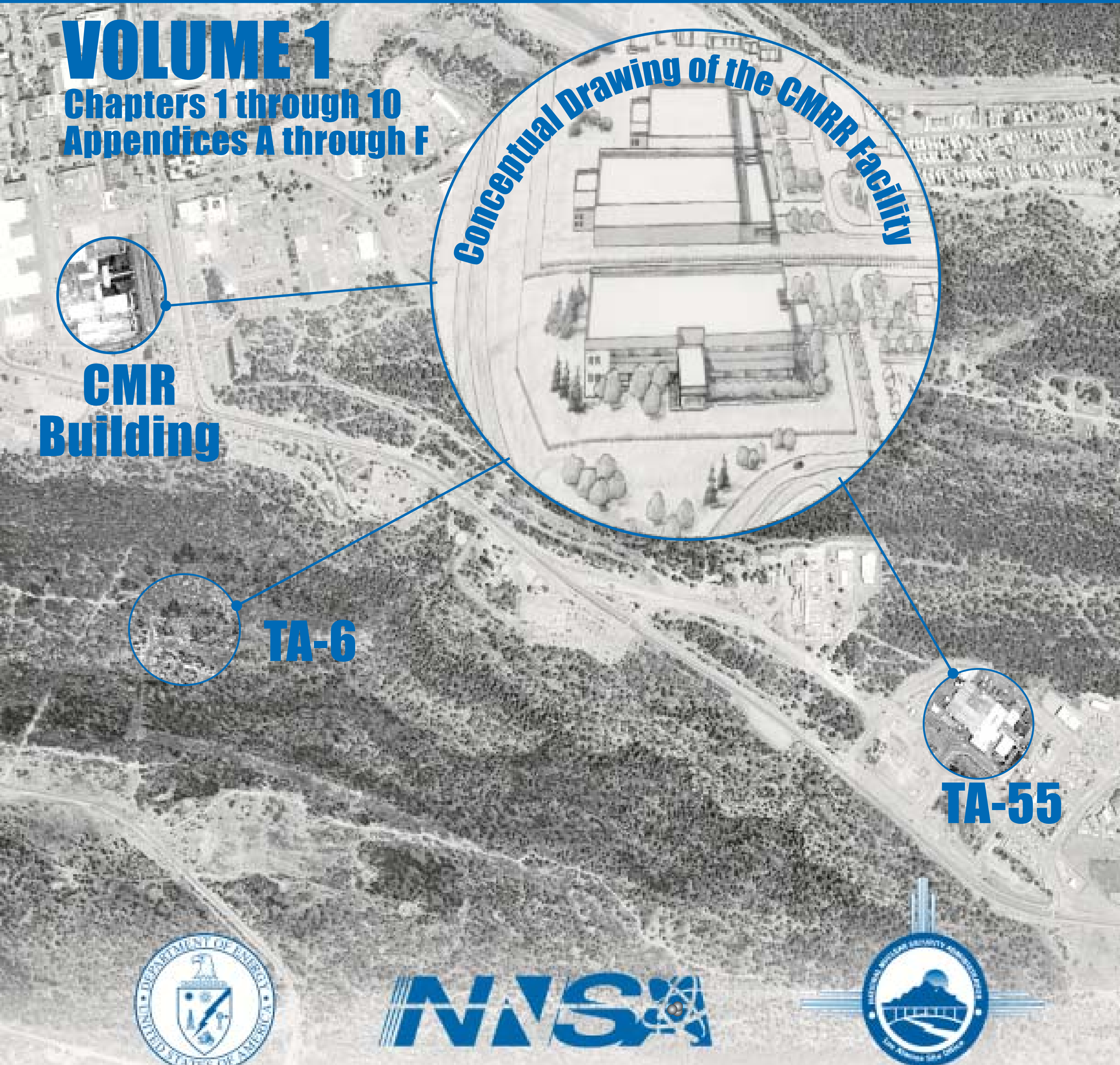

U.S. Department of Energy

National Nuclear Security Administration

Los Alamos Site Office

COVER SHEET

Responsible Agency: United States Department of Energy (DOE), National Nuclear Security Administration (NNSA)

Title: *Draft Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory (CMRR EIS)*

Location: Los Alamos, New Mexico

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***Abstract*:** NNSA, an agency within DOE, proposes to replace the Chemistry and Metallurgy Research (CMR) Building at Los Alamos National Laboratory (LANL). The *CMRR EIS* will examine the potential environmental impacts associated with the proposed action of consolidating and relocating the mission-critical CMR capabilities from a degraded building to a new modern building(s).

The existing CMR Building, constructed in the early 1950s, houses most of LANL's analytical chemistry and materials characterization capabilities (AC and MC). Other capabilities at the CMR Building include actinide processing, waste characterization, and nondestructive analysis 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 that the extensive upgrades originally planned would be much more expensive and time consuming and of only marginal effectiveness. As a result, DOE decided to perform only the upgrades necessary to ensure the safe and reliable operation of the CMR Building through 2010 and to seek an alternative path for long-term reliability.

The *CMRR EIS* evaluates the potential direct, indirect, and cumulative environmental impacts associated with the proposed action. The Proposed Action is to replace the CMR Building. The Preferred Alternative is to construct a new CMRR Facility at Technical Area (TA) 55, consisting of two or three buildings. One of the new buildings would provide space for administrative offices and support functions. The other building(s) would provide secure laboratory spaces for

research and analytical support activities. The buildings would be expected to operate for a minimum of 50 years. Tunnels may be constructed to connect the buildings. Alternative 2 would be to construct the new CMRR Facility within an undeveloped "greenfield" area near TA-55 at TA-6. Alternatives 3 and 4 would be to continue using the existing CMR Building for administrative offices and support functions with the implementation of minimal necessary structural and system upgrades and repairs, together with the construction of new nuclear laboratory building(s) at either TA-55 or TA-6. The EIS also presents an analysis of impacts associated with the dispositioning of all or portions of the existing CMR Building.

Public Comments: In preparing this draft EIS, NNSA considered comments received from the public during the scoping period (July 23, 2002 to August 31, 2002). Locations and times of public hearings on this document will be announced in the *Federal Register* in May 2003. Comments on this draft EIS will be accepted at the address listed above for a period of 45 days following its issuance and will be considered for the preparation of the final EIS. Any comments received after the 45-day period will be considered to the extent practicable for the preparation of the final EIS.

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ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

AC and MC	analytical chemistry and materials characterization
AEI	areas of environmental interest
ANL-W	Argonne National Laboratory-West
BIO	Basis for Interim Operations
C	Centigrade
CEDE	cumulative effective dose equivalents
Center	Interagency Emergency Operations Center
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CFC	chlorofluorocarbons
CFR	*Code of Federal Regulations*
CMR	chemistry and metallurgy research
CMRR	Chemistry and Metallurgy Research Building Replacement Project
CTG	combustion turbine generators
D&D	decontamination and decommissioning
dBA	decibels A-weighted
DCGs	Derived Concentration Guides
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DP	Defense Programs
DSW	Directed Stockpile Work
EA	environmental assessment
EIS	environmental impact statement
EOC	Emergency Operations Center
EPA	U.S. Environmental Protection Agency
F	Fahrenheit
FONSI	finding of no significant impact
FR	*Federal Register*
FRS	flood retention structure
g	gravitational acceleration
HFC	hydrofluorocarbons
INEEL	Idaho National Engineering and Environmental Laboratory
INP	Integrated Nuclear Planning
LANL	Los Alamos National Laboratory
LANL SWEIS	*Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory*
MCE	maximum considered earthquake
MCL	Maximum Contaminant Level
mg/L	milligrams per liter
MMI	Modified Mercalli Intensity

MPF	Modern Pit Facility
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMSA	New Mexico Statutes Annotated
NNSA	National Nuclear Security Administration
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NTS	Nevada Test Site
OSHA	Occupational Safety and Health Administration
PEIS	programmatic environmental impact statement
PFC	perfluorocarbons
PIDAS	Perimeter Intrusion Detection and Assessment System
PM_{10}	particulate matter less than or equal to 10 microns in aerodynamic diameter
RCRA	Resource Conservation and Recovery Act
RLWTF	Radioactive Liquid Waste Treatment Facility
SEA	special environmental analysis
SNL/NM	Sandia National Laboratories/New Mexico
SNM	special nuclear material(s)
SRS	Savannah River Site
SS&M	Stockpile Stewardship and Management
SWS	Sanitary Wastewater Systems
TA	technical area
TRU	transuranic waste
UC at LANL	University of California, current LANL Management and Operating contractor
USFWS	U.S. Fish and Wildlife Service
U.S.C.	*United States Code*
WIPP	Waste Isolation Pilot Plant
WR	War-Reserve

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/million	Parts/million	1[a]	Milligrams/liter
Micrograms/liter	1[a]	Parts/billion	Parts/billion	1[a]	Micrograms/liter
Micrograms/cubic meter	1[a]	Parts/trillion	Parts/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 C + 17.78	1.8	Degrees F	Degrees F - 32	0.55556	Degrees C
Relative					
Degrees C	1.8	Degrees F	Degrees F	0.55556	Degrees C
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}

1. INTRODUCTION AND PURPOSE OF AND NEED FOR AGENCY ACTION

Chapter 1 of this environmental impact statement (EIS) provides an overview of the U.S. Department of Energy (DOE), National Nuclear Security Administration's (NNSA's) proposal for consolidation and relocation of mission-critical chemistry and metallurgy research (CMR) capabilities currently located at Los Alamos National Laboratory's (LANL's) CMR Building at Technical Area 3 (TA-3). Chapter 1 includes background information on CMR capabilities and on the CMR Building's physical condition, the purpose of and need for agency action, the scope of the *Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory*, Los Alamos, New Mexico (*CMRR EIS*), and the alternatives analyzed in the EIS. Chapter 1 also discusses other National Environmental Policy Act (NEPA) documents related to the chemistry and metallurgy research replacement (CMRR) proposal, as well as the scoping and public comment period process used to obtain public input on the issues addressed in this *CMRR EIS*.

1.1 INTRODUCTION

NNSA, a separately organized agency within DOE, is responsible for providing the nation with nuclear weapons, ensuring the safety and reliability of those nuclear weapons, and supporting programs that reduce global nuclear proliferation. NNSA is also responsible for the administration of LANL. LANL is located in north-central New Mexico and covers an area of about 40 square miles (103 square kilometers). LANL was originally established in 1943 as "Project Y" of the Manhattan Project, with a single-focused 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 (known first as the Los Alamos Scientific Laboratory, it acquired the LANL name in the 1980s) and 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 civilian programs. LANL is now a multi-disciplinary, multi-purpose institution engaged in theoretical and experimental research and development. The Federal agency with administrative responsibility for LANL has evolved from the post-World War II Atomic Energy Commission, to the Energy Research and Development Administration, and finally to DOE, NNSA. The University of California (UC at LANL) is the current LANL Management and Operating contractor and has served in this capacity since the laboratory's inception.

Current DOE, NNSA mission-support work provided by UC at LANL stems from its original purpose to build the world's first nuclear weapon. The work includes research and development performed for a variety of programs within DOE, as well as cost-reimbursable work identified as "work for others." This designation, "work for others," encompasses non-DOE-sponsored work performed in support of other Federal agencies, universities, institutions, and commercial firms that is compatible with the DOE mission work conducted at LANL and that cannot reasonably be performed by the private sector. Within DOE, the NNSA mission is to: "(1) enhance United States national security through the military application of nuclear energy; (2) maintain and enhance the safety, reliability, and performance of the United States nuclear weapons stockpile, including the ability to design, produce, and test, in order to meet national security requirements; (3) provide the United States Navy with safe, militarily effective nuclear propulsion plants and to ensure the safe and reliable operation of those plants; (4) promote international nuclear safety and nonproliferation; (5) reduce global danger from weapons of mass destruction; and (6) support United States leadership in science and technology" (50 USC Chapter 41, § 2401(b)). In the mid-1990s, DOE, in response to direction from the President and Congress, developed the Stockpile Stewardship and Management Program (SS&M) to provide a single, highly integrated technical program for maintaining the continued safety and reliability of the nuclear weapons stockpile. Stockpile stewardship comprises the activities associated with research, design, development, and testing of nuclear weapons, and the assessment and certification of their safety and reliability. Stockpile management comprises operations associated with producing, maintaining, refurbishing, surveilling, and dismantling the nuclear weapons stockpile. Work conducted at LANL provides science, research and development, and production support to these NNSA missions, with a special focus on national security. Under the direction of DOE, UC at LANL has developed facilities, capabilities, and expertise at LANL to perform theoretical research (including analysis, mathematical modeling, and high-performance computing), experimental science and engineering ranging from bench-scale to multi-site, multi-technology facilities (including accelerators and radiographic facilities); and advanced and nuclear materials research, development, and applications (including weapons components testing, fabrication, stockpile assurance, replacement, surveillance, and maintenance including theoretical and experimental activities). These capabilities developed

CMRR EIS Terminology

Missions: In this EIS, "missions" refers to the major responsibilities assigned to DOE and NNSA. DOE and NNSA accomplish their missions by assigning groups or types of activities to their national laboratories, production facilities, and other sites.

Programs: DOE and NNSA have program offices, each of which has primary responsibilities within the set of Administration and Department missions. Funding and direction for activities at DOE and NNSA facilities are provided through these program offices, and similar or coordinated sets of activities conducted to meet the mission responsibilities are often referred to as "programs." Programs generally are long-term efforts with broad goals or requirements.

Capabilities: "Capabilities" refers to the combination of facilities, equipment, infrastructure, and expertise necessary to undertake types or groups of activities and to implement mission assignments. Capabilities at LANL have been established over time, principally through mission-support work assignments and activities directed by program offices.

Projects: The term "projects" is used to describe activities with a clear beginning and end that are undertaken to meet a specific goal or need. Projects are usually relatively short-term efforts, and they can cross multiple programs and missions. Projects can range from very small efforts to major undertakings.

Campaign: "Campaigns" are composed of activities focused on science and engineering that address critical capabilities, tools, computations, and experiments needed to achieve certification, manufacturing, and refurbishment.

under the direction of DOE (or its predecessor agencies) now allow UC at LANL to conduct research and development assignments at LANL for the new NNSA that include continued production of War-Reserve (WR) products, assessment and certification of the nuclear weapons stockpile, surveillance of WR components and weapon systems, ensuring safe and secure storage of strategic materials, and management of excess plutonium inventories. These LANL assignments are all conducted in support of the NNSA Stockpile Stewardship Program and funded as either Directed Stockpile Work (DSW), campaigns, or Readiness in Technical Base Facilities work activities. In addition, LANL supports actinide (actinides are 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. 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. Additional information regarding DOE and NNSA work assignments at LANL is presented in the 1999 LANL *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory (LANL SWEIS)*. This document and other related documents can be found in the DOE Reading Rooms in Albuquerque, New Mexico (at the Government Information Department, Zimmerman Library, University of New Mexico), and in Los Alamos (at the Community Relations Office located at 1619 Central Avenue).

Nuclear Facilities Hazards Classification (DOE Order 411.1)

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.

SNM Safeguards and Security (DOE Order 474.1-1A)

DOE uses a cost-effective, graded approach to provide SNM safeguards and security. Quantities of SNM stored at each DOE site are categorized into Security Categories I, II, III, and 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" to saboteurs, alphabetically with the most attractive materials for conversion of such materials into nuclear explosive devices being identified by the letter "A," and lesser attractive materials being designated progressively by the letters "B" through "E."

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. Of primary importance are the facilities located within the CMR Building and the Plutonium Facility (located at TA-3 and -55, respectively), which are used for processing, characterizing, and storing special nuclear material (SNM)[1]. Most of the LANL mission support functions previously listed require analytical chemistry, material characterization, and actinide research and development support capabilities and capacities that currently exist at facilities within the CMR Building and are not available elsewhere.

[1] *Special nuclear material: plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material that the U.S. Nuclear Regulatory Commission determines to be special nuclear material.*

Other unique capabilities are located at the 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.

The CMR Building is over 50 years old and many of its utility systems and structural components are aged, outmoded, eroding, and generally deteriorating. Studies conducted in the late 1990s identified a seismic fault trace located beneath one of the wings of the CMR Building that greatly increases the level of structural integrity required at the CMR Building to meet current structural seismic code requirements for a Hazard Category 2[2] nuclear facility. Correcting the CMR Building's defects by performing repairs and upgrades and retrofitting utility systems for long-term use housing the mission-critical CMR capabilities would be extremely difficult and costly. Over the long term, 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 Record of Decision for the *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.

1.2 HISTORY OF THE CMR BUILDING

Construction on the CMR Building at LANL within TA-3 was initiated in 1949 and operations began in 1952. The three-story CMR Building (Building 3-29) is supported by an adjacent radioactive liquid waste pump house (Building 3-154). The CMR Building has a central corridor and 8 wings, providing over 550,000 square feet (51,097 square meters) of working area. The original construction provided a main corridor with seven wings. In 1960, an additional wing (Wing 9) was added to accommodate activities that require hot cells for the remote handling of radioactive materials. Wings 6 and 8 were never constructed. The CMR Building is currently designated as a Hazard Category 2, Security Category III nuclear building.

The CMR Building's main function is to house research and development capabilities involving analytical chemistry, materials characterization, and metallurgic studies on actinides and other metals. These activities have been conducted almost continuously in the CMR Building since it became operational. Analytical chemistry and materials characterization (AC and MC) services performed in the CMR Building now support virtually every program at LANL. **Figure 1–1** shows the CMR Building.

The CMR Building was initially designed and constructed to comply with the Uniform Building Codes in effect at the time. Over the intervening years, a series of upgrades have been performed to address changing building and safety requirements (DOE 1997a). By the mid-1990s, the CMR

[2]*A Hazard Category 2 nuclear facility is one in which the hazard analysis identifies the potential for significant onsite consequences. See box inset in Section 1.1 for additional information on hazard categories.*

Figure 1B1 CMR Building

Building had been operating continuously for over 40 years and was approaching its 50-year design life. In 1992, DOE initiated planning and implementation of CMR Building upgrades to address specific safety, reliability, consolidation, and safeguards and security issues. These upgrades were intended to extend the useful life of the CMR Building for an additional 20 to 30 years. In 1997 and 1998, a series of operational, safety, and seismic issues surfaced regarding the long-term viability of the CMR Building. In responding to these issues, DOE determined that originally-planned extensive upgrades to the CMR Building would be expensive, time consuming, and only marginally effective in providing the required operational risk reduction and program capabilities to support DOE and NNSA missions. As a result, in 1999, the CMR Upgrades Project was downscoped to accommodate only upgrades necessary to ensure safe and reliable operations through 2010, consistent with an overall strategy for managing risk at the CMR Building. This risk management strategy recognized that the 50-year-old CMR Building could not continue mission support at an acceptable level of risk to public and worker health and safety without operational restrictions. It also committed NNSA and LANL to manage the CMR Building to a planned end of life in or about the year 2010, and to develop long-term facility and site plans to replace and relocate CMR capabilities. Since this strategy was adopted, CMR capabilities have been restricted substantially, both by planned NNSA actions and by unplanned facility outages that have included the operational loss of two of the seven wings of the CMR Building.

1.3 PURPOSE OF AND NEED FOR AGENCY ACTION

AC and MC are fundamental capabilities required for the research and development support of the DOE and NNSA missions at LANL. CMR capabilities have been present at LANL for the entire history of the site and are critical for future work conducted there.

CMR Building operations and capabilities are currently being restricted in scope due to safety constraints; the building is not being operated to the full extent needed to meet the DOE, NNSA operational requirements established in 1999 for the next 10 years. In addition, continued support of LANL's existing and evolving roles is anticipated to require modification of some capabilities such as the ability to physically handle larger containment vessels (as compared to existing capabilities) in support of dynamic experimentation and subsequent cleanout. The facilitation and consolidation of like activities at LANL would enhance operational efficiency in terms of security, support, and risk reduction in handling and transportation of nuclear materials.

NNSA needs to act now to provide the physical means for accommodating the continuation of the CMR Building's functional, mission-critical CMR capabilities beyond 2010 in a safe, secure, and environmentally sound manner at LANL. At the same time, NNSA should also take advantage of the opportunity to consolidate like activities for the purpose of operational efficiency, and it might be prudent to provide extra space for future modifications or additions to existing capabilities.

1.4 THE PROPOSED ACTION AND SCOPE OF THE *CMRR EIS*

NNSA proposes to relocate LANL AC and MC, and associated research and development capabilities that currently exist primarily at the CMR Building, to a newly constructed facility, and to continue to perform those operations and activities at the new facility for the reasonably foreseeable future (for the purposes of this EIS, the operations are assessed for a 50-year operating period). As shown in **Figure 1–2**, the *CMRR EIS* evaluates construction of a new CMRR Facility at TA-55 as the Preferred Alternative, a "Greenfield" Site Location Alternative at TA-6, two "Hybrid" Alternatives, and the No Action Alternative.

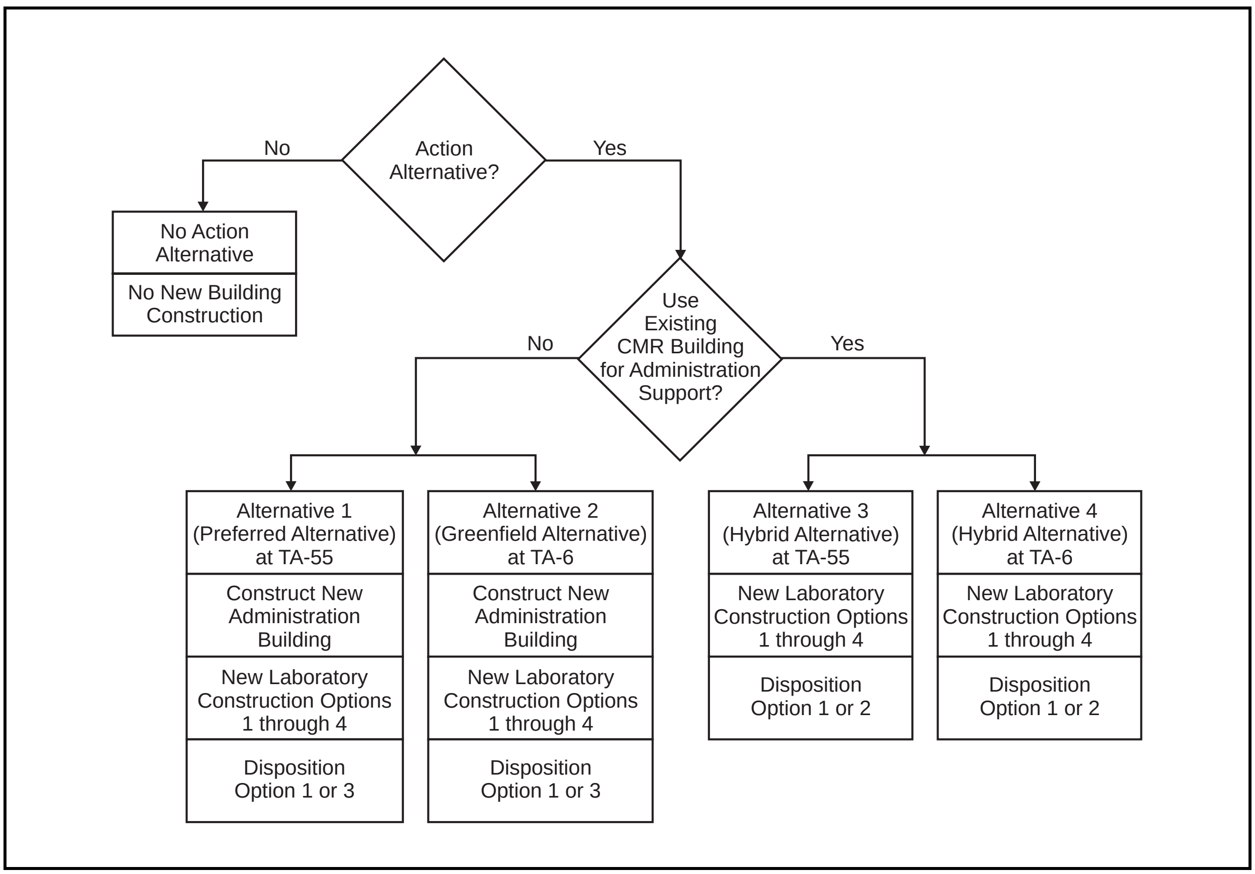


Figure 1B2 Alternatives and Options Evaluated in Detail in the *CMRR EIS*

NNSA's Preferred Alternative (Alternative 1) is to construct two to three new buildings within TA-55 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 in the 1999 *LANL SWEIS*. This alternative also includes construction of a parking area(s) and other infrastructure support facilities. AC and MC capabilities would be moved from the existing CMR Building into the new buildings using a phased approach, and operations would resume there in a staged manner (there would be a period of operational overlap between the old CMR Building and the new CMRR Facility), and the existing CMR Building would be dispositioned. One of the new buildings in TA-55 would provide administrative offices and house support activities. AC and MC activities would be conducted in either two separate laboratories (Construction Options 1 and 2) or in one new laboratory (Construction Options 3 and 4). The configuration of the laboratories has not been determined at this stage of the project, but will be driven by safety, security, cost and operational efficiency parameters to be evaluated during the conceptual design. As indicated in Figure 1–2, if an action alternative were selected for implementation, then construction of new laboratories would take place in either TA-55 or TA-6. The construction options are:

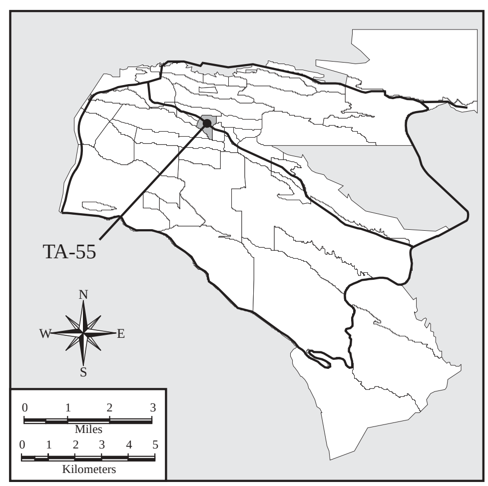
Construction Option 1: Build two separate laboratories above ground.

Construction Option 2: Build two separate laboratories, one below ground and one above ground.

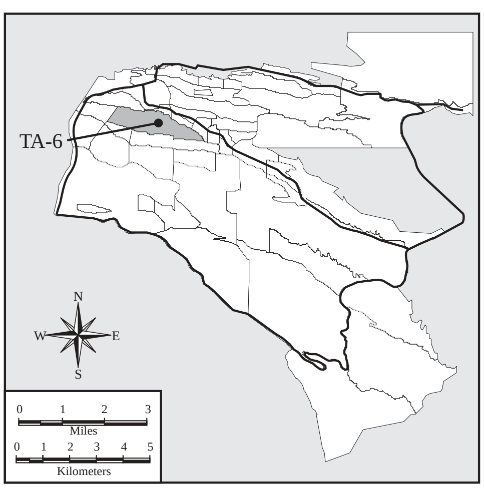
Construction Option 3: Build one consolidated laboratory above ground.

Construction Option 4: Build one consolidated laboratory below ground.

If a single new laboratory were constructed, it would be designated a Hazard Category 2 nuclear facility, and all AC and MC activities would be conducted in one building. If two new laboratories were constructed, one of the new buildings would be designated a Hazard Category 2 nuclear facility and the other designated a Hazard Category 3 nuclear facility. This EIS will evaluate the environmental impacts that could result from constructing the Hazard Category 2 building aboveground and also belowground level. This EIS will also include an evaluation of environmental impacts that could result from construction of tunnels to connect the new buildings, SNM storage vaults, utility structures, security structures, and the construction of parking space for occupants of the new CMRR Facility.



TA-55 Site



TA-6 Site

An alternative site for the new CMRR Facility will also be analyzed in this EIS – namely, constructing the new CMRR Facility within TA-6; this alternative is referred to as the “Greenfield” Site Alternative. The TA-6 site is a relatively undeveloped, forested area with some prior disturbance in limited areas. The construction options are the same as those described for the Preferred Alternative.

Two other "Hybrid" Alternatives are analyzed in this EIS, 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 could be decommissioned, decontaminated, or demolished. A new CMRR Facility laboratory building or buildings would be constructed in either TA-55 (Alternative 3) or TA-6 (Alternative 4) with the same construction options.

Disposition analyses for the existing CMR Building under each of the action alternatives shown in Figure 1–2 would include:

Disposition Option 1: reuse of the building for administrative and other activities appropriate to the physical conditions of the structure, with the performance of necessary structural and systems upgrades and repairs.

Disposition Option 2: decontamination, decommissioning, and demolition of selected parts of the existing CMR Building, with some portions of the Building being reused.

Disposition Option 3: decontamination, decommissioning, and demolition of the entire existing CMR Building.

The No Action Alternative would involve the continued use of the existing CMR Building with minimal routine maintenance and 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 construction would be undertaken.

This EIS provides an evaluation of potential direct, indirect, and cumulative environmental impacts that could result from relocating existing AC and MC capabilities from the CMR Building to TA-55 (the Preferred Alternative). The *CMRR EIS* will also provide the analyses of direct and indirect impacts that could result from implementing the various action alternatives identified and the No Action Alternative. These alternatives were developed by a team of NNSA and LANL staff who evaluated various criteria and site locations at LANL. The selection criteria for siting considered security issues, infrastructure availability, environmental issues, safety and health infrastructure, and compatibility between sites and CMR capabilities. The alternatives analyzed in this EIS are described in greater detail in Chapter 2.

1.5 DECISIONS TO BE SUPPORTED BY THE *CMRR EIS*

The analyses of environmental impacts that could occur if NNSA implemented the Preferred Alternative evaluated in this *CMRR EIS* will provide NNSA's decision maker (in this case the Administrator of NNSA) with important environmental information for use in the overall decision-making process. The decisions to be made by the NNSA decision maker regarding the CMRR project are:

- Whether to construct a new CMRR Facility to house AC and MC capabilities at LANL
- Whether to construct a new building to house administrative offices and support functions in conjunction with the new laboratory facilities
- Whether to locate the new CMRR Facility building(s) at TA-55 next to the existing structures that house LANL plutonium capabilities, or to locate the CMRR Facility building(s) within TA-6, which is a “greenfield” site
- Whether to construct the new CMRR Facility with one large laboratory that would house both the Hazard Category 2 and 3 capabilities, or with two separate laboratory buildings, one to house Hazard Category 2 capabilities and one to house Hazard Category 3 capabilities
- Whether to construct the new Hazard Category 2 laboratory as an aboveground structure or a belowground structure
- What to do with the existing CMR Building if new CMRR Facility laboratories are constructed.

Other considerations, in addition to the environmental impact information provided by this EIS, that are not evaluated in this EIS, will also influence NNSA’s final CMRR project decisions. These considerations include cost estimate information, schedule considerations, safeguards and security concerns, and programmatic considerations of impacts. In accordance with the Council on Environmental Quality’s NEPA-implementing regulations (40 CFR 1500 through 1508): “1500.1 Purpose. …(c) Ultimately, of course, it is not better documents but better decisions that count. NEPA's purpose is not to generate paperwork – even excellent paperwork – but to foster excellent action. The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment. These regulations provide the direction to achieve this purpose.”

There are decisions related to the CMR capabilities and activities at LANL that the NNSA Administrator will not make based on the Final *CMRR EIS* analysis. These include the following:

NNSA will not make a decision to remove mission support assignments of CMR capabilities from LANL or to alter the operational level of these capabilities. CMR capabilities were a fundamental component of Project Y during the Manhattan Project era, and the decision to facilitate 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 supporting and to expand CMR capabilities at LANL after World War II; and 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 SS&M program and made programmatic decisions at that time that required the retention of CMR capabilities at LANL (see later discussion of the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* in Section 1.6.1.3 of this EIS). In 1999, DOE, through its *LANL SWEIS* analyses, concluded that specific decisions regarding the replacement of the CMR Building for its continued operations and capabilities support were not then ready to be made because of a lack of information regarding the proposal(s). With the support of the *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. Having made these critical decisions within the past 7 years, NNSA will not revisit decisions at this time related to the maintenance of CMR capabilities at LANL to support critical NNSA missions.

NNSA will not make a decision on other elements or activities that have been recently undertaken associated with the LANL "Integrated Nuclear Planning" initiative. During 2000 to 2001, NNSA initiated planning activities associated with the CMRR project to address long-term AC and MC mission support beyond the year 2010, consistent with the strategy for managing the operation of the CMR Building. During this same timeframe, UC at LANL was implementing or initiating other activities, including identification of potential upgrades to the existing Plutonium Facility, campaigns for pit[3] manufacturing and certification, planned safeguards and security system upgrades, and the proposed relocation of TA-18 capabilities. Such actions were undertaken to address safeguards and security upgrades, operational inefficiencies, and long-term facilities infrastructure requirements related to or affecting LANL nuclear facilities. Recognizing the need for CMRR to be integrated with other contemplated actions, near and long term, affecting the nuclear mission capabilities at LANL, NNSA and UC at LANL developed the Integrated Nuclear Planning (INP) process. INP is intended to provide an integrated, coordinated plan for the consolidation of LANL nuclear facility construction, refurbishment and upgrade, and retirement activities. As such, INP is a planning process, not an overarching construction project, and is a tool used by NNSA and UC at LANL to ensure effective, efficient integration of multiple, distinct stand-alone projects and activities related to or affecting LANL nuclear facilities capabilities. As individual elements or activities associated with INP become mature for decision and implementation, each element and activity moves ahead in the planning, budgeting, and NEPA compliance process on its own merits.

NNSA's overall concept for TA-55 would have it contain all or at least most of the Security Category I nuclear operations needed for LANL operations. To that end, however, are the following considerations: the various potential LANL Security Category I nuclear facilities are independent of one another in terms of their programmatic utility to DOE and NNSA; these Security Category I nuclear facilities are also independent of one another in terms of their individual operations and the capabilities they house; the existing structures are of differing ages and therefore replacement of the aging structures would become necessary at different times; the construction of major facilities within a relatively tight area would require they be staggered so that the area could physically accommodate the necessary construction laydown sites and needed storage areas; and the additional security elements required for the construction and startup of

[3]*The central core of a primary assembly in a nuclear weapon, typically composed of plutonium-239 and/or highly enriched uranium (HEU), and other materials.*

operations in Hazard Category 2 nuclear facilities predicates the need for their separate construction in terms of scheduling.

NNSA recently completed an EIS for relocating LANL's TA-18 capabilities and materials and decided to move Security Category I and II capabilities and materials to another DOE site away from LANL (see discussion in Section 1.6.1.13 regarding the *Final Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory*). NNSA is separately considering the construction and operation of a pit manufacturing facility on a scale greater than can currently be accommodated in existing facilities at LANL, and is considering LANL's TA-55 as a possible site (though it is not currently identified as the preferred site location). (See additional discussion regarding this proposal and its associated NEPA compliance analyses in Section 1.6.2.1).

1.6 Related National Environmental Policy Act Reviews

This section explains the relationship between the *CMRR EIS* and other relevant NEPA compliance impact analyses documents and NNSA programs. Completed NEPA compliance analyses are addressed in Section 1.6.1; ongoing NEPA compliance analyses are discussed in Section 1.6.2; and the relationships to other LANL proposals are discussed in Section 1.6.3.

1.6.1 Completed NEPA Compliance Actions

1.6.1.1 *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 the *Environmental Assessment for the Proposed CMR Building Upgrades at the Los Alamos National Laboratory,* Los Alamos, New Mexico (DOE 1997a). DOE prepared this environmental assessment (EA) to analyze the effects that could be expected from performing various necessary extensive structural modifications and systems upgrades at LANL's existing CMR Building. Changes to the Building included structural modifications needed to meet 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 CMR Building Upgrades project on February 11, 1997.

As mentioned earlier in Chapter 1 of this EIS, these upgrades were intended to extend the useful life of the CMR Building an additional 20 to 30 years. However, late in 1997 and on 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 Building would be much more expensive and time consuming than had been anticipated and would be marginally effective in providing the required operational risk reduction and program capabilities 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 about the year 2010. CMR Building operations and capabilities are currently being restricted due to safety and security constraints; the Building is not operational to the full extent needed to meet DOE NNSA requirements established in 1999 for the then foreseeable future over the next 10 years. In addition, continued support of LANL's existing and evolving mission roles is anticipated to require additional capabilities such as the ability to handle large containment vessels in support of dynamic experiments. The continued adequate, safe, and secure housing of these operational and capability requirements beyond the year 2010 is the subject of this EIS.

1.6.1.2 *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement* (DOE/EIS-0240)

In June 1996, DOE issued the *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement* (DOE 1996a). DOE prepared this EIS because of the need to move rapidly to neutralize the proliferation threat of surplus highly enriched uranium and to demonstrate the U.S. commitment to nonproliferation. Alternatives considered included several approaches to blending down the highly enriched material to make it non-weapons-usable and suitable for fabrication into fuel for commercial nuclear reactors. In the Record of Decision, published in the *Federal Register* on August 5, 1996 (61 FR 40619), DOE stated that it would implement a program that would blend as much as 85 percent of the surplus highly enriched uranium to a uranium-235 enrichment level of approximately 4 percent for commercial use and blend the remaining surplus highly enriched uranium down to an enrichment level of about 0.9 percent for disposal as low-level radioactive waste. Highly enriched uranium used in support of ongoing CMR activities could be dispositioned, when necessary, using material management methods described in the *Highly Enriched Uranium EIS*.

1.6.1.3 *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (DOE/EIS-0236)

In September 1996, DOE issued the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (DOE 1996b). This Programmatic Environmental Impact Statement (PEIS) 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 stewardship portion of the document analyzed the development of three new facilities to provide enhanced experimental capabilities. The Record of Decision was published in the *Federal Register* on December 26, 1996 (61 FR 68014). In the Record of Decision, DOE elected to downsize a number of weapons complex facilities, build the National Ignition Facility at Lawrence Livermore National Laboratory, and reestablish pit fabrication capability at LANL. A supplemental analysis (DOE/EIS-0236-SA, September 1999) was prepared to examine the plausibility of a building-wide fire at LANL's Plutonium Facility and to examine new studies regarding seismic hazards at LANL. The supplemental analysis concluded that there is no need to prepare a supplemental EIS. The impacts of this action have been included in the baseline assessment and are included 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 support the stockpile stewardship mission addressed in the *Stockpile and Stewardship Management EIS.*

1.6.1.4 *Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE/EIS-0200-F)

In May 1997, DOE issued the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE 1997b). This PEIS examined the potential environmental and cost impacts of strategic management alternatives for managing five types of radioactive and hazardous wastes resulting from nuclear defense and research activities at sites around the United States. The five waste types are low-level mixed waste, low-level radioactive waste, transuranic waste, high-level radioactive waste, and hazardous waste. This PEIS provided information on the impacts of various siting alternatives that DOE would use to decide at which sites to locate additional treatment, storage, and disposal capacity for each waste type. This information included the cumulative impacts of combining future siting configurations for the five waste types and the collective impacts of other past, present, and reasonably foreseeable future capabilities.

The selective waste management facilities considered for the five waste types were treatment and disposal facilities for low-level mixed waste, treatment and disposal facilities for low-level radioactive waste, treatment and storage facilities for transuranic waste in the event that treatment is required before disposal, storage facilities for canisters of treated (vitrified) high-level radioactive waste, and treatment of nonwastewater hazardous waste by DOE and commercial vendors. In addition to the no action alternative, which included only existing or approved waste management facilities, the alternatives for each of the five waste type configurations included decentralized, regionalized, and centralized alternatives for using existing and operating new waste management facilities. However, the siting, construction, and operation of any new facility at a selected site would not be decided until completion of a sitewide or project-specific environmental review.

DOE published four decisions from this PEIS. In its Record of Decision for the Treatment and Management of Transuranic Waste published in the *Federal Register* (63 FR 3629) and subsequent revisions to this Record of Decision (65 FR 82985, 66 FR 38646, and 67 FR 56989, respectively), 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 onsite until it could be shipped to the Waste Isolation Pilot Plant in Carlsbad, New Mexico, for disposal.

In the second Record of Decision published in the *Federal Register* (63 FR 41810), DOE decided to continue using offsite facilities for the treatment of major portions of the nonwastewater hazardous waste generated at DOE sites. This decision did not involve any transfers of nonwastewater hazardous waste among DOE sites.

In the third Record of Decision, published in the *Federal Register* on August 26, 1999 (64 FR 46661), DOE decided to store immobilized high-level radioactive waste in a final form at the site of generation [Hanford, Idaho National Engineering and Environmental Laboratory (INEEL), Savannah River Site (SRS), and the West Valley Demonstration Project] until transfer to a geologic repository for ultimate disposal.

DOE addressed the management and disposal of low-level and mixed radioactive waste in a fourth Record of Decision, published in the *Federal Register* on February 25, 2000 (65 FR 10061). In this Record of Decision, DOE decided to perform minimal treatment of low-level radioactive waste at all sites and continue, to the extent practicable, disposal of onsite low-level radioactive waste at INEEL, LANL, the Oak Ridge Reservation, and SRS. DOE decided to treat mixed low-level radioactive waste at the Hanford Site, INEEL, the Oak Ridge Reservation, and SRS, with disposal at the Hanford Site and the Nevada Test Site (NTS). Radioactive and hazardous wastes generated by current and future CMR operations at LANL would continue to be managed in accordance with these Records of Decisions and amended decisions.

1.6.1.5 *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory*, Los Alamos, New Mexico (DOE/EIS-0238)

In January 1999, DOE issued the *LANL SWEIS* (DOE 1999a). This document assessed four alternatives for the operation of LANL: (1) No Action, (2) Expanded Operations, (3) Reduced Operations, and (4) Greener Alternative. The Record of Decision for the *LANL SWEIS* was published in the *Federal Register* on September 20, 1999 (64 FR 50797). In the Record of Decision, DOE selected the Expanded Operations Alternative with reductions to certain weapons-related work. The Expanded Operations Alternative described in the *LANL SWEIS* analyzed the impacts from the continuation of all present activities at LANL, at the highest level of activity. The Record of Decision states that operations at the CMR Building would continue and increase by approximately 25 percent over past No Action operational levels. The effects from the Expanded Operations Alternative level of activity at LANL are discussed in Chapter 4, “Environmental Consequences,” of the *LANL SWEIS*, and have been included in the assessment of baseline conditions at LANL for the proposed action alternatives presented in this EIS.

The No Action Alternative assessed in this EIS is consistent with the Preferred Alternative identified in the *LANL SWEIS* and its associated Record of Decision. However, as a result of continued reductions in the CMR Building's operational capacity due to the structural deterioration caused by aging and the need to ensure compliance with safety requirements for that building, the No Action Alternative no longer allows UC at LANL to fully meet NNSA's CMR mission requirements at LANL. The No Action Alternative analyzed in the *CMRR EIS* reflects the current reduced level of operations at the CMR Building.

1.6.1.6 *Surplus Plutonium Disposition Final Environmental Impact Statement* (DOE/EIS-0283)

In November 1999, DOE issued the *Surplus Plutonium Disposition Final Environmental Impact Statement*, (DOE 1999d), an EIS that was tiered from the *Storage and Disposition of Weapons-Usable Fissile Materials Programmatic Environmental Impact Statement* (DOE/EIS-0229). The Record of Decision for the PEIS, published in the *Federal Register* on January 14, 1997 (62 FR 3014), outlined DOE’s approach to plutonium disposition and established the groundwork for the *Surplus Plutonium Disposition EIS*. The fundamental purpose of the program is to ensure that plutonium produced for nuclear weapons and declared excess to national security needs (now and in the future) will never again be used for nuclear weapons.

The *Surplus Plutonium Disposition EIS* evaluated reasonable alternatives for the siting, construction, and operation of facilities required to implement DOE's disposition strategy for up to (50 metric tons) of surplus plutonium. The disposition facilities analyzed in the *Surplus Plutonium Disposition EIS* included pit disassembly and conversion, plutonium conversion and immobilization, and mixed oxide fuel fabrication. The *Surplus Plutonium Disposition EIS* also analyzed the potential impacts of fabricating a limited number of mixed oxide fuel assemblies for testing in a reactor.

In the Record of Decision, published in the *Federal Register* on January 11, 2000 (65 FR 1608), DOE decided to provide for the safe and secure disposition of surplus plutonium as mixed oxide fuel through immobilization. On April 19, 2002 (67 FR 19432) DOE/NNSA amended the Records of Decision for the *Storage and Disposition of Weapon's-Usable Fissile Materials PEIS* and *Surplus Plutonium Disposition EIS*. This Amended Record of Decision announced the cancellation of the immobilization portion of the disposition strategy as well as changes to NNSA's strategy for long term storage of surplus pit and nonpit plutonium. Plutonium used in support of ongoing CMR activities could be dispositioned, when necessary, using material management methods described in the *Surplus Plutonium Disposition EIS*.

1.6.1.7 *Special Environmental Analysis for the Department of Energy, National Nuclear Security Administration: Actions Taken in Response to the Cerro Grande Fire at Los Alamos National Laboratory*, Los Alamos, New Mexico (DOE/SEA-03)

In September 2000, NNSA issued this special environmental analysis (SEA) to document their assessment of the impacts of emergency activities conducted at LANL in response to the Cerro Grande wildfire. In May 2000, the wildfire burned 7,684 acres (3,110 hectares) within the boundaries of LANL and an additional 35,446 acres (14,345 hectares) in neighboring areas (DOE 2000b). As a result, NNSA took emergency action to protect the lives of its employees, contractors, and subcontractors, and other people living and working in the LANL region, their property, and the environment.

The urgent nature of the actions required in response to the Cerro Grande Fire precluded compliance with NEPA in the usual manner, so NNSA invoked the emergency circumstances clause of both the Council on Environmental Quality's NEPA-implementing regulations (40 CFR 1506.11) and DOE's NEPA-implementing regulations (10 CFR 1021.343). The SEA assessed the impacts that resulted from actions undertaken by NNSA (or on behalf of NNSA or with NNSA funding) to address the emergency situation. The SEA described actions and their impacts, mitigation measures taken for actions that rendered their impacts not significant or that lessened the adverse effects, and an analysis of cumulative impacts. Actions not included in the SEA will be the subject of other NEPA reviews and analyses. Actions taken in response to the SEA are discussed in Chapter 3, "Affected Environment," and have been included in the baseline conditions for the No Action Alternative in the *CMRR EIS*.

1.6.1.8 *Environmental Assessment for the Proposed Construction and Operation of a New Interagency Emergency Operations Center at Los Alamos National Laboratory*, Los Alamos, New Mexico (DOE/EA-1376)

In July 2001, NNSA issued the *Environmental Assessment for the Proposed Construction and Operation of a New Interagency Emergency Operations Center at Los Alamos National Laboratory*, Los Alamos, New Mexico (DOE 2001). The purpose for this EA was to evaluate the impacts of the construction and operation of a new Interagency Emergency Operations Center (Center) at TA-69 at LANL. The new Center will include a 30,000-square-foot (2,700-square-meter) facility, a garage, a 130-car parking lot, and a 150-foot-tall (45-meter) fire suppression water storage tank with antenna attachments on about a 5-acre (2-hectare) site. The new Center will be designed as a state-of-the-art multi-use facility housing about 30 full-time UC and Los Alamos County (or their contractor) staff. Under normal operating conditions, the facility will serve as the County fire, police, and 911-dispatch center and the administrative offices for the LANL Emergency Management and Response staff. Up to about 120 Federal, state, local, and tribal representatives may also be accommodated at the Center in the event of an emergency on the general scale of the May 2000 Cerro Grande Fire. The new Center will be designed to meet and withstand, to the extent practical, any anticipated emergency such that emergency response actions will likely not be compromised by the emergency itself. The Finding of No Significant Impact was signed on July 26, 2001. The effects of this action are factored into the assessment of potential cumulative impacts at LANL in the *CMRR EIS*.

1.6.1.9 *Environmental Assessment of the Proposed Disposition of the Omega West Facility at Los Alamos National Laboratory*, Los Alamos, New Mexico (DOE/EA-1410)

In March 2002, NNSA issued the *Environmental Assessment of the Proposed Disposition of the Omega West Facility at Los Alamos National Laboratory*, Los Alamos, New Mexico (DOE 2002a). This EA was prepared to analyze the environmental consequences of removing the Omega West Facility and the remaining support structures from Los Alamos Canyon. The Proposed Action included the characterization, decontamination of structures (the removal of radiological and chemical contamination to minimize the amount of waste disposed), and the demolition of structures (including the reactor vessel); the segregation, size reduction, packaging, transportation, and disposal of wastes; and removal of several feet of potentially contaminated soil from beneath the Omega West Facility. Under the Proposed Action, two waste disposal options were evaluated. One would involve the transportation of up to 330 covered truckloads [approximately 144,000 cubic feet (4,080 cubic meters)] of radioactive low-level waste to another disposal site or a commercial facility. The other option would involve managing the low-level waste onsite at LANL at TA-54, Area G.

A Phased Removal Alternative was also considered involving similar decontamination and demolition actions as the Proposed Action to ensure the safe removal and disposal of waste resulting from the immediate removal of the support buildings and structures. In the Phased Removal Alternative, the demolition of the reactor vessel and Room 101 of Building 2-1, which houses the empty reactor vessel, would be conducted at an undetermined time in the future before 2025. The Finding of No Significant Impact for the Proposed Action was signed on

March 28, 2002. The effects of this action are factored into the assessment of potential cumulative impacts at LANL in the *CMRR EIS*.

1.6.1.10 *Environmental Assessment for the Proposed Future Disposition of Certain Cerro Grande Fire Flood and Sediment Retention Structures at Los Alamos National Laboratory*, Los Alamos, New Mexico (DOE/EA-1408)

In August 2002, NNSA issued the *Environmental Assessment for the Proposed Future Disposition of Certain Cerro Grande Fire Flood and Sediment Retention Structures at Los Alamos National Laboratory,* Los Alamos, New Mexico (DOE 2002c). This EA was prepared to analyze the environmental consequences resulting from future disposition of certain flood retention structures built within the boundaries of LANL in the wake of the Cerro Grande Fire. In May 2000, a prescription burn, started on Federally-administered land to the northwest of LANL, blew out of control and was designated as a wildfire. This wildfire, which became known as the Cerro Grande Fire, burned approximately 7,650 acres (3,061 hectares) within the boundaries of LANL. During the fire, a number of emergency actions were undertaken by DOE and NNSA to suppress and extinguish the fire within LANL. Immediately thereafter, NNSA undertook additional emergency actions to address the post-fire conditions. Due to hydrophobic soils (nonpermeable soil areas created as a result of very high temperatures often associated with wildfires) and the loss of vegetation from steep canyon sides caused by the fire, surface runoff and soil erosion on hillsides above LANL were greatly increased over prefire levels. The danger to LANL facilities and structures and homes located down-canyon from the burned area was magnified.

NNSA constructed certain flood and sediment detention structures in the wake of the Cerro Grande Fire as part of its emergency response actions. These structures were built to address the changes in local watershed conditions that resulted from the fire. The long-term disposition of these structures was not considered as part of the decision to undertake the construction actions. Watershed conditions are expected to return to a prefire status or approximate the prefire condition over the next 3 to 8 years. NNSA needs to take actions regarding the disposition of these structures when they are no longer necessary to protect LANL facilities and the businesses and homes located downstream. The structures addressed in this EA are: (1) a flood retention structure constructed of roller-compacted concrete located in Pajarito Canyon; (2) a low-head weir, constructed of rectangular rock-filled wire cages (gabions), and associated sediment detention basin in Los Alamos Canyon; (3) reinforcements of four road crossings, including a land bridge along Anchor Ranch Road in Two-Mile Canyon and State Road 501 embankment reinforcements at Two-Mile Canyon, Pajarito Canyon, and Water Canyon; and (4) a steel diversion wall upstream of TA-18 in Pajarito Canyon.

The Proposed Action is to remove part of the above ground portion of the flood retention structure, including gabions that are currently being installed along the downstream channel. Design studies would be performed at the time of removal to determine the channel width needed and the required slope. At the end of the partial flood retention structure removal, the streambed would be graded, the remaining sides of the flood retention structure would be stabilized, and the banks would be reseeded. The Proposed Action would also include removal of the access road in order for that part of the canyon wall to be recontoured and stabilized if TA-18 facilities remain in place; if TA-18 facilities are relocated, this access road might remain in place. The area would be monitored and maintained to prevent erosion of the slopes and damage to the floodplain and downstream wetlands. The Proposed Action also includes removal of the entire above ground portions of the steel diversion wall at TA-18. Any removal of the two identified structures would not occur until after the Pajarito watershed has returned to prefire conditions, or the local ecosystem has recovered enough to approximate a prefire condition. The Proposed Action would leave the other subject structures in place with continued performance of routine maintenance activities. The Finding of No Significant Impact was signed on August 7, 2002. The effects of this action are factored into the assessment of potential cumulative impacts at LANL in the *CMRR EIS*.

1.6.1.11 *Environmental Assessment for Proposed Access Control and Traffic Improvements at Los Alamos National Laboratory*, Los Alamos, New Mexico (DOE/EA-1429)

In August 2002, NNSA issued the *Final Environmental Assessment for Proposed Access Control and Traffic Improvements at Los Alamos National Laboratory*, Los Alamos, New Mexico (DOE 2002d). This EA was prepared to analyze the environmental consequences resulting from the construction of eastern and western bypass roads around the LANL TA-3 area and the installation of vehicle access controls and related improvements to enhance security along Pajarito Road and in the LANL core area. This Proposed Action would modify the current roadway network and traffic patterns. It would also result in traversing Areas of Environmental Interest identified in the *LANL Habitat Management Plan*, demolition of part of an historic structure at Building 3-40, and traversing several potential release sites and part of the Los Alamos County landfill. The Finding of No Significant Impact was signed on August 23, 2002. The effects of this action are factored into the assessment of potential cumulative impacts at LANL in the *CMRR EIS*.

1.6.1.12 *Environmental Assessment for the Installation and Operation of Combustion Turbine Generators at Los Alamos National Laboratory*, Los Alamos, New Mexico (DOE/EA-1430)

In December 2002, NNSA issued a final EA and a Finding of No Significant Impact for a proposal to install and operate two new simple-cycle, gas-fired combustion turbine generators (CTGs), each with an approximate output of 20 megawatts of electricity, as stand-alone structures within the Building-22 Co-generation Complex at TA-3 (DOE 2002g). Installation of the CTGs will occur consecutively and will include installation of two new compressors to provide the gas pressure required for operation of the CTGs. The project will consider two options: (Option A) installation of two CTGs (CTG 1 and CTG 2) that would be used long term as simple-cycle, gas-fired turbine generators without cogeneration capabilities, and (Option B) installation and subsequent conversion of one or both of the installed CTGs from simple-cycle operation to combined-cycle cogeneration at some future date. In addition to these two options for installing and operating the proposed CTGs, the existing steam turbines in the TA-3 Cogeneration Complex will be maintained and refurbished and will continue to be operated long term with the CTGs. The contributory effects of this action are factored into the assessment of potential cumulative impacts at LANL in the *CMRR EIS*.

1.6.1.13 *Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory* (DOE/EIS-319)

In August 2002, NNSA issued the *Final Environmental Impact Statement for the Proposed Relocation of Technical 18 Capabilities and Materials at the Los Alamos National Laboratory* (*TA-18 Relocation EIS*) (DOE 2002e). This EIS evaluated the potential impacts of relocating criticality experiment capabilities and SNM from TA-18, a facility at LANL that supports defense and national security missions. TA-18 is the nation's only facility currently capable of performing general-purpose nuclear materials handling for a variety of experiments, measurements, nonproliferation safeguards and arms control, and training. The *TA-18 Relocation EIS* evaluated the potential environmental impacts associated with relocating TA-18 capabilities and materials to the following alternative locations: (1) LANL's TA-55; (2) the Device Assembly Facility at NTS (the Preferred Alternative); (3) TA-V at the Sandia National Laboratories/New Mexico (SNL/NM); and (4) the Argonne National Laboratory-West (ANL-W), located near Idaho Falls, Idaho. In addition, the *TA-18 Relocation EIS* also evaluated the No Action alternative of maintaining the capabilities and materials at the present TA-18 location as described in the *LANL SWEIS*, and upgrading these existing facilities to meet current and future DOE environmental safety and health requirements.

In the Record of Decision, published in the *Federal Register* on December 31, 2002 (67 FR 251), DOE decided to relocate TA-18 Security Category I and II capabilities and materials to the Device Assembly Facility at NTS. The contributory effects of ongoing activities at TA-18 have been included in the conditions described for LANL in Chapter 3, "Affected Environment," and are included in the potential cumulative impacts resulting from the *CMRR EIS* proposed action.

1.6.2 Ongoing NEPA Compliance Actions

1.6.2.1 *Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility* (DOE/EIS-0236-S2)

In September 2002, NNSA issued a Notice of Intent on September 23, 2002 in the *Federal Register* (67 FR 59577) to prepare a *Supplemental Programmatic Environmental Impact Statement on Stockpile Stewardship and Management for a Modern Pit Facility* (MPF) in order to decide: (1) whether to proceed with the MPF; and (2) if so, where to locate the MPF.

NNSA is responsible for the safety and reliability of the U.S. nuclear weapons stockpile, including protection of production readiness to maintain that stockpile. Since 1989, DOE has been without the capability to produce plutonium pits (the portion of a nuclear weapon that generates the fission energy to drive modern thermonuclear weapons). NNSA, the Department of Defense (DoD), and Congress have highlighted the lack of long-term pit production capability as a national security issue requiring timely resolution. While an interim capability is currently being established at LANL, classified analyses indicate that this capability will not suffice for long-term maintenance of the nuclear deterrent that is a cornerstone of U.S. national security policy.

Consistent with the 1996 *SSM PEIS* Record of Decision (61 FR 68014) and the 1999 *LANL SWEIS* Record of Decision (64 FR 50797), NNSA has been reestablishing a small pit manufacturing capability at LANL. The establishment of the interim pit production capacity is expected to be completed in 2007. However, classified analyses indicate that the capability being established at LANL will not support either the projected capacity requirements (number of pits to be produced over a period of time), or the agility (ability to rapidly change from production of one pit type to another, ability to simultaneously produce multiple pit types, or the flexibility to produce pits of a new design in a timely manner) necessary for long-term support of the stockpile. In particular, any systemic problems that might be identified in an existing pit type or class of pits (particularly any aging phenomenon) could not be adequately addressed today nor with the capability being established at LANL. Although no such problems have been identified, the potential increases as pits age. NNSA's inability to respond to such issues is a matter of national security concern. NNSA is responsible for ensuring that appropriate pit production capacity and agility are available when needed, and this Supplement to the *SSM PEIS* is being undertaken to assist NNSA in discharging this responsibility.

The CMRR Facility would provide AC and MC capabilities for existing mission support assignments at LANL that are expected to continue for the long-term. Such AC and MC capabilities are needed independent of the proposed action that will be analyzed in the *MPF EIS* for constructing and operating a new MPF at one of five DOE and NNSA sites across the county. The CMRR Facility could provide AC and MC support capabilities for pit manufacturing at LANL if a decision were made not to construct a new MPF and, instead, to continue to use LANL's existing capabilities and facilities for pit manufacturing (this possibility was explicitly analyzed in the *LANL SWEIS* Expanded Operations Alternative and is implicitly analyzed in this *CMRR EIS*). However, should a decision be made to construct a new MPF at LANL, the level of AC and MC support capabilities required for pit production capacities associated with the new MPF would be beyond LANL's pit production level capacity as described in the LANL SWEIS Expanded Operations Alternative and would also be beyond the level of pit manufacturing AC and MC support that would be provided by the new CMRR Facility. The conceptual design for a new MPF includes locating necessary support capabilities for AC and MC work within the MPF itself – the MPF would be a self-contained facility in that respect. The *MPF EIS* will, accordingly, analyze the direct environmental impacts of AC and MC capabilities for pit manufacturing associated with a new MPF for the various operational level options under consideration for that facility. The cumulative impact section (Section 4.8) provides an assessment of the environmental impacts of constructing and operating both the CMRR Facility and a new MPF at LANL (to the extent those impacts are known or can be currently estimated).

1.6.2.2 *Environmental Assessment for the Proposed Issuance of a Special Use Permit to the Incorporated County of Los Alamos for the Development and Operation of a New Solid Waste Landfill at Los Alamos National Laboratory*, Los Alamos, New Mexico (DOE/EA-1460)

In December 2002, NNSA determined the need to prepare an EA for a proposal by the Incorporated County of Los Alamos to develop and operate a new solid waste landfill within LANL for nonhazardous wastes. The wastes disposed of at this new landfill would be generated by LANL operations and by commercial and residential users within Los Alamos County. The existing Los Alamos County Landfill, also located within the LANL boundaries, would be closed and monitored. The existing landfill site would be used to recycle wastes and compact and bale wastes that could not be recycled. The baled wastes would be trucked periodically to the new landfill for disposal. The preparation of the EA is currently underway. The contributory effects of this action are factored into the assessment of potential cumulative impacts at LANL in the *CMRR EIS*.

1.6.2.3 *Environmental Assessment for Conversion of an Existing Building into a Proposed Radiography Facility at TA-55 at Los Alamos National Laboratory*, Los Alamos, New Mexico

In March 2002, NNSA identified its intent to prepare an EA regarding the renovation of Building 55-41, located within TA-55 at LANL, to accommodate x-ray generators and associated support equipment needed to perform nondestructive examinations of nuclear items and components. Currently, nuclear components and items are shipped from TA-55 to radiography facilities at TA-8 over a distance of approximately 4 miles (6.4 kilometers). This requires implementation of a rolling roadblock when the materials are transported, and set up of a temporary material accountability area at TA-8 while the nondestructive examination procedures take place. The proposed action would provide a more efficient nondestructive radiography capability to support stockpile stewardship and management programs at LANL, and eliminate the need for transport outside the security perimeters of TA-55 where nuclear items and components, including pits, are stored or managed. The preparation of this EA is currently underway. The contributory effects of this action are factored into the assessment of potential cumulative impacts at LANL in the *CMRR EIS*.

1.6.3 Relationships to Other LANL Projects

DOE routinely conducts planning activities at its sites to identify long-term strategies and options for maintaining infrastructure in support of various missions. As part of these efforts, potential projects or actions are identified as options for future consideration. Many of these projects never go beyond the initial planning phases due to various factors such as insufficient justification or inadequate funding.

In order to perform the necessary long-term integrated planning for nuclear facilities capabilities at LANL, NNSA and LANL staff have established the INP effort. As previously stated in Section 1.5, INP is chartered to provide an integrated, coordinated plan for the consolidation of LANL nuclear facility construction, refurbishment and upgrade, and retirement activities, including those of the proposed CMRR Facility. Security Category I nuclear operations at the CMR Building are discussed in Section 1.1. While proposals regarding CMR activities may fall within the scope of this plan along with other activities such as analytical chemistry, security, and pit manufacturing, NNSA has determined that the CMRR proposal must move forward independent of this broader planning effort to ensure continuous mission support. Many of the activities in this planning effort are in the preliminary phase of consideration and the efforts are too speculative at the present time for NEPA analysis and decision making. To the extent sufficient information is available, this *CMRR EIS* discusses the potential cumulative impacts from other reasonably foreseeable activities at LANL.

1.7 THE SCOPING PROCESS

As a preliminary step in the development of an EIS, regulations established by the Council on Environmental Quality (40 CFR 1501.7) and DOE require "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action." The purpose of this scoping process is: (1) to inform the public about a proposed action and the alternatives being considered, and (2) to identify and/or clarify issues that are relevant to the EIS by soliciting public comments.

On July 23, 2002, NNSA published a Notice of Intent in the *Federal Register* (67 FR 48160) to prepare the *CMRR EIS*. In this Notice of Intent, NNSA invited public comment on the *CMRR EIS* proposal. During the NEPA process, there are several opportunities for public involvement (see **Figure 1–3**). The Notice of Intent listed the issues initially identified by NNSA for evaluation in the EIS. 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 the EIS. The Notice of Intent informed the public that comments on the proposed action could be communicated via the U.S. Postal Service, a special DOE website on the Internet, a toll-free phone line, a toll-free fax line, and in person at public meetings to be held in the vicinity of LANL.

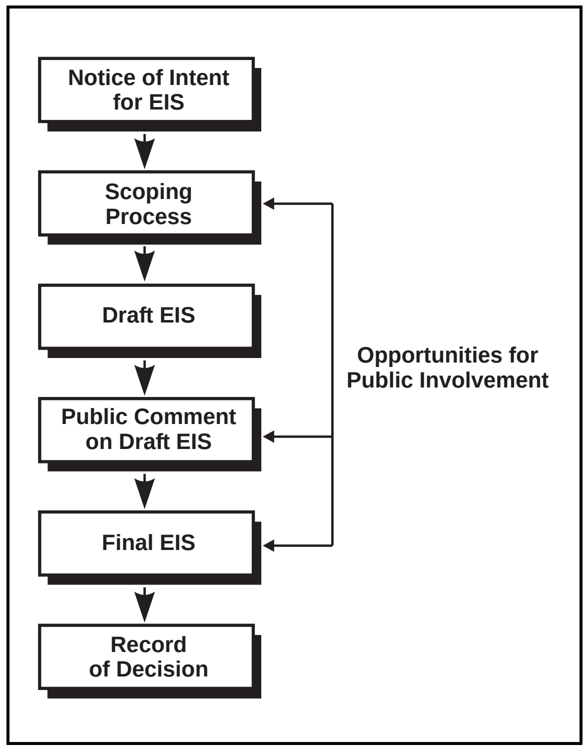


Figure 1B3 NEPA Process

Public scoping meetings were held on August 13, 2002, in Pojoaque, New Mexico and on August 15, 2002, in Los Alamos, New Mexico. As a result of previous experience and positive responses from attendees of other DOE NEPA public meetings and hearings, NNSA chose an interactive format for the scoping meetings. Each meeting began with a presentation by NNSA representatives who explained the proposed CMRR Facility project. Afterwards, the floor was opened to questions, comments, and concerns from the audience. NNSA representatives were available to respond to questions and comments. The proceedings and formal comments presented at each meeting were recorded verbatim, and a transcript for each meeting was produced. The public was also encouraged to submit written or verbal comments during the meetings, or to submit comments via letters, the DOE website, toll-free phone line, or toll-free fax line, until the end of the scoping period. All comments received during the scoping period were reviewed for consideration by NNSA in preparing this EIS.

It should be noted that, for EIS public scoping purposes, a comment is defined as a single opinion concerning a specific issue. An individual commentor's public statement may contain several such comments. Most of the verbal and written public statements submitted during the EIS scoping period contained multiple comments on various specific issues. These issues are summarized in the following section.

Summary of Major Comments

Approximately 75 comments were received from citizens, interested groups, and local officials during the public scoping period. Many of the verbal and written comments received addressed the need to identify the decontamination and decommissioning of the existing CMR Building, including expected waste streams and volumes, its impact upon the Low-Level Radioactive Solid Waste Disposal Facility (TA-54), and the transportation and security risks that would be associated with transferring any existing inventories of SNM. Additional waste management concerns expressed by commentors included the need to identify the types and volumes of waste generated by the proposed action; the facilities available at each site to treat, store, or dispose of the waste; and compatibility of the proposed action with state and Federal regulations.

Many of the comments also addressed the need for NNSA to describe in detail the existing CMR Building capabilities and processes versus those of the proposed replacement building, as well as the specific NNSA mission requirements supporting the purpose and need for the proposed action. In particular, comments addressed the design and cost of any buildings to be constructed or modified, need for handling containment vessels, validity of experiments to evaluate aging effects on weapons materials, and controls to limit releases to the environment.

Several comments addressed the need for NNSA to describe the relationship of the proposed action to the Stockpile Stewardship Program, other existing DOE NEPA documentation, and proposed new plutonium pit production facilities. In particular, commentors expressed concern over the potential for improper segmentation of analyses and the possible need for an *"integrated TA-55 EIS."*

Commentors also expressed concern about environmental, health, and safety risks associated with the new CMRR Facility operations. They requested that NNSA evaluate the potential consequences of the proposed action on the health and safety of area residents and address environmental justice issues, including the potential impacts to environmental, aesthetic, and cultural resources of adjacent Pueblo lands. Comments also suggested that the EIS quantify all radionuclides and chemicals used and emitted from the proposed replacement building. Concerns were raised about the safety and security of the facilities, including how NNSA would address possible acts of sabotage, and the risks associated with transferring SNM inventories between the existing CMR Building and the new CMRR Facility.

Major issues identified by NNSA during the scoping process were addressed in this EIS in the following areas:

- Land use and visual resources
- Site infrastructure
- Air quality and noise
- Water resources, including surface water and groundwater

- Geology and soils
- Ecological resources, including terrestrial resources, wetlands, aquatic resources, and threatened and endangered species
- Cultural and paleontological resources, including prehistoric resources, historic resources, and Native American resources
- Socioeconomics, including regional economic characteristics, demographic characteristics, housing and community services, and local transportation
- Environmental justice
- Radiological and hazardous chemical impacts during routine normal operations and accidents
- Waste management and pollution prevention
- Emergency preparedness and security

In addition to these areas, the EIS also addresses monitoring and mitigation, unavoidable impacts and irreversible and irretrievable commitment of resources, and impacts of long-term productivity.

2. PROJECT DESCRIPTION AND ALTERNATIVES

Chapter 2 begins with a brief summary description of the current and future support that the Los Alamos National Laboratory (LANL) analytical chemistry and materials characterization (AC and MC) capabilities are providing to the Stockpile Stewardship and Management Program (SS&M). It provides descriptions of the existing Chemistry and Metallurgy Research (CMR) Building and current AC and MC capabilities, as well as the proposed new Chemistry and Metallurgy Research Replacement Project (CMRR) Facility. The chapter includes a description of the reasonable alternatives, the alternatives considered and subsequently eliminated from detailed evaluations, the planning assumptions and bases for the analyses presented in the environmental impact statement (EIS), and the Preferred Alternative.

2.1 CURRENT AND FUTURE SUPPORT OF STOCKPILE STEWARDSHIP

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* (*SS&M PEIS*); the Record of Decision of which was published in the *Federal Register* (FR) on December 26, 1996 (61 FR 68014). Specific LANL assignments for the foreseeable future include production of War-Reserve (WR) products, assessment and certification of the nuclear weapons stockpile, surveillance of WR components and weapon systems, ensuring safe and secure storage of strategic materials, and management of excess plutonium inventories. In addition, LANL also supports actinide[1] science missions ranging from the plutonium-238 heat-source program for the National Aeronautics and Space Administration (NASA) to arms control and technology development.

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 (TA) 3 (primarily the CMR Building) and TA-55 (primarily the Plutonium Facility) that are used for processing, characterizing and storing of large quantities of special nuclear material (SNM). In addition, the DOE Record of Decision for the *SS&M PEIS* indicates that the Plutonium Facility and the CMR Building will require increased SNM storage and handling capabilities to support the pit fabrication mission. The operations in these key facilities, along with those in several support facilities, are critical to the SS&M mission and to critical programs supporting the DOE Offices of Science, Environmental Management, Nonproliferation and National Security, and Nuclear Energy, Science, and Technology.

[1] *Actinides are any of a series of elements with atomic numbers ranging from actinium-89 through lawrencium-103.*

In January 1999, NNSA approved a strategy for managing risks at the CMR Building. This strategy recognized that the 50-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. In addition, the strategy committed NNSA and the University of California (UC at LANL) to manage the facility to a planned end-of-life in or about the year 2010. Finally, it committed NNSA and UC at LANL to develop long-term facility and site plans to relocate CMR capabilities elsewhere in LANL, as necessary to maintain support of national security missions. Since this strategy was approved, CMR capabilities have been restricted substantially, both by planned NNSA actions and by unplanned facility outages that have included the operational loss of two of the eight wings of the CMR Building. With each year, 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 immediately to ensure that LANL can maintain its support of critical national security missions. The CMRR project seeks to relocate and consolidate mission-critical CMR capabilities at LANL to ensure continuous support of NNSA SS&M strategic objectives; these capabilities are necessary to support the current and future directed stockpile work and campaign activities at LANL beyond 2010. Given that such action is necessary, it is prudent to also establish any anticipated capabilities and capacities necessary for long-term mission support.

2.2 DESCRIPTION OF THE EXISTING CMR 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 was constructed between 1949 and 1952. In 1960, a new wing (Wing 9) was added for activities that must be performed in hot cells. The planned Wings 6 and 8 were never constructed. In 1986, an SNM storage vault was added underground. The three-story building now has eight wings (Wings 1, 2, 3, 4, 5, 7, 9 and an Administration Wing) connected by a spinal corridor and contains a total of 550,000 square feet (51,097 square meters) of space. It is a multiple-user facility in which specific wings are associated with different activities and is now the only LANL facility with full capabilities for performing SNM AC and MC. The Plutonium Facility at TA-55 provides support to CMR in the areas of materials control and accountability, waste management, and SNM storage.

Waste treatment and pretreatment conducted within the CMR Building is designed to meet waste acceptance criteria for receiving waste management and disposal facilities, onsite or offsite. 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 Radioactive Liquid Waste Treatment Facility (RLWTF) at TA-50 for treatment and disposal. The primary sources of radioactive inorganic waste at the CMR Building include laboratory sinks, duct washdown systems, and overflows and blowdowns from circulating chilled water systems.

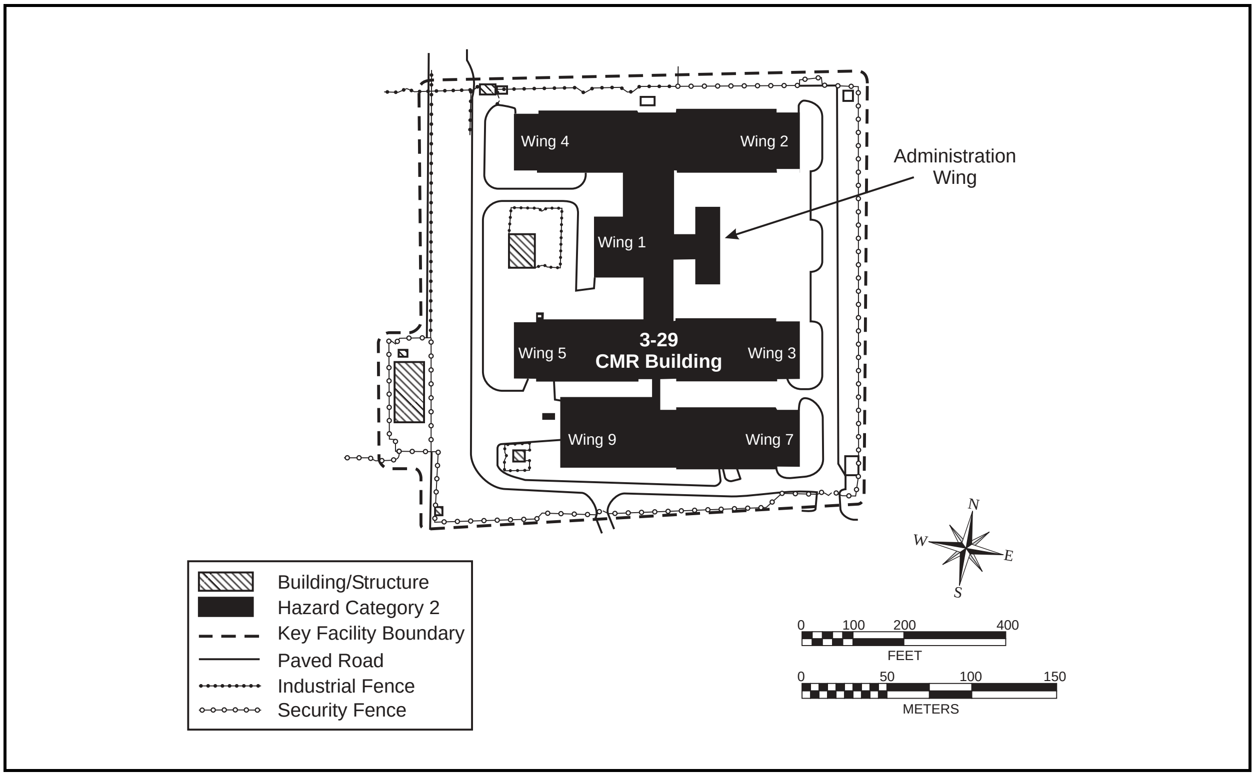


Figure 2–1 TA-3 Chemistry and Metallurgy Research Building

The CMR Building infrastructure is designed with air, temperature, and power systems that are operational nearly 100 percent of the time. Power to these systems is backed up with an uninterruptible power supply.

The CMR Building was constructed between 1949 and 1952 to the industrial 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 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 where the building cannot be operated at levels required to meet mission requirements without restrictions to activities and limits on material inventories. Although completed upgrades to the CMR Building will allow for continued safe nuclear operations at an acceptable level of risk through 2010, it cannot be relied upon to meet long-term mission support requirements beyond that timeframe. Major extensive upgrades to building structural and safety systems would be required to sustain nuclear operations. Furthermore, geologic studies and seismic investigations completed at LANL from 1996 through 1998 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. Upgrades to the structure of the CMR Building to address seismic code requirements were identified as being cost prohibitive.

The CMR Building was originally designated as a Hazard Category 2, Security Category II facility under the criteria contained in DOE-STD-1027-92 and DOE Order 474.1-1A. The Security Category designation of a facility is determined by the type, quantity, and attractiveness level 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 UC at LANL have restricted CMR Building operations and have reduced SNM quantities allowed within the Building. As a result, the CMR Building is currently operated as a Hazard Category 3, Security Category III facility. A Hazard Category 3 facility is designated as a nuclear facility for which a hazard analysis estimates the potential for only significant localized consequences.

2.2.2 Administrative Wing

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

2.2.3 Laboratories

Each CMR Building wing consists of basement, first, and second floors. 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 on 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 to the spinal corridor end of each wing. A large ventilation equipment room is located on the second floor of each wing adjoining the spinal corridor. Radiological labs contain gloveboxes and hoods required for individual processes. A radioactive liquid waste drainline system routes liquid waste from CMR Building laboratories to the RLWTF at TA-50.

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, radioactive material transfer area, 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 transferring 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 CMR 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-231, plutonium-238, and plutonium-239) is performed inside specialized ventilation hoods, hot cells (enclosed, shielded areas that safely facilitate the remote manipulation of radioactive materials), and gloveboxes (enclosed areas with protective gloves that facilitate the safe handling of hazardous materials). 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 *Site-Wide Environmental Impact Statement for the Continued Operation of the Los Alamos National Laboratory* (*LANL SWEIS*) described ongoing CMR Building capabilities at the time it was issued. Some of the capabilities are no longer performed at the CMR Building. The principal capabilities currently performed at the CMR Building are described below.

2.3.1 AC and MC

AC and MC capabilities in the CMR Building involve the study, evaluation, and analysis of radioactive materials. In general terms, analytical chemistry is that branch of chemistry that deals with the separation, identification, and determination of the components in a sample. Materials characterization relates to the measurement of basic material properties and the change in those properties as a function of temperature, pressure, or other factors. These 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, NNSA complex (such as the Hanford Reservation, Savannah River Site, and Sandia National Laboratories). Sample characterization activities include assay and determination of isotopic ratios of plutonium, uranium, and other radioactive elements; identification of major and trace elements in materials; the content of gases; constituents at the surface of various materials; and methods to characterize waste constituents in hazardous and radioactive materials.

2.3.2 Destructive and Nondestructive Analysis

Destructive and nondestructive analysis employs analytical chemistry, metallographic analysis, measurement on the basis of neutron or gamma radiation from an item, and other measurement techniques. These activities are used in support of weapons quality, 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 involves 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, 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.

2.3.4 Fabrication and Metallography

Fabrication and metallography at the CMR Building involves a variety of materials, including hazardous and nuclear materials. Much of this work is done with metallic uranium. A variety of parts, including targets, weapons components, and parts used for research and experimental tasks are fabricated and analyzed.

2.4 PROPOSED CMRR PROJECT CAPABILITIES

This section presents the elements of the operational capabilities proposed to be included within the CMRR project; those elements of existing capabilities housed within the CMR Building that are not planned to carryover into the CMRR project; and a description of the CMRR project alternatives analyzed in this *EIS for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory* (*CMRR EIS*).

2.4.1 AC and MC 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 currently are found at the CMR Building, although a subset of AC and MC capabilities currently resides in the TA-55 Plutonium Facility and other locations at LANL. This project element includes relocating all mission-essential CMR AC and MC capabilities and consolidation of AC and MC capabilities where possible to provide efficient and effective mission support.

2.4.2 AC and MC Capabilities Consolidated from the Plutonium Facility into the CMRR Facility

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

2.4.3 SNM Storage Capability

An SNM storage capability would be provided sized to support CMRR Facility operations. The CMRR Facility storage capability would be designed to replace the current storage vault at the

CMR Building. The SNM storage requirements would be developed in conjunction with, and integrated into, a long-term LANL SNM storage strategy.

2.4.4 Large Containment Vessel Handling Capability

The CMRR Facility would provide large containment vessel support for the Dynamic Experiments Program, including vessel loading and unloading operations, material recovery, and purification of materials. These capabilities would be selected to complement the AC and MC capabilities already housed at the CMR Building, and the floor space occupied by these capabilities would be sized consistent with the mission capacity requirements.

2.4.5 Mission Contingency Space

The CMRR Facility would be sized to include mission contingency space of approximately 30 percent net floor space for AC and MC operations. This mission contingency space would be available to accommodate future growth, expansion, or changes to existing capabilities. Hazard Category 2 or 3 nuclear facility construction typically requires large, long-duration, high-cost projects that are not conducted on a regular, routine basis by NNSA. Because new nuclear facility construction is not a routine process, mission contingency space is planned for CMRR to address minor changes in requirements that may occur over the duration of design and construction to accommodate future growth. Mission contingency space would not be equipped and made operational until required and would be subject to additional National Environmental Policy Act (NEPA) review.

2.4.6 Nuclear Materials Operational Capabilities and Space for non-LANL Users

This capability would provide research laboratory space for non-LANL users to allow other NNSA and DOE nuclear sites to support Defense Program related missions at LANL. Of particular interest are options for relocating and consolidating some of the Lawrence Livermore National Laboratory Hazard Category 2 operations to LANL to support long-term Defense Program missions.

2.4.7 Existing CMR Capabilities and Activities Not Proposed for Inclusion within the New CMRR Facility

Not all capabilities either previously or currently performed within the existing CMR Building at LANL would be transferred into 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 elsewhere at DOE, NNSA sites other than at LANL. These capabilities would cease to exist at LANL, or could continue to exist within the CMR Building.

2.5 DESCRIPTION OF THE ACTION ALTERNATIVES

The *CMRR EIS* analyzes five main alternatives for the CMRR project. While the No Action Alternative does not meet NNSA's purpose and need for actions, the other four alternatives analyzed were identified as reasonable alternatives for NNSA's proposed action.

No Action Alternative: Continued use of the existing CMR Building at TA-3 with minimal maintenance and component replacements to allow continued operations, although CMR operations would be restricted. No new buildings to support LANL AC and MC capabilities would be constructed.

Alternative 1: Construct a new CMRR Facility at LANL TA-55 (Preferred Alternative).

Alternative 2: Construct a new CMRR Facility within a "greenfield" site at LANL TA-6.

Alternative 3: Hybrid Alternative involving construction of a new CMRR Facility for SNM Laboratory(s) at LANL TA-55, with continued use of the existing CMR Building at TA-3 for administrative offices and support functions including "lite"[2] laboratories and other general activities.

Alternative 4: Hybrid Alternative involving construction of a new CMRR Facility for SNM Laboratory(s) at LANL TA-6 with continued use of existing CMR Building at TA-3 for administrative offices and support functions (including lite laboratories and other general activities).

For each of the above-listed alternatives involving new construction, there are four different construction options considered with respect to the CMRR Facility. These construction options are driven by the Security and Hazard Categorization for the portion of the CMRR Facility that would house operations involving SNM. Operations that use relatively large amounts (several grams per sample) of SNM, such as sample management and plutonium assay, require designated Hazard Category 2 facility(ies), which have structures, systems, and components appropriate for such operations. Operations that use smaller amounts of SNM (gram to microgram per sample) require designated Hazard Category 3 facility(ies), which use structures, systems and components appropriate for this kind of facility. Safeguards and security issues may require that any building designated as a Hazard Category 2 facility be located below ground (specifically, below the elevation level of the surrounding land). These facility hazard categorization and safeguards and security requirements drivers have resulted in the identification of the following construction options for the four action alternatives listed above:

Construction Option 1: Construct a separate nuclear SNM-capable Hazard Category 2 laboratory building and a separate Hazard Category 3 laboratory building above ground with a separate building to house administrative offices and support functions (total of three buildings).

[2] *The term "lite" is an informal, simplified spelling of the word "light." In this context, the term "light" refers to occurring in small amounts, force, or intensity; specifically, the CMRR Facility lite laboratories would contain very small amounts of radioactive materials and nonradioactive materials and chemicals.*

Construction Option 2: Construct a separate nuclear SNM-capable Hazard Category 2 laboratory building below ground, construct a Hazard Category 3 laboratory building above ground with a separate building to house administrative offices and support functions (total of three buildings).

Construction Option 3: Construct a consolidated nuclear SNM-capable Hazard Category 2 laboratory above ground with a separate building to house administrative offices and support functions (total of two buildings).

Construction Option 4: Construct a consolidated nuclear SNM-capable Hazard Category 2 laboratory below ground with a separate building to house administrative offices and support functions (total of two buildings).

This EIS will also include an evaluation of environmental impacts that could result from construction of tunnels to connect the new buildings, special nuclear material storage vaults, utility structures, security structures, and the construction of parking space for the occupants of the new CMRR Facility.

A more detailed description of the alternatives follows and a more detailed description of the construction options is provided in Section 2.7.2.

2.5.1 No Action Alternative: Continued Use of Existing CMR Building – No New Building Construction

The No Action Alternative is to continue to use the existing CMR Building for SNM AC and MC operations, administrative support, office space and lite laboratory functions. The CMR Building would receive minimal routine maintenance and limited component replacement and repairs and no new buildings to support LANL AC and MC operations would be constructed. The CMR Building would continue to be operated as a Hazard Category 3, Security Category III facility, which limits the amount of SNM that can be used and the level of operations. These limitations do not currently support the level of operations required for the missions that NNSA has assigned to LANL through the *SS&M PEIS* and *LANL SWEIS* Records of Decision.

2.5.2 Alternative 1 (the Preferred Alternative): Construct New CMRR Facility at TA-55

The Preferred Alternative is to construct two or three buildings at the TA-55 site for the CMRR Facility. Based on planning completed to date, facility hazard categorization, and the safeguards and security requirements described above, there are two potential CMRR Facility layout scenarios; a three-building scenario, and a two-building scenario.

Under the three-building scenario, a Hazard Category 2, Security Category I building and a Hazard Category 3, Security Category II building would be constructed within a Perimeter Intrusion and Detection Alarm System (PIDAS) fence. The existing TA-55 PIDAS would be extended to enclose the CMRR Hazard Category 2 and Hazard Category 3 buildings. The exact amount of PIDAS extension required is dependent on final site selection at TA-55 (see **Figure 2–2**). Primary electrical and water services would be extended from existing

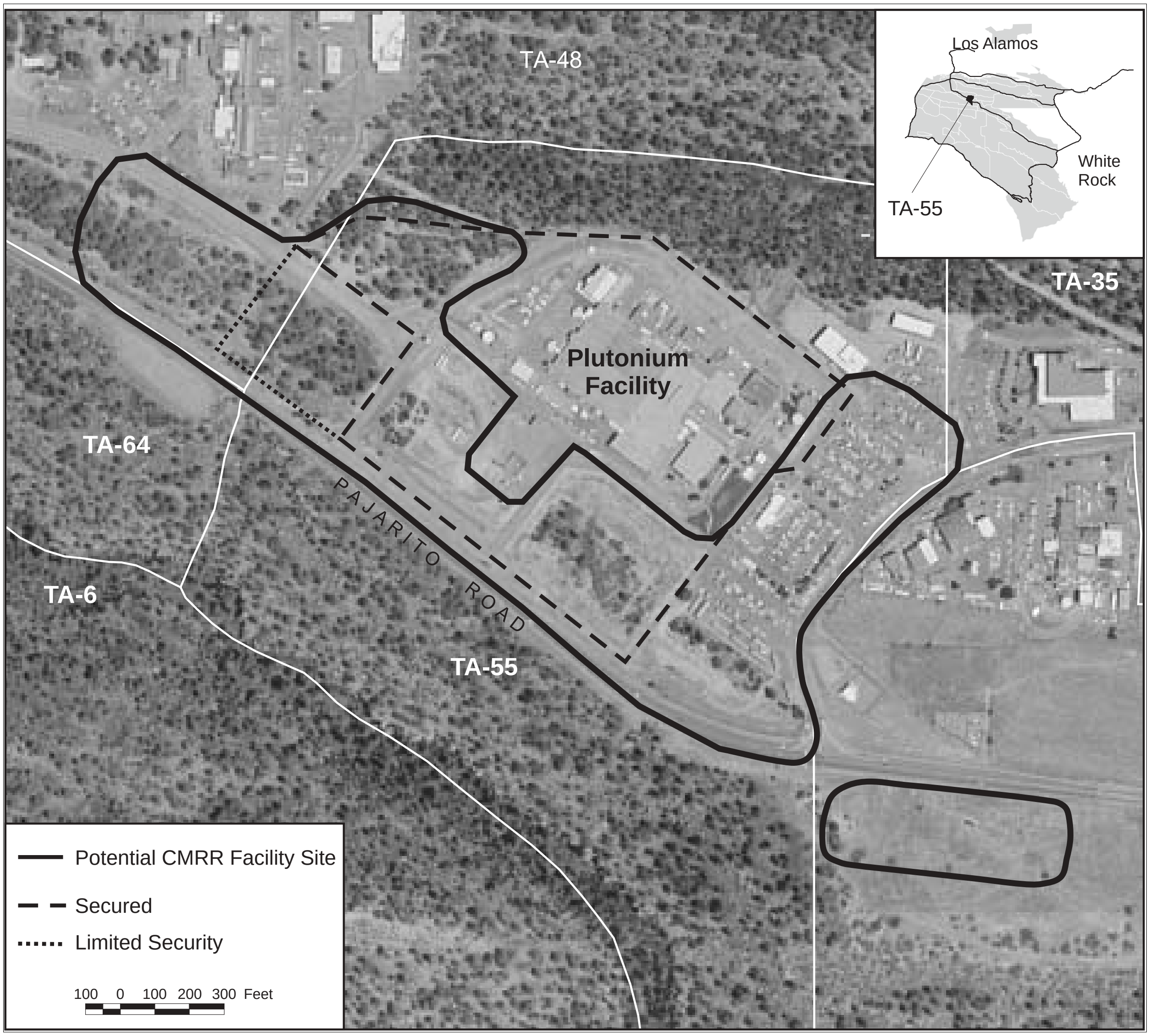


Figure 2–2 Plan View of Area Available for Future CMRR Facility at TA-55 Locations

TA-55 services. Fire protection systems for CMRR would be developed and integrated with the TA-55 sitewide fire protection service.

The three-building scenario would be implemented with either Construction Option 1 or Construction Option 2. Under Construction Option 1, all three buildings would be built above ground with access between the buildings provided by aboveground walkways and doors, and also by underground access tunnels constructed to meet life-safety and appropriate security codes that would link the three buildings. The administrative offices and support functions building would be constructed and operated outside the PIDAS fence. This building would provide office and cafeteria space in addition to lite laboratory space used for such activities as glovebox mockup, process testing, chemical experimentation, training, and general research and development. The lite laboratory area(s) within this building would be allowed to contain only very small amounts of nuclear materials such that it would be designated a Radiological Facility.

The administrative offices and support functions building would be linked to the Hazard Category 3 laboratory building via the previously mentioned underground tunnel with its separate security station. The Hazard Category 2 laboratory building would in turn be linked to the Hazard Category 3 laboratory building through the underground tunnel; this would allow efficient transfer of samples from one building to the next. In addition, another underground tunnel would be constructed to connect the existing Plutonium Facility (Building 55-4) with the Hazard Category 2 building; this tunnel would also contain a vault spur for the CMRR Facility long-term SNM storage requirements.

The two-building scenario would be implemented with either Construction Option 3 or Construction Option 4. Under the two-building scenario, all nuclear AC and MC operations would be housed in one Hazard Category 2 nuclear laboratory building, and the administrative offices and support functions building would be the second building component. Tunnels and other features of the buildings and structures would be the same as those described for the three-building scenario, with some minor variation in locations and other features due to the differences in the location, size, and number of buildings constructed.

The location of the CMRR Facility within TA-55 would either be at the southeast corner of TA–55 near the intersection of Pajarito Road and Pecos Drive, at the west side of TA-55 between the Plutonium Facility and TA-48, or at the east side of TA-55 where the existing paved parking area is located. Construction of the CMRR Facility within TA-55 would eliminate or minimize the need for facility support space requirements for SNM shipping and receiving capabilities, as those functions would be conducted at the adjacent Plutonium Facility. Depending upon the exact location of the CMRR Facility within TA-55, some minor road realignment of Pecos Drive may be required.

Movement (transition) of operations from the existing CMR Building into the new CMRR Facility would be accomplished in carefully staged phases over a period of about 2 to 4 years, dependent on the final scope and schedule for CMRR Facility construction. During this transition period, both the new CMRR Facility and existing CMR Building would be operational.

The existing CMR Building would be dispositioned once all nuclear AC and MC operations and administrative support functions have been removed. Disposition could involve the renovation and reuse of the building for nonnuclear purposes (such as for administrative purposes, office spaces, and laboratory use involving nonnuclear work) together with the continued use of Wing 9 of the building for SNM hot cell work by non-Defense Program users. No definitive new building reuse purposes have been identified at this time; additional NEPA compliance review would be necessary when specific activities were identified for re-occupation and operation within the existing CMR Building. Disposition of the CMR Building could also result in demolition of the entire structure. A conceptual decommissioning and demolition of the CMR Building is discussed in Section 4.9.2 of this *CMRR EIS*.

2.5.3 Alternative 2 (Greenfield Site Alternative): Construct New CMRR Facility at TA-6

Alternative 2 is to construct the CMRR Facility at a "greenfield" location within Los Alamos National Laboratory. The proposed greenfield site is at TA-6, just south of the main technical area, TA-3. This site was identified as one that would be outside of necessary health and safety buffer zones associated with LANL explosives testing areas and other controlled operational sites, with most necessary utilities located nearby, and with appropriate access roads already available. **Figure 2–3** shows the TA-6 CMRR Facility site location.

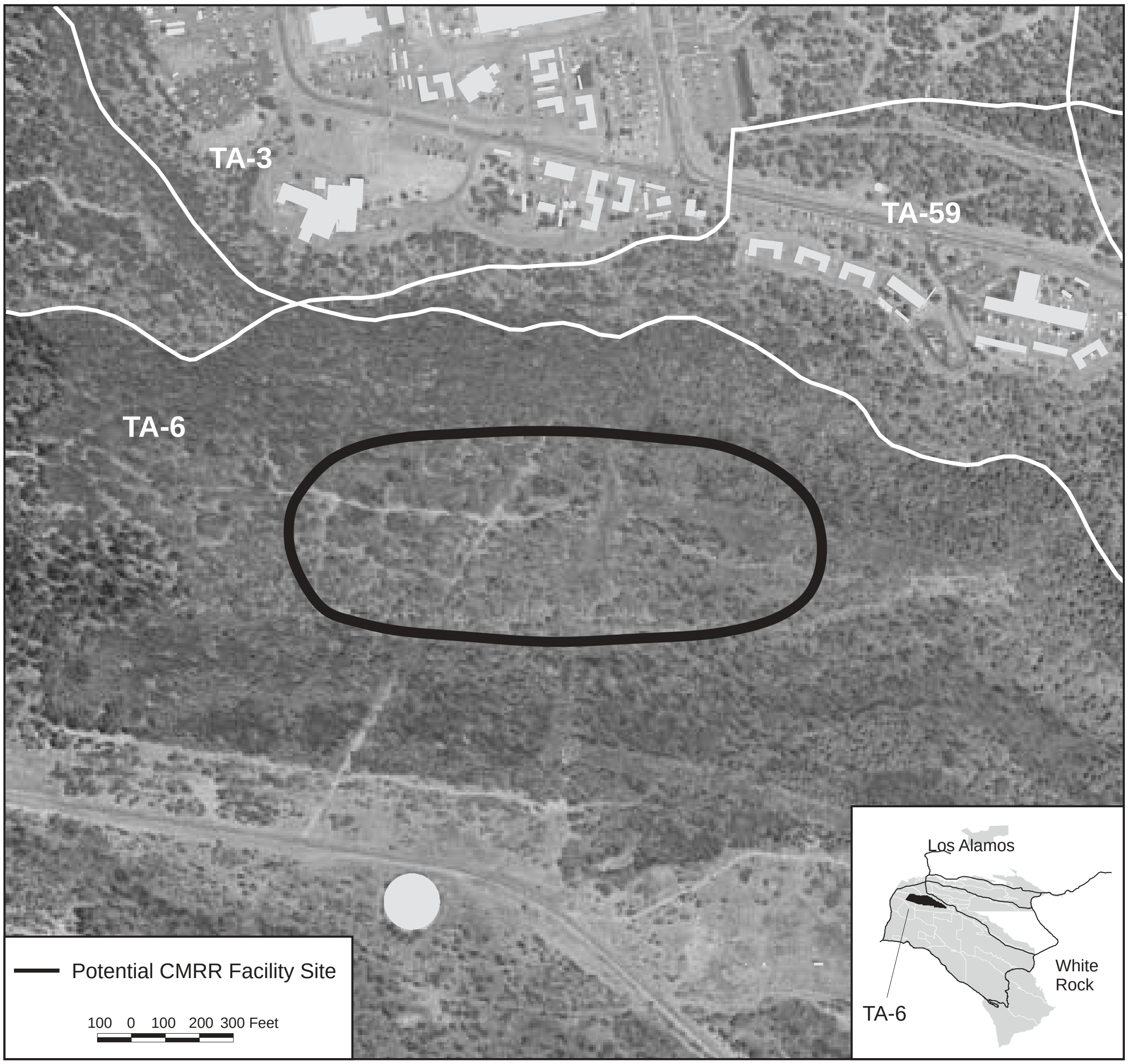


Figure 2–3 Plan View of Area Available for Future CMRR Facility at TA-6

In this "Greenfield" Alternative, the CMRR Facility layout would consist of a three-building or a two-building scenario as described for Alternative 1, with the same construction options. Access between the CMRR Facility buildings constructed at TA-6 could occur above or below ground through an access tunnel. While laboratory space requirements would be the same as in Alternative 1, facility support space requirements such as shipping and receiving capabilities would need to be expanded under this alternative, due to the physical separation between the Plutonium Facility at TA-55 and the TA-6 proposed CMRR Facility site location. Shipping and receiving elements, as well as an SNM vault similar to those existing in the CMR Building, would be replicated. This alternative differs in this respect from Alternative 1. Additionally, because TA-6 is physically separated from TA-55, transportation of SNM (namely samples coming in and residues and wastes leaving) would cover greater distances than exist between the existing CMR Building and the Plutonium Facility.

The construction site would need utilities and services; about 1.5 acres (0.6 hectares) of trenching would be required for electric power service, communications lines, natural gas lines, potable water, and sewage services. A new permitted discharge to Pajarito Canyon would be required for stormwater runoff. Liquid radioactive wastes would be collected and contained onsite until transported by tanker truck or a new buried waste line to the TA-50 RLWTF for treatment and disposal. This new pipeline, potentially requiring about 3 acres (1.2 hectares) of trenching and disturbance, would be directionally drilled and placed beneath Two-Mile Canyon or suspended across the canyon reach to avoid exposure along the sides of the canyon and shallow burial across the canyon bottom. Other site wastes would be transported to appropriate waste treatment and disposal facilities at LANL or offsite. A short access road would need to be constructed that would require the disturbance of about 1.5 acres (0.6 hectares) of land.

A new security fence and PIDAS would need to be constructed around the buildings designated as Hazard Category 2 and 3 facilities. This PIDAS installation would be more extensive at the TA-6 location than a PIDAS extension of the existing system at TA-55, not only because of the additional fencing, but also because of the communications infrastructure required to transmit PIDAS information back to the central LANL security facility.

The transfer of CMR operations to the new CMRR Facility would be the same as described for Alternative 1, as would the decommissioning and disposition of the existing CMR Building.

2.5.4 Alternative 3 (Hybrid Alternative at TA-55): Construct New Hazard Category 2 and 3 SNM Laboratory Buildings (Above or Below Ground) at TA-55 and Continue Use of the CMR Building

An alternative to constructing the new administrative offices and support functions building portion of the CMRR Facility would be to continue use of the existing CMR Building for these functions, together with construction of the AC and MC building(s) at TA-55. This alternative differs from Alternatives 1 and 2 in that it retains the administrative offices and support functions of the CMRR Facility in the existing CMR Building at LANL.

Under this alternative, construction of new SNM-capable Hazard Category 2 and 3 building(s) would occur consistent with Alternative 1. As with the other Alternatives, there are four basic construction options driven by the facility hazard categorization and safeguards and security requirements.

The nuclear materials building(s) where SNM would be used would be constructed as described in Alternative 1, with a set of one Hazard Category 2 and one Hazard Category 3 buildings or with a single Hazard Category 2 building. These Hazard Categories 2 and 3 nuclear operations buildings would be the same size and have the same physical construction parameters as in Alternative 1.

The existing TA-55 security fence and PIDAS would be extended to encompass the building(s) designated as Hazard Category 2 or 3 facilities. No additional fencing or security measures would be needed for the existing CMR Building.

The administrative offices and support functions for the CMRR Facility would remain at the existing CMR Building at TA-3. As noted earlier in Section 2.2.1, upgrades would be required to the CMR Building's structural and safety systems in order to sustain nuclear capabilities there. Irrespective of upgrades required for nuclear operations, any future use of the existing CMR Building beyond 2010 would require repairs and upgrades to meet minimal structural and life safety code requirements. Seismic conditions beneath the existing CMR Building could preclude the use of wings 2 and 4, requiring that they be decommissioned and unoccupied once decommissioning was completed. Wing 9 would not be used for office or lite laboratory space. The existing administrative areas (Administration Wing and Wing 1) and Wings 3, 5, and 7 could be used for CMR administrative support, office space and lite laboratory space (see **Figure 2–4**).

Operationally, Alternatives 3 and 4 (described later) are quite inefficient and costly because staff and technicians would have offices in a facility that is very remote from the CMRR Facility laboratories where most of their work would be performed. Additionally, not providing offices near the laboratories would probably decrease the capacity of the facility and would be a detriment to the employee quality of work life. Finally, one of the uses of the lite laboratory function in the CMRR Facility's administrative offices and support functions building would be to mock up and set up gloveboxes while they are still uncontaminated to test equipment, prove-in procedures, and train on the new equipment prior to moving the gloveboxes into the nuclear facilities. Placing the lite laboratories in the existing CMR Building would severely hinder, if not prohibit, this use of the lite laboratories due to structural upgrade requirements, inadequate or incompatible ventilation system, and operational inefficiency created by the physical separation between TA-3 and TA-55 (and TA-6). Utilities, waste management, and security requirements would be the same as those described in Alternative 1, with the exception that utility service requirements would be fewer due to the administrative offices and support functions remaining within the existing CMR Building.

2.5.5 Alternative 4 (Hybrid Alternative at TA-6): Construct New Hazard Category 2 and 3 SNM Laboratories (Above or Below Ground) at TA-6 and Continue Use of the CMR Building

An alternative to constructing a new administrative offices and support functions building portion of the CMRR Facility would be to continue use of the existing CMR Building for these functions, together with construction of the AC and MC building(s) at TA-6. This alternative

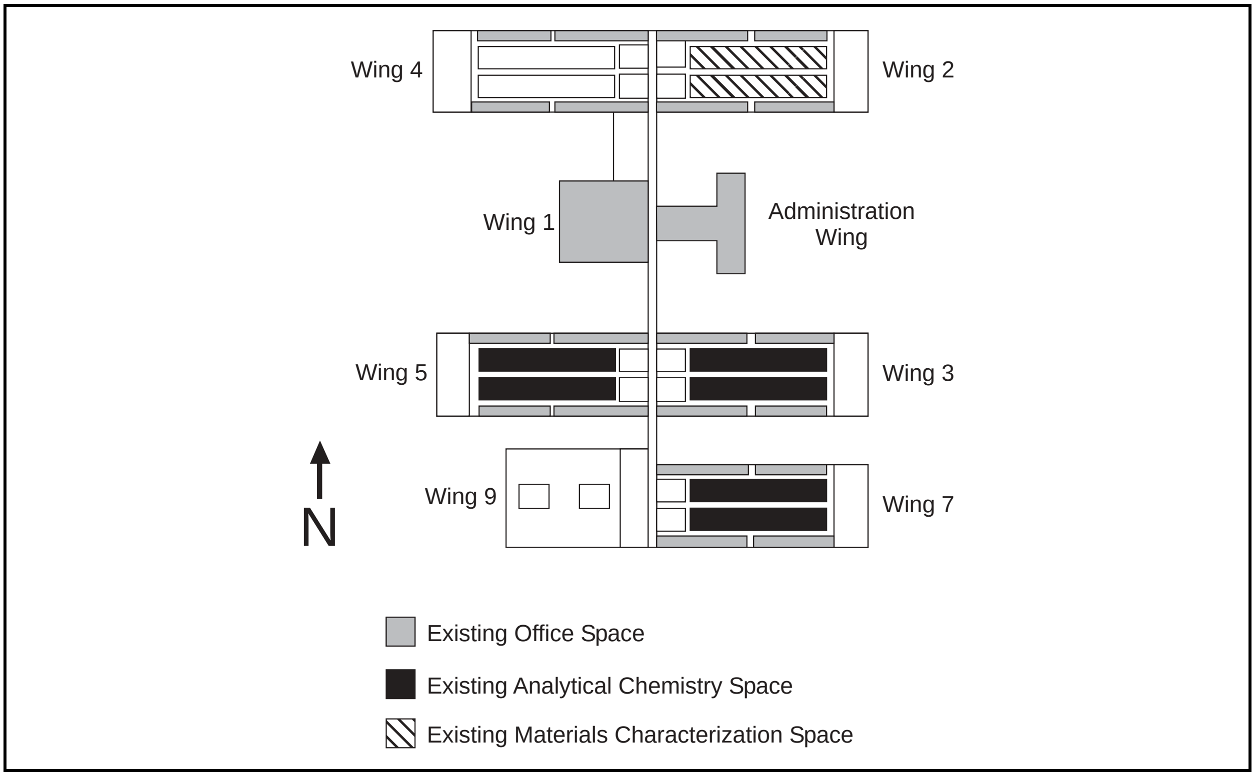


Figure 2–4 Simple Layout of Existing CMR Building

differs from Alternatives 1 and 2 in that it retains the administrative offices and support functions for the CMRR Facility in the existing CMR Building.

Under this alternative, construction of new SNM-capable Hazard Category 2 and 3 buildings would occur consistent with Alternative 2. As with the other alternatives, there are four basic construction options driven by the facility hazard categorization and safeguards and security requirements.

The nuclear materials building(s) where SNM would be used would be constructed as described for Alternative 2, with a single Hazard Category 2 building or a set of one Hazard Category 2 and one Hazard Category 3 buildings. These Hazard Category 2 and 3 nuclear operations buildings would be the same size and have the same physical construction parameters as in Alternative 2.

Utilities, waste management, and security requirements would be the same as those described in Alternative 2, with the exception that utility service requirements would be fewer due to the administrative offices and support functions remaining within the existing CMR Building.

Operationally, this alternative has the combined features of both Alternatives 2 and 3. The nuclear AC and MC operations would be physically segregated from their source of SNM, and personnel would be segregated from their laboratories. The alternative would also require additional construction for security fence and PIDAS installation and additional shipping and receiving capability requirements.

2.6 ALTERNATIVES CONSIDERED AND DISMISSED

2.6.1 Removing CMR Capabilities from LANL or Altering the Operational Level of Capabilities

The alternative of removing CMR capabilities from LANL or altering the operational level of these capabilities was considered and dismissed. As explained in Section 1.5, DOE considered the issue of maintaining CMR capabilities (along with other capabilities at LANL) in 1996 as part of the review of the SS&M program and made programmatic decisions at that time that required the retention of CMR capabilities at LANL. In 1999, DOE, through its *LANL SWEIS* analyses, concluded that specific decisions regarding the replacement of the CMR Building for its continued operations and capabilities support were not then mature because of lack of information regarding the proposal(s). With the support of the *LANL SWEIS* impact analysis, however, DOE made a decision on the level of operations at LANL that included the level of operational capabilities housed by the CMR Building. Having made these critical decisions within the past 7 years, NNSA does not believe that it needs to revisit these decisions at this time related to the maintenance of CMR capabilities at LANL to support critical NNSA missions.

2.6.2 Considering the CMRR Project as Part of the "Integrated Nuclear Planning" Initiative at TA-55

The option of including the CMRR project environmental review as part of the so-called "Integrated Nuclear Planning" initiative for TA-55 was considered and dismissed. As discussed in Section 1.5, the various potential LANL Security Category I nuclear facilities are independent of one another in terms of their individual operations and the capabilities they house; the existing structures are of differing ages and therefore replacement of the aging structures would become necessary at different times; the construction of major facilities within a relatively tight geographic area would require that they be staggered so that the area can physically accommodate the necessary construction laydown sites and storage areas needed; the additional security elements required for the construction and startup of operations in Hazard Category 2 nuclear facilities also predicates the need for their separate construction in terms of schedule.

NNSA recently completed an EIS for relocating LANL's TA-18 capabilities and materials and to move these particular capabilities and materials to another DOE site away from LANL and TA-55. NNSA is separately considering the construction and operation of a pit manufacturing facility on a scale greater than can currently be accommodated in existing facilities at LANL, and is considering TA-55 as a possible site. In the future, NNSA will eventually need to consider decisions on relocating or upgrading the aging TA-55 LANL Plutonium Facility, which is about 30 years old; however, any proposal for such a project is very speculative and not ready for decision at this time.

2.6.3 Alternative LANL Sites

The sites at TA-55 reflect NNSA's goal to bring all nuclear facilities within a nuclear core area. Siting of the CMRR Facility at TA-55 would colocate the AC and MC capabilities near the existing Plutonium Facility where the programs operations that require these capabilities are located.

The greenfield site at TA-6 was chosen using data and maps from the *2000 Comprehensive Site Plan* (LANL 2000f), the *Core Area Development Plan* and the *Anchor Ranch Area Development Plan* (LANL 2000g). These documents contain detailed development opportunity maps, which were developed using a set of siting criteria or constraints. Using geographical information system (GIS) processing software, a set of physical and operational constraints were scored, combined, and used to identify sitewide development opportunities. The physical constraints contained information regarding various topographic features, seismic fault lines, Federally-protected threatened and endangered species habitat information, floodplains, and wetlands locations. Also considered were surface hydrology, cultural resources, climate, vegetation, soils, and geology of LANL. The operational constraints considered locations of radiological sources, the White Rock Canyon Reserve, solid waste landfill, hazardous waste sites, range of radio frequencies, and airspace and blast buffer zones. The screening results are documented on a set of sitewide development opportunities maps found within these three documents. These documents also contain summary planning maps that reflect existing land uses as well as undeveloped (so called "greenfield") lands. Combining the development opportunities maps and summary maps allows identification of potential greenfield sites that would be suitable for siting CMRR Facility building(s). The final siting step for locating the CMRR Facility outside of TA-55 was to consider NNSA's desire to bring all nuclear facilities within a nuclear core area; TA-6 is the only greenfield site available for consideration in the general area of TA-55.

2.6.4 Extensive Major Upgrades to the Existing CMR Building for Use Beyond 2010

The proposal to complete extensive upgrades to the existing CMR Building's structural and safety systems to meet current mission support requirements for the suite of capabilities that exist in the Building today for another 20 to 30 years of operations was considered and evaluated by DOE and UC at LANL in the 1998 to 1999 timeframe. This approach to maintaining these mission-critical nuclear support capabilities would require a capital investment in excess of several hundred million dollars for just two wings of the CMR Building. The cost of upgrading the entire structure would be the same or more for constructing the proposed CMRR Facility. Implementing this alternative would not reduce the overall footprint of the CMR Building, which is costly to maintain and operate in part due to the amount of wasted space incorporated into its design, nor would it change the underpinning seismic condition of the CMR Building. Additionally, implementing this alternative would not allow for the consolidation of like activities presently located within the Plutonium Facility into one facility. This alternative was not considered to be reasonable to meet NNSA's purpose and need for action.

2.7 Planning Information and Bases for Analyses

This *CMRR EIS* evaluates the potential direct, indirect, and cumulative environmental impacts that could result from relocating existing AC and MC capabilities currently residing in the CMR Building to new facilities at different locations at LANL. This involves: (1) the construction of new facilities with several construction options; (2) the relocation of materials and equipment from the existing CMR Building to new facilities; (3) the operation of new facilities for their design lifetime, following a transition period during which operations would be gradually transferred to the new facilities; (4) transportation of SNM (namely samples coming in and residues and wastes returning) between the Plutonium Facility at TA-55 and the new CMRR Facility; and (5) the disposition of the existing CMR Building. The operational characteristics for the CMRR Facility are based on the level of CMR Building operations identified by the Expanded Operations Alternative in the 1999 *LANL SWEIS*. Some of the more specific information and considerations that form the bases of the analyses and impact assessments in the *CMRR EIS* are presented below.

2.7.1 No Action Alternative

As required by Council of Environmental Quality regulations, the *CMRR EIS* evaluates a No Action Alternative for comparison purposes. This alternative reflects the decisions reached by DOE for operations within the CMR Building described in the Record of Decision for the *LANL SWEIS*. No new construction under the No Action Alternative would be initiated.

The impacts associated with the No Action Alternative for each resource area consider the current level of CMR operations and capabilities that are currently restricted to a minimal level, as discussed in Section 2.5.1.

2.7.2 Construction Options

The new buildings proposed for the CMRR project are currently in conceptual design stage and, as a result, are not described in great detail in this EIS. However, to support the EIS analysis, conservative information has been used such that construction requirements and operational characteristics of these buildings bound the environmental impacts. Thus, the potential impacts from implementation of the finalized design would be expected to be less severe than those analyzed in the *CMRR EIS*.

For each alternative involving new construction, four different construction options were considered for the Hazard Category 2, Hazard Category 3, and administrative offices and support functions buildings. These options are driven by facility hazard and security categorizations for the portion of the CMRR Facility that will conduct operations involving SNM. In addition, and common to all options, is the construction of tunnels to connect the new buildings, special nuclear material storage vault(s), utility structures, security structures, and the construction of parking space for the occupants of the new CMRR Facility.

Construction Option 1: For the purpose of this EIS analysis, Construction Option 1 was considered to be the option that would bound the potential environmental impacts resulting from construction activities. Thus, Construction Option 1 is the reference case for estimating the impacts for all action alternatives. This construction option includes separate SNM-capable Hazard Category 2 and 3 laboratories constructed above ground with a separate administrative offices and support functions building also constructed above ground. The requirements for each facility are as follows:

- Hazard Category 2 Building: Total square footage of approximately 100,000 square feet (9,290 square meters), with total disturbed construction site of approximately 2.5 acres (1 hectare). The maximum depth of excavation for construction would be no more than 50 feet (15.2 meters).

- Hazard Category 3 Building: Total square footage of approximately 100,000 square feet (9,290 square meters), with total disturbed construction site of approximately 2.25 acres (0.9 hectares). The maximum depth of excavation for construction would be no more than 50 feet (15.2 meters).

- Administrative Offices and Support Functions Building: Total square footage of approximately 200,000 square feet (18,580 square meters) dispersed over several stories, with a total disturbed construction site of approximately 4.0 acres (1.6 hectares). One or more floors could be constructed below ground with a maximum depth of excavation approximately 50 feet (15.2 meters). The administrative offices and support functions building would contain a lite laboratory capable of handling materials up to a Hazard Category designation of Radiological Facility (less than 8.4 grams of plutonium-239 equivalent radioactive material), and would also include a utility structure housing utility equipment and services for all elements of the CMRR Facility. This utility structure would house power, hot water, heat, sanitary sewer, and chilled water services for the entire CMRR Facility. The utility structure [approximately 25,000 square feet (2,325 square meters)] is included in the total estimated square footage for the administrative offices and support functions building. This building aboveground would be a maximum height three stories, or approximately 35 feet (10.6 meters) aboveground level.

In implementing this construction option with either Alternative 1 (Preferred Alternative) or Alternative 3, connecting tunnels would be constructed. These tunnels would be used for belowground linkage of the CMRR Facility as well as linkage with the Plutonium Facility at TA-55. In Alternative 1, the estimated length of tunnels would be approximately 1,200 feet (366 meters) and depth of excavations would be no more than 50 feet (15 meters). In Alternative 3, the estimated length of tunnels would be approximately 750 feet (229 meters), with a depth of excavation of approximately 50 feet (15 meters). These tunnels would be constructed utilizing cut and cover construction methods requiring specialized safety, security, and waterproofing methods. Alternatives 2 and 4 would require slightly larger facility support space requirements for such capabilities as shipping and receiving of materials into and out of the CMRR Facility. This space would be no more than one percent of the total 200,000 square foot total.

Construction Option 2: This construction option includes the same building elements as Construction Option 1, with the exception that the SNM-Capable Hazard Category 2 building would be constructed below grade. For the Hazard Category 2 building, the maximum depth of excavation would increase to approximately 75 feet (23 meters). Excavated materials would be stockpiled onsite and would be used for regrading and constructing berms for the PIDAS around the facility. All other assumptions for the Hazard Category 3 and the administrative offices and support functions building would be the same as described in Construction Option 1.

Construction Option 3: This construction option includes a single consolidated SNM-capable Hazard Category 2 laboratory and a separate administrative offices and support functions building.

In this option, all Hazard Category 2 and Hazard Category 3 operations would be housed in the single Hazard Category 2 laboratory. The Hazard Category 2 building would contain a total of approximately 200,000 square feet (18,580 square meters) and be constructed with one floor below grade containing the Hazard Category 2 operations, and one floor above grade containing Hazard Category 3 operations. All assumptions for the administrative offices and support functions building would be the same as described in Construction Option 1.

In implementing this construction option with Alternatives 1 and 3 (at TA-55), connecting tunnels between the CMRR Facility and the Plutonium Facility would be excavated to a maximum depth of 50 feet (15 meters), with the estimated total length of tunnels approximately 1,200 feet (366 meters) for Alternative 1, and 500 feet (152 meters) for Alternative 3.

Construction Option 4: This option includes a single consolidated SNM-capable Hazard Category 2 laboratory constructed below grade and a separate administrative offices and support functions building.

As with Construction Option 3, all Hazard Category 2 and 3 operations would be housed in the single Hazard Category 2 laboratory constructed below grade. Maximum depth of excavation would be 75 feet (23 meters). All assumptions for the administrative offices and support functions building would be the same as described in Construction Option 1. Assumptions with respect to the connecting tunnels between facility elements would the same as Construction Option 3.

General Construction Requirements for All Construction Options - Construction methods and materials employed on the CMRR project would be typical conventional light[3]-industrial for the administrative offices and support functions building, and heavy-industrial, nuclear facility construction for the CMRR project nuclear laboratory elements. Information that is common to all the construction activities encompassed by the four construction options and four action alternatives is presented in the following paragraphs. A summary of construction requirements is presented in **Table 2–1**.

All construction work would be planned, managed, and performed to ensure that standard worker safety goals are met. All work would be performed in accordance with good management practices, with regulations promulgated by the Occupational Safety and Health Administration, and in accordance with various DOE orders involving worker and site safety practices. To prevent serious injuries, all site workers (including contractors and subcontractors) would be required to submit and adhere to a Construction Safety and Health Plan. This Plan would be reviewed by UC at LANL staff before construction activities begin. Following approval of this Plan, UC and NNSA site inspectors would routinely verify that construction contractors and

[3]*Light industry refers to the use of small-scale construction machinery.*

subcontractors were adhering to the Plan, including all Federal and state health and safety standards.

Table 2–1 Summary of CMRR Construction Requirements

Building/Material Usage	*Hazard Category 2 Building*	*Hazard Category 3 Building*	*Administrative Offices and Support Functions Building*	*Other Construction Elements*
Land (acres)	2.5	2.25	4.0	18 [a]
Water (gallons)	757,300	670,500	1,354,500	963,000
Electricity (megawatt-hours)	88.75	88.75	135	Not applicable
Concrete (cubic meters)	1,375	1,067	2,340	Not applicable
Steel (metric tons)	136	106	265	Not applicable
Peak construction workers	300			
Waste (nonhazardous) (metric tons)	130	99	295	10
Construction period (months)	17	17	26	6

Source: LANL 2002e.

[a] The land affected by other construction elements would include: parking (5 acres), laydown area (2 acres), concrete batch plant (5 acres) at either TA-55 or TA-6. Additionally 6 acres of land would be affected at TA-55 due to road realignment. An equal area (6 acres) at TA-6 would be affected for extensive trenching for utilities (1.5 acres), radioactive liquid waste pipeline (3 acres), and new road (1.5 acres).

Site preparation prior to the commencement of building construction at either the TA-55 site or TA-6 construction site, in whole or in part, would involve clearing the site of native vegetation. The TA-55 site would involve some removal of asphalt and concrete material at the construction site and removal of mostly grassy vegetation coverage with a few mature trees. The TA-6 construction site would require the removal of mature trees and shrubs as well as grassy vegetation coverage. No asphalt or concrete material are present at the proposed TA-6 construction site.

Noise at the site would occur mainly during daylight hours and would be audible primarily to the involved workers. Construction equipment would be maintained in accordance with applicable health and safety requirements and inspected on a regular basis. Workers would be required to use personal protective equipment (such as eye and hearing protection, hard hats, and steel-toed boots). Machinery guards would also be used as necessary based on activity-specific hazards analyses.

Clearing or excavation activities during site construction have the potential to generate dust and encounter previously buried materials that could include unknown potential release sites (PRS) containing hazardous, toxic, or radioactive materials, or objects of cultural significance. If buried materials or artifacts of cultural significance were encountered during construction, activities would cease until their significance was determined and appropriate actions taken. Standard site dust suppression methods (such as spraying with water or use of soil tackifiers[4]) would be used onsite to minimize the generation of dust during all phases of construction activities. The New

[4] *Tackifiers are chemical dust suppressants often sprayed on construction sites. The chemical dust suppressants are mixed with water, which acts to disperse the chemicals and then evaporates after application. The chemicals that are left behind bind the soil particles together into larger particles that are less easily blown into the air.*

Mexico Environment Department (NMED) does not regulate dust from excavation or construction sites, but best achievable control measures (BACMs) would be used to control fugitive dust and particulate emissions.

Any suspected or known areas of PRS resulting from prior LANL activities would be evaluated to identify procedures for working within those site 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 either stored onsite and returned to the site as fill material or characterized and disposed of appropriately at LANL or an offsite waste management facility.

Engineering best management practices (BMPs) would be implemented for each building and structure site as part of a site Storm Water Pollution Prevention (SWPP) Plan executed under a National Pollution Discharge Elimination System (NPDES) construction permit. These BMPs could include the use of hay bales, plywood, or synthetic sedimentation fences with appropriate supports installed to contain excavated soil and surface water discharge during construction. After construction of each building and structure mounds of loose soil would be removed from the area and the site would be landscaped. The landscaping would incorporate to the maximum extent practicable a design to capture and utilize area precipitation to minimize the need for permanent watering systems. Low-pressure sprinklers could be required to supply water for the establishment of plants and grassy areas over the first year or two of growth. Plants native to the Pajarito Plateau would be used primarily where practicable. Other native New Mexico plants that require drip watering systems could be used minimally. All site revegetation would be performed in coordination with the LANL Wildfire Hazard Reduction Program and other LANL natural and cultural resource management plans under implementation at the time.

The site construction contractor would be prohibited from using chemicals that generate Resource Conservation and Recovery Act (RCRA)-regulated wastes. Non-RCRA-regulated wastes generated during construction, such as packaging and strapping material, excess gypsum board pieces, broken or bent nails and screws, and empty material containers, would be disposed of at the Los Alamos County Landfill or its replacement facility.

Parking within TA-55 would be shifted during the construction phase, and traffic flow would be altered for short periods during delivery of construction materials and by the addition of construction workers in the area. About 300 construction workers would be onsite during the peak construction period, adding about 135 vehicles to local LANL roadways during construction. These workers would park their personal vehicles at a parking areas located at the edge of the construction sites at either TA-55 or TA-6.

No construction would be conducted within a floodplain or wetland. No known cultural resource areas are located within the proposed building sites. Construction activities at either the TA-6 or the TA-55 sites would have the potential to affect unoccupied habitats for sensitive animals that are designated as Federally protected threatened or endangered species under the Endangered Species Act of 1973, as amended (50 CFR 17.11). Timing of some activities and exact work commencement would, in part, be determined by the provisions of the LANL *Threatened and Endangered Species Habitat Management Plan* (HMP).

Each of the buildings and structures would be appropriately designed according to general design criteria for a new facility (DOE Order 413.3). The new CMRR Facility would be designed as a state-of-the-art facility. Consistent with DOE Order 413.3, sustainable facility designs would include features that would allow the structures to operate with improved electric and water use efficiency and would incorporate recycled and reclaimed materials into their construction. For example: the new office building (if constructed) would incorporate building and finish materials, and carpets and furnishings made of reclaimed and recycled materials, low-flow lavatory fixtures to minimize potable water use, and energy-efficient lighting fixtures and equipment to reduce electric consumption. The finished landscaping of the involved construction area would utilize captured precipitation, reused and recycled materials and native plant species. Permanent safety and security exterior 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.

Utility services (including potable water, electric power, communications, sanitary waste, radioactive liquid waste, and natural gas services) are sufficient and available onsite at TA-55 to serve the new buildings and structures. Utility lines are located adjacent to the building sites at TA-55 and would require minimal trenching to connect them to the new structures. At TA-6, utility services would need to be routed over a distance to the proposed building site. Extensive trenching (approximately 1.5 acres [0.6 hectares]) would be required to connect them to the new structures. If a new radioactive liquid waste pipeline were constructed to connect TA-6 with the waste water treatment facility at TA-50, trenching of about 3 acres (1.2 hectares) would be necessary to accommodate that individual service line.

Each of the buildings constructed as part of the CMRR Facility would be appropriately designed and equipped to meet applicable facility environmental, safety, and health requirements and standards. Design features would include such items and systems as uninterruptible electric power supplies (UPS); backup diesel-powered generators; heating, ventilation and air conditioning systems with standard dust-type filters or specialty filters, including high efficiency particulate air filter (HEPA); and other facility health, safety, and security equipment as required and appropriate.

Equipment: Standard equipment used for light and heavy industrial construction activities would be used for the project. Not all construction equipment and machinery would be operating at the same time. Equipment would be needed for excavation, trenching, earth moving, compaction, heavy and light lifting, paving, mechanical fabrication and installation, concrete forming, pumping and placement purposes, as well portable power supplies, primary and secondary electrical installation and distribution. Dump trucks, bulldozers, drill rigs, cranes, cement mixer trucks, front-end loaders, lifts, compressors, trenchers, backhoes, paving equipment, excavators, tamper compactors, welders, water trucks, pickup trucks and other similar equipment and machinery would be used. General purpose hand-held equipment used during construction of the various buildings would include hammers, nail guns, various saws and other hand-held or hand-manipulated tools. These vehicles and pieces of equipment would operate primarily during the daylight hours and would be left onsite over night. If nighttime construction activities are required, additional exterior artificial lighting would be used. Temporary construction trailers would be present at the construction sites during the construction period. A lay down area for equipment and materials would be used at the construction site; this area would be about 2 acres (0.8 hectares) in size.

A dedicated concrete batch plant with a maximum production rate of 125 cubic yards per hour (96 cubic meters per hour) would be set up and utilized to meet concrete quantity and quality requirements during construction of the nuclear laboratory elements of the CMRR project. This dedicated batch plant would require a maximum of 5 acres (2 hectares) of land at TA-55, with a maximum of 100 workers.

Materials: Construction materials for the CMRR project would include standard materials used for light and heavy industrial construction applications. The administrative offices and support functions building component of the CMRR Facility, if built, would utilize standard construction materials typically used in office and lite-laboratory construction. These materials could include concrete masonry units (CMUs), gypsum board, steel studs and beams and wooden boards and trim pieces. No specialized construction materials would be needed. For the nuclear laboratories element of the CMRR Facility, significant quantities of standard construction elements would be anticipated, specifically, concrete and steel. The main structural elements for the nuclear laboratories would probably be constructed primarily of reinforced concrete cast-in-place and solid grout-filled CMUs. The foundation system for the buildings would mostly consist of cast-in-place concrete. Some specialized concrete additives could be required during construction dependent upon final design requirements and construction scheduling yet to be determined. As noted earlier, a dedicated concrete batch plant would be used to support construction of the nuclear laboratory elements of the CMRR Facility in order to meet supply and quality assurance requirements.

An asphalt parking area of about 5 acres (2 hectares) would be constructed as part of the CMRR project. The parking area would be constructed of standard materials including asphalt and concrete.

Construction materials would be procured primarily from New Mexico suppliers. Supplies would be delivered to and stored at existing LANL storage areas or at the construction site laydown area at either at TA-55 or TA-6.

Construction Methods: Standard construction methods for light and heavy industrial construction would be used for the CMRR Facility. Construction of the administrative offices and support functions building element of the CMRR Facility would employ construction methods and techniques for standard commercial or light-industrial construction. No specialized construction methods or procedures would be anticipated. The nuclear laboratories element of the CMRR Facility is expected to require specialized construction with regards to the cast-in-place reinforced concrete. This would be accomplished with traditional reinforced concrete construction methods subject to stringent quality assurance requirements associated with nuclear facilities. Although standard, traditional construction methods would be employed, the large volumes of concrete to be placed, combined with the quality assurance requirements and the need for close integration with existing facilities and other ongoing LANL projects would require significant project management oversight.

Workers (Total and Peak): Construction workers would mostly be drawn from communities across New Mexico. The total number of workers onsite at any one time could be as great as about 300 site construction workers for the CMRR Facility building(s) and parking lot construction. Estimated peak construction worker numbers are listed in Table 2–1. CMRR Facility construction elements could be sequenced. If the administrative offices and support functions building were constructed, it would be built first, followed by the of the nuclear laboratories building(s) after the administrative offices and support functions building construction was well underway. Construction of the administrative offices and support functions building would engage a peak construction workforce of about 150 workers. Depending on the final positioning of the nuclear laboratories element of the CMRR Facility, the construction workforce for that effort could peak at about 300 workers. The estimated peak construction workforce for the associated parking area would be about 50 workers.

Construction Schedule: As noted, the construction activities for the CMRR Facility could be sequenced, commencing with the administrative offices and support functions building, followed by the construction of the nuclear laboratories element. Construction of the administrative offices and support functions building would commence in fiscal year (FY) 2004, with completion expected in FY 2007. The total construction duration of that element of the CMRR Facility would be about 26 months. Construction of the nuclear laboratory element of the CMRR Facility would begin in about FY 2008, with completion expected in FY 2011. The total duration of that element of the CMRR Facility would be about 34 months. Completion of the administrative offices and support functions building, would allow transition of some administrative functions and support for CMRR Facility construction activities. Construction of the nuclear laboratories element would be sequenced if the final design is based on separate Hazard Category 2 and 3 buildings. Transition from the existing CMR Building would occur as new CMRR Facility buildings were completed and approved for startup and operations.

2.7.3 Project Schedule

For the purpose of the analysis in the EIS, it was estimated that construction under any of the alternatives would start late in 2004 last approximately 5 years. The new facilities would be designed for a lifetime performance of at least 50 years; therefore, operation is projected to range from 2010 to 2060. It is also expected that simultaneous operation of the existing CMR Building and the new CMRR Facility would last a maximum of 4 years, between about 2010 and 2014.

2.7.4 Operational Characteristics

The operational characteristics of the CMRR Facility are based on the level of operations identified by the Expanded Operations Alternative in the 1999 SWEIS for the CMR Building; the Facility's capabilities were discussed previously within Section 2.4 of this EIS. The CMRR Facility's operational characteristics are summarized in **Table 2–2** and briefly discussed in the following paragraphs. The operational characteristics are estimated to be the same regardless of the location of the CMRR Facility; however, as noted in the text, the particulars of some operations may differ between geographic locations. Operational administrative controls and activities would be employed at the building(s) and structures that would enhance the overall LANL waste minimization effort and efforts to reduce the use of potable water and energy sources (such as recycling office waste). Every effort would be made to encourage recycling and reuse of waste materials. LANL has existing recycling contracts for the following materials: metal, paper, cardboard, concrete, asphalt, wire, smoke detectors, exit signs and light bulbs.

Table 2–2 Operational Characteristics of the CMRR Facility (per year)

Electricity usage (megawatt hours)	19,272
Water usage (million gallons)	10.4
Nonradiological gaseous effluent	very small [a]
Radiological gaseous/airborne effluent (curies)	Pu-239 = 0.00076; Kr-85 = 100; Xe-131m = 45; Xe-133 = 1,500; H-3 (water vapor) = 750; and H-3 (elemental) = 250
Nonradiological liquid effluent (gallons)	530,000
Radiological liquid effluent	None [b]
Workforce	550
Worker average dose and cumulative dose	110 millirem, and 50 person-rem
Waste generation:	
Transuranic waste (cubic yards)	61
Mixed transuranic waste (cubic yards)	26.7
Low level radioactive waste (cubic yards)	2,433
Mixed low-level radioactive waste (cubic yards)	25.6
Chemical waste (RCRA/TSCA) (pounds)	24,700
Sanitary waste (million gallons)	7.15 [c]

Pu = plutonium; Kr = krypton; Xe = xenon; H-3 = tritium; RCRA = Resource Conservation and Recovery Act; TSCA = Toxic Substance Control Act

[a] The amount of chemical effluent through the facility stack would be very small, well below the screening levels used to determine the need for additional analysis (DOE 1999a).

[b] No direct discharge to the environment. Radiological liquid waste would be collected and transported to TA-50 for treatment.

[c] This estimate is based on the assumption of 550 workers generating 50 gallons per day and 260 working days per year.

Source: DOE 1999a, LANL 2001b, LANL 2002e.

Infrastructure Parameters: Activities associated with the operation of the CMRR Facility would not be energy- or water-use intensive. Use of potable water and electric power would represent small fractions of the sitewide energy and potable water use. Other use of nonwaste related infrastructure utility services would be expected to remain at about the level of use currently resulting from operations at the CMR Building.

Nonradiological Gaseous Effluent: Activities in the CMRR Facility would involve use of many industrial-type nonradiological chemicals. The quantities of nonradiological chemicals at the CMRR Facility would be maintained at the minimum quantities needed for ongoing work and would not be stockpiled beyond a monthly use quantity. The potential gaseous effluent expected to result as a consequence of the use of nonradiological volatile chemicals through the facility stack would be very small. Emissions from the emergency diesel generator testing and operation are included in the *CMRR EIS* environmental impacts analyses.

Radiological Gaseous Effluent: The various analytical and experimental activities at the CMRR Facility would be projected to generate the following maximum gaseous or airborne effluents annually: 0.00076 curies of airborne actinides (considered being plutonium-239 equivalent); 100 curies of kryton-85; 45 curies of xenon-131; 1,500 curies of xenon-133; and

1,000 curies of tritium (750 curies in oxide [as water vapor HTO] form, and 250 curies as gas [T_2] form).

Nonradiological Liquid Effluent: It is estimated the CMRR Facility operations and supporting systems would generate the same level of nonradiological liquid effluent discharge as the CMR Building. The CMR Building discharges nonradiological liquid effluent seasonally at a rate of 1 gallon per minute, or about 530,000 gallons per year (2 million liters per year) through a single NPDES outfall.

Radiological Liquid Effluent: Activities at the CMRR Facility would generate radioactive wastes. If the CMRR Facility is located at TA-55, these wastes would be collected and discharged into a network of drains that would route the solutions to the RLWTF at TA-50 for treatment and disposal. If located at TA-6, these waters would be collected and either transported to the RLWTF by tanker trucks or by a newly constructed pipeline connecting the TA-6 CMRR Facility site to the TA-50 RLWTF through a tie-in to existing RLWTF waste lines present either at TA-3 or at TA-59. The treatment process at the RLWTF includes ultrafiltration and reverse osmosis that, in total, remove particulate materials as small as one nanometer (10^{-9} meters) in size. The current CMR Building's radiological liquid effluent rate is not monitored, so information about the exact rate of production of this effluent type is unknown.

Radioactive Waste Generation: Activities at the CMRR Facility would generate radioactive wastes, including those disposed of as transuranic wastes, low-level wastes and mixed wastes. The annual radioactive waste generation rates include 61 cubic yards (46.6 cubic meters) of transuranic wastes; 26.7 cubic yards (20.4 cubic meters) of mixed transuranic wastes; 2,433 cubic yards (1,860 cubic meters) of low level radioactive wastes; 25.6 cubic yards (19.6 cubic meters) of mixed low level radioactive waste.

Chemical Waste Generation: Operations at the CMRR Facility would generate 24,692 pounds (11,200 kilograms) of chemical wastes annually.

Sanitary Waste Generation: It is estimated the operations and personnel at the CMRR Facility would produce about 7.15 million gallons (27 million liters) of sanitary waste[5] annually.

Workforce: The operational workforce at the CMRR Facility would be about 550 people. If either of the Hybrid Alternatives were implemented, this workforce would be separated between TA-3, the existing CMR Building, and either TA-55 or TA-6. Work would typically be conducted over a 40-hour equivalent work week during daytime hours.

Worker Dose: The estimated worker doses are based on historical exposure data for LANL workers (*DOE Worker Occupational Exposure Annual Report for 2000*). 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 operation at the new CMRR Facility.

[5] *This estimate is based on the annual sanitary waste production rate for 550 workers, each generating about 50 gallons (189 liters) per day of sanitary waste over 260 working days per year.*

2.7.5 Transportation

Radioactive and SNM shipments would be conducted within the LANL site. Transport distances would vary across alternatives, from a very short distance, [about 100 to 300 feet (30 to 90 meters)] in Alternative 1 (Preferred Alternative at TA-55), to about 3 to 5 miles (5 to 8 kilometers) in Alternative 2, at TA-6. Movement of materials outside TA-55 would occur on NNSA-controlled roads. DOE procedures and U.S. Nuclear Regulatory Commission regulations would not require the use of certified Type B casks within DOE sites. However, DOE procedures require closing the roads and stopping traffic for shipment of material (fissile or SNM) in noncertified packages. Shipment using certified packages, or smaller quantities of radioactive materials and SNM could be performed while site roads are open. As part of current security implementation at LANL, the roads to be used to transport the radioactive and SNM materials would have limited public access capabilities.

Material transport under the proposed action would include a one-time transport of some or all of the equipment at the CMR Building to the new CMRR Facility at TA-55 or TA-6. This movement would occur over a period of 2 to 4 years over open or closed roads.

2.7.6 Accident Analysis

A core set of accident scenarios were selected for analysis in the *CMRR EIS*. The impacts of the accidents analyzed for each alternative reflect and bound the impacts of all reasonably foreseeable accidents that could occur if the alternative were implemented. More details on accident scenarios and assumptions used in the evaluation of human health impacts from facility accidents are presented in Appendix C.

2.7.7 Disposition of the CMR Building

The disposition options for the existing CMR Building include:

Disposition Option 1: Reuse of the Building for administrative and other activities appropriate to the physical conditions of the structure with the performance of necessary structural and systems upgrades and repairs.

Disposition Option 2: Decontamination, decommission, and demolition of selected parts of the existing CMR Building, with some portions of the Building being reused.

Disposition Option 3: Decontamination, decommission, and demolition of the entire existing CMR Building.

Over the past 50 years of operation, certain areas within the existing CMR Building, pieces of equipment, and building systems have become contaminated with radioactive material and by operations involving SNM. These areas include about 3,100 square feet (290 square meters) of contaminated conveyors, gloveboxes, hoods and other equipment items; 760 cubic feet (20 cubic meters) of contaminated ducts; 580 square feet (50 square meters) of contaminated hot cell floor space; and 40,320 square feet (3,750 square meters) of laboratory floor space.

At this time, 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 NEPA compliance would be required when the disposition of the CMR Building actually becomes mature for decision in about 15 years.

2.7.7.1 Decontamination and Demolition Process

The process that would be used to decontaminate and demolish the CMR Building is described in the text box provided within this section. Detailed project-specific work plans for the decontamination and demolition of the CMR Building would be developed and approved by NNSA before any actual work began. These plans would include those required for environmental compliance (such as a Storm Water Pollution Prevention Plan) and monitoring activities (such as using a real-time gamma radiation monitor). Some of the work could involve technologies and equipment that have been used in similar operations, and some could use newly developed technologies and equipment. It is not likely that all of the decontamination and demolition work elements described in the following discussion would be utilized. All work would be carefully planned in accordance with established state and Federal laws and regulations (such as National Emissions Standards for Hazardous Air Pollutants [NESHAPs]), DOE Orders, and LANL procedures and best management practices.

The decontamination and demolition work is estimated to require up to one million person-hours. At any given time, a workforce from 2 to 100 or more workers could be onsite during various work element activities (LANL 2003). DOE and LANL's limit for worker exposures is 5 rem per year (10 CFR 835).

2.7.7.2 CMR Building Decontamination

The CMR Building consists of three levels, each essentially covering the full footprint of the structure. Radioactive contamination in the CMR Building is known or suspected in quantities that could require some level of decontamination or control for continued use or to control the spread of contamination during demolition. The three building levels include:

- **Attic—**Contains primarily facility equipment and is expected to be mostly free of radioactive contamination.

- **Main Floor—**Most of the CMR Building's laboratory and office space is on this level. The ceilings are expected to be mostly clean, with increasing potential for contamination towards the floor. It is estimated that 45 percent of the items and surfaces at this level are contaminated to some degree.

- **Basement—**Contains facility equipment, and has the highest potential for contamination. The ventilation ducts and piping in this area are on the contaminated side of the process flow, and it is expected that some contamination would migrate down into the basement. It is assumed that all equipment and surfaces in the basement are contaminated to some degree.

The CMR Building (except for Wing 9) is constructed of reinforced concrete floors (typically 4 inches [10 centimeters] thick), reinforced concrete walls (1 foot, 6 inches [46 centimeters] thick), reinforced concrete frame, and steel framing with light-gauge, metal deck roof. The entire facility is supported on reinforced concrete basement walls and columns on spread footings. Wing 9 is constructed differently with the above-grade walls consisting of lightly reinforced concrete masonry walls. The floor and grade slabs are thicker (approximately 11 inches [28 centimeters]) and the footings and concrete around and under the hot cells are massive (LANL 2003).

The overall footprint is estimated to be 195,000 square feet (18,116 square meters) and the average height from the bottom of the basement slab to the top of the roof is 50 feet (15 meters). Thus the total volume of the Building is estimated to be 360,000 cubic yards (275,242 cubic meters) (LANL 2003).

Ventilation System. The exhaust side of the ventilation system is large and highly contaminated. Most of the contaminated ductwork is in the basement.

Radioactive Liquid Waste Line. The radioactive liquid waste system carries contaminated wastewater to the Radioactive Liquid Waste Treatment Facility at TA-50. This is a highly contaminated system and is thought to be the largest contributing source of contamination within the CMR Building, due to leakage. It has been estimated that the radioactive liquid waste line consists of approximately 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) stainless steel pipe. It is expected that the bulk of this piping would be transuranic waste, with some portions being mixed low-level radioactive waste due to mercury contamination. Also, in areas of leakage, surrounding concrete, walls, floors, and other adjacent surfaces may have higher levels of contamination (LANL 2003).

Vacuum Systems. Of the two large vacuum systems in the CMR Building, one is highly contaminated. 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 the walls. It has been estimated that 432,000 square feet (40,134 square meters) would have to be replaced to achieve a level of decontamination adequate for reuse of the space for operations (LANL 2003).

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. Approximately 73,000 linear feet (22,250 meters) of asbestos pipe insulation has been found in the CMR Building, with another 9,400 square feet (873 square meters) on ducts. Floor tile (up to 20,000 square feet [1,858 square meters]) and ceiling tile may also contain asbestos (LANL 2003).

Decontamination of the CMR Building would consist of the removal of nonradiological and radiological contamination from the building using vacuum blasting, sand blasting, carbon dioxide bead blasting, scabbling, and mechanical separation of radioactive and nonradioactive materials. This would include removal of flooring, ceiling tiles, insulation, and paint contaminated with asbestos, lead, and other toxic-contaminated materials. Some of these materials may also be contaminated with radionuclides and require special handling. Radiologically contaminated and uncontaminated debris would be segregated. The extent of decontamination performed would be limited to those activities required to minimize radiological and hazardous material exposure to workers, the public, and the environment.

Decontamination of the CMR Building would also include the removal of asbestos debris. About 50 percent of the asbestos debris is anticipated to be free of radiological contamination. The other 50 percent of the asbestos debris is expected to be radiologically contaminated and would require special handling.

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

Worker exposure to ionizing radiation would be controlled to limit any individual's dose to less than 1 rem per year. Where practical, shielding and remotely operated equipment would be used to reduce radiation levels at worker locations.

2.7.7.3 Demolition of the CMR Building

Once the CMR Building has been decontaminated, demolition could proceed. All demolition debris would be sent to appropriate disposal sites. The CMR Building is not expected to be technically difficult to demolish and waste debris would be handled, transported, and disposed of in accordance with standard LANL procedures and is discussed in Section 2.7.7.5.

Demolition of uncontaminated portions of the Building would be performed using standard industry practices. A post-demolition site survey would be performed in accordance with the requirements of the *Nuclear Regulatory Commission Manual for Conducting Radiation Surveys* (NUREG/CR-5849).

2.7.7.4 Waste Management and Pollution Prevention Techniques

Waste management and pollution prevention techniques that could be implemented during the demolition of the CMR Building would include:

- Conducting routine briefings of workers;
- 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 drip, spray, squirt bottles or portable tanks for decontamination rinses;
- Using impermeable materials such as plastic liners or mats and drip pallets to prevent the spread of contamination;
- Avoiding areas of contamination until they are due for decontamination;
- Reducing waste volumes (by such methods as compaction); and
- Engaging in the use of recycling actions (materials such as lead, scrap metals, and stainless steel could be recycled to the extent practical).

Some of the wastes generated from the decontamination and demolition of the CMR Building would be considered residual radioactive material. DOE Order 5400.5 establishes guidelines, procedures, and requirements to enable the reuse, recycle, or release of materials that are below established limits. Materials that are below these limits are acceptable for use without restrictions. The residual radioactive material that would be generated by the decontamination and demolition of the CMR Building would include uncontaminated concrete, soil, steel, lead, roofing material, wood, and fiberglass. The concrete material could be crushed and used as backfill at LANL. Soil could also be used as backfill or as topsoil cover, depending on their characteristics. Steel and lead could be stored and reused or recycled at LANL. Wood, fiberglass, and roofing materials would be disposed at the Los Alamos County Landfill or its replacement facility. The total amount of waste generated from the disposition of the CMR Building is anticipated to be 36,000 cubic yards (27,500 cubic meters); this estimate does not include the amount of waste generated by the demolition of the outbuildings, parking lots, or soil removal. The total volume of solid waste, and recyclable materials generated from the disposition of the CMR Building is estimated at 20,000 cubic yards (15,300 cubic meters) (LANL 2003). The volume of radioactive waste generated from the disposition of the CMR Building is estimated to be 16,000 cubic yards (12,200 cubic meters).

Asbestos that is not radiologically contaminated would be packaged according to applicable requirements and sent to the LANL asbestos transfer station for shipment offsite to a permitted asbestos disposal facility along with other asbestos waste generated at LANL.

Radioactive contaminated soil, concrete, walls, and tiles would be packaged as low-level radioactive wastes and disposed of at TA-54, Area G, or an offsite commercial facility. Gloveboxes and radioactive liquid waste lines categorized as transuranic waste would be disposed at the Waste Isolation Pilot Plant.

If any other RCRA-regulated hazardous wastes were generated by disposition activities, they would be handled, packaged, and disposed of according to LANL's hazardous waste management program. Hazardous wastes would be stored at TA-54, Area L at LANL until sufficient quantities are accumulated for shipment to offsite treatment, storage, and disposal facilities. Any hazardous waste generated by the demolition of the CMR Building would be transferred to an appropriate offsite facility for disposal. All offsite shipments would be transported by a properly licensed and permitted shipper and conducted in compliance with DOT regulations and DOE standards.

2.7.8 Disposition of the CMRR Facility

Disposition of the new CMRR Facility would be considered at the end of its designed lifetime operation of at least 50 years. It is anticipated that the impacts from the disposition of the CMRR Facility would be similar to those discussed for the disposition of the existing CMR Building.

2.8 THE PREFERRED ALTERNATIVE

Council on Environmental Quality regulations require an agency to identify its preferred alternative, if one or more exists, in the draft EIS [40 CFR 1502.14(e)]. The Preferred Alternative is the alternative that the agency believes would fulfill its statutory mission, giving consideration to environmental, economic, technical, and other factors. In the draft stage of this *CMRR EIS*, Alternative 1 (construct a new CMRR Facility at TA-55), is NNSA's Preferred Alternative for the replacement of the CMR capabilities. At this draft stage, NNSA has not identified a preferred construction option or a preferred option for the disposition of the CMR Building.

2.9 SUMMARY OF ENVIRONMENTAL CONSEQUENCES FOR THE CMR BUILDING REPLACEMENT PROJECT

This section comparatively summarizes the alternatives analyzed in this EIS 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. In addition, environmental impacts common to all alternatives are also summarized. These include transportation risks and CMR Building and CMRR Facility disposition impacts.

Table 2–3 presents a comparison of the environmental impacts for each of the alternatives discussed in detail in Chapter 4, including facility construction and operations impacts. For the most part, environmental impacts would be small and would be similar among the alternatives analyzed.

2.9.1 Construction Impacts

In evaluating construction impacts, Construction Option 1 was considered to be the option that would bound the potential environmental impacts from construction activities. The results therefore, in Table 2–3 represent Construction Option 1 for all alternatives.

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 environmental impacts resulting from construction for this alternative.

Alternative 1 (Preferred Alternative)—The construction of new Hazard Category 2 and 3 buildings, the construction of 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, and would not change the area's current

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 CMR Building would then be segregated into areas of contamination and non-contamination. Contaminated areas would be further subdivided by the type of contamination: radioactive materials, hazardous materials, toxic materials including asbestos, and any other 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 prior to decontamination.

Removal of Contamination. Workers would remove or stabilize contamination according to the type and condition of materials. If the surface of a wall was found to be contaminated, it might be physically stripped off. If contamination was found within a wall, a surface coating might be applied to keep the contamination from releasing contaminated dust during dismantlement and keeping 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 any large pieces. Knocking down portions of the CMR Building, foundation, and parking lot could require the use of 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 onsite at LANL or disposed of as construction waste onsite or offsite. Asphalt would be placed in containers and trucked to established storage sites within LANL, at TA-59 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 still radiologically contaminated would be segregated as low-level radioactive waste if no hazardous[1] contamination is present. Radiologically-contaminated and non-contaminated asbestos debris would also be segregated separately. Other types of debris that would be segregated include mixed low-level radioactive waste,[2] non-contaminated construction debris, and debris requiring special handling. Segregation activities could be conducted on a gross scale using heavy machinery or could 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 disposal facility.

Debris would be packaged for transport and disposal according to waste type, characterization, ultimate disposition, and U.S. Department of Transportation (DOT) or DOE transportation requirements. Uncontaminated construction debris could be sent by truck with no packaging to the local landfill. Demolition debris would also be recycled or reused to the extent practicable. Debris would be disposed of either on or offsite depending on the available capacity of existing disposal facilities. Offsite disposal would involve greater transportation requirements depending on the type of waste, packaging, acceptance criteria, and location of the receiving facility.

Testing and Cleanup of Soil and Contouring and Seeding. The soils beneath the CMR Building would be sampled and tested for contamination. Any contaminated soil 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 were 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 non-native cereal grains selected to hold the soil in place until native vegetation becomes stabilized.

[1] *Hazardous waste is a category of waste regulated under the RCRA. Hazardous RCRA waste must be solid and exhibit at least one of four characteristics described in 40 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, special nuclear, or byproduct material subject to the Atomic Energy Act.*

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 adverse effects to 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 socioeconomic region of influence. Waste generated during construction would be adequately managed by the existing LANL capacity for handling waste.

Alternative 2 (Greenfield Alternative)—The construction of new Hazard Category 2 and 3 buildings, the construction of an administrative offices and support functions building, 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. Construction would also 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 change 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 region of influence. Waste generated during construction would be adequately managed by the existing LANL capacity 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.

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 a parking lot at TA-55 would affect 22.75 acres (9.2 hectares) of disturbed land, and 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 adverse effects to 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 capacity 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 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 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 change 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 region of influence. Waste generated during construction would be adequately managed by the existing LANL capacity 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.

2.9.2 Operations Impacts

Relocating CMR operations to either TA-55 or TA-6 at LANL would require similar facilities, infrastructure support procedures, resources, and numbers of workers during operations. For most environmental areas of concern, differences would be minor. There would be no perceivable differences in impacts between the 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 TRU waste generated by CMRR Facility operations would be treated and packaged in accordance with the WIPP Waste Acceptance Criteria and transported to WIPP or a similar type facility for DOE disposition.

Normal operations for each of the action alternatives would increase the amount of radiological releases as compared to current CMR Building operations. Current operations at the CMR Building are restricted, and 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 0.3 millirem per year which translates to 1.5×10^{-7} latent cancer fatalities per year from normal 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 0.001 latent cancer fatalities per year in the entire population from normal operation at the new CMRR

Facility. Statistically, this would equate to a chance of one additional fatal cancer among the exposed population in 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 there would statistically 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 0.00042 latent cancer fatalities per year. This 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 0.002 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.

2.9.3 Environmental Impacts Common to All Alternatives

As previously noted, overall CMR operational characteristics at LANL would not change regardless of the ultimate location of the replacement facility and the alternative implemented. Sampling methods and mission operations in support of analytical chemistry and materials characterization (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 alternatives would generally have the same amount of operational impacts. In other words, all of the alternatives would produce equivalent levels of emissions and radioactive releases into the environment, infrastructure requirements would be the same, and each alternative would generate the same amount of radioactive and nonradioactive 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 CMRR Facility would result from the decontamination and demolition of the Building and the transport and disposal of radiological and nonradiological waste materials.

Transportation Risks

All alternatives except the No Action Alternative, would require the relocation and one-time transport of SNM equipment and materials. Transport of SNM, equipment, and other materials currently located at CMR Building to the new CMRR Facility at TA-55 or TA-6 would occur over a period of 2 to 4 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 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 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 (3.1×10^{-10}). For all alternatives, the overall environmental impacts and potential risks of transporting AC and MC samples would be small.

Impacts During the Transition from the CMR Building to the New CMRR Facility

During a four-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, 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 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 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.

CMR Building and CMRR Facility Disposition Impacts

All action alternatives would require some level of decontamination and demolition of the existing CMR Building. Operational 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.

Table 2–3 Summary of Environmental Consequences for the CMR Replacement Project

<table>
<tr><th>Resource/Material Categories</th><th colspan="2">No Action Alternative</th><th colspan="2">Alternative 1 (relocate CMR AC and MC operations to TA-55) [a]</th><th colspan="2">Alternative 2 (relocate CMR AC and MC operations to TA-6) [a]</th><th colspan="2">Alternative 3 (relocate CMR AC and MC operations to TA-55) [b]</th><th colspan="2">Alternative 4 (relocate CMR AC and MC operations to TA-6) [b]</th></tr>
<tr><td colspan="11">Land Resource</td></tr>
<tr><td>Construction [c]/ Operations [d]</td><td colspan="2">No impact</td><td colspan="2">26.75 acres/ 13.75 acres</td><td colspan="2">26.75 acres/ 15.25 acres</td><td colspan="2">22.75 acres/ 9.75 acres</td><td colspan="2">22.75 acres/ 11.25 acres</td></tr>
<tr><td colspan="11">Air Quality</td></tr>
<tr><td>Construction [c]</td><td colspan="2">No impact</td><td colspan="2">Small temporary impact</td><td colspan="2">Small temporary impact</td><td colspan="2">Small temporary impact</td><td colspan="2">Small temporary impact</td></tr>
<tr><td>Operations</td><td colspan="2">0.00003 curies of actinides</td><td colspan="2">- 0.00076 curies of actinides
- 2,645 curies of tritium and noble fission gases</td><td colspan="2">- 0.00076 curies of actinides
- 2,645 curies of tritium and noble fission gases</td><td colspan="2">- 0.00076 curies of actinides
- 2,645 curies of tritium and noble fission gases</td><td colspan="2">- 0.00076 curies of actinides
- 2,645 curies of tritium and noble fission gases</td></tr>
<tr><td colspan="11">Water Resource</td></tr>
<tr><td>Construction [c]</td><td colspan="2">No impact</td><td colspan="2">Small temporary impact</td><td colspan="2">Small temporary impact</td><td colspan="2">Small temporary impact</td><td colspan="2">Small temporary impact</td></tr>
<tr><td>Operations</td><td colspan="2">Small impact</td><td colspan="2">Small impact</td><td colspan="2">Small impact</td><td colspan="2">Small impact</td><td colspan="2">Small impact</td></tr>
<tr><td colspan="11">Ecological Resources</td></tr>
<tr><td>Construction [c]</td><td colspan="2">No impact</td><td colspan="2">Indirect adverse effect to Mexican spotted owl habitat</td><td colspan="2">No impact</td><td colspan="2">Indirect adverse effect to Mexican spotted owl habitat</td><td colspan="2">No impact</td></tr>
<tr><td>Operations</td><td colspan="2">No impact</td><td colspan="2">Indirect adverse effect to Mexican spotted owl habitat</td><td colspan="2">No impact</td><td colspan="2">Indirect adverse effect to Mexican spotted owl habitat</td><td colspan="2">No impact</td></tr>
<tr><td colspan="11">Socioeconomics</td></tr>
<tr><td>Construction [c]</td><td colspan="2">No impact</td><td colspan="2">No noticeable changes;
300 workers (peak) 1,152 jobs</td><td colspan="2">No noticeable changes;
300 workers (peak), 1,152 jobs</td><td colspan="2">No noticeable changes;
300 workers (peak); 1,152 jobs</td><td colspan="2">No noticeable changes;
300 workers (peak), 152 jobs</td></tr>
<tr><td>Operations</td><td colspan="2">No impact</td><td colspan="2">No increase in workforce [e]</td><td colspan="2">No increase in workforce [e]</td><td colspan="2">No increase in workforce [e]</td><td colspan="2">No increase in workforce [e]</td></tr>
<tr><td colspan="11">Public and Occupational Health and Safety</td></tr>
<tr><td>Normal Operations</td><td>Dose</td><td>LCF</td><td>Dose</td><td>LCF</td><td>Dose</td><td>LCF</td><td>Dose</td><td>LCF</td><td>Dose</td><td>LCF</td></tr>
<tr><td>Population dose (person-rem per year)</td><td>0.04</td><td>0.00002</td><td>1.9</td><td>0.001</td><td>2.0</td><td>0.001</td><td>1.9</td><td>0.001</td><td>2.0</td><td>0.001</td></tr>
<tr><td>MEI (millirem per year)</td><td>0.006</td><td>3.0×10^{-9}</td><td>0.33</td><td>1.7×10^{-7}</td><td>0.35</td><td>1.8×10^{-7}</td><td>0.33</td><td>1.7×10^{-7}</td><td>0.35</td><td>1.8×10^{-7}</td></tr>
<tr><td>Average individual dose (millirem per year)</td><td>0.0001</td><td>6.6×10^{-11}</td><td>0.006</td><td>3.1×10^{-9}</td><td>0.006</td><td>3.2×10^{-9}</td><td>0.006</td><td>3.1×10^{-9}</td><td>0.006</td><td>3.2×10^{-9}</td></tr>
<tr><td>Total worker dose (person-rem per year)</td><td>22</td><td>0.009</td><td>61</td><td>0.02</td><td>61</td><td>0.02</td><td>61</td><td>0.02</td><td>61</td><td>0.02</td></tr>
<tr><td>Average worker dose (millirem per year)</td><td>110</td><td>0.00004</td><td>110</td><td>0.00004</td><td>110</td><td>0.00004</td><td>110</td><td>0.00004</td><td>110</td><td>0.00004</td></tr>
<tr><td>Hazardous chemicals</td><td colspan="2">None</td><td colspan="2">None</td><td colspan="2">None</td><td colspan="2">None</td><td colspan="2">None</td></tr>
</table>

Resource/Material Categories	*No Action Alternative*	*Alternative 1 (relocate CMR AC and MC operations to TA-55)* [a]	*Alternative 2 (relocate CMR AC and MC operations to TA-6)* [a]	*Alternative 3 (relocate CMR AC and MC operations to TA-55)* [b]	*Alternative 4 (relocate CMR AC and MC operations to TA-6)* [b]
Accidents (Maximum Annual Cancer Risk, LCF)					
Population	0.002	0.00042	0.0004	0.00042	0.0004
MEI	3.5×10^{-6}	1.2×10^{-6}	5.6×10^{-7}	1.2×10^{-6}	5.6×10^{-7}
Noninvolved worker	0.00013	0.000038	0.000036	0.000038	0.000036
Environmental Justice	No disproportionally high and adverse impacts on minority or low-income populations				
Waste Management (cubic yards of solid waste per year unless otherwise indicated): Waste would be disposed of properly with small impact					
Transuranic waste	19.5	61	61	61	61
Mixed Transuranic	8.5	27	27	27	27
Low-level radioactive waste	1,021	2,433	2,433	2,433	2,433
Mixed low-level radioactive waste	6.7	26	26	26	26
Hazardous waste (pounds per year)	10,494	24,692	24,692	24,692	24,692
Transportation					
Accidents [f]	***Dose***	***Dose***	***Dose***	***Dose***	***Dose***
MEI (rem per year)	7.7×10^{-7}	0	0.00015	0	0.00015

LCF = latent cancer fatality; MEI = maximally exposed individual member of the public.

[a] Relocate CMR AC and MC and actinide research and development activities to a new CMRR Facility consisting of an administrative offices and support functions building and Hazard Category 2 and 3 buildings.

[b] Relocate CMR AC and MC and actinide research and development activities to a new CMRR Facility consisting of only Hazard Category 2 and 3 buildings.

[c] Construction impacts are based on Construction Option 1 which is bounding.

[d] Acreage reflects building footprints, parking lot, and new roads as applicable.

[e] CMR operations would require no additional workers beyond what was projected by the Expanded Operations Alternative analyzed in the *LANL SWEIS*. Increased CMRR Facility operations at LANL would require up to 550 workers. This would be an increase of 346 workers over current requirements. The Expanded Operations Alternative presented in the *LANL SWEIS* addressed the impact of this increase in employment.

[f] Population transportation impacts would be bounded by the normal operation and accident impacts evaluated for the various alternatives.

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 from 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; climate, air quality, and noise; geology and soils; surface and groundwater quality; ecological resources; cultural and paleontological resources; socioeconomics; environmental justice; human health; and waste management and pollution prevention.

3.1 INTRODUCTION

In accordance with the Council on Environmental Quality National Environmental Policy Act (NEPA) implementing regulations (40 CFR [*Code of Federal Regulations*] 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 any environmental changes brought about by implementing the proposed action can be evaluated; the reference conditions are the currently existing conditions.

The proposed action considered in this *Draft Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at the Los Alamos National Laboratory* (*CMRR EIS*), would place chemistry and metallurgy research (CMR) activities at Technical Area (TA) 3 (the location of the existing CMR Building), TA-6 (the "greenfield" location), or TA-55 (the preferred new location). The affected environment at LANL is described for the following resource areas: land use and visual resources; site infrastructure; climate, air quality, and noise; geology and soils; surface and groundwater quality; ecological resources; cultural and paleontological resources; socioeconomics; environmental justice; human health; and waste management and pollution prevention. The level of detail varies depending on the potential for impacts resulting from each alternative.

The following site-specific and recent project-specific documents were important sources of information in describing the existing environment at LANL. Numerous other sources of site- and resource-related data were also used in the preparation of this chapter and are cited as appropriate:

- *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory (LANL SWEIS)* (DOE 1999a)

- *Final Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory* (DOE 2002e).

The U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) evaluated the environmental impacts of the proposed action and other alternatives within defined regions of influence. The regions of influence are specific to the type of effect evaluated, and encompass geographic areas within which any significant impact would be expected to 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 facilities. Economic effects such as job and income changes were evaluated within a socioeconomic region of influence that includes the county in which LANL is located and nearby counties in which substantial portions of the site's workforce reside. Brief descriptions of the regions of influence are given in **Table 3–1**. More detailed descriptions of the regions of influence and the methods used to evaluate impacts are presented in Appendix A.

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 to it
Site infrastructure	LANL
Air quality	LANL, nearby offsite areas within local air quality control regions where significant air quality impacts may occur, and Class I areas within 62 miles (100 kilometers)
Noise	LANL, nearby offsite areas, access routes to the sites, and the transportation corridors
Geology and soils	LANL and nearby offsite areas
Surface and groundwater quality	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 where approximately 90 percent of LANL employees reside
Environmental justice	The minority and low-income populations within 50 miles (80 kilometers) of LANL
Human health	The site and offsite areas within 50 miles (80 kilometers) of LANL
Waste management and pollution prevention	LANL

Reference conditions for each environmental resource area were determined for ongoing operations from information provided in previous environmental studies, relevant laws and regulations, and other government reports and databases. More detailed information of the affected environment can be found in annual site environmental reports and site NEPA documents. Unless otherwise referenced, the following description of the affected environment at LANL, TA-3, TA-6, and TA-55 are based all or in part on information provided in the *LANL SWEIS* (DOE 1999a), which is incorporated by reference.

3.2 LAND USE AND VISUAL RESOURCES

LANL is located on approximately 25,600 acres (10,360 hectares) of land in north central New Mexico (**Figure 3–1**). 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 DOE's

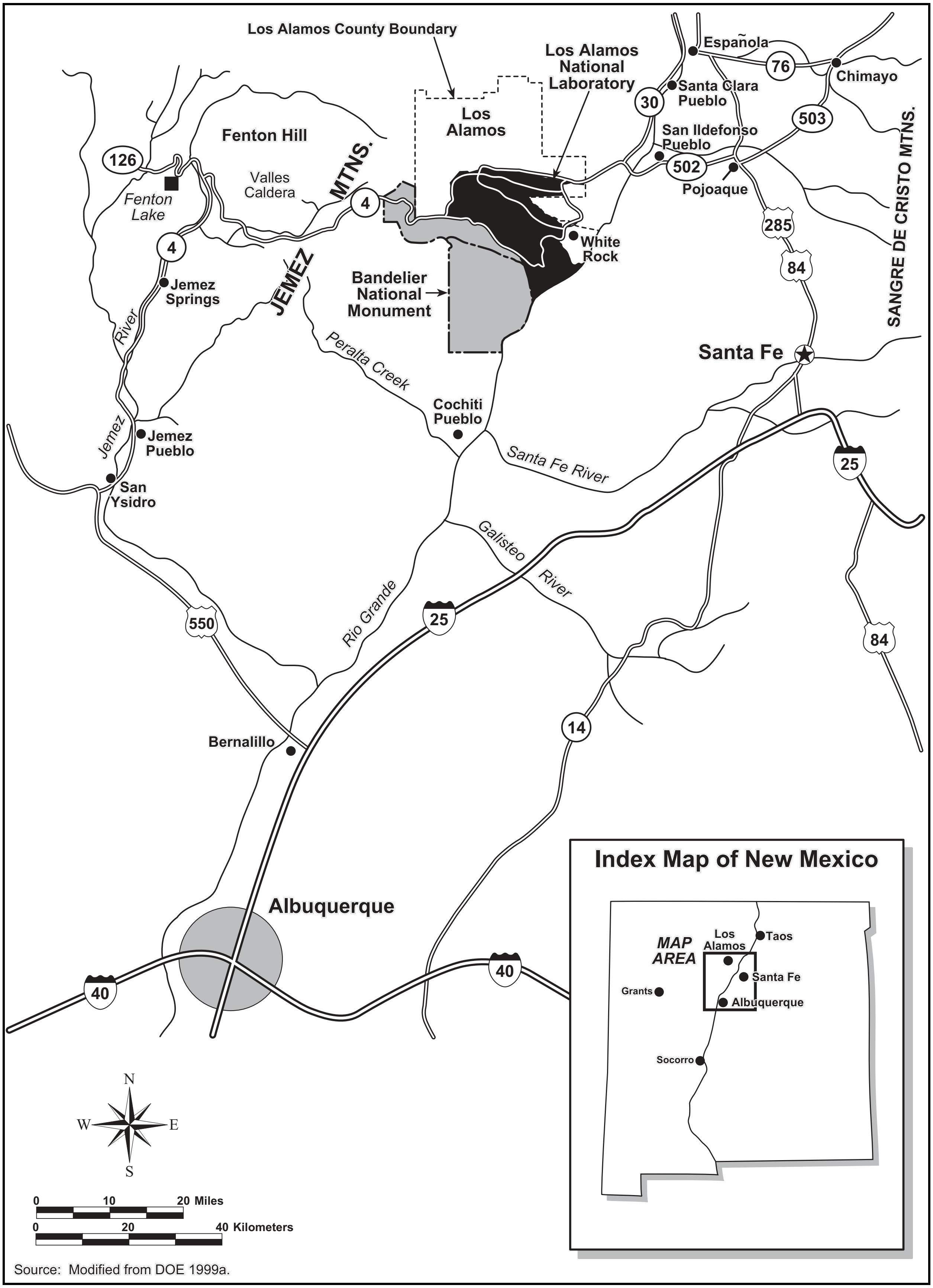


Figure 3–1 Location of LANL

NNSA. It is operated by the University of California under contract to DOE. Portions of LANL are located in Los Alamos and Santa Fe counties. DOE's principal missions are national security, energy resources, environmental quality, and science; each of these missions is supported by activities conducted at LANL. NNSA's national security mission includes maintaining and enhancing the safety, reliability, and performance of the U.S. nuclear weapons stockpile; promoting international nuclear safety and nonproliferation; reducing global danger from weapons of mass destruction; and providing safe and reliable nuclear propulsion plants for the U.S. Navy.

LANL is divided into 49 separate TAs with location and spacing that reflect the site's historical development patterns, regional topography, and functional relationships (**Figure 3–2**). While the exact number of structures changes somewhat with time (for example, as a result of the Cerro Grande Fire; see Section 3.2.1), in 1999 there were 944 permanent structures, 512 temporary structures, and 806 miscellaneous buildings with approximately 5,000,000 square feet (465,000 square meters) that could be occupied. In addition to onsite office space, about 213,300 square feet (19,833 square meters) of space was leased within the Los Alamos town site and White Rock community.

3.2.1 Land Use

Land use in the LANL region is linked to the economy of northern New Mexico, which depends heavily on tourism, recreation (such as skiing and fishing), agriculture, and the state and Federal governments for its economic base. Area communities are generally small, such as the Los Alamos town site with under 12,000 residents, and primarily support urban uses including residential, commercial, lite industrial, and recreational facilities. The region also includes Native American communities; lands of the Pueblo of San Ildefonso shares LANL's eastern border, and other pueblos are located nearby. Major governmental bodies that serve as land stewards and determine land uses within Los Alamos and Santa Fe counties include county governments, DOE, Department of Agriculture (U.S. Forest Service, Santa Fe National Forest), the Department of the Interior (National Park Service, Bandelier National Monument, and the Bureau of Land Management), 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 (see **Figure 3–3**).

The *LANL SWEIS* used a hazard-based land use approach to characterize land use at LANL. This approach is based on the most hazardous activities in each TA and is organized into six categories.

Support—Includes TAs with only support facilities that do not perform research and development activities and are generally free from chemical, radiological, or explosive hazards; also includes undeveloped TAs other than those that serve as buffers.

Research and Development—Includes TAs that perform research and development activities with associated chemical and radiological hazards, but that are generally free of explosives hazards; does not include waste disposal sites.

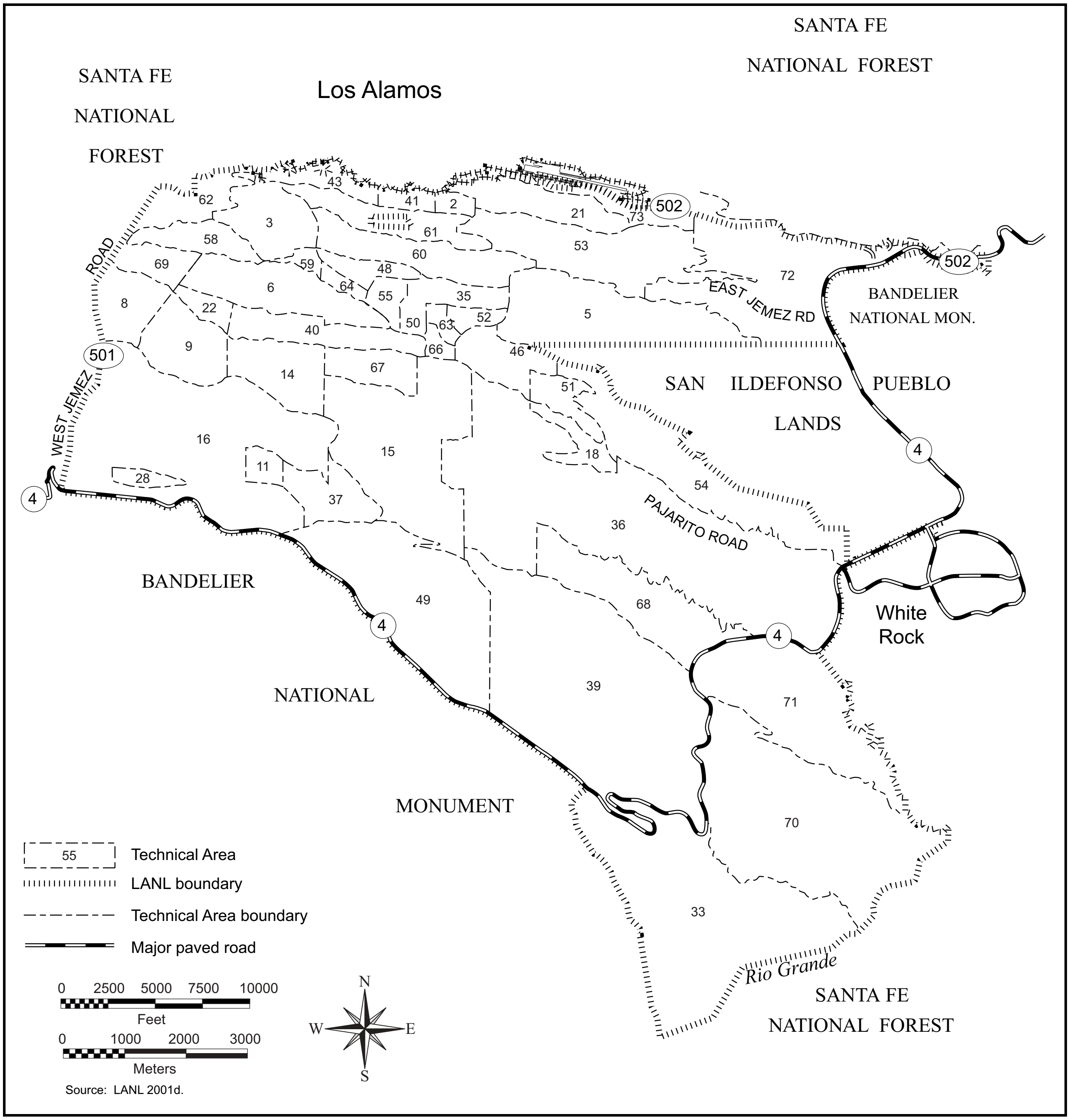


Figure 3–2 Technical Areas of LANL

Research and Development/Waste Disposal—The remaining research and development areas (i.e., those areas that are generally free of explosives hazards and have existing waste disposal sites).

Explosives—Includes TAs where explosives are tested or stored, but does not include waste disposal sites.

Explosives/Waste Disposal—The remaining sites where explosives are tested or stored (such as those with existing waste disposal sites).

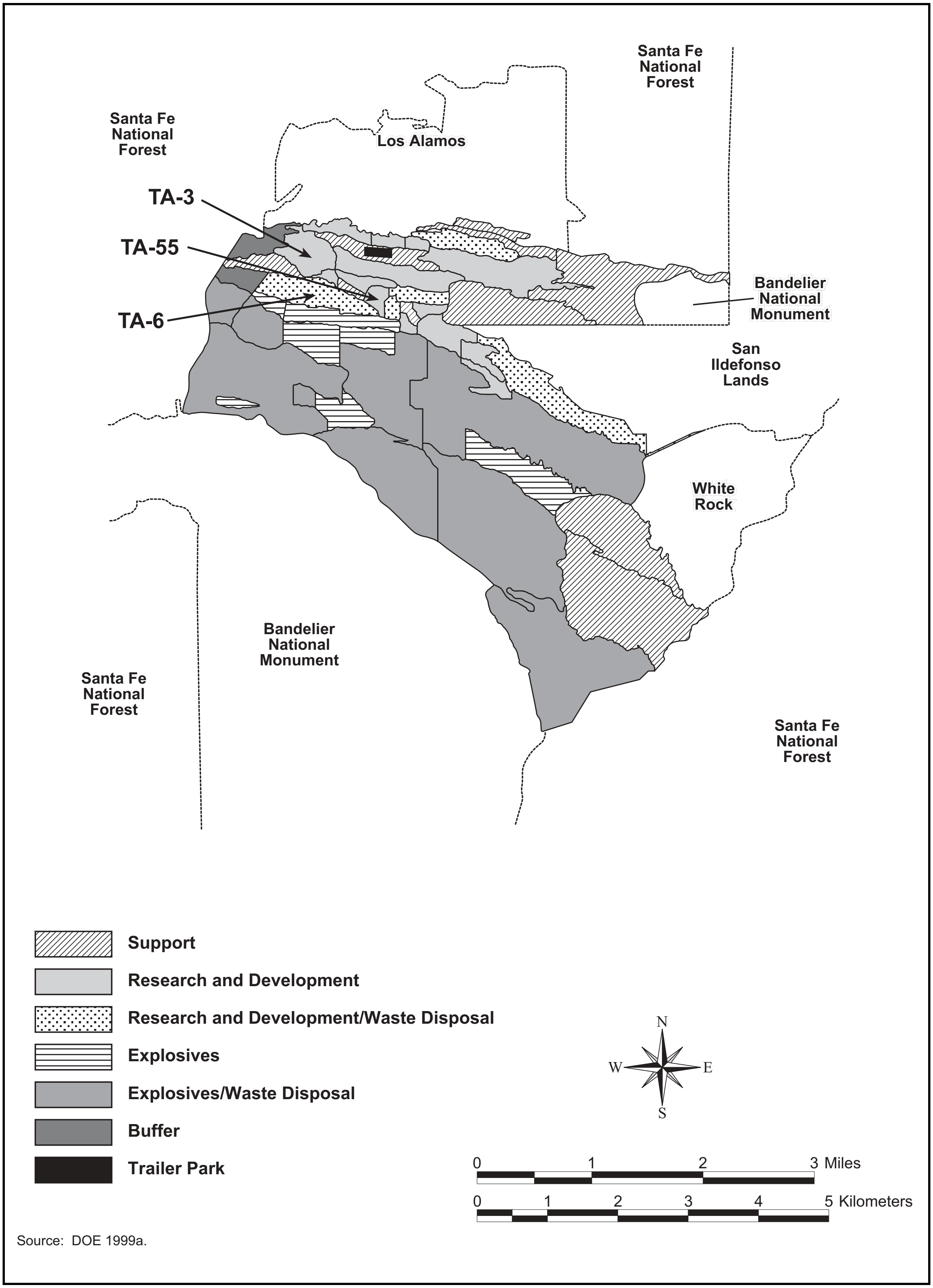


Figure 3–3 Land Use at and Adjacent to LANL

Buffer—Land identified in each of the usage types described above also may serve as a buffer area. This last land use category therefore includes areas that only serve as buffers for the safety or security of other TAs, usually explosives areas.

The *LANL Comprehensive Site Plan* (LANL 2000f) incorporated the *LANL SWEIS* hazard-based land use approach and augmented it by describing and mapping 10 land use categories. The entire Laboratory site is divided into the following land uses: 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.

LANL is divided into TAs that are used for building sites, experimental areas, and waste disposal locations. However, those uses account for only a small part of the total land area of the site. In fact, only 5 percent of the site is estimated to be unavailable to most wildlife (because of security fencing). Most of the site is undeveloped to provide security, safety, and expansion possibilities for future mission-support requirements. There are no agricultural activities present at LANL, nor are there any prime farmlands in the vicinity. 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 piñon-juniper woodland ecosystems (DOE 1996c). In 1999, the White Rock Canyon Reserve was dedicated. It is about 1,000 acres (405 hectares) in size and is located on the southeast perimeter of LANL. The reserve is managed jointly by DOE and the National Park Service for its significant ecological and cultural resources and research potential (LANL 2000e).

Beginning on May 5, 2000, a wildfire known as the Cerro Grande Fire burned across the Los Alamos area. By the time the fire was fully contained on June 6, it had 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 2002c). In general, impacts of the fire on land use in the region should be temporary. Access and use of certain recreation areas and trails will continue to be restricted over the next year or 2 within at least part of LANL and the surrounding forestlands. Within LANL, 45 structures (trailers, transportable and storage units) were totally destroyed and 67 were damaged. The fire also affected land use in the Los Alamos town site, where about 230 housing units were totally destroyed. The Cerro Grande Fire at times threatened structures at TA-3 and TA-55; however, no permanent buildings were damaged or destroyed. Although the fire burned across TA-6, it did so at a generally low intensity and did not burn any buildings in the area (DOE 2000b, LANL 2000c).

The Los Alamos County Comprehensive Plan, which is presently being updated (Los Alamos County 2002), identifies land planning issues and establishes land planning objectives on private and county lands comprising 8,613 acres (3,488 hectares). Twenty-nine percent of this land is located within the Los Alamos town site (inclusive of Royal Crest Trailer Park) and 26 percent is located in the community of White Rock. The remaining 45 percent of the land is undeveloped and is used for recreational activities and open space. LANL, as a Federal government property, is not addressed in the County plan. Land-use designations in the Santa Fe County Plan are based on groundwater protection goals. Therefore, this plan designates LANL as "Agricultural and Residential," although, as noted above, there are no agricultural activities on the site, nor are there any residential uses within LANL boundaries (DOE 1996c).

TA-3 is situated in the west-central portion of LANL and is separated from the Los Alamos townsite by Los Alamos Canyon. It is located within the *LANL SWEIS* defined Research and Development land use category (see Figure 3-3) and is an area that has been designated for Experimental Science by the *LANL Comprehensive Site Plan* (LANL 2000f). TA-3 covers 357 acres (144 hectares), of which 69 percent has been developed. Site facilities are located on the top of a mesa between the upper reaches of Sandia and Mortandad Canyons. It is the administration complex within LANL and contains the Director's office, administrative offices, and support facilities. Major facilities within the area include the CMR Building, the Sigma Complex, the Main Shops, and the Materials Science Laboratory. Other buildings house central computing facilities, chemistry and materials science laboratories, Earth and space science laboratories, physics laboratories, technical shops, cryogenics laboratories, the main cafeteria, badge office, and the study center. A security fence to aid in physical safeguarding of special nuclear materials (SNM) bounds the CMR Building.

TA-6 is adjacent to and south of TA-3 and is located on a mesa between Twomile and Pajarito Canyons. It is situated about 0.6 miles (1 kilometer) south of Los Alamos. The area falls within the *LANL SWEIS* defined Research and Development/Waste Disposal land use category (Figure 3-3). Lands within TA-6 are designated in the *LANL Comprehensive Site Plan* for Experimental Science and High-Explosives Research and Development (LANL 2000f). TA-6 encompasses 500 acres (202 hectares) of which only 1 percent is occupied by a gas cylinder staging facility and vacant buildings pending decommissioning.

TA-55 is situated in the west-central portion of LANL approximately 1.1 miles (1.8 kilometers) south of Los Alamos townsite. It is located within the Research and Development land use category as defined in the *LANL SWEIS* (Figure 3–3). The area is designated for Nuclear Materials Research and Development by the *LANL Comprehensive Site Plan* (LANL 2000f). TA-55 encompasses 40 acres (16 hectares) of which 43 percent is developed. The main complex has five connected buildings including the Administration Building, Support Office Building, Support Building, Plutonium Facility, and Warehouse. The Nuclear Materials Storage Facility is separate from the main complex. TA-55 facilities provide research and applications in 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. A security fence to aid in physical safeguarding of SNM bounds the entire site.

3.2.2 Visual Resources

The topography in northern New Mexico is rugged, especially in the vicinity of LANL. Mesa tops are cut by deep canyons, creating sharp angles in the land form. 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 Bureau of Land Management Visual Resource Contrast rating of Class II and III. Management activities within these classes may be seen but should not dominate the view.

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 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 have been altered by the Cerro Grande Fire. Although the visual environment is still diverse, interesting, and panoramic, portions of the visual landscape are dramatically stark. Rocky outcrops forming the mountains are now visible through the burned forest areas. The eastern slopes of the Jemez Mountains, instead of presenting a relatively uniform view of dense green forest, are now a mosaic of burned and unburned areas. Grasses and shrubs initially will replace forest stands and will contribute to the visual contrast between the burned and unburned areas for many years. University of California, current LANL Management and Operating contractor (UC at LANL) and neighboring land stewards are in the process of mechanically thinning the forests within LANL and nearby to reduce the existing fuel loads. This effort involves the removal of both burned and live trees. This tree thinning process will increase the visibility of industrial and residential areas within LANL and Los Alamos County. Local effects include reduced visual appeal of trails and recreation areas (DOE 2000b).

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. Developed areas within LANL are consistent with a Class IV Visual Resource Contrast rating, in which management activities dominate the view and are the focus of viewer attention.

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 domes at TA-54. Similarly, the Los Alamos town site appears mostly residential in character, with the water storage towers very 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 town site is predominantly visible from higher elevation viewpoints. At night, the lights of LANL, the Los Alamos town site, and White Rock are directly visible from various locations across the viewshed as far away as the towns of Española and Santa Fe.

TA-3 is located on a mesa at the base of the Jemez Mountains between the upper reaches of Sandia and Mortandad Canyons. TA-3 is heavily developed and contains numerous buildings that are austere and industrial in appearance. Multi-storied buildings within TA-3 are visible from the Los Alamos town site and from upper elevations of the Pajarito Plateau. The visual resources of TA-3 are consistent with a Class IV Visual Resource Contrast rating, that is, management activities may dominate the view and be the major focus of viewer attention (DOI 1986).

TA-6 is located on a mesa between Twomile and Pajarito Canyons. The area is largely undeveloped; however, it contains a gas cylinder staging facility and vacant buildings pending decommissioning. The heavily wooded area is visible from Pajarito Road and from higher elevations to the west along the upper reaches of the Pajarito Plateau rim. The visual resources of TA-6 are consistent with a Class III Visual Resource Contrast rating, that is, management activities may attract attention but should not dominate the view of the casual observer (DOI 1986).

TA-55 is located on a mesa about 1 mile (1.6 kilometers) southeast of TA-3. While not visible from lower elevations, TA-55 is visible from higher elevations to the west along the upper reaches of the Pajarito Plateau rim, from where it appears as one of several scattered built-up areas among the heavily forested areas of the site. As is the case for TA-3, developed portions of TA-55 would have a Class IV Visual Resource Contrast rating.

3.3 SITE INFRASTRUCTURE

Site infrastructure characteristics for LANL are summarized in **Table 3–2.** Each infrastructure characteristic is further discussed in the following paragraphs.

Table 3–2 LANL Sitewide Infrastructure Characteristics

Resource	*Site Usage* [a]	*Site Capacity*
Transportation		
Roads (miles)	80 [b]	Not applicable
Railroads (miles)	0	Not applicable
Electricity [c]		
Energy (megawatt hours per year)	491,186	963,600
Peak load demand (megawatts)	85.5	110
Fuel		
Natural gas (cubic feet per year)	2,530,000,000 [d]	8,070,000,000 [e]
Water (gallons per year)	344,000,000	542,000,000 [f]

[a] All site usage values are for fiscal year except for water use, which is calendar year.
[b] Includes paved roads and paved parking areas only.
[c] Usage and capacity values are for the entire Los Alamos Power Pool.
[d] Usage value for LANL plus baseline usage for other Los Alamos County users.
[e] Entire service area capacity, which includes LANL and other Los Alamos area users.
[f] Equivalent to DOE's leased water rights.
Sources: DOE 1999a, DOE 1999c, LANL 2002d.

3.3.1 Ground Transportation

About 80 miles (130 kilometers) of paved roads and parking surface have been developed at LANL (see Table 3–2). There is no railway service connection at the site. Local and linking regional transportation systems, including roadways, are detailed in Section 3.9.4.

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, that was established in 1985. Electric power is supplied to the Power Pool through two existing regional 115-kilovolt electric power lines. The first line (the Norton-Los Alamos line) is administered by DOE and originates from the Norton Substation near White Rock, and the second line (the Reeves Line) is owned by the Public Service Company of New Mexico and originates from the Bernalillo-Algodones Substation. Both transmission substations are owned by the Public Service Company of New Mexico. DOE also operates a gas-fired steam and electrical power generating plant at TA-3 (TA-3 Co-generation Complex) that is used on an as-needed basis, primarily during peak demand periods of LANL operations and during pool outages. DOE also maintains various low-voltage transformers at LANL facilities and approximately 34 miles (55 kilometers) of 13.8-kilovolt distribution lines (DOE 2000a). Within LANL, DOE also maintains two power distribution substations: the Eastern TA Substation and the TA-3 Substation. In mid-2001, LANL broke ground for construction of the new Western TA Substation as part of a project to provide overall electrical supply reliability across the site and to provide redundant capacity for LANL and the Los Alamos town site in the event of an outage at either of LANL's two existing substations. The Western TA Substation will be serviced by a new 115-kilovolt power transmission line originating at the existing Norton Substation. The new substation's main transformer is rated at 56-megavolt-amperes or about 45 megawatts (DOE 2000a, LANL 2002d).

Recent changes (as of August 1, 2002) in transmission agreements with the Public Service Company of New Mexico have resulted in the removal of contractual restraints on Power Pool resources import capability. Import capacity is now limited only by the physical capability (thermal rating) of the transmission lines, which is approximately 110-120 megawatts from a number of hydroelectric, coal, and natural gas power generators throughout the western United States. Onsite electrical generating capability for the Power Pool is limited by the existing TA-3 steam and electric power plant, which is capable of producing up to 20 megawatts of electric power that is shared by the Power Pool under contractual arrangement (DOE 2002g). However, an environmental assessment (DOE 2002g) has been prepared for a project that will support the installation of two new, gas-fired combustion turbine generators within the TA-3 Co-generation Complex and upgrading the existing steam turbines. Each new unit will have an electric generating capacity of 20 megawatts, with the first unit to be installed in the Fiscal Year 2003 (FY03) to FY04 timeframe. The second unit is currently not planned for installation until FY07 at the earliest (DOE 2002g). Thus, construction and installation of the first combustion turbine generator will boost LANL's onsite electrical generating capacity by 20 megawatts in the near future.

Electricity consumption and peak demands by LANL have historically fluctuated, largely as a result of power demand by the Los Alamos Neutron Science Center. Electric power availability from the Pool (based on a peak load import capacity of 110 megawatts) is 963,600 megawatt-hours per year. In FY01, LANL used 375,143 megawatt-hours of electricity. Other Los Alamos County users consumed an additional 116,043 megawatt-hours. The FY01 peak load was about 70.9 megawatts for LANL and about 14.6 megawatts for the rest of the county (LANL 2002d). The CMR Building at TA-3 used 12,598 megawatt-hours of electricity in FY01, and TA-55 used 14,509 megawatt-hours of electricity in the same period (Johnson Controls 2002). Electricity usage within TA-6 is minimal, as there are no permanently occupied or operated facilities in the area.

3.3.3 Fuel

Natural gas is the primary fuel used in Los Alamos County and at LANL. The natural gas system includes a high-pressure main and distribution system to Los Alamos County and pressure-reducing stations at LANL buildings. In August 1999, DOE sold the 130-mile- (209-kilometer-long) main gas supply line and associated metering stations serving Los Alamos and vicinity to the Public Service Company of New Mexico (LANL 2000d). The county and LANL both have delivery points where gas is monitored and measured. LANL burns natural gas to generate steam to heat buildings and to generate electric power. The natural gas delivery system servicing the Los Alamos area has a contractually-limited capacity of about 8.07 billion cubic feet (229 million cubic meters) per year (DOE 1999c). In FY01, LANL used approximately 1.49 billion cubic feet (42.3 million cubic meters) of natural gas (see Table 3–2). Some 90 percent of the natural gas used at LANL is for heating and the remainder for electricity generation to meet peak demands (LANL 2002d). The rest of the service area including Los Alamos County is estimated to use an average of 1.04 billion cubic feet (29.5 million cubic meters) of natural gas annually (DOE 1999c). Relatively small quantities of fuel oil are also stored at LANL as a backup fuel source and use is negligible. TA-3 and TA-55 use natural gas to fire boilers and for other facility uses. There are no active facilities within TA-6 that consume natural gas. TA-55 is estimated to use approximately 45 million cubic feet (1.3 million cubic meters) of natural gas annually (DOE 2002e).

3.3.4 Water

The Los Alamos water supply system consists of 14 deep wells, 153 miles (246 kilometers) of main distribution lines, pump stations, storage tanks, and 9 chlorination stations. This system supplies potable water to all of the county, LANL, and Bandelier National Monument. On September 8, 1998, DOE transferred operation of the water production system from DOE to Los Alamos County under a lease agreement. Under the lease agreement, DOE retained responsibility for operating the distribution system within LANL boundaries, whereas the county assumed full responsibility for operating the water system, including ensuring compliance with Federal and state drinking water regulations (DOE 2000a, LANL 2002d). On September 5, 2001, DOE completed the transfer of ownership of the water system to the county along with 70 percent (3,879-acre feet [4.8 million cubic meters] or 1,264 million gallons [4,785 million liters] per annum) of its rights to water. The remaining 30 percent (1,662-acre feet [2.1 million cubic meters] or 542 million gallons [2.05 billion liters] per annum) of the water rights is leased by DOE to the county for 10 years with the option to renew the lease for 4 additional 10-year terms. A contract with the U.S. Bureau of Reclamation for an additional 1,200-acre feet (1.5 million cubic meters) per year of San Juan-Chama Transmountain Diversion Project water was also transferred to Los Alamos County.

In 2001, LANL used approximately 344 million gallons (1.30 billion liters) of water (LANL 2002d) (see Table 3–2). Potable water is obtained from deep wells located in three well fields (Gauje, Otowi, and Pajarito). Water use at TA-6 is negligible as there are no permanently occupied or operated facilities.

3.4 CLIMATE, AIR QUALITY, AND NOISE

3.4.1 Climate

Los Alamos has a semiarid, temperate mountain climate. This climate is characterized by seasonable, variable rainfall with precipitation ranging from 10 to 20 inches (25 to 51 centimeters) per year. The climate of the Los Alamos town site is not as arid (dry) as that part near the Rio Grande, which is arid continental. Meteorological conditions within Los Alamos are influenced by the elevation of the Pajarito Plateau. Climatological averages for atmospheric variables such as temperature, pressure, winds, and precipitation presented are based on observations made at the official Los Alamos meteorological weather station from 1961 to 1990. Normal (30-year mean) minimum and maximum temperatures for the community of Los Alamos range from a mean low of 17.4 degrees Fahrenheit (F) (-8.1 degrees Centigrade [C]) in January to a mean high of 80.6 degrees F (27 degrees C) in July. Normal (30-year mean) minimum and maximum temperatures for the community of White Rock range from a mean low of 14.6 degrees F (-9.7 degrees C) in January to a mean high of 85.6 degrees F (29.8 degrees C) in July. Temperatures in Los Alamos vary with altitude, averaging 5 degrees F (3 degrees C) higher in and near the Rio Grande Valley, which is 6,500 feet (1,981 meters) above sea level, and 5 to 10 degrees F (3 to 5.5 degrees C) lower in the Jemez Mountains, which are 8,500 to 10,000 feet (2,600 to 3,050 meters) above sea level. Los Alamos town site temperatures have dropped as low as -18 degrees F (-28 degrees C) and have reached as high as 95 degrees F (35 degrees C). The normal annual precipitation for Los Alamos is approximately 19 inches (48 centimeters). Annual precipitation rates within the county decline toward the Rio Grande Valley, with the normal precipitation for White Rock at approximately 14 inches (34 centimeters). The Jemez Mountains receive over 25 inches (64 centimeters) of precipitation annually. The lowest recorded annual precipitation in Los Alamos town site was 7 inches (17 centimeters) and the highest was 39 inches (100 centimeters).

Thirty-six percent of the annual precipitation for Los Alamos County and LANL results from thunderstorms that occur in July and August. Winter precipitation falls primarily as snow. Average annual snowfall is approximately 59 inches (150 centimeters), but can vary considerably from year to year. Annual snowfall ranges from a minimum of 9 inches (24 centimeters) to a maximum of 153 inches (389 centimeters).

Los Alamos County winds average 7 miles per hour (3 meters per second). Wind speeds vary throughout the year, with the lowest wind speeds occurring in December and January. The highest winds occur in the spring (March through June), due to intense storms and cold fronts. The highest recorded wind in Los Alamos County was 77 miles per hour (34 meters per second). Surface winds often vary dramatically with the time of day, location, and elevation, due to Los Alamos' complex terrain.

In addition to seasonal changes in wind conditions, surface winds often vary with the time of day. An up-slope air flow often develops over the Pajarito Plateau in the morning hours. By noon, winds from the south usually prevail over the entire plateau. The prevalent nighttime flow ranges from the west-southwest to northwest over the western portion of the plateau. These nighttime winds result from cold air drainage off the Jemez Mountains and the Pajarito Plateau. Analyses of Los Alamos Canyon wind data indicate a difference between the atmospheric flow in the canyon and the atmospheric flow over the Pajarito Plateau. Cold air drainage flow is observed about 75 percent of the time during the night and continues for an hour or two after sunrise until an up-canyon flow forms. Wind conditions are discussed further in the *LANL SWEIS* (DOE 1999a).

Thunderstorms are common in Los Alamos County, with an average of 60 thunderstorms occurring in a year. Lightning can be frequent and intense. The average number of lightning-caused fires in the 2,727 acres (1,104 hectares) of Bandelier National Monument for the years 1990 through 1994 is 12 per year. There are no recorded instances of large-scale flooding in Los Alamos County. However, flash floods from heavy thunderstorms are possible in areas such as arroyos, canyons, and low-lying areas. No tornadoes are known to have touched the ground in the Los Alamos area.

3.4.2 Air Quality

3.4.2.1 Nonradiological Releases

LANL operations can result in the release of nonradiological air pollutants that may affect the air quality of the surrounding area. LANL is 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 (carbon monoxide, nitrogen dioxide, lead, ozone, sulfur dioxide, and particulate matter) (40 CFR 81.332).

In addition to the National Ambient Air Quality Standards (NAAQS) established by the U.S. Environmental Protection Agency (EPA), the State of New Mexico has established ambient air quality standards for carbon monoxide, nitrogen dioxide, sulfur dioxide, total suspended particulates, hydrogen sulfide, and total reduced sulfur. Additionally, New Mexico has established permitting requirements for new or modified sources of regulated air pollutants. Air quality permits have been obtained from the State Air Quality Bureau for beryllium operations, operation of an air curtain destructor, operation of an asphalt plant, open burning of high-explosive wastes, operation of a rock crusher, the TA-3 power plant and TA-33 generator that were modified or constructed after August 31, 1972. In accordance with Title V of the Clean Air Act, as amended, and New Mexico Administrative Code 20.2.70, UC at LANL and DOE submitted a sitewide operating permit application to the New Mexico Environment Department (NMED) in December 1995. NMED has reviewed the application and issued a Notice of Completeness, but has not yet issued an operating permit. In November 2002, UC at LANL prepared and submitted a comprehensive update and replacement to the December 1995 application. NMED has reviewed the November 2002 application and issued a Notice of Completeness in December 2002, but has not yet issued an approved operating permit.

Criteria pollutants released from LANL operations are emitted primarily from combustion sources such as boilers, emergency generators, and motor vehicles. **Table 3–3** presents information regarding the primary existing sources. In October 2002, UC at LANL installed a flue gas recirculation system on the TA-3 steam plant boilers that will reduce nitrogen oxide (NO_x) emissions by 70 percent (LANL 2002c). LANL's sitewide operating permit application requests voluntary facility-wide emission limits in order 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. Toxic air pollutant emissions from LANL activities are released primarily from laboratory, maintenance, and waste management operations. Unlike a production facility with well-defined operational processes and schedules, LANL is a research and development facility with great fluctuations in both the types of chemicals emitted and their emission rates. LANL and DOE have a program to review new and modified operations for their potential to emit air pollutants.

Table 3–3 Air Pollutant Emissions at LANL in 2001

Pollutant	*LANL Sources (tons per year)*	*TA-3 Sources (tons per year)*	*TA-6 Sources (tons per year)*	*TA-55 Sources (tons per year)*
Carbon monoxide	29.1	18.6	(a)	1.65
Nitrogen dioxide	93.8	73.9	(a)	2.88
PM_{10}	5.5	3.59	(a)	0.24
Sulfur dioxide	0.82	0.72	(a)	0.01
Volatile organic compounds	24.1	2.51	(a)	0.1
Hazardous air pollutants	7.4	0.41	(a)	0.67

PM_{10} = particulate matter less than or equal to 10 microns in aerodynamic diameter.
[a] No emission units exist at TA-6.
Source: LANL 2001d, LANL 2002d.

Only limited monitoring of the ambient air has been performed for nonradiological air pollutants within the LANL region. NMED operated an ambient air quality monitoring station adjacent to Bandelier National Monument between 1990 and 1994 to record sulfur dioxide, nitrogen dioxide, ozone, and particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM_{10}) levels (see **Table 3–4**).

NMED discontinued operation of this station in FY95 because recorded values were well below applicable standards. Beryllium monitoring performed in 1999 at 9 onsite stations, 10 perimeter stations, and 6 regional stations showed that beryllium levels were low. The New Mexico beryllium ambient standard has been repealed.

Table 3–4 Nonradiological Ambient Air Monitoring Results

Pollutant	*Averaging Period*	*Most Stringent Standard [a] (micrograms per cubic meter)*	*Ambient Concentration [b] (micrograms per cubic meter)*
Sulfur dioxide	Annual 24 hours 3 hours	41 [c] 205 [c] 1,030 [d]	2 18 Not applicable
Nitrogen dioxide	Annual 24 hours	73.7 [c] 147 [c]	4 9
Ozone	1 hour	185 [d]	138
PM_{10}	Annual 24 hours	50 [d] 150 [d]	8 29

PM_{10} = particulate matter less than or equal to 10 microns in aerodynamic diameter.
[a] The most stringent of the state and Federal standards are shown.
[b] 1994 ambient concentrations from monitoring site near Bandelier National Monument at TA-49.
[c] State standard.
[d] Federal standard (NAAQS).
Source: DOE 1999a.

Criteria pollutant concentrations attributable to existing LANL activities would be below the concentrations estimated for the Expanded Operations Alternative, which were estimated for the *LANL SWEIS* and are presented in **Table 3–5**.

Table 3–5 Modeled Ambient Air Concentrations from LANL Sources

Pollutant	*Averaging Period*	*Most Stringent Standard* [a] *(micrograms per cubic meter)*	*Maximum Estimated Concentration* [b] *(micrograms per cubic meter)*
Carbon monoxide	8 hours 1 hour	7,800 11,700	1,440 2,710
Lead	Calendar quarter	1.5	0.00007
Nitrogen dioxide	Annual 24 hours	73.7 147	9 90
PM_{10}	Annual 24 hours	50 150	1 9
Sulfur dioxide	Annual 24 hours 3 hours	41 205 1,030	18 130 254
Total suspended particulates	Annual 24 hours	60 150	2 18

PM_{10} = particulate matter less than or equal to 10 microns in aerodynamic diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR Part 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic PM_{10} mean standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million (ppm). These values have been converted to micrograms per cubic meter ($\mu g/m^3$) with appropriate corrections for temperature (70 degrees F [21 degrees C]) and pressure (elevation 7,005 feet [2,135 meters]), following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

[b] Based on the Expanded Operations Alternative in the *LANL SWEIS*. The annual concentrations were analyzed at locations to which the public has access–the site boundary or nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of certain TAs to which the public has short access.

Source: DOE 1999a.

For toxic air pollutants, a bounding analysis was performed for the *LANL SWEIS*, which indicated that the pollutants of concern for exceeding the guideline values at LANL were emissions from the High Explosives Firing Site operations and emissions that contributed to additive risk from all TAs on receptors near the Los Alamos Medical Center. These combined cancer risks were dominated by chloroform emissions from the Health Research Laboratory. It was shown that pollutants released under the No Action Alternative in the *LANL SWEIS* are not expected to cause air quality impacts that would affect human health and the environment.

As reported in a special environmental analysis for the Cerro Grande Fire in 2000 (DOE 2000b), there could be some temporary increase in suspended particulate matter as a result of removal of vegetation cover, but air quality would be expected to be within the parameters analyzed in the *LANL SWEIS*.

In accordance with the Clean Air Act, as amended, and New Mexico regulations, the Bandelier Wilderness Area has been designated as a Class I area (that is, wilderness areas that exceed 10,000 acres [4,047 hectares]), where visibility is considered to be an important value (40 CFR 81 and 20 New Mexico Administrative Code [NMAC] 2.74) and requires protection. Visibility is measured according to a standard visual range (i.e., how far an image is transmitted through the atmosphere to an observer some distance away). Visibility has been officially monitored by the National Park Service at the Bandelier National Monument since 1988. The view distance at Bandelier National Monument has been recorded from approximately 40 to 103 miles (77 to 166 kilometers). The visual range has not deteriorated during the period for which data are available.

3.4.2.2 Radiological Releases

Radiological air emissions in 2001 from all LANL TAs are presented in **Table 3–6**. Radiological air emissions from TA-3, TA-6, and TA-55 are also shown in the table. Plutonium and uranium releases for the year did not change significantly from those experienced in 2000. A single release from TA-16 in January 2001 accounted for 7,600 curies (81 percent) of the tritium released at LANL for the entire year.

Table 3–6 Radiological Airborne Releases to the Environment at LANL in 2001

Radionuclide	*LANL (curies)*	*TA-3 (curies)*	*TA-6 (curies)*	*TA-55 (curies)*
Tritium	9,400	—	—	3.3
Americium-241	2.7×10^{-7}	2.6×10^{-7}	—	6.2×10^{-9}
Plutonium (includes -238, -239, -240)	9.3×10^{-6}	9.2×10^{-6}	—	4.3×10^{-8}
Uranium (includes -234, -235, -238)	7.3×10^{-6}	7.1×10^{-6}	—	1.7×10^{-7}
Thorium	7.7×10^{-7}	5.1×10^{-7}	—	2.7×10^{-7}
Particulates/vapor activation products	1.1	2.7×10^{-7}	—	1.2×10^{-7}
Gaseous/mixed activation products	6,100	—	—	—
Total	15,500	.000017	—	3.3

Note: Dashed lines indicate no measurable releases.
Source: LANL 2002b.

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 Laboratory operations. Radionuclides emitted from stacked 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). The average ambient air concentrations calculated from the field and analytical data for the last 5 years by the type of radioactivity and by specific radionuclide are presented in **Table 3–7**.

3.4.3 Noise

Existing LANL-related publicly detectable noise levels are generated by a variety of sources, including construction noise, truck and automobile movements to and from the LANL TAs, high explosives testing, and firearms practice of security guards activities. Noise levels within Los Alamos County unrelated to LANL are generated predominantly by traffic movements and, to a much lesser degree, other residential-, commercial-, and industrial-related activities. Limited data currently exist on the levels of routine background ambient noise levels, air blasts, or ground vibrations produced by LANL operations that include explosives detonations.

Table 3–7 Average Background Concentration of Radioactivity in the Regional Atmosphere near LANL [a]

	Units	*EPA Concentration limit [b]*	*1997*	*1998*	*1999*	*2000*	*2001*
Gross Alpha	Ci/m3	Not applicable	0.7	0.8	1.0	1.0	0.8
Gross Beta	Ci/m3	Not applicable	14.1	12.4	13.4	13.0	13.9
Tritium	Ci/m3	1,500	0.7	0.5	0.5	0.8	-0.1
Plutonium 238	Ci/m3	2,100	0.0	0.1	-0.2	0.0	0.0
Plutonium 239, 240	Ci/m3	2,000	-0.2	0.4	0.1	0.0	0.1
Americium-241	Ci/m3	1,900	0.2	0.3	-0.2	0.3	-0.2
Uranium 234	Ci/m3	7,700	14.1	12.9	16.1	17.1	17.9
Uranium 235	Ci/m3	7,100	0.6	0.9	1.2	0.9	1.3
Uranium 238	Ci/m3	8,300	12.2	12.8	15.2	15.9	17.7

[a] Data from regional air sampling stations operated by LANL during the last 5 years. Locations can vary by year.
[b] Each EPA limit equals 10 mrem per year.
Note: negative numbers. 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 2002c.

Traffic noise contributes heavily to the background noise heard by humans over most of the county. Although some measurements of sound specifically targeting traffic-generated noise have been made at various county locations in recent studies, these sound levels are found to be highly dependent upon the exact measuring location, time of day, and meteorological conditions. There is, therefore, no single representative measurement of ambient traffic noise for the LANL site. Noise generated by traffic has been computer modeled to estimate the impact of incremental traffic for various studies, including recent NEPA analyses, without demonstrating meaningful change from current levels due to any new activities. While very few measurements of nonspecific background ambient noise in the LANL area have been made, two such measurements have been taken at a couple of locations near the LANL boundaries next to public roadways.

The standard unit used to report sound pressure levels is the decibel (dB); the A-weighted frequency scale (dBA) is an expression of adjusted pressure levels by frequency that accounts for human perception of loudness. Background noise levels were found to range from 31 to 35 decibels A-weighted (dBA) at the vicinity of the entrance to Bandelier National Monument and New Mexico Route 4 (NM 4). At White Rock, background noise levels range from 38 to 51 dBA (1-hour equivalent sound level); this is slightly higher than was found near Bandelier National Monument, probably due to higher levels of traffic and the presence of a residential neighborhood, as well as the different physical setting. The detonation of high explosives represents the peak noise level generated by LANL operations. The results of these detonations are air blasts and ground vibrations.

The primary source of detonation activities is the high explosives experiments conducted at the LANL Pulsed High-Energy Radiation Machine Emitting X-Rays Facility and surrounding TAs with active firing sites. The Dual Axis Radiographic Hydrodynamic Test Facility has begun operation (followed by a corresponding reduction of Pulsed High-Energy Radiation Machine Emitting X-Rays Facility operations) and is a source of high explosives testing. Explosives detonations were performed in March 1995 for the *Dual Axis Radiographic Hydrodynamic Test Facility Final Environmental Impact Statement* (DOE 1995) analysis, and measurements of air blasts and ground vibrations were obtained for representative Pulsed High-Energy Radiation Machine Emitting X-Rays Facility explosives tests.

Air blasts consist of higher-frequency, audible air pressure waves that accompany an explosives detonation. This noise 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 workers. Air blasts and most LANL-generated ground vibrations result from testing activities involving aboveground explosives research. The effects of vibration from existing activities at LANL are discussed further in the *LANL SWEIS* (DOE 1999a).

The forested condition of much of LANL (especially where explosives testing areas are located); the prevailing area atmospheric conditions; and the regional topography that consists of widely varied elevations and rock formations all influence how noise and vibrations can be both attenuated (reduced) and channeled away from receptors. These regional features are jointly responsible for the lack of environmental noise pollution or ground vibration concerns to the area resulting from LANL operations. Sudden loud “booming” noises associated with explosives testing are similar to the sound of thunder and may occasionally startle members of the public and LANL workers alike.

Loss of large forest areas from the Cerro Grande Fire in 2000 has had an adverse effect on the ability of the surrounding environment to absorb noise. However, types of noise and noise levels associated with LANL, and from activities in surrounding communities, have not changed significantly as a result of the fire (DOE 2000b).

Noise generated by LANL operations, together with the audible portions of explosives air blasts, is regulated by worker protection standards and is consistent with the Los Alamos County Code regarding noise generation. Los Alamos County has 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). Between 7 a.m. and 9 p.m., 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.

The Los Alamos County Community Development Department has determined that LANL does not need a special permit under the Los Alamos County Code because noise related to explosives testing is not prolonged, nor is it considered unusual to the Los Alamos community. Traffic noise from truck and automobile movements around the LANL TAs is excepted under Los Alamos County noise regulations, as is traffic noise generated along public thoroughfares within the county. The vigor and well being of area wildlife and sensitive, federally-protected bird populations suggest that sound levels at LANL are present within an acceptable tolerance range for most wildlife species and sensitive nesting birds found along the Pajarito Plateau.

3.5 GEOLOGY AND SOILS

LANL is located on the Pajarito Plateau within the Southern Rocky Mountains Physiographic Province. The Pajarito Plateau lies between the Valles Caldera in the Jemez Mountains to the west and the Rio Grande to the east (see **Figure 3–4**). 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 that begins in northern Mexico, trends northward across central New Mexico, and ends in central Colorado. The rift is comprised of a complex system of north-trending basins formed from down-faulted blocks of the Earth's crust. In the Los Alamos area, the rift is about 35 miles (56 kilometers) wide and contains the Española Basin. The Sangre de Cristo Mountains border the rift on the east. The Jemez Mountains lie west of the rift and the Pajarito Fault system.

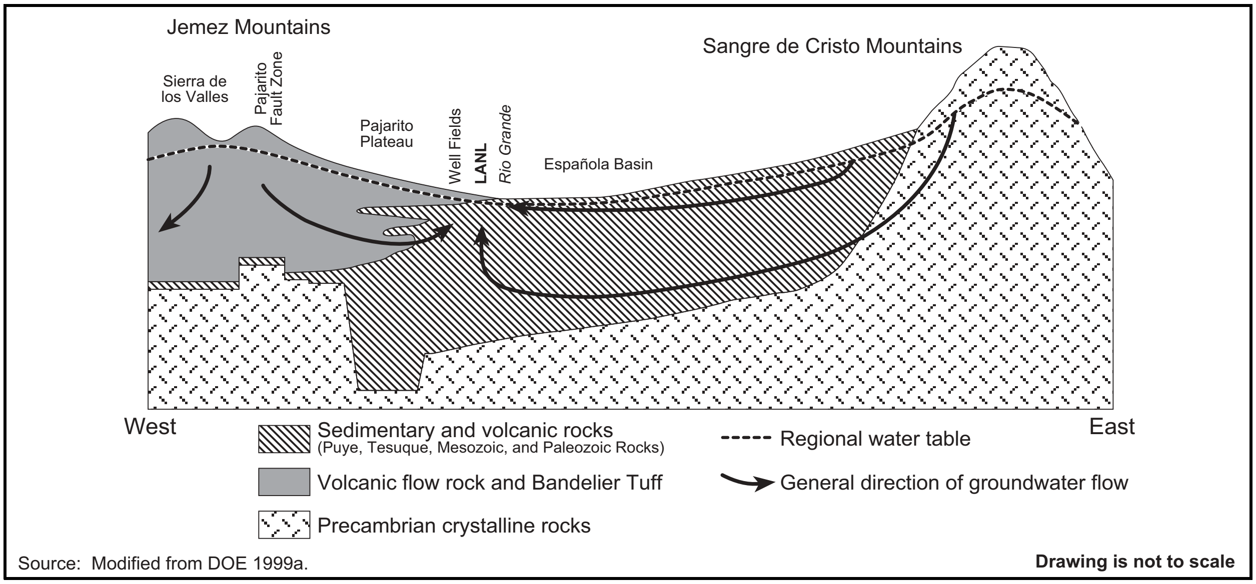


Figure 3–4 Geology and Hydrogeology of the Española Portion of the Northern Rio Grande Basin

Rocks in the LANL region are volcanic in origin, or sedimentary deposits. Volcanic activity began forming the Jemez Mountains about 16.5 million years ago (Gardner et al. 1986) and 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). Several independent lines of evidence indicate that future volcanic activity in the Jemez Mountains is likely (LANL 1999), but recurrence intervals have not been firmly established.

3.5.1 Geology

3.5.1.1 Surficial Geologic Units

In the LANL area, the youngest surficial geologic units consist of artificial fill due to modern development, colluvium, and alluvium along stream channels in canyons. Extensive areas on the Pajarito Fault escarpment show evidence of mass wasting and land slides. Detailed mapping and trench studies in the Pajarito Fault zone have identified multiple alluvial fan deposits, the youngest of which contained detrital charcoal dated at 9,300 to 9,600 years old. The El Cajete Pumice, which dates from 50,000 to 60,000 years old, 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 dated at approximately 1.1 million years old (LANL 2001a).

3.5.1.2 Bedrock Units

Bedrock outcrops typically occur on greater than 50 percent of the surface of LANL (DOE 1996c). Forming the Pajarito Plateau, the Bandelier Tuff is the bedrock upon which nearly all LANL facilities are constructed. The Bandelier Tuff consists of the upper Tshirege and lower Otowi Members that were violently erupted about 1.2 and 1.6 million years ago from the Valles and Toledo Calderas, respectively (see Figure 3–1). The Bandelier Tuff is generally thickest to the west near its source and thins eastward across the Pajarito Plateau. Likewise, the Tshirege Member is strongly welded and harder in the west and less welded farther from its source. In the LANL area, the Bandelier Tuff attains a thickness of more than 700 feet (200 meters) and consists of multiple ash-flow deposits of rhyolitic tuff and pumice. In particular, the Tshirege Member consists of multiple cooling units that create nearly horizontal light- and dark-colored strata on canyon walls throughout the LANL area that are visible to motorists. The dark-colored units are harder and more resistant to erosion; they form steep cliffs and cap the mesas. The light-colored softer units form the slopes. This alternating sequence of hard and softer strata creates a stair-step appearance to canyon walls.

Beneath the Bandelier Tuff, older rocks include the 1.7- to 4-million-year-old Puye Formation, which is a complex deposit consisting predominantly of poorly sorted coarse sands to boulders resulting from erosion of the Jemez Mountains. The Puye Formation also includes ash and pumice falls from Jemez Mountain volcanism, inter-bedded basalt flows and debris from the Cerros del Rio volcanic field (2 to 3 million years old), localized deposits of well-rounded cobbles and boulders of crystalline rocks from the ancestral Rio Grande, and fine-grained lake deposits in the eastern portions of the fan. The Tschicoma Formation (2 to 7 million years old) consists of intermediate composition volcanic rocks and forms the bulk of the Jemez Mountains. The Tschicoma Formation inter-fingers with the Puye Formation beneath the western portion of the Plateau. Older still, the Santa Fe Group (4 to 21 million years old) is the thickest and most extensive group of sedimentary deposits in the upper Española Basin. In the vicinity of the Pajarito Plateau, the Santa Fe Group consists of the Tesuque Formation and overlying Chamita Formation; each formation consists of fluvial, slightly consolidated sedimentary rocks derived from erosion of the Sangre de Cristo Mountains to the east. The Santa Fe Group also contains older volcanic tuff deposits and basalt flows, and overlies Precambrian age (greater than 570 million years old) crystalline basement rock.

The Pajarito Fault system defines the western boundary of the Rio Grande Rift. In Los Alamos County, the Pajarito Fault system consists of the Pajarito, Rendija Canyon, and Guaje Mountain Fault zones (see **Figure 3–5**). Of these three fault zones, the Pajarito is the largest and delineates the boundary between the Pajarito Plateau and Jemez Mountains. The Rendija Canyon Fault changes from a single-trace, down-to-the-west displacement in the northern part of Los Alamos

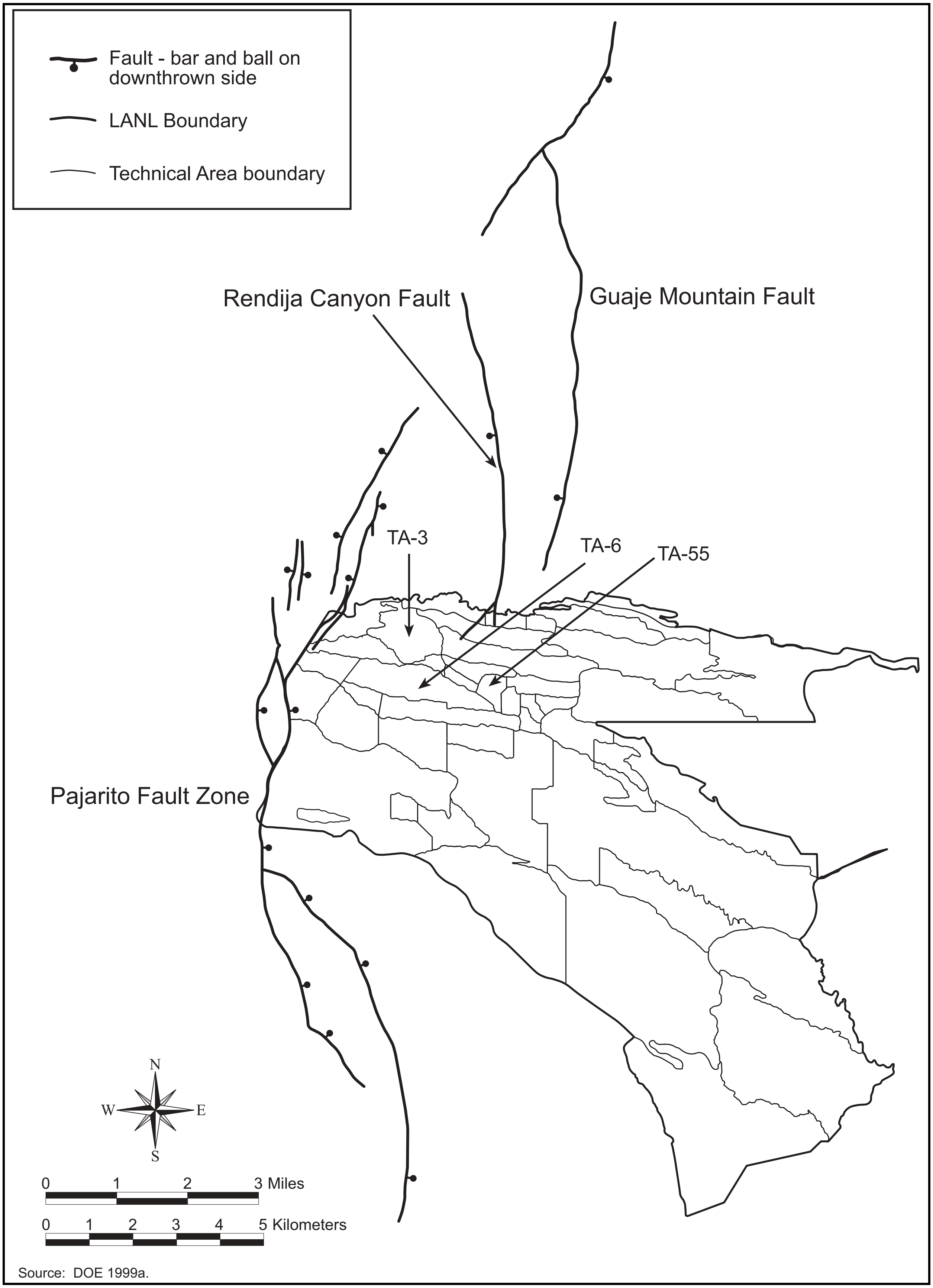


Figure 3–5 Major Faults at LANL

County to a broad zone of smaller faults within LANL property (see Figure 3–5). Locally, the Pajarito and Rendija Canyon Fault zones define a down-faulted block of the Bandelier Tuff that lies beneath the western part of the Los Alamos town site and TA-3. East-southeast trending cross structures define the southern end of the down-faulted block within this structurally complex area (LANL 1999).

The present CMR Building at TA-3 is located within this structurally complex area. Recent core drilling indicated 8 feet (2.4 meters) of high angle, reverse-fault displacement located at the northeastern edge of the present CMR Building (LANL 1998a). In the same study, interpretation of data from other boreholes suggested that the surface fault trace trends southwest beneath the northern portion of the CMR Building. Based on this investigation, it was concluded that the CMR Building site has, in the past, been impacted by fault rupture. While the probabilistic assessment of the potential for surface rupture indicates that the probability is low (10,000- to 20,000-year recurrence interval), this site would not be considered adequate for a new nuclear facility (DOE 1999a). High-precision geologic mapping has connected the fault displacement at the CMR Building with marker-horizon displacements located 0.25 miles (0.4 kilometers) away in North Twomile Canyon and 0.5 miles (0.8 kilometers) away in Twomile Canyon, southwest of the CMR Building (LANL 1999). A concentration of secondary fault features in the southeast corner of TA-3 is inferred to define the southern end of the Rendija Canyon Fault (DOE 1999a). If the Rendija Canyon Fault zone extends southward along strike beyond its identified position, it would encroach upon TA-6 south of TA-3 (see Figure 3–5). More recent mapping by the LANL Seismic Hazards program, however, suggests that the Rendija Canyon faulting in TA-3 becomes diffuse and ceases in the vicinity of Twomile Canyon (Lewis 2002).

The Rendija Canyon Fault zone lies 0.8 miles (1.3 kilometers) northwest of TA-55 (see Figure 3–5). TA-55 is located within an area of relatively simple structure where virtually no fault deformation can be documented (LANL 1999). Detailed mapping has shown that the closest fault (not shown on Figure 3–5) is located 0.28 miles (0.46 kilometers) west of the Plutonium Facility (DOE 1999a).

As mapped, the Guaye Mountain Fault zone dies out within the Los Alamos town site approximately 2 miles (3.2 kilometers) north-northeast of TA-55; it has not been identified within LANL. Another LANL Seismic Hazards mapping project is ongoing in the central portion of the site (Gardner 2002).

Estimates of the most recent movements along the faults are based on trench studies exposing fault displacements of surficial geologic units (see Section 3.5.1.2). Based on radiocarbon dates obtained from charcoal found in fracture fill, a seismic event caused displacement within the Pajarito Fault zone sometime prior to 8,000 years ago (LANL 2001c). Detailed study in a seismic trench excavated near the new Emergency Operations Center (EOC) in TA-69 (see Figure 3–2) indicates that the most recent paleoseismic event in this area occurred about 8,600 years ago (LANL 2002c). Radiocarbon analyses from faulted and overlying alluvial units indicate that movement on the Guaje Mountain Fault occurred between 4,200 and 6,500 years ago (LANL 1990). The most recent seismic event on the Rendija Canyon Fault is poorly constrained between 8,000 and 23,000 years ago (Wong et al. 1995).

A capable fault is one that has had movement at or near the ground surface at least once within the past 35,000 years, or recurrent movement within the past 500,000 years (10 CFR Part 100, Appendix A). Therefore, the three major faults in Los Alamos County are considered active and capable per the U.S. Nuclear Regulatory Commission definition of the term as used for seismic safety.

3.5.1.3 Seismicity

Although the LANL region is within an intra-continental rift zone, the area demonstrates low seismicity compared to regions bordering on active continental plate boundaries such as southern California. For example, since 1973 only 6 earthquakes have been recorded within a 62-mile (100-kilometer) radius of TA-3 at LANL (USGS 2002a). In the same period, the San Francisco area experienced 1,161 earthquakes by comparison (USGS 2002b). The LANL-area earthquakes ranged in magnitude from 1.6 to 4.5 while the San Francisco-area earthquakes ranged from 1.0 to 7.1.

From 1873 to the present, 46 earthquakes have occurred within 62 miles (100 kilometers) of TA-3 at LANL (USGS 2002c). Recurrence intervals for these earthquakes ranged from same-day events to a maximum of about 20 years. The closest recorded earthquake to TA-3 occurred on August 17, 1952. The epicenter of this earthquake was located approximately five miles (eight kilometers) south-southeast of TA-3. This earthquake predated magnitude determination but had a reported Modified Mercalli Intensity (MMI) of V. For reference, Table A-6 in Appendix A shows the MMI scale of observed earthquake effects and compares it with measures of earthquake magnitude and peak ground acceleration. The largest recorded earthquake within 62 miles (100 kilometers) of TA-3 at LANL was the May 1918 Cerrillos Earthquake. The epicenter of this earthquake was located 31 miles (50 kilometers) southeast of TA-3 and had a reported MMI of VII. The most recent earthquake occurred on December 25, 1988, at a distance of 56 miles (90 kilometers) south-southeast of TA-3. The magnitude was measured at 2.8 (USGS 2002a).

Seismic hazard analysis demonstrates that the highest seismic hazard at LANL would be to a site built atop a trace of the Pajarito Fault (LANL 2001a). Along the Pajarito Fault system, an earthquake with a magnitude greater than or equal to 6 is estimated to have an annual probability of occurrence of once every 4,000 years. An earthquake with a magnitude greater than or equal to 7 is estimated to have an annual probability of occurrence of once every 100,000 years (LANL1999).

Measures of peak acceleration indicate what an object on the ground would experience during an earthquake. This motion is expressed in units of gravitational acceleration (g). The hazard study of facilities in eight LANL TAs found that earthquakes having an annual probability of occurrence of once in every 10,000 years would cause a horizontal peak ground acceleration ranging from 0.53 g to 0.57 g (Wong et al. 1995). Further, the U.S. Geological Survey has developed seismic hazard metrics and associated maps that are used by the new *International Building Code*. The National Earthquake Hazard Reduction Program maps are based on the estimated natural periods of structural vibration due to earthquake activity and depict maximum considered earthquake (MCE) ground motions of 0.2- and 1.0-second spectral acceleration, respectively, based on a 2 percent probability of exceedance in 50 years (corresponding to an annual probability of occurrence of about 1 in 2,500) (ICC 2000). The three alternative sites for the CMR Building are within a 1.25-mile- (2-kilometer-) wide area. Due to their proximity, calculated MCE ground motion values for the 3 sites are identical and range from 0.19 g for a 1.0-second spectral acceleration to 0.60 g for a 0.2-second spectral acceleration. The calculated peak ground acceleration for the given probability of exceedance at the site is 0.26 g (USGS 2002d). Maintenance and refurbishment activities at LANL are specifically intended to upgrade the seismic performance of older structures. Construction of new facilities must meet DOE Standard 1020-2002 that, in part, implements DOE Order 420.1, as superseded by DOE Order 420.1A. As stated in DOE Order 420.1A, DOE 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. DOE Order 420.1A, Section 4.4, stipulates the natural phenomena hazards mitigation requirements for DOE facilities and specifically provides for the reevaluation and upgrade of existing DOE facilities when there is a significant degradation in the safety basis for the facility.

During seismic events, facilities near a cliff edge or in a canyon bottom below 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. As for other geologic hazards due to seismic activity, the potential for land subsidence and soil liquefaction at LANL are considered low and negligible, respectively.

3.5.1.4 Economic Geology

No active mines, mills, pits, or quarries exist in Los Alamos County or at LANL. Rock and mineral resources, however, including sand, gravel, and volcanic pumice are mined throughout the surrounding counties. Sand and gravel are primarily used in construction for road building. Pumice aggregate is used in the textile industry to soften material. Pumice is also used as an abrasive, for building blocks, and in landscaping. The major sand and gravel quarry in the area is located 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 subbases for roads.

3.5.2 Soils

Soils in Los Alamos County have developed from decomposition of volcanic and sedimentary rocks within a semi-arid climate and range in texture from clay and clay loam to gravel. Soils that form on mesa tops are well drained and range in thickness from 0 to 40 inches (0 to 102 centimeters). Those 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 logging practices, livestock grazing, loss of vegetative cover, and decreased precipitation (DOE 1999a). 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. No prime farmland soils have been designated in Los Alamos County (DOE 2002e).

In May 2000, the Cerro Grande Fire burned the east-facing slope of the Jemez Mountains immediately upslope of LANL. The fire also burned significant areas within the western and central portions of the site. The loss of ground cover vegetation due to the fire increased the potential for soil erosion in these areas. Following the fire, the U.S. Forest Service Burn Area Emergency Rehabilitation Team found no significant areas of hydrophobic (water repellent) soil conditions within LANL. Due to exposed soils in the Jemez Mountains upslope of LANL, prevention of possible flooding of high-risk LANL facilities during intense precipitation events became a high priority. The possibility for enhanced erosion will likely persist for some 3 to 5 years (DOE 2002e).

3.6 SURFACE AND GROUNDWATER QUALITY

3.6.1 Surface Water

Surface water in the Los Alamos area occurs primarily as short-lived or intermittent reaches of streams (locally these ordinarily dry stream beds are known as “arroyos”). Perennial springs on the flanks of the Jemez Mountains supply base flow into the upper reaches of some canyons, but the volume is insufficient to maintain surface flows across the LANL site before they are depleted by evaporation, transpiration, and infiltration. Runoff from heavy thunderstorms or snowmelt reaches the Rio Grande, the major river in north-central New Mexico, several times a year in some drainages. Effluents from sanitary sewage, industrial water treatment plants, and cooling tower blowdown enter some canyons at rates sufficient to maintain surface flows for varying distances. Major watersheds in the LANL region are shown in **Figure 3–6**. All of these watersheds are tributaries to an 11-mile (18-kilometer) segment of the Rio Grande between Otowi Bridge and Frijoles Canyon. The Rio Grande passes through Cochiti Lake, approximately 11 miles (18 kilometers) below Frijoles Canyon.

The Los Alamos Reservoir, in upper Los Alamos Canyon, has a capacity of about 41 acre-feet (51,000 cubic meters). The reservoir water was used for recreation, swimming, fishing, and landscape irrigation in the Los Alamos town site until the Cerro Grande Fire occurred in 2000; the reservoir is now used as a floodwater and silt retention structure and is closed to the public (DOE 2000b). The Pajarito Plateau Canyons, which serve as collection points for the regional watersheds, originate either along the eastern rim of the Sierra de Los Valles or on the Pajarito Plateau. Within LANL boundaries, only Los Alamos, Pajarito, Water, Ancho, Sandia, Pueblo, and Chaquehui Canyons contain reaches or streams with sections that have continuous flow. Intermittent streams within LANL boundaries are not classified, but are protected by the State of New Mexico for livestock watering and wildlife habitat use (NMAC 20.6.4.10). Surface water within LANL boundaries is not a source of municipal, industrial, or irrigation water, but is used by wildlife that live within, or migrate through, the region.

Most of LANL effluent is discharged into normally dry arroyos, and this LANL effluent discharge is required to meet effluent limitations under the National Pollutant Discharge Elimination System (NPDES) permit program that requires routine effluent monitoring.

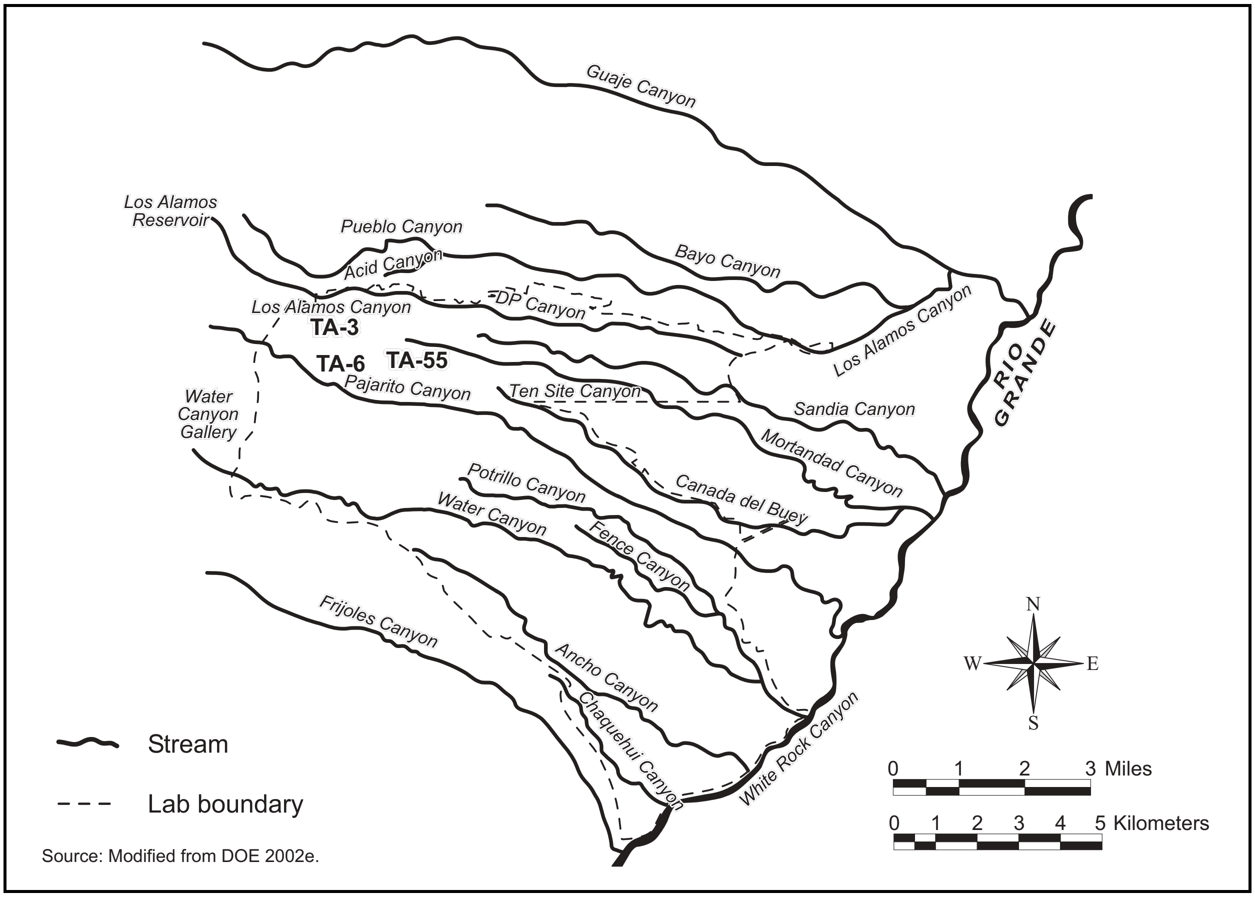


Figure 3–6 Surface Water Features at LANL

Therefore, the water quality of the intermittent streams is more characteristic of the quality of these discharges than of natural runoff, as reflected in the results of 2001 surface water and runoff monitoring. LANL's current NPDES permit (No. NM0028355), which was reissued in December 2000, covers all onsite industrial and sanitary effluent discharges. DOE and the University of California are co-permittees under the permit. As a result of an outfall reduction program, the number of outfalls requiring monitoring under the permit was reduced from 36 (including one sanitary outfall from the TA-46 Sanitary Wastewater Systems [SWS] Facility and 35 industrial wastewater outfalls) to 21 in the recently reissued permit. This reduction was achieved by removing process flows for seven industrial outfalls and completing the lease transfer of the drinking water system, including nine associated outfalls, to Los Alamos County. During 2001, permit compliance was determined from analysis of 1,085 industrial outfall samples and 134 samples from the SWS Facility (Outfall 13S) for such parameters as metals, radionuclides, and conventional parameters (such as pH and total suspended solids). Monitoring results are submitted to EPA and to the NMED. The NPDES permit compliance rate for all discharge points was nearly 100 percent, with a total of just 4 industrial outfall samples exceeding permit limits. These included one sample from the TA-3 Power Plant outfall (NPDES Outfall 001) in February 2001 that exceeded both the daily maximum and daily average effluent limit for total suspended solids. In addition, one sample from the TA-16 High-Explosive Waste Treatment Facility outfall (NPDES Outfall 05A055) exceeded the upper limit for pH in March 2001, and one sample from the TA-15 DARHT Cooling Tower outfall (NPDES Outfall

03A185) exceeded the water quality-based effluent limitation for selenium in September 2001. In all four cases, the cause of the effluent limitation exceedance was investigated and a corrective action was implemented (LANL 2002c). Industrial and sanitary effluent management is discussed further in Section 3.12.7.

LANL also operated under 11 NPDES stormwater discharge permits in 2001, including 10 issued for specific construction projects and 1 site-wide NPDES Storm Water Multi-Sector General Permit for Industrial Dischargers for which DOE and the University of California are also co-permittees. As required under this general permit, LANL performed stormwater monitoring in 2001 and developed and implemented 20 stormwater pollution prevention plans for its industrial activities (LANL 2002c).

LANL monitors surface waters from regional and Pajarito Plateau stations to evaluate the environmental effects of facility operations. Historical activities and resulting effluent discharges have affected water courses and associated sediments particularly in Acid, Pueblo, Los Alamos, and Mortandad Canyons and, consequently, continue to affect surface water and runoff quality in these areas. Surface water grab samples are collected annually from locations where effluent discharges or natural runoff maintains stream flow. Runoff samples are also collected and, since 1996, they have been collected using stream gauging stations, some with automated samplers. Samples are collected when a significant rainfall event causes flow in a monitored portion of a drainage. Many runoff stations are located where drainages cross the LANL boundaries. Detailed information on surface water and stormwater runoff monitoring, including analytical results, are contained in the annual site environmental report (LANL 2002c).

Among the environmental effects produced by the Cerro Grande Fire was an increased potential for stormwater runoff through the canyons that cross LANL property as a result of the loss of vegetation and soil organic matter. It is expected that soil erosion rates and corresponding sediment loads in runoff from denuded watersheds will be much higher than prefire levels for many years resulting in the potential for sediment and debris-laden runoff to reach the Rio Grande. It is also likely that runoff and ambient water quality in canyon drainages will be temporarily reduced by the increase in suspended sediment and by the liberation of organic nitrogen from fire-burned soils, the latter of which can also impact shallow groundwater (DOE 2000b).

UC at LANL has delineated all 100-year floodplains within LANL boundaries, which are generally associated with canyon drainages. There are a number of structures within the 100-year floodplain. Most may be characterized as small storage buildings, guard stations, well heads, water treatment stations, and some lite laboratory buildings. There are no waste management facilities in the 100-year floodplain. Some facilities are characterized as "moderate hazard" due to the presence of sealed sources or x-ray equipment, but most are designated "low hazard" or "no hazard." Overall, most laboratory development is on mesa tops, and development within canyons is light. Nevertheless, for practical purposes, the Cerro Grande Fire has increased the extent of all delineated floodplains in and below burned watershed areas (predominantly Los Alamos, Sandia, Mortandad, Pajarito, and Water Canyons) due to vegetation loss. This allows more stormwater runoff to reach the canyon bottoms and could subject LANL facilities located within or near the prefire delineated floodplain areas to increased erosion or sediment and debris deposition (DOE 2000b).

TA-3 is situated on a portion of South Mesa and above the upper reaches of Sandia and Mortandad Canyons that border the area on the east. Twomile Canyon, which converges with Pajarito Canyon south and east of TA-3 near the border of TA-55 with TA-6, abuts TA-3 on the south and west. Los Alamos Canyon borders TA-3 to the north. Since the area is heavily developed, surface drainage primarily occurs as sheet flow runoff from the impervious surfaces within the complex either east toward Sandia and Mortandad Canyons or south and west toward Twomile Canyon. Only a small portion of the northern part of the area drains toward Los Alamos Canyon (USGS 1984). No developed areas of TA-3 lie within the delineated 100-year floodplains associated with Sandia and Mortandad Canyons. The associated 100-year floodplains are mapped as occupying the respective canyon bottom headlands originating in the eastern portion of TA-3 (DOE 2002d). In general, stream flow within the canyons is ephemeral in nature. A short reach of the upper part of Sandia Canyon flows continuously, due in part to discharges from the TA-3 Power Plant outfall (NPDES Outfall 001) that consists of cooling water from the power plant and recycled, treated effluent from the TA-46 SWS Facility. Mortandad Canyon also receives natural runoff as well as effluent from several NPDES outfalls, including from the Radioactive Liquid Waste Treatment Facility (RLWTF) at TA-50 (DOE 1999a, LANL 2002c). In addition, cooling tower and related effluents are discharged to Sandia Canyon from four TA-3 facility outfalls and to Mortandad Canyon from two TA-3 facility outfalls, including from the CMR Building via NPDES Outfall 03A-021 (EPA 1999a, EPA 2000, LANL 2002d).

TA-6 encompasses a largely undeveloped area of Twomile Mesa situated between Twomile Canyon to the north and the larger Pajarito Canyon to the south (USGS 1984). As such, surface water drainage across TA-6 generally follows the shallow arroyos that convey runoff to the east and southeast to the canyons.

TA-55 is located on a narrow mesa (Mesita del Buey) about 1 mile (1.6 kilometers) southeast of TA-3. The mesa is flanked by Mortandad Canyon to the north and Twomile Canyon to the south (USGS 1984). Like TA-3, the site is largely comprised of a heavily developed facility complex with surface drainage primarily occurring as sheet flow runoff from the impervious surfaces within the complex. No developed portions of the complex are located within a delineated floodplain. One TA-55 facility discharges cooling tower blowdown directly to Mortandad Canyon (via NPDES Outfall 03A181) (EPA 1999b, EPA 2001). The RLWTF at TA-50, as mentioned above, specifically receives and treats plutonium processing and other wastes from TA-55 facilities with effluent discharged via NPDES Outfall 051 to Mortandad Canyon (LANL 2002c, LANL 2002d).

3.6.2 Groundwater

Groundwater in the Los Alamos area occurs as perched groundwater near the surface in shallow canyon bottom alluvium and at deeper levels in the main (regional) aquifer (LANL 2002c). Most aquifers underlying LANL and vicinity, except for perched groundwater bodies, are considered Class II aquifers (i.e., those currently used or potentially available for drinking water or other beneficial use). Alluvial groundwater bodies within LANL boundaries have been primarily characterized by drilling wells on a localized basis where LANL operations are conducted. Wells in Mortandad, Los Alamos, Pueblo, and Pajarito Canyons and in Cañada del Buey indicate the presence of continually saturated alluvial groundwater bodies. Intermediate perched groundwater bodies of limited extent are known to occur within the conglomerates and basalts beneath the alluvium in portions of Pueblo, Los Alamos, and Sandia Canyons; in volcanic rocks on the sides of the Jemez Mountains to the west of LANL, discharged at spring heads; and on the western portion of the Pajarito Plateau (LANL 2002c).

The locations and extent of perched groundwater bodies have not been fully characterized at LANL, but investigations continue, and unidentified perched aquifers may exist. The depth to perched groundwater from the surface ranges from approximately 90 feet (27 meters) in the middle of Pueblo Canyon to about 450 feet (137 meters) in lower Sandia Canyon. The regional aquifer exists in the sedimentary and volcanic rocks of the Española Basin, with a lateral extent from the Jemez Mountains in the west to the Sangre de Cristo Mountains in the east (see Figure 3–4). The hydrostratigraphic (water-bearing) units comprising the regional aquifer include the interconnected Puye Formation and the Tesuque Formation of the Santa Fe Group, with the top of the aquifer originating in the Cerros del Rio Formation, rather than in the Puye Formation, in some locations. Groundwater flow paths are conceptually illustrated in Figure 3–4. Groundwater flow is generally to the east.

The regional aquifer is hydraulically separated for practical purposes from the overlying perched alluvial and intermediate depth perched groundwater bodies by unsaturated volcanic tuff and sedimentary strata, with the regional water table surface lying at a depth that varies from approximately 1,200 feet (366 meters) along the western boundary of the Pajarito Plateau to approximately 600 feet (183 meters) along its eastern edge. Thus, these hydrogeologic conditions tend to insulate the regional aquifer from near-surface waste management activities. Water in the regional aquifer is under artesian conditions under the eastern part of the Pajarito Plateau near the Rio Grande.

Recharge of the regional aquifer has not been fully characterized and sources are uncertain; data suggest that the regional aquifer of the Española Basin is not strongly interconnected across its extent. Recent investigations further suggest that the majority of water pumped to date has been from storage, with minimal recharge of the regional aquifer. While the regional aquifer is present beneath all watersheds across the LANL region, it is also generally considered to receive negligible recharge from surface water streams in the watersheds. Springs in the LANL area originate from alluvial and intermediate perched groundwater bodies and the regional aquifer and occur in the Guaje, Pueblo, Los Alamos, Pajarito, Frijoles, and White Rock Canyon watersheds. Some 27 springs discharge from the regional aquifer into White Rock Canyon. A perched aquifer yields a relatively high flow to a former potable water supply gallery in Water Canyon (LANL 2002c).

Short-term effects of the Cerro Grande Fire on LANL groundwater resources include a potential increase in the prevalence of perched groundwater and springs. Also, as discussed for surface water, the liberation of organic nitrogen from burned soils could impact shallow groundwater in the perched and alluvial zones although the effects on deeper groundwater resources are not known (DOE 2000b).

Groundwater monitoring in support of groundwater management and protection efforts is conducted within and near LANL and encompasses the alluvial zone, intermediate perched groundwater zone, regional aquifer, and springs. The groundwater monitoring network for alluvial groundwater consists of shallow observation wells located in Mortandad, Los Alamos, Pueblo, and Pajarito Canyons and in Cañada del Buey. Perched groundwater is monitored from two test wells and one spring (i.e., the Water Canyon Gallery). The monitoring network for the regional aquifer includes 8 deep test wells completed by the U.S. Geological Survey, 12 deep supply wells that are part of the Los Alamos water supply system and produce water for all of LANL and the surrounding communities, and from numerous springs, including those in White Rock Canyon (LANL 2002c).

Effluent discharges have affected canyon bottom perched alluvial groundwater in Pueblo, Los Alamos, and Mortandad Canyons. Most notably, radionuclide constituents in effluents discharged to Mortandad Canyon from the RLWTF at TA-50 have often exceeded the DOE Derived Concentration Guides (DCGs) for public dose from drinking water. Nitrate also contained in the effluent has caused alluvial groundwater concentrations to exceed the New Mexico groundwater standard and EPA Maximum Contaminant Level (MCL) of 10 milligrams per liter (mg/L). The nitrate source is nitric acid from plutonium processing at TA-55 that enters the TA-50 waste stream. A reverse osmosis and ultrafiltration treatment system that removes additional radionuclides and nitrate from the effluent began operation in April 1999. As a result, effluent discharges from the RLWTF now meet the DOE DCGs for public dose and drinking water standards for nitrate; the RLWTF effluent has met DOE DCGs continuously since December 10, 1999 (LANL 2002c).

Groundwater monitoring results for perched alluvial and intermediate-depth groundwater in 2001 were similar to previous years with groundwater near the location of current or historic liquid waste discharges showing elevated contaminant levels, including in Los Alamos and Mortandad Canyons. In past years, the levels of tritium, strontium-90, and gross beta in alluvial groundwater in Mortandad Canyon have usually exceeded EPA drinking water criteria. In 2001, strontium-90 exceeded the EPA MCL in two alluvial monitoring wells in Mortandad Canyon and was also detected in surface water in the canyon. None of the other monitored radiochemical parameters exceeded either the DOE DCGs or EPA MCLs. During 2001, nitrate concentrations in alluvial groundwater were below the New Mexico groundwater standard and EPA MCL, except for one downstream well in Mortandad Canyon. Two wells in Mortandad Canyon also exceeded the New Mexico standard of 1.6 mg/L for fluoride. Perchlorate, a nonradiological contaminant (with a provisional drinking water standard of 0.018 mg/L) was detected in groundwater in every alluvial groundwater well sampled in Mortandad Canyon, with a maximum concentration of 0.22 mg/L. The perchlorate source is the RLWTF effluent; however, a treatment system was installed in 2001 at the RLWTF to remove perchlorate from the facility's effluent (LANL 2002c).

For regional aquifer samples from wells and springs in 2001, the radiochemical results were generally below the DOE drinking water DCGs and the EPA or New Mexico standards applicable to a drinking water system, with most results near or below the analytical detection limit. This excludes relatively high detections of uranium isotopes and gross alpha emitters due to naturally occurring uranium. The only radionuclide consistently detected in samples from production wells or test wells within the regional aquifer is tritium, particularly beneath Los Alamos, Pueblo, and Mortandad Canyons. In 2001, groundwater samples taken from supply well O-1 had tritium concentrations averaging 31.6 pCi/L (maximum 40.2 pCi/L). While higher than background concentrations in the regional aquifer around LANL, maximum observed concentrations are about 500 times smaller than the EPA MCL (20,000 pCi/L). Tritium was either not detected or was found at background levels in other water supply wells. No high-explosive compounds or degradation products were detected in the regional aquifer in 2001, although LANL, along with regulatory agencies, continues to investigate detections of high-explosive constituents above EPA Health Advisory guidance values that were found beneath TA-16 in 1998 during drilling of characterization well R-25. Perchlorate was detected during 2001 from the O-1 water supply well at concentrations of 2 and 5 micrograms per liter (μg/L), depending on analytical method. The source of the perchlorate might be residual perchlorate from the now decommissioned radioactive liquid waste treatment plants that discharged effluents into upper Pueblo Canyon until 1964. Otherwise, no supply wells had any concentrations of nonradiochemical constituents exceeding drinking water limits (LANL 2002c). Additional information on groundwater monitoring, including analytical results, is presented in the annual site environmental report (LANL 2002c).

The main aquifer is the only body of groundwater in the region that is sufficiently saturated and permeable to transmit economic quantities of water to wells for public use. All drinking water for Los Alamos County, LANL, and Bandelier National Monument comes from the main aquifer. Water use is detailed in Section 3.3.4.

The depth to the top of the main aquifer is about 1,000 feet (300 meters) beneath the mesa tops in the central part of the Pajarito Plateau, which encompasses TA-3 and TA-6 (DOE 2002d). Groundwater within the main aquifer beneath the central plateau is expected to flow to the east and southeast. The depth to groundwater beneath TA-55 is approximately 1,280 feet (390 meters) and the flow direction is inferred as east and southeast (DOE 2002e). As discussed above, radioactive effluents from TA-3 and TA-55 are conveyed through RLWTF at the TA-50 wastewater treatment facility and then discharged to Mortandad Canyon. No industrial or radioactive effluents are generated at TA-6.

3.7 ECOLOGICAL RESOURCES

3.7.1 Terrestrial Resources

LANL lies within the Colorado Plateau Province. Ecosystems within the laboratory site itself are quite diverse, due partly to the increasing temperature and decreasing moisture along the approximately 12-mile (19-kilometer) wide, 5,000-foot (1,525-meter) elevational gradient from the peaks of the Jemez Mountains to the Rio Grande. Only a small portion of the total land area at LANL has been developed. In fact, only five percent of the site is estimated to be unavailable to most wildlife (because of security fencing). The remaining land has been classified into four major vegetation zones that are defined by the dominant plants present and occur within specific elevational zones. These include mixed juniper savannah (5,200 to 6,200 feet [1,600 to

1,900 meters]), piñon-juniper woodland (6,200 to 6,900 feet [1,900 to 2,100 meters]), ponderosa pine forest (6,900 to 7,500 feet [2,100 to 2,300 meters]), and mixed conifer forest (7,500 to 9,500 feet [2,300 to 2,900 meters]) (see **Figure 3–7**). The vegetative communities on and near LANL are very diverse, with over 900 species of vascular plants identified in the area. As noted in Section 3.2.1, the 1,000-acre (405-hectare) White Rock Canyon Reserve, located in the southeast portion of LANL, was dedicated in 1999 because of its ecological and cultural resources and research potential. DOE will continue to own and control access to the property. The National Park Service will cooperatively manage the reserve to enhance and ensure protection of habitat and wildlife (DOE 1999c).

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. Common animals found on LANL include the black-headed grosbeak (*Pheuclicus melanocephalus*), western bluebird (*Sialia mexicana*), elk (*Cervus elaphus*), and raccoon (*Procyon lotor*). The most important and prevalent big game species at LANL are mule deer (*Odocoileus hemionus*) and elk. Elk populations have increased in the area from 86 animals introduced in 1948 and 1964 to an estimated population of over 10,000 animals. Hunting is not permitted onsite. 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 1999c). A variety of migratory birds have been recorded at the site and are protected under the Migratory Bird Treaty Act.

In May 2000, the Cerro Grande Fire burned across 7,684 acres (3,110 hectares) of forest area within LANL (DOE 2002c). Fire suppression activities resulted in the clearing of an additional 130 acres (52 hectares). Depending on fire intensity, vegetation will either be replaced by new species or recover in a relatively short period. Where the fire intensity was high, it is likely that recolonization will be by other than the original species, with the possibility that exotic plants may predominantly occur in areas previously dominated by native species (DOE 2000b).

Throughout LANL's history, developments within various TAs have caused significant alterations in the terrain and the general landscape of the Pajarito Plateau. These alterations have resulted in significant changes in land use by most groups of wildlife, particularly birds and large mammals that have large seasonal and daily ranges. Certain projects required the segregation of large areas such as mesa tops and, in some cases, project areas were secured by fences around their perimeters. These alterations have undoubtedly caused some species of wildlife, such as elk and mule deer, to alter their land-use patterns by cutting off or changing seasonal or daily travel corridors to wintering areas, breeding and foraging habitats, and bedding areas (DOE 1996c). The Cerro Grande Fire dramatically altered the habitat of many animals. While initially eliminating or fragmenting the habitats of many animals (such as reptiles, amphibians, small mammals, and birds), the habitat for other species (such as large mammals) will increase or improve by the newly created foraging areas. During the fire, individuals of many species died. Population recovery is expected within the next several breeding seasons. Elk and mule deer populations are expected to increase in response to the additional foraging areas resulting from postfire vegetation regrowth (DOE 2000b).

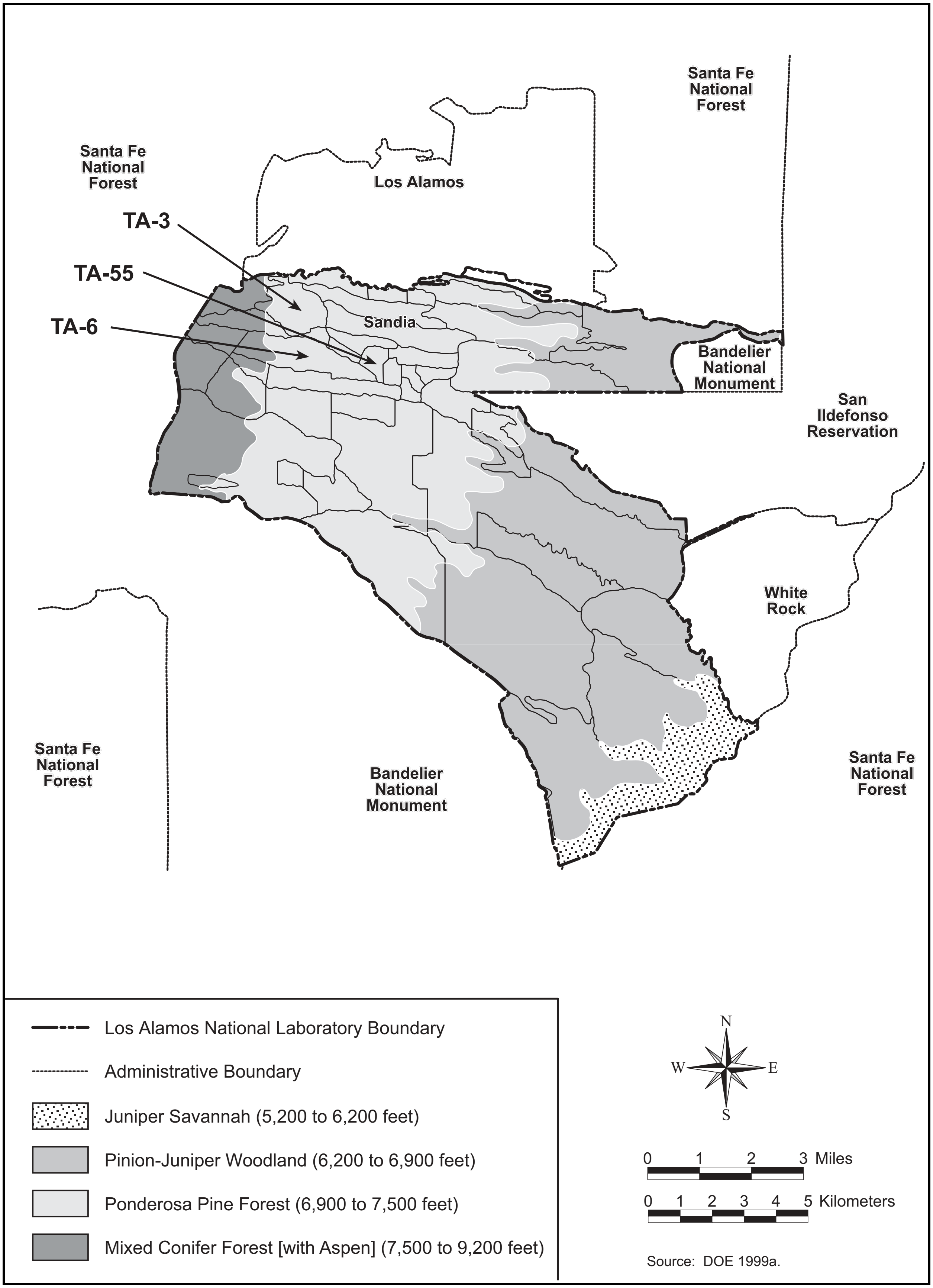


Figure 3–7 LANL Vegetation Zones

LANL recently proposed a Wildfire Hazard Reduction Project that would involve treating 250 acres (100 hectares) of mixed conifer, 6,150 acres (2,490 hectares) of ponderosa pine, and 3,600 acres (1,457 hectares) of piñon-juniper habitat in order to reduce future fire hazards (Marsh 2001). While the project would typically use both heavy equipment and hand tools, heavy equipment would not be used on slopes greater than 30 percent.

TA-3 is primarily located in the ponderosa pine forest vegetation zone, although the western-most portion of the area lies within the mixed conifer forest vegetation zone. Approximately 69 percent of the 357-acre (144-hectare) site is developed. Wildlife likely to be present in the area include elk, mule deer, raccoon, deer mouse (*Peromyscus maniculatus*), American robin (*Turdus migratorius*), Steller's jay (*Cyanocitta stelleri*), white breasted nuthatch (*Sitta carolinensis*), western bluebird (*Sialia mexicana*), and prairie lizard. Due to the presence of security fencing, no large animals are likely to be found within fenced portions of TA-3.

The eastern portion (approximately 80 percent) of TA-6 is located within the ponderosa pine forest vegetation zone while the western portion falls within the mixed conifer forest vegetation zone. TA-6 encompasses 500 acres (203 hectares) of which only 1 percent is developed. Wildlife species found within TA-6 would be similar to those noted above for TA-3. Due to the undeveloped nature of the area, wildlife are free to migrate across the site.

TA-55 is located in the ponderosa pine forest vegetation zone; however, 43 percent of the 40-acre (16-hectare) site is developed. Animal species likely to be present in the area would be similar to those noted above for TA-3. Due to the presence of security fencing, no large animals would be found within developed portions of TA-55.

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 Federal- and state-listed species. The majority of the wetlands in the area are associated with canyon stream channels or are present on mountains or mesas as isolated meadows containing ponds or marshes, often in association with springs or seeps. There are also some springs bordering the Rio Grande within White Rock Canyon. Cochiti Lake, located downstream from LANL, supports lake-associated wetlands.

Wetlands occurring at LANL were identified in 1990 as part of the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory and subsequently as part of ongoing environmental work at the site. Twenty-seven wetlands totaling 77 acres (31 hectares) have been identified on the site with more than 95 percent of these located in the Sandia, Mortandad, Pajarito, and Water Canyon watersheds (DOE 2002c).

About 13 acres (5 hectares) of wetlands within LANL boundaries are caused or enhanced by process effluent wastewater from 21 NPDES-permitted outfalls. These artificially created wetlands are afforded the same legal protection as wetlands that stem from natural sources. In 1996, the effluent from NPDES outfalls, both storm water and process water, contributed

108 million gallons (407 million liters) to wetlands within LANL boundaries. Nearly half of the outfalls are probable sources of drinking water for large mammals.

During the Cerro Grande Fire, 16 acres (6.5 hectares), or 20 percent of the wetlands occurring at LANL, were burned at a low or moderate intensity. No wetlands within LANL were severely burned. Secondary effects from the fire to wetlands may also occur as a result of increased runoff due to the loss of vegetation. Wetlands were not disturbed by fire suppression activities; however, a number of projects were undertaken after the Cerro Grande Fire to control runoff and erosion. Two projects involving the enlargement of culverts in lower Pajarito Canyon, one about 0.25 miles (0.4 kilometers) downstream from TA-18 and the other at State Road 4, resulted in removal of about 1.5 acres (0.6 hectares) of wetland vegetation composed primarily of willow (*Salix* spp.) trees. Wetland vegetation is likely to regenerate over the next several years if the area is not silted in or scoured away by flood waters (DOE 2000b).

There are 8 wetlands located within TA-3 that total 1.1 acres (0.44 hectares). This includes Sandia wetlands, LANL's largest wetlands, located within both TA-3 and TA-60. Vegetation associated within the area wetlands is characterized by the presence of species such as rush (*Juncus* spp.), willow, and broad-leafed cattail (*Typha latifolia* L). Wildlife associated with these wetlands include raccoon, red-winged black birds (*Agelauis phoenixe*), ravens (*Corvus corvax*), marsh wrens (*Cistothorus palustris*), song sparrows (*Melospiza melodia*), many-lined skinks (*Eumeces multivirgatus*), and canyon tree frogs (*Hyla arenicolor*).

There are no wetlands located within TA-6. However, there is a narrow band of riparian vegetation located along portions of the stream channel of Two Mile Canyon. Vegetation found along the stream includes coyote willow (*Salix exigua* Nutt.), water birch (*Betula occidentalis* Hook.), and inland rush (*Juncus interior* Wiegand). Animal species present are similar to those noted above for TA-3.

Three wetlands are located within TA-55, totaling 1.02 acres (0.41 hectares), all of which result from natural sources. Vegetation associated with these wetlands includes rush, willow, and broad-leafed cattail. Wildlife species using these areas are similar to those noted above for TA-3.

3.7.3 Aquatic Resources

While 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 region, several of the canyon floors on LANL contain reaches of perennial surface water. Examples of 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 water-loving 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 species utilize these waters (DOE 1999c). For example, terrestrial wildlife use onsite streams for drinking and associated riparian habitat for nesting and feeding.

Aquatic habitat present within TA-3 and TA-55 is minimal and is associated with ponding within wetland areas. Animal species using these areas would be similar to those noted in Section 3.7.2. No aquatic areas exist within TA-6.

3.7.4 Threatened and Endangered Species

The USFWS is responsible for listing federally-protected plants and animals as endangered, threatened, and candidate, under provisions of the Endangered Species Act of 1973, as amended, and for designating critical habitat necessary for their survival. Species previously listed as Category 2 candidate species (i.e., those for which listing was possibly appropriate) are now listed as species of concern. The state separates the regulatory authority for plants and animals between the New Mexico State Forestry Division and the New Mexico Game and Fish Department, respectively. The Forestry Division lists plants as endangered, sensitive, and review, while the Game and Fish Department designates animals as endangered and threatened. The U.S. Forest Service lists species for special management consideration on lands under their jurisdiction and protects these species under the authority of the Endangered Species Act of 1973. Only Federal and state threatened and endangered species are legally protected. Plants and animals receiving other designations do not receive legal protection, but should be considered during project planning.

A number of Federal and state protected and sensitive (rare or declining) species have been documented in the LANL region (see **Table 3–8**). These consist of three Federal endangered species (the black-footed ferret [*Mustela nigripes*], whooping crane [*Grus americana*], and southwestern willow flycatcher [*Empidonax traillii extimus*]), two Federal threatened species (the bald eagle [*Haliaeetus leucocephalus*] and Mexican spotted owl [*Strix occidentalis lucida*]), and 20 species of concern. Species listed as endangered, threatened, sensitive, or review by the State of New Mexico are also included in Table 3–8. No Federal critical habitat has been designated at LANL. However, areas of the Santa Fe National Forest near LANL have been designated as critical habitat for the Mexican spotted owl.

The results of the Cerro Grande Fire likely will not cause a long-term change to the overall number of federally-listed threatened and endangered species inhabiting the region. However, the results of the fire likely will change the distribution and movement of various species, including the Mexican spotted owl. The areas off LANL that have been proposed as critical habitat suffered heavy damage during the Cerro Grande Fire. Specifically, two primary areas considered as critical habitat for the Mexican spotted owl located on Forest Service land near LANL suffered almost 100 percent vegetation mortality. The fire may also have long-term effects on the habitat of several state-listed species, including the Jemez Mountain salamander. As noted in Section 3.7.2, two projects undertaken after the fire to enlarge culverts in the lower Pajarito Canyon disturbed about 1.5 acres (0.6 hectares) of wetland vegetation composed primarily of willow trees. This wetland was potential habitat for the southwestern willow flycatcher at LANL; however, it was not a confirmed nesting or roosting habitat and was of marginal quality (DOE 2000b).

Table 3–8 Threatened, Endangered, and Other Sensitive Species of LANL

Common Name	Scientific Name	Federal Status [a]	State Status	Potential to Occur [b]
Mammals				
Black-footed ferret	*Mustela nigripes*	FE	-	Low
Spotted bat	*Euderma maculatum*	-	T	High
New Mexico meadow jumping mouse	*Zapus hudsonius luteus*	-	T	Moderate
Western small-footed myotis bat	*Myotis ciliolabrum melanorhinus*	SOC	SOC	High
Little brown occult bat	*Myotis lucifugus occultus*	SOC	SOC	Moderate
Little brown bat	*Myotis lucifugus carissima*	SOC	SOC	Moderate
Fringed bat	*Myotis thysanodes thysanodes*	SOC	SOC	High
Yuma bat	*Myotis yumanensis yumanensis*	SOC	SOC	High
Long-legged bat	*Myotis volans interior*	SOC	SOC	High
Long-eared bat	*Myotis evotis evotis*	SOC	SOC	High
Townsend's pale big-eared bat	*Plecotus townsendii pallescens*	SOC	SOC	High
Big free-tailed bat	*Nyctinomops macrotis*	SOC	SOC	Moderate
Ringtail	*Bassariscus astutus*	SOC	SOC	High
Western spotted skunk	*Spilogale gracilis*	SOC	SOC	Moderate
Red fox	*Vulpes vulpes*	SOC	SOC	Moderate
Goat peak pika	*Ochotona princeps nigrescens*	SOC	SOC	Low
American marten	*Martes americana origenes*	SOC	SOC	Low
Birds				
Whooping crane	*Grus americana*	FE (Ex)	E	Low
Southwestern willow flycatcher	*Empidonax trailii extimus*	FE	E	Moderate
Bald eagle	*Haliaeetus leucocephalus*	FT	T	Moderate
Mexican spotted owl	*Strix occidentalis lucida*	FT	-	Moderate
Mountain plover	*Charadrius montanus*	PT	-	Low
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	C	-	Moderate
Baird's sparrow	*Ammodramus bairdii*	-	T	Low
Northern goshawk	*Accipiter gentilis*	SOC	SOC	Low
Loggerhead shrike	*Lanius ludovicianus*	SOC	SOC	Moderate
Gray vireo	*Vireo vicinior*	SOC	SOC	Moderate
Black swift	*Cypseloides niger borealis*	SOC	SOC	Low
Amphibians				
Western boreal toad	*Bufo boreas boreas*	C	E	Low
Jemez mountain salamander	*Plethodon neomexicanus*	-	T	Moderate
Fish				
Flathead chub	*Hybopsis gracilis*	SOC	SOC	Low
Invertebrates				
Pearly checkerspot butterfly	*Charidryas acastus acastus*	SOC	SOC	Low

Common Name	***Scientific Name***	***Federal Status*** [a]	***State Status***	***Potential to Occur*** [b]
Plants				
Mountain lily	*Lilium philadelphicum*	-	E	Moderate
Yellow lady's slipper orchid	*Cypripedium parviflorum* var. *pubescens*	-	E	Moderate
Heleborine orchid	*Epipactis gigantea*	-	S	Moderate
Checker-lily	*Fritillaria atropurpurea*	-	R	Moderate

[a] **Codes for Legal Status:**
FE = Federally endangered, species for which a final rule has been published in the *Federal Register* (FR) to list the species as endangered.
SOC = Species of Concern, species that have been proposed for listing in the past or could potentially be listed in the lifetime of the project. These species do not receive legal protection.
FE (Ex) = Federally endangered, but New Mexico population is an experimental nonessential population.
FT = Federally threatened, species for which a final rule has been published in the FR to list the species as threatened.
P = Proposed for listing.
T (state, animal) = Threatened, any animals 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.
C = Candidate for listing, substantial information exists on biological vulnerability to support proposals to list as endangered or threatened.
E (state, animal) = Endangered, any animal species or subspecies whose prospects of survival or recruitment in New Mexico are in jeopardy.
E (state, plant) = Endangered, any plant species whose prospects of survival within the state are in jeopardy or are likely, within the foreseeable future, to become jeopardized.
S = Sensitive, any plant taxon that is considered to be rare because of restricted distribution or low numerical density.
R = Review, any plant taxon about which more information is needed. The species is either taxonomically questionable or poorly understood as to distribution or endangerment.

[b] **Potential to Occur**
High = The species is known to exist at LANL.
Moderate = Some species habitat components exist at LANL.
Low = Species habitat components do not exist at LANL.

Sources: Keller 2002, NMNHP 2002.

Habitat that is either occupied by Federally-protected species or that is potentially suitable for use by these species in the future has been delineated within LANL. The LANL Habitat Management Plan, implemented in 1998, identifies areas of environmental interest (AEI) for various Federally-listed threatened or endangered species. In general, an 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 core area from disturbances that would degrade its value. The Plan defines the types and levels of activities that may be conducted within these areas. AEIs at LANL are managed and protected by DOE and the University of California because of their significance to biological or other resources. AEIs have been established for the Mexican spotted owl, bald eagle, and southwestern willow flycatcher (LANL 1998b). They have not been established for the whooping crane and black-footed ferret since suitable habitat for these species does not occur at LANL (LANL 2000b).

Although core and buffer AEIs for the Mexican spotted owl have been established within the northern half of TA-3, surveys have not identified this species as actually occurring within the area. The existing CMR Building does not fall within the AEI for the spotted owl. AEIs for the bald eagle and southwestern willow flycatcher do not coincide with TA-3.

Core and buffer areas for the Mexican spotted owl occur in the southern and eastern portions of TA-6. Surveys of these areas have not located any spotted owls. Chemistry and Metallurgy Research Building Replacement Project (CMRR) facilities would be located within the central section of the site, which is outside of the designated Mexican spotted owl AEI. AEIs for the bald eagle and southwestern willow flycatcher do not coincide with TA-6.

TA-55 falls completely within core and buffer AEIs for the Mexican spotted owl; however, as is the case for TA-3 and TA-6, surveys have not identified any owls within the area. The location of the proposed CMRR within TA-55 falls within both core and buffer areas for this species. AEIs for the bald eagle and southwestern willow flycatcher do not coincide with TA-55.

3.8 CULTURAL AND PALEONTOLOGICAL RESOURCES

3.8.1 Prehistoric Resources

Prehistoric resources at LANL refer to any material remains and items used or modified by people before the establishment of a European presence in the upper Rio Grande Valley in the early seventeenth century. Archaeological surveys have been conducted of approximately 90 percent of the land within LANL (with 85 percent of the area surveyed receiving 100 percent coverage) to identify the cultural resources. The majority of these surveys emphasized prehistoric Native American archaeological sites, including pueblos, rock shelters, rock art, water control features, trails, and game traps. A total of 1,777 prehistoric sites have been recorded at LANL, of which 439 have been assessed for potential nomination to the National Register of Historic Places. Of these, 379 sites were determined to be eligible, 60 sites ineligible, and two of undetermined status. The remaining 1,338 sites, which have not been assessed for nomination to the National Register of Historic Places, are assumed to be eligible until assessed. Three areas in the vicinity of LANL have been established as National Register of Historic Places sites or districts: Bandelier National Monument, Puye Cliffs Historic Ruins, and the Los Alamos Scientific Laboratory National Historic District. The latter is the location of former TA-1 in downtown Los Alamos, which includes Fuller Lodge, the Bathtub Row Houses, and the Ice House Monument at Ashley Pond.

The Cerro Grande Fire directly impacted 215 prehistoric sites. Effects to cultural resource sites included effects originating from burned-out tree root systems forming conduits for modern debris and water to mix with subsurface archaeological deposits and for entry by burrowing animals. Also, snags or dead or dying trees have fallen and uprooted artifacts (DOE 2000b). Additionally, the leveling of a staging area in TA-49 during the fire destroyed one and damaged two other prehistoric sites. Areas at LANL burned by the Cerro Grande Fire have been surveyed for impacts and mitigation measures have been implemented.

TA-3 contains two prehistoric lithic scatter sires. The New Mexico State Historic Preservation Office has concurred that the sites are eligible for the National Register of Historic Places.

TA-6 contains one prehistoric one- to three-room structure. This site has yet to be assessed for eligibility status with regard to the National Register of Historic Places.

TA-55 contains no prehistoric sites.

3.8.2 Historic Resources

Historic resources present within LANL boundaries and on the Pajarito Plateau can be attributed to nine locally defined Periods: U.S. Territorial, Statehood, Homestead, Post Homestead, Historic Pueblo, Undetermined historic, Manhattan Project, Early Cold War, and Late Cold War. The number of sites identified from each period are as follows: 1 from the U.S. Territorial Period, 9 from the Statehood Period, 71 from the Homestead Period, 5 from the Post Homestead Period, 1 from the Historic Pueblo Period, 36 from the Undetermined Historic Period, 56 from the Manhattan Project Period, and 527 from the Early and Late Cold War Periods. Thus, a total of 706 historic sites have been identified at LANL.

The Cerro Grande Fire directly impacted 11 historic buildings and 56 historic sites. Structures and artifacts form the Homestead Period, Manhattan Project Period, and Cold War Period were adversely affected. The fire destroyed virtually all-wooden buildings associated with the Homestead Period, and the burned properties were largely reduced to rubble. V-Site, one of the last vestiges of the Manhattan Project Period remaining at Los Alamos, was the location where work was conducted on the Trinity device. This important historical site was partially destroyed by the fire. Also, a historic structure and building at TA-2 were adversely impacted by post-fire activities (DOE 2000b).

TA-3 contains 43 historic resources. The New Mexico State Historic Preservation Office has determined that two of these resources are eligible for the National Register of Historic Places. The remaining 41 have yet to be assessed for eligibility status.

TA-6 contains 20 historic resources. The New Mexico State Historic Preservation Office has concurred that four of these resources are eligible and two are not eligible for the National Register of Historic Places. The remaining fourteen have yet to be assessed for eligibility status.

TA-55 contains 11 historic resources, one of which the New Mexico State Historic Preservation Office has concurred with the determination that it is eligible for the National Register of Historic Places, and two have been determined to be not eligible. The remaining eight have yet to be assessed.

3.8.3 Traditional Cultural Properties

Consultations to identify traditional cultural properties were conducted with 19 Native American tribes in connection with the preparation of the *LANL SWEIS*. Two Hispanic communities were also contacted. These consultations identified 15 ceremonial and archaeological sites, 14 natural features, 10 ethnobotanical sites, 7 artisan material sites, and 8 subsistence features at LANL. In addition to physical cultural entities, concern has been expressed that “spiritual,” “unseen,” “undocumentable,” or “beingness” aspects can be present at LANL that are an important part of Native American culture and may be adversely impacted by LANL’s presence and operation. Additional consultations regarding traditional cultural properties are ongoing for LANL and other New Mexico properties administered by NNSA and DOE.

3.8.4 Paleontological Resources

A single paleontological artifact has been discovered at a site within LANL boundaries; 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. No palentological resources have been identified in the close vicinity of TA-3, -6, or -55.

3.9 SOCIOECONOMICS

Statistics for population, housing, community services, and local transportation are presented for the region of influence, a three-county area in New Mexico made up of Los Alamos, Santa Fe, and Rio Arriba counties **(Figure 3–8)**. The majority (89.7 percent) of all LANL employees reside in the Tri-County area (see **Table 3–9**).

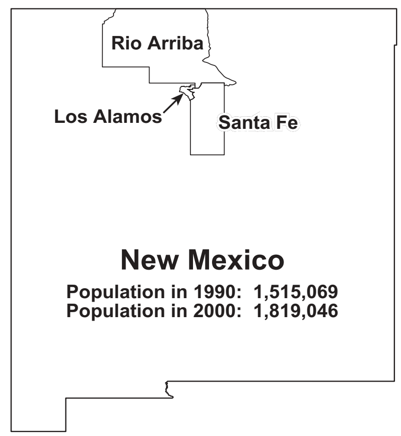


Figure 3–8 Counties in the LANL Region of Influence

3.9.1 Regional Economic Characteristics

Between 1990 and 1999, the civilian labor force in the Tri-County area increased 14.4 percent to 92,189. In 1999, the annual unemployment average in the region of influence was 3.7 percent, which was less than the annual unemployment average of 5.6 percent for New Mexico (DOL 2000).

In 1997, government agencies and enterprises represented the largest sector of employment in the Tri-County area (35.6 percent). This was followed by service activities (29.5 percent) and retail (20.7 percent). The totals for these employment sectors in New Mexico were 25.1 percent, 27.5 percent, and 23.7 percent, respectively (NMDL 1998).

Table 3–9 Distribution of Employees by Place of Residence in the LANL Region of Influence in 1996

County	*Number of Employees* [a]	*Total Site Employment (percent)*
Los Alamos	5,381	50.8
Rio Arriba	2,149	20.3
Santa Fe	1,967	18.6
Region of influence total	9,497	89.7

[a] Data not available for nontechnical contractors or consultants.
Source: DOE 1999a.

3.9.2 Demographic Characteristics

The 2000 demographic profile of the region of influence population and income information is included in **Table 3–10**. Persons self-designated as minority individuals comprise 57.9 percent of the total population. This minority population is composed largely of Hispanic or Latino and

American Indian residents. The Pueblos of San Ildefonso, Santa Clara, San Juan, Nambe, Pojoaque, Tesuque, and part of the Jicarilla Apache Indian Reservation are included in the region of influence.

Table 3–10 Demographic Profile of the Population in the LANL Region of Influence

	Los Alamos County	*Rio Arriba County*	*Santa Fe County*	*Region of Influence*
Population				
2000 population	18,343	41,190	129,292	188,825
1990 population	18,115	34,365	98,928	151,408
Percent change from 1990 to 2000	1.3	19.9	30.7	24.7
Race (2000) (percent of total population)				
White	90.3	56.6	73.5	71.5
Black or African American	0.4	0.3	0.6	0.5
American Indian and Alaska Native	0.6	13.9	3.1	5.2
Asian	3.8	0.1	0.9	1.0
Native Hawaiian & Other Pacific Islander	0.0	0.1	0.1	0.1
Some other race	2.7	25.6	17.7	18.0
Two or more races	2.3	3.3	4.1	3.7
Percent minority	17.9	86.4	54.5	57.9
Ethnicity (2000)				
Hispanic or Latino	2,155	30,025	63,405	95,585
Percent of total population	11.7	72.9	49.0	50.6

Source: DOC 2001.

Income information for the LANL region of influence is included in **Table 3–11**. There are significant differences in the income levels among the three counties, especially between Rio Arriba County, at the low end, and Los Alamos County, at the upper end. The median household income in Los Alamos County is over double that of the New Mexico state average while the median household income of Rio Arriba County is below the state average. In 1999, only 2.9 percent of the population in Los Alamos County was below the official poverty level, while in Rio Arriba County, 20.3 percent of the population was below the poverty level (DOC 2003).

Table 3–11 Income Information for the LANL Region of Influence

	Los Alamos County	*Rio Arriba County*	*Santa Fe County*	*New Mexico*
Median household income 1999 ($)	78,993	29,429	42,207	34,133
Percent of persons below poverty line (1999)	2.9	20.3	12.0	18.4

Source: DOC 2003.

3.9.3 Housing and Community Services

Table 3–12 lists the total number of occupied housing units and vacancy rates in the region of influence. In 1990, the Tri-County area contained 63,386 housing units, of which 56,514 were occupied. The median value of owner-occupied units was $125,100 in Los Alamos County, which is higher than the other two counties and over twice the median value of units in Rio Arriba County. The vacancy rate was lowest in Los Alamos County (4.7 percent) and highest in Rio Arriba County (20.2 percent). During the Cerro Grande Fire in 2000, approximately

230 housing units were destroyed or damaged in northern portions of Los Alamos County (DOE 2000b). As a result, vacancy rates have decreased.

Community services include public education and healthcare (including hospitals, hospital beds, and doctors). In 1998, student enrollment totaled 26,290 in the region of influence and the average student-to-teacher ratio was 17:1 (Department of Education 2000). In 1998, three hospitals served the Tri-County area with a hospital bed-to-population ratio of 1.9 hospital beds per 1,000 persons. The average region of influence's physician-to-population ratio was 2.7 physicians per 1,000 persons (Gaquin and DeBrandt 2000).

Table 3–12 Housing and Community Services in the LANL Region of Influence

	Los Alamos County	*Rio Arriba County*	*Santa Fe County*	*Region of Influence*
Housing (1990) [a]				
Total units	7,565	14,357	41,464	63,386
Occupied housing units	7,213	11,461	37,840	56,514
Vacant units	352	2,896	3,624	6,872
Vacancy rate (percent)	4.7	20.2	8.7	10.8
Median value ($)	125,100	57,900	103,300	Not available
Public Education (1998) [b]				
Total enrollment	3,674	6,917	15,699	26,290
Student-to-teacher ratio	14.8:1	18:1	17.2:1	17:1
Community Healthcare (1998) [c]				
Hospitals	1	1	1	3
Hospital beds per 1,000 persons	2.9	2.1	1.7	1.9
Physicians per 1,000 persons	2.6	0.9	3.3	2.7

Sources:
[a] DOE 1999a.
[b] Department of Education 2000.
[c] Gaquin and DeBrandt 2000.

3.9.4 Local Transportation

Motor vehicles are the primary means of transportation to LANL. Regional transportation route(s) to LANL include: Albuquerque and Santa Fe – I-25 to U.S. 84/285 to NM 502; from Española are NM 30 to NM 502; and from Jemez Springs and western communities – NM 4. Hazardous and radioactive material shipments leave or enter LANL from East Jemez Road to NM 4 to NM 502 (see Figure 3–1). Only two major roads, NM 502 and NM 4, access Los Alamos County. Los Alamos County traffic volume on these two segments of highway is primarily associated with LANL activities.

A public bus service located in Los Alamos operates within Los Alamos County. The Los Alamos bus system consists of seven buses that operate 5 days a week. The nearest commercial bus terminal is located in Española. The nearest commercial rail connection is at Lamy, New Mexico, 52 miles (83 kilometers) southeast of LANL. LANL does not currently use rail for commercial shipments. The primary commercial international airport in New Mexico is located in Albuquerque. The small Los Alamos County Airport is owned by the Federal Government, and the operations and maintenance are performed by the County of Los Alamos under a lease agreement. The airport is located parallel to East Road at the southern edge of the Los Alamos community. Until January 1996, the airport provided regular passenger and cargo service through specialized contract carriers such as Ross Aviation, which were under contract with DOE to provide passenger and cargo air service to Los Alamos County and LANL. DOE continues to negotiate with various companies to provide for service to the Los Alamos Airport.

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 D, 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 multiracial (with at least one race designated as a minority race under Council on Environmental Quality (CEQ) Guidelines (CEQ 1997)). Persons whose income is below the Federal poverty threshold are designated as low income.

There are three locations at LANL being considered for the continued operation of CMR activities. These are TA-3, TA-6, and TA-55 (see Section 1.4). **Figure 3–9** shows locations for these activities. The location for the new CMRR Facility at TA-55 is approximately 1.2 miles (1.9 kilometers) southeast of the existing CMR Building. The location for the new CMRR Facility at TA-6 is approximately 0.5 miles (0.8 kilometers) south of the existing CMR Building.

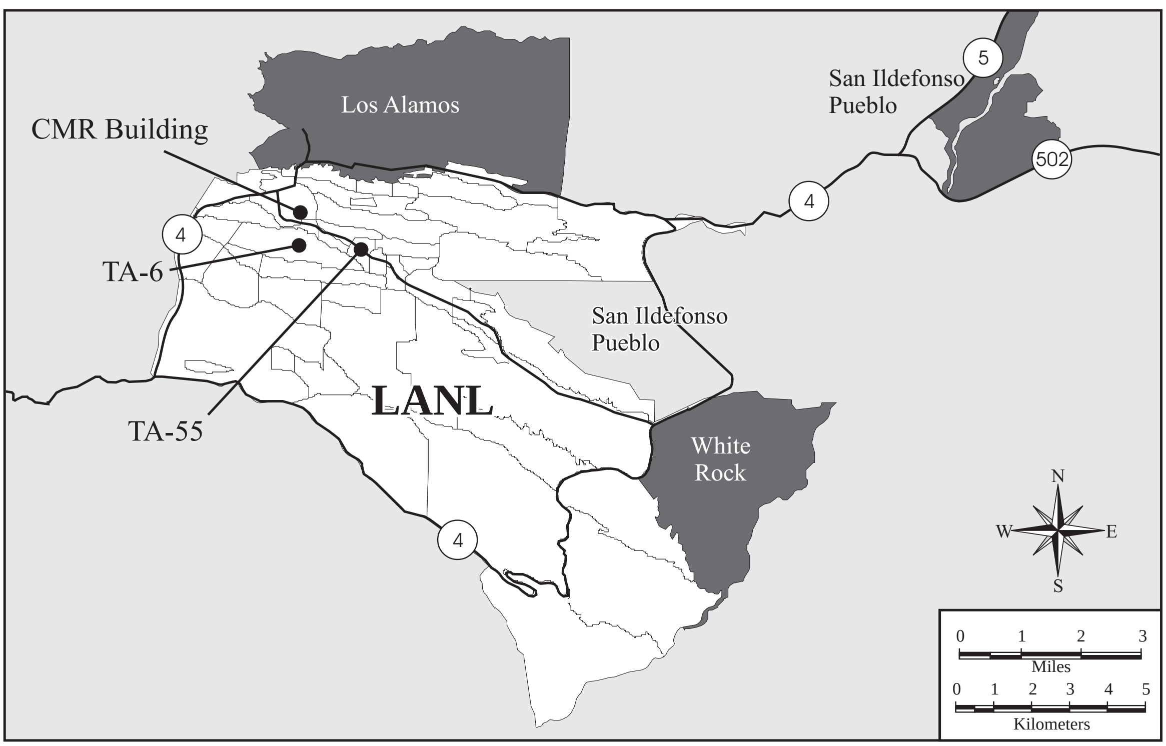


Figure 3–9 CMR Building and Sites for the New CMRR Facility

Populations at risk include persons who live within 50 miles (80 kilometers) of the existing CMR Building or the proposed locations for CMRR Facilities at TA-55 or TA-6. As indicated in **Figure 3–10**, eight counties are 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.

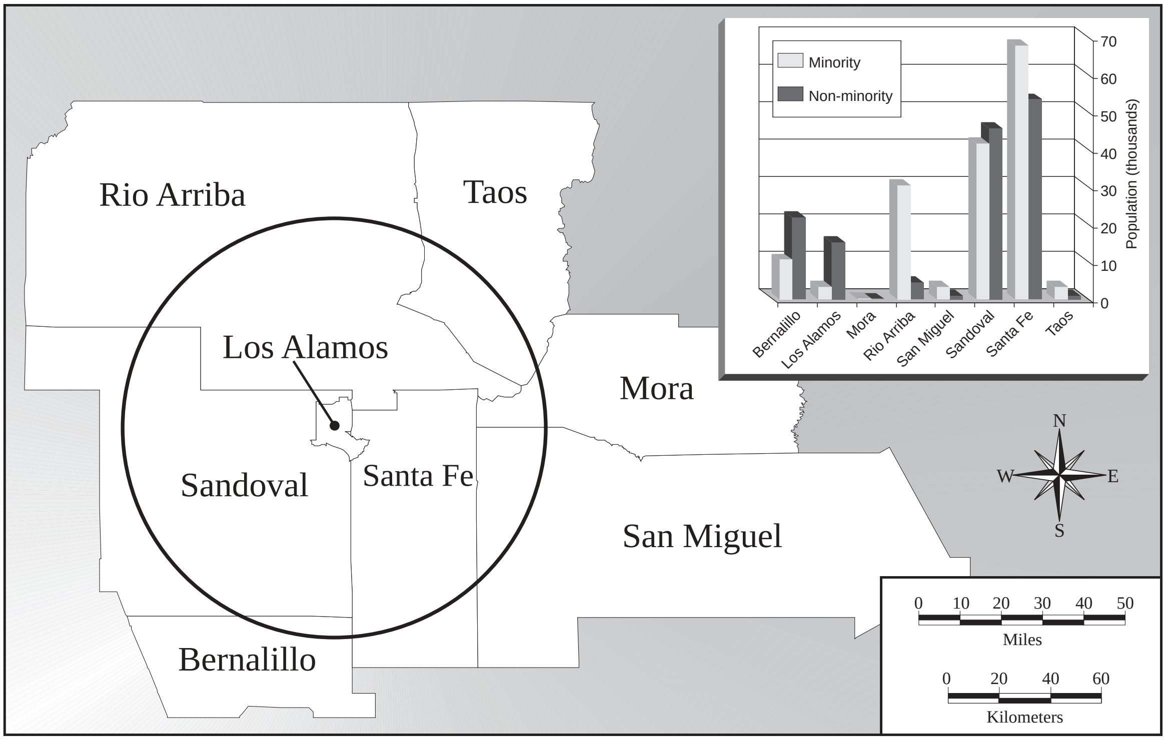


Figure 3–10 Minority and Non-Minority Populations by County Living in the Potentially Affected Area

Figure 3–10 shows the minority and non-minority populations by county living within the potentially affected area surrounding the existing CMR Building in the year 2000. Because CMRR Facility locations are relatively close to one another, the minority and non-minority populations living in potentially affected areas surrounding the TA-6 and TA-55 sites differ from those surrounding the existing CMR Building at TA-3 by less than three percent. Minorities living in the 8 counties comprised approximately 53 percent of the total population at risk. Nearly 70 percent of the total and minority populations at risk lived in Sandoval and Santa Fe counties.

Figure 3–11 shows cumulative minority populations as a function of distance from TA-3, TA-6, and TA-55. Values along the vertical axis of Figure 3–11 show the minority population (in thousands) 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. Nearly 40 percent of the potentially affected minority population lived in the Santa Fe area in 2000. Cumulative minority populations surrounding TA-3 and TA-6 are almost identical as a function of distance from the site. Because the CMRR Facility could be located in TA-55, it would be approximately one mile (1.6 kilometers) closer to the Santa Fe area. The surge in minority population resulting from minority residents of Santa Fe occurs at a distance that is approximately one mile (1.6 kilometers) less than the corresponding distance for TA-3 and TA-6.

Figure 3–12 shows the composition of the potentially affected minority population surrounding TA-55. Hispanics and American Indians comprised approximately 94 percent of the potentially affected minority population. Nearly one-half of the potentially affected Hispanic and American Indian populations lived in the Santa Fe area in 2000. The racial and Hispanic composition in the potentially affected area is reasonably representative of that for the State of New Mexico. Hispanics comprised approximately 76 percent of New Mexico's minority population in 2000, and American Indians comprised nearly 16 percent of the State's minority population. Among the 50 states, New Mexico has the second largest percentage minority population (55 percent). Only the State of Hawaii has a larger percentage minority population (77 percent).

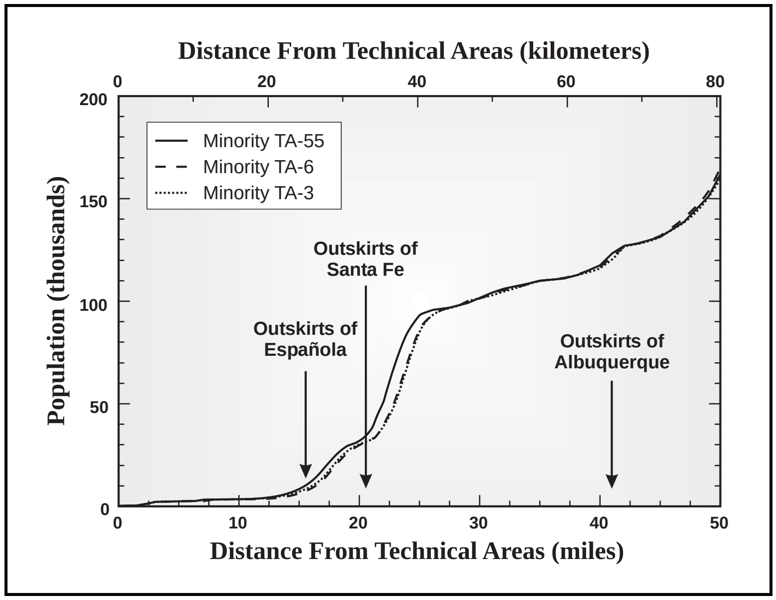


Figure 3–11 Minority Populations as a Function of Distance from TA-3, TA-6, and TA-55

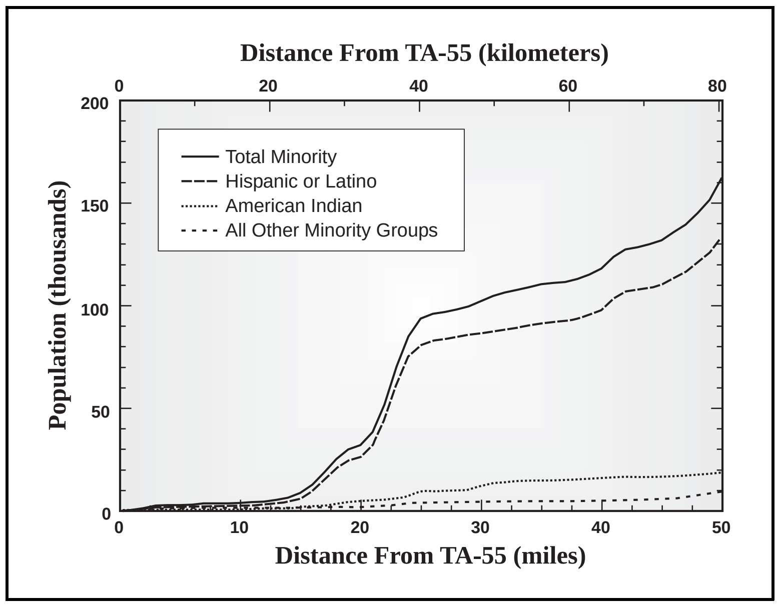


Figure 3–12 Minority Groups TA-55

As indicated in **Figure 3–13** the largest potentially affected low-income populations reside in Sandoval and Santa Fe counties. Approximately 70 percent of the total potentially affected low-income population lived in these two counties in 2000. Low-income persons comprised approximately 13 percent of the total potentially affected population.

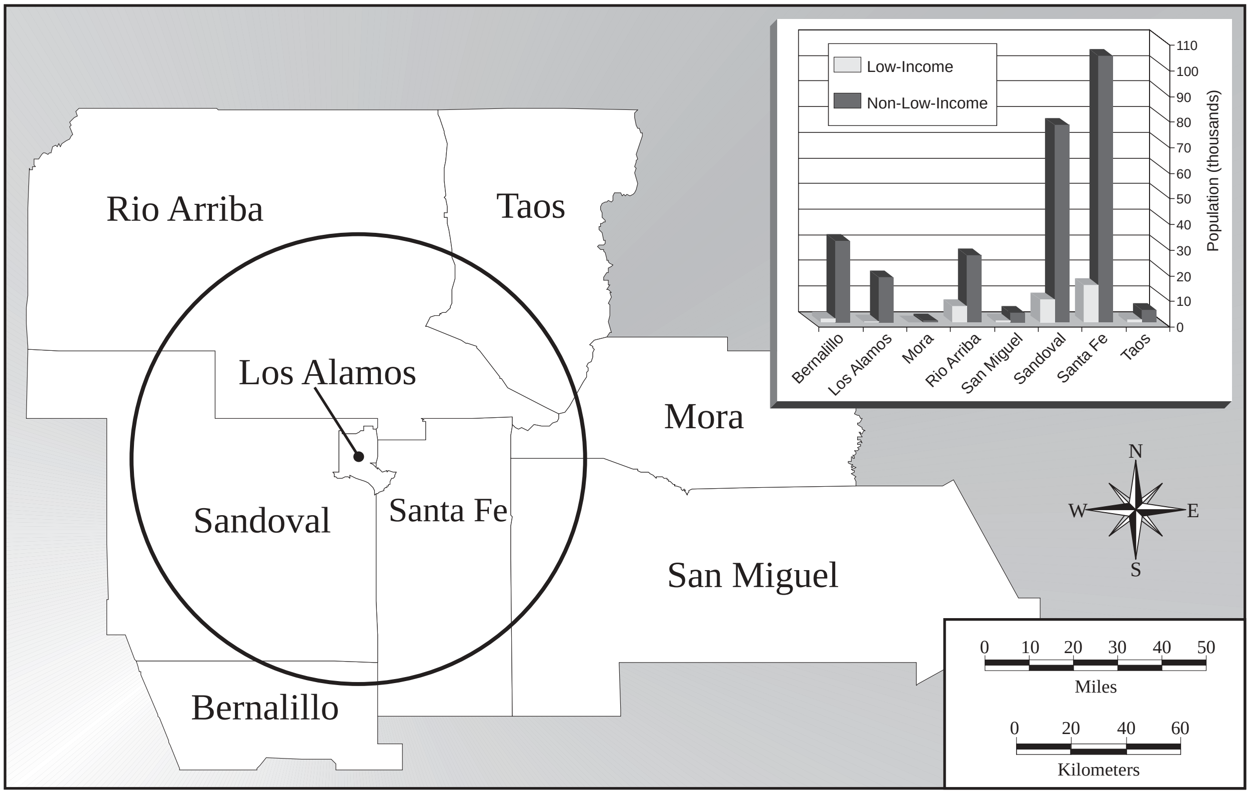


Figure 3–13 Low-Income and Non-Low-Income Populations by County Living in the Potentially Affected Area

Figure 3–14 shows the cumulative low-income population as a function of distance from TA-3, TA-6, and TA-55. The overall shape of these curves is similar to those shown in Figures 3–11 and 3–12. Low-income populations surrounding TA-3, TA-6, and TA-55 are concentrated in the Española, Santa Fe, and Albuquerque areas. Nearly 40 percent of the potentially affected low-income population lived in the Santa Fe area in 2000.

At the public scoping meetings on the CMRR EIS held in Pojoaque, New Mexico, on August 13, 2002 (see Section 1.7), the Director of Environmental and Cultural Preservation for the Pueblo San Ildefonso identified environmental justice concerns over the implementation of the Preferred Alternative. Pueblo of San Ildefonso land is located adjacent to the boundary of LANL TA-54.

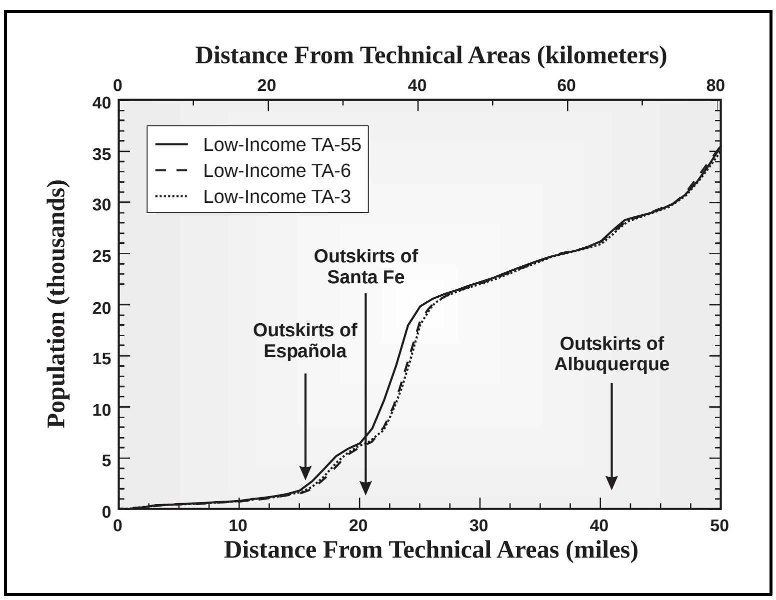


Figure 3–14 Cumulative Low-Income Population as a Function of Distance from TA-3, TA-6, and TA-55

While no one resides on this land, members of the Pueblo use it for hunting, gathering, and ceremonial and cultural purposes. Residents of Pueblo San Ildefonso expressed concern that pollution resulting from implementation of the Preferred Alternative could contaminate Mortandad Canyon, which in turn drains onto Pueblo land and sacred areas. At the scoping meetings, the representative of the Pueblo San Ildefonso requested that this EIS evaluate alternatives that would locate the CMRR Facility farther away from their lands. Also, a former Governor of the Pueblo of Acoma expressed concern that implementation of the Preferred Alternative could contaminate areas surrounding LANL, and that LANL's record of compliance with environmental regulations was not satisfactory.

3.11 HUMAN HEALTH

Public and occupational health and safety issues 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 from 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 3–13**. Annual background radiation doses to individuals are expected to remain constant over time. Background radiation doses are unrelated to LANL operations.

Table 3–13 Sources of Radiation Exposure to Individuals in the LANL Vicinity Unrelated to LANL Operations

Source	*Effective Dose Equivalent (millirem per year)*
Natural Background Radiation	
External cosmic [a]	50 to 90
External terrestrial [b]	50 to 150
Internal terrestrial and global cosmogenic	40
Radon (in homes)	200
Other Background Radiation	
Diagnostic x-rays and nuclear medicine	50
Weapons test fallout	<1
Consumer and industrial products	10
Total	400 to 500

[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 2001a.

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 2001 are listed in *Environmental Surveillance at Los Alamos During 2001* (LANL 2002c), and are presented in Section 3.4.2.2.

The annual population dose for the public resulting from these releases is 1.6 person-rem, which corresponds to an average annual individual dose of 0.006 millirem for individuals residing within 50 miles (80 kilometers) of the LANL site. (The estimated population for this region in 2001 was 277,000.) The dose to the offsite public is almost exclusively the result of airborne releases from LANL. The annual dose to the maximally exposed offsite individual was calculated to be 1.9 millirem. A calculation for a maximally exposed onsite individual was also made. This individual was assumed to be a member of the public who traveled along Pajarito Road on a relatively frequent basis and was therefore susceptible to a dose from the operation of facilities at TA-18 higher than that received by the general offsite public. The annual dose to this maximally exposed onsite individual was calculated to be 4.2 millirem (LANL 2002c). These doses fall within the radiological limits (individual dose limit of 10 millirem per year from airborne emissions and 100 millirem per year from all sources) given in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, and are much lower than those from background radiation.

Using a risk estimator of one latent cancer death per 2,000 rem dose (see Appendix B), the estimated probability of this maximally exposed person developing a latent fatal cancer from radiation exposure associated with 1 year of LANL operations is less than one in one million (1×10^{-6}). According to the same risk estimator, 0.0008 excess latent fatal cancers 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 expected during 2001 from all causes in the population of 277,000 living within 50 miles (80 kilometers) of LANL was 554. This expected number of fatal cancers is much higher than the 0.0008 latent fatal cancers estimated from LANL operations in 2001.

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 2001 are presented in **Table 3–14**. These doses fall within the radiological limits established by 10 CFR 835, *Occupational Radiation Protection*. Using a risk estimator of one latent fatal cancer per 2,500 person-rem among workers (see Appendix B) and a total workers dose of 113 person-rem, the number of estimated latent fatal cancers among LANL workers from normal operations in 2001 is 0.045. The risk estimator for workers is lower than the estimator for the public because of the absence from the workforce of the more radiosensitive infant and child age groups.

Table 3–14 Radiation Doses to Workers from Normal LANL Operations in 2001 (total effective dose equivalent)

Occupational Personnel	*Onsite Releases and Direct Radiation*	
	Standard	***Actual***
Average radiation worker (millirem)	(a)	85
Total workers (person-rem) [b]	None	113

[a] The radiological limit for an individual worker is 5,000 millirem per year (10 CFR 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 1,330 workers with measurable doses in 2001.

Source: DOE 2002h.

External radiation doses have been measured in areas of TA-3, TA-6, and TA-55 that may contain radiological sources for comparison with offsite natural background radiation levels. Measurements taken in 2001 showed doses within TA-3 (excluding some restricted locations within the area) to be between 110 and 129 millirem, within TA-6 to be 132 millirem, and within TA-55 to be between 142 and 150 millirem. Offsite doses from background radiation were measured to be as high as 144 millirem (LANL 2002c).

In 2001, the average concentration 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, 8×10^{-16} curies per cubic meter, and 1.4×10^{-14} curies per cubic meter, respectively. The concentration of plutonium-239 was about twice that measured at offsite regional locations; the concentrations of gross alpha and gross beta radiation were about the same as measured regionally (LANL 2002c). No specific measurements were reported for the TAs, but the concentrations would be expected to be similar to the average site values.

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 to 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 to the public could occur during normal operations at LANL via inhalation of air containing hazardous chemicals released to the atmosphere by LANL operations. Risks to public health from ingestion of contaminated drinking water or direct exposure are also potential pathways.

Baseline air emission concentrations for air pollutants and their applicable standards are presented in Section 3.4.2.1. 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 Health Effects Studies

Numerous epidemiological studies have been conducted in the LANL area. These studies have been summarized in the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management (SSM PEIS)* (DOE 1996b). One study conducted by the New Mexico Department of Health reported elevations in brain cancer incidence during the mid to late 1980s, compared to state and national reference populations, but random fluctuation could not be ruled out. Breast cancer incidence rates in Los Alamos from 1970 to 1990 remained level, but higher than New Mexico rates. Reproductive and demographic factors known to increase the risk of breast cancer have been prevalent in the county. Ovarian cancer incidence in the county from 1986 to 1990 was approximately twofold greater than that observed in a New Mexico State reference population. In the mid to late-1980s, a twofold excess risk of melanoma was observed in Los Alamos County compared with a New Mexico State reference population. A more recent study observed a fourfold increase in thyroid cancer incidence during the late 1980s and early 1990s compared with the state as a whole, but the rate began to decline in 1994 and 1995. No statistically significant excess cancers were reported for male workers exposed to plutonium. However, statistically significant excesses in kidney cancer and lymphomatic leukemia were observed in male workers exposed to external radiation. For more detailed descriptions of studies reviewed and the findings, refer to Appendix Section D.1.2 of the *LANL SWEIS* (DOE 1999a) and to Appendix Section E.4.6 of the *SSM PEIS* (DOE 1996b).

3.11.4 Accident History

Unanticipated incidents have occurred at the CMR Building that had the potential for impacts to workers and the public. However, the consequences of most of the incidents were minor, and none resulted in fatal worker injuries. In most of these incidents, no inhalation of radioactive material occurred, and it was possible to decontaminate the workers and areas near where the contamination occurred. The following is a list of historical incidents that are pertinent to this EIS:

- In 1981, a radiological incident occurred in Wing 3 of the CMR Building. Plutonium-238 heat source material was accidently spilled. As a result, there was widespread wing contamination and 15 laboratory employees, a public worker, and two residential houses in Santa Fe were contaminated.

- In 1971, 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.

- There have been at least nine, and perhaps many more spills of radioactive materials during operations within ventilated hoods and operations outside of containment boxes. One typical spill occurred when a worker 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.

- Several incidents occurred in the time period from 1992 through 1997 that caused contamination outside of the facility. These incidents were the result of stack releases in excess of DOE guidelines and of contaminated material sent to the Los Alamos landfill. Four other environmental contamination incidents occurred outside the CMR Building prior to this period. During 1995, there were two releases at the CMR Building involving 116 micro curies of uranium-235 from Wing 4 and 1.24 micro curies of plutonium-239 from Wing 3. Also, in this time period, 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 exposure of 15 rem in the lungs.

- Three incidents of small fires occurred in the time interval from 1996 through 1997. 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.

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.

3.11.5 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 151.1, *Comprehensive Emergency Management System*). 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 Hanford in May 1997.

The current EOC is located within TA-59 near TA-3. A new EOC is under construction within TA-69 near TA-8. The move to the new, state-of-the-art facility is expected to occur in early

2004. The new EOC incorporates many of the lessons learned from operation of the existing EOC during, and for 3 months following, the Cerro Grande Fire in 2000. The new EOC is planned as a multi-agency user facility that is capable of accommodating a large number of emergency responders simultaneously. The facility will also routinely accommodate 911 emergency workers of Los Alamos County, as well as LANL's emergency responder staff.

3.12 WASTE MANAGEMENT AND POLLUTION PREVENTION

Waste management includes minimization, characterization, treatment, storage, transportation, and disposal of waste generated from ongoing DOE activities. The waste is managed using appropriate treatment, storage, and disposal technologies, and in compliance with all applicable Federal and state statutes and DOE orders. LANL manages the following types of waste: transuranic, mixed transuranic, low-level radioactive, mixed low-level radioactive, hazardous, and nonhazardous. Each of these waste types is generated by CMR activities.

3.12.1 Waste Inventories and Activities

CMR operations in the existing CMR Building generate transuranic waste, mixed transuranic waste, low-level radioactive waste, mixed low-level radioactive waste, hazardous waste, and nonhazardous waste. It is assumed in this EIS that transuranic waste, mixed transuranic waste, low-level radioactive waste, mixed low-level radioactive waste, hazardous waste, and nonhazardous waste would be treated, stored, and disposed of in accordance with current and developing site practices. No high-level radioactive waste is generated from the CMR activities conducted at the CMR Building.

In accordance with the Records of Decision for the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste (Waste Management PEIS)* (DOE, DOE/EIS-0200-F, May 1997), waste could be treated and disposed of onsite at LANL or at other DOE sites or commercial facilities. Based on the Record of Decision for hazardous waste published on August 5,1998 (63 FR 41810), nonwastewater hazardous waste will continue to be treated and disposed of at offsite commercial facilities. Based on the Record of Decision for low-level radioactive waste and mixed low-level radioactive waste published on February 18, 2000 (65 FR 10061), minimal treatment of low-level radioactive waste will be performed at all sites, and to the extent practicable, onsite disposal of low-level radioactive waste will continue. Hanford and Nevada Test Site (NTS) will be made available to all DOE sites for disposal of low-level radioactive waste. Mixed low-level radioactive waste analyzed in the *Waste Management PEIS* will be treated at Hanford, the Idaho National Engineering and Environmental Laboratory (INEEL), the Oak Ridge Reservation and the Savannah River Site (SRS), and will be disposed of at Hanford and NTS. Based on the Record of Decision for transuranic waste (63 FR 3629), DOE has decided to treat LANL's transuranic waste onsite prior to disposal at an offsite facility. DOE is in the process of developing a policy for the management of mixed transuranic waste.

The existing CMR Building has established several capabilities for managing waste, including analyzing, packaging, storing, and transporting low-level, transuranic, and hazardous waste generated from programmatic operations. All liquid radioactive and inorganic chemical wastes meet the Laboratory's waste acceptance criteria before the waste is sent via the industrial waste line to the Laboratory's RLWTF at TA-50 for processing. Because the volume of liquid organic chemical wastes is very low, the wastes are collected in small containers in temporary holding areas, packaged, and transported from the CMR Building to TA-50 by truck. Low-level solid wastes are also packaged in the CMR Building, where care is taken to avoid combining hazardous wastes with radioactive wastes to form mixed wastes. Solid wastes are stored in temporary locations until they are shipped to waste storage and disposal locations at TA-54.

Waste generation rates from CMR activities are provided in **Table 3–15**; also included for comparison are total waste generation rates for all LANL activities. Selected waste management facilities at LANL are summarized in **Table 3–16**.

Although not listed on the National Priorities List, LANL adheres to Comprehensive Environmental Response, Compensation, and Liability Act guidelines for environmental restoration projects that involve certain hazardous substances not covered by the Resource Conservation and Recovery Act (RCRA). LANL's environmental restoration program originally consisted of approximately 2,100 potential release sites (DOE 1999d). At the end of 1999, there remained 1,206 potential release sites requiring investigation or remediation and 118 buildings awaiting decontamination and decommissioning.

Based on a review by LANL's Environmental Restoration Program, the boundary of Potential Release Site 48-001 overlaps a small area in the corner of the proposed relocation site at TA-55. This area of overlap involves possible surface soil contamination from TA-48 stack emissions. Further investigation and any necessary remediation of this site will be completed under LANL's Environmental Restoration Program (LANL 2001d) and in accordance with LANL's Hazardous Waste Facility Permit. More information on regulatory requirements for waste disposal is provided in Chapter 5.

Table 3–15 Selected Waste Generation Rates from CMR and LANL Activities

Waste Type	*Units*	*CMR Generation Rate*	*LANL Generation Rate*
Transuranic	Cubic yards per year	19.5 [a]	169 [a]
Mixed transuranic	Cubic yards per year	8.5 [a]	41.2 [a]
Low-level radioactive	Cubic yards per year	1,021 [a]	3,714 [a]
Mixed low-level radioactive	Cubic yards per year	6.7 [a]	128 [a]
Hazardous	Pounds per year	10,494 [a]	1,897,304 [a,b]
Nonhazardous			
Liquid	Cubic yards per year	Not available	906,188 [c]
Solid	Cubic yards per year	Not available	7,132 [c]

[a] *LANL SWEIS*, Table 4.9.3.3-1.
[b] This waste type also includes biomedical waste.
[c] DOE 1999d.
Note: The generation rates are attributed to facility operations and do not include the waste generated from environmental restoration actions.

Table 3–16 Selected Waste Management Facilities at LANL

Facility Name/Description	*Capacity*	*Status*	*Applicable Waste Type*					
			TRU	*Mixed TRU*	*LLW*	*MLLW*	*HAZ*	*NHAZ*
Treatment Facility (cubic yards per year)								
Transuranic waste volume reduction	1,413	Online	X	X				
RAMROD and RANT facilities	1,373	Online	X	X				
Low-level radioactive waste compaction	99	Online			X			
Sanitary wastewater treatment	1,386,456	Online						X
Storage Facility (cubic yards)								
Low-level radioactive waste storage	867	Online			X			
Mixed low-level radioactive waste storage	763	Online				X		
Hazardous waste storage	2,438	Online					X	
Disposal Facility								
TA-54, Area G low-level radioactive waste disposal (cubic yards)	330,245 [a]	Online			X			
Sanitary tile fields (cubic yards per year)	742,560	Online						X

[a] Current inventory of 326,975 cubic yards. Capacity will be expanded as part of the implementation of the *LANL SWEIS* Record of Decision.

TRU = transuranic waste, LLW = low-level radioactive waste, MLLW = mixed low-level radioactive waste, HAZ = hazardous waste, NHAZ = non-hazardous waste, RAMROD = Radioactive Materials Research, Operations, and Demonstration; RANT = Radioactive Assay and Nondestructive Test.

Source: DOE 1999d.

3.12.2 Transuranic Waste

Transuranic waste is generated by analytical, processing, and fabrication activities in the CMR Building at LANL. All projects generating transuranic waste are required to implement waste minimization (64 FR 50797).

As part of the implementation of the Record of Decision for Transuranic Waste (TRU) Waste Treatment and Storage, part of the *Waste Management Programmatic Environmental Impact Statement* (DOE 1997b), LANL will treat transuranic waste onsite. Most transuranic waste will be disposed at the Waste Isolation Pilot Plant (WIPP) in New Mexico. However, WIPP commenced TRU waste disposal operations in March 1999, and the preferred alternative in the *WIPP Disposal Phase Final Supplemental Environmental Impact Statement (SEIS)* (DOE 1997c) included a 35-year operating period. The WIPP disposal phase is, therefore, assumed to end in 2034. Several DOE sites, including LANL, expect to generate TRU waste beyond 2034 as a result of ongoing missions. The National TRU Waste Management Plan classifies TRU waste generated after 2034 as waste having no current plan for disposal.

The CMRR Facility would start operations in 2010 with full operations planned for 2012. The operating life of the CMRR Facility is at least 50 years. To accommodate all projected TRU waste from the CMRR Facility and other ongoing operations, DOE would need to extend the disposal phase for the WIPP repository or develop a new TRU waste repository similar to the WIPP. Because sufficient lead time exists to develop such a repository, and given the fact that

DOE has successfully demonstrated the capability of disposing TRU waste, this EIS assumes that a TRU waste repository similar to the WIPP would be available.

The total volume of TRU waste currently managed by DOE (stored and projected) is estimated to be 249,949 cubic yards (191,100 cubic meters) of which 244,194 cubic yards (186,700 cubic meters) is contact handled TRU and 5,755 cubic yards (4,400 cubic meters) is remote handled TRU waste. A portion of this waste will be treated or repackaged prior to disposal, and the reported volumes may change depending on the selected processing or repackaging methodology. The estimated volume to be disposed of at WIPP is 151,853 cubic yards (116,100 cubic meters), of which 148,191 cubic yards (113,300 cubic meters) is contact handled TRU (of which about 4,185 cubic yards [3,200 cubic meters] has already been disposed), and 3,662 cubic yards (2,800 cubic meters) is remote handled TRU waste (DOE 2002b).

WIPP's total capacity for both contact handled and remote handled TRU waste is set at 229,676 cubic yards (175,600 cubic meters) by the *WIPP Land Withdrawal Act*. The Consultation and Cooperation Agreement restricts the quantity of remote handled TRU waste to only 5 percent by volume. Thus, the total volume of remote handled TRU waste cannot exceed 9,260 cubic yards (7,080 cubic meters). If the maximum allowable remote handled TRU waste volume were disposed, the available capacity for contact handled TRU waste would be 220,416 cubic yards (168,520 cubic meters). The CMRR Facility operations are expected to generate 61 cubic yards (47 cubic meters) per year of contact handled TRU waste. Over a 50-year operating life, this would result in a total of about 3,050 cubic yards (2,350 cubic meters) of contact handled TRU waste. Based on current TRU waste forecasts, the available contact handled TRU waste disposal capacity at WIPP is about 72,225 cubic yards (55,220 cubic meters). The available capacity or new capacity would be sufficient to accommodate the estimated volumes of TRU waste from CMRR Facility operations.

3.12.3 Mixed Transuranic Waste

Transuranic waste that also contains hazardous components regulated under RCRA is managed as mixed transuranic waste. Once generated, the mixed transuranic waste generally is transferred to a satellite storage area at the existing CMR Building. Subsequent storage, bulking, and transportation operations are performed according to hazardous waste management and U.S. Department of Transportation (DOT) regulations and DOE directives. The storage, bulking, and transportation preparation activities take place at TA-54. Most mixed transuranic waste will be disposed at WIPP or a similar facility.

3.12.4 Low-Level Radioactive Waste

Radioactive wastes that contain less than 100nCi/g of transuranic radionuclides are managed as low-level waste. Solid low-level radioactive waste generated by LANL's operating divisions is characterized and packaged for disposal at the onsite low-level radioactive waste disposal facility at TA-54, Area G, or sent to off-site licensed commercial facilities for disposal. Low-level radioactive waste minimization strategies are intended to reduce the environmental impact associated with low-level radioactive waste operations and waste disposal by reducing the amount of low-level radioactive waste generated and/or minimizing the volume of low-level radioactive waste that will require storage or disposal onsite. A 1998 analysis of the low-level radioactive waste landfill at TA-54, Area G, indicated that at previously planned rates of disposal, the disposal capacity would be exhausted in a few years. Reduction in low-level radioactive waste generation has extended this time to approximately five years; however, potentially large volumes of waste from planned construction upgrades and demolition activities at LANL could rapidly fill the remaining capacity (LANL 2000a).

As part of the implementation of the Record of Decision in the *LANL SWEIS*, DOE will continue onsite disposal of LANL-generated low-level radioactive waste using the existing footprint at the Area G low-level waste disposal area and will expand disposal capacity into Zones 4 and 6 at Area G. This expansion would cover up to 72 acres (29 hectares). Additional sites for low-level radioactive waste disposal at Area G would provide onsite disposal for an additional 50 to 100 years (64 FR 50797, LANL 2000a).

The primary sources of liquid low-level radioactive waste at the CMR Building are laboratory sinks, duct wash-down systems, and overflows and blowdowns from circulating chilled-water systems, generating approximately 10,400 gallons per day (LANL 2002f) (Internal Memorandum, Estimate of CMR Flows, Prepared by Pete Worland, LANL FWO-WFM, September 25, 2002). The liquid waste is transferred through a system of pipes and by tanker trucks to the RLWTF at TA-50, Building 1. The radioactive components are removed and disposed of as solid low-level radioactive waste at TA-54, Area G. The remaining liquid is discharged to a permitted outfall that empties into Mortandad Canyon (LANL 2000a).

3.12.5 Mixed Low-Level Radioactive Waste

There are seven major mixed low-level radioactive waste streams at LANL: circuit boards, gloveboxes, lead parts, research and development chemicals, personal protective equipment, fluorescent tubes, and waste generated from spills and spill cleanup. Typically, mixed low-level radioactive waste is transferred to a satellite storage area once generated. Whenever possible, mixed low-level materials are surveyed to confirm the radiological contamination levels, and if decontamination will eliminate either the radiological or the hazardous component, materials are decontaminated and removed from the mixed low-level radioactive waste category (LANL 2000a).

Proper waste management and DOT documentation are provided for solid waste operations at TA-54, Area G or Area L, to process remaining mixed low-level radioactive waste for storage, bulking, and transportation. RCRA waste management operations at Area G involve storage of mixed low-level radioactive waste in above-grade container areas including buildings, sheds, and domes. There are currently no hazardous or mixed waste disposal operations at Area G. The storage units have operated under the LANL hazardous waste facility permit (expired 1999) and interim status. All the storage units will be included in the pending renewal of the permit. The renewed permit will also include provisions for final remediation of the past disposal operations. As part of the renewal process, NMED has recently requested a closure and post-closure plan to include groundwater monitoring for historic hazardous waste disposal units and an extensive information document regarding further details of Area G waste management operations. From TA-54, mixed low-level radioactive waste is sent to commercial and DOE treatment and disposal facilities. The waste is treated/disposed of by various processes (such as segregation of hazardous components, macroencapsulation, or incineration) (LANL 2000a).

In October 1995, the State of New Mexico issued a Federal Facility Compliance Order to both DOE and LANL requiring compliance with the site treatment plan. That plan documents the development of treatment capacities and technologies or use of offsite facilities for treating mixed waste generated at LANL that is stored beyond the 1-year timeframe (LANL 2000e). LANL has met, and continues to meet, the treatment goals of the plan without further milestones.

3.12.6 Hazardous Waste

Hazardous waste commonly generated at LANL includes many types of laboratory research chemicals, solvents, acids, bases, carcinogens, compressed gases, metals, and other solid waste contaminated with hazardous waste. This may include equipment, containers, structures, and other items intended for disposal and contaminated with hazardous waste (such as compressed gas cylinders). After the hazardous waste is collected, it is sorted and segregated. Some materials are reused within LANL, and others are decontaminated for reuse. Those materials that cannot be decontaminated or recycled are packaged and shipped to offsite RCRA-permitted treatment and disposal facilities (LANL 2000a).

3.12.7 Nonhazardous Waste

Both LANL and Los Alamos County use the same landfill located within LANL boundaries. The landfill is operated under a special permit by Los Alamos County. The Los Alamos County Landfill received about 22,013 tons (20 million kilograms) of solid waste from all sources during the period July 1995 through June 1996, with LANL contributing about 22 percent of the solid waste. Since the Cerro Grande Fire, the generation of wastes from community and LANL cleanup activities has increased several fold. The Los Alamos County landfill is scheduled for closure on June 30, 2004. A replacement facility, which could be located either at LANL or offsite, would then be used by LANL for nonhazardous waste disposal. It is currently anticipated that, if located offsite, the replacement facility would be located within 100 miles (160 kilometers) of LANL. Both LANL and Los Alamos County would need to transport their wastes to the new facility.

Sanitary liquid waste is delivered by dedicated pipelines to the SWS Facility at TA-46. The plant has a design capacity of 600,000 gallons (2.27 million liters) per day, and in 2000 processed a maximum of about 250,000 gallons (950,000 liters) per day. Some septic tank pumpings are delivered periodically to the plant via tanker truck for treatment. Sanitary waste is treated by an aerobic digestion process. After treatment, the liquid from this process is recycled to the TA-3 power plant for use in cooling towers or is discharged to Sandia Canyon adjacent to the power plant under an NPDES permit and groundwater discharge plan. Under normal operating conditions, the solids from this process are dried in beds at the SWS Facility and are applied as fertilizer as authorized by the existing NPDES permit.

3.12.8 Waste Minimization

LANL's Environmental Stewardship Office manages LANL's pollution prevention program. This is accomplished by eliminating waste through source reduction or material substitution; recycling potential waste materials that cannot be minimized or eliminated; and treating all waste that is generated to reduce its volume, toxicity, or mobility prior to storage or disposal. The achievements and progress have been updated at least annually. Implementing pollution prevention projects reduced the total amount of waste generated at LANL in 1999 by approximately 3,216 cubic yards (2,459 cubic meters). Examples of pollution prevention projects completed in 1999 at LANL include reduction of low-level radioactive waste and mixed low-level radioactive waste by 152 cubic yards (116 cubic meters), by decontaminating waste metal and reduction of transuranic waste by 4 cubic yards (3 cubic meters), and by using improved nondestructive assay instrumentation, which enabled the measurement and characterization of waste as either transuranic or low-level radioactive waste (DOE 2000c).

3.12.9 Waste Management PEIS Records of Decision

The *Final Waste Management Programmatic Environmental Impact Statement for Managing, Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (*Waste Management PEIS*) resulted in several Records of Decision affecting waste management actions at LANL (**Table 3–17**). Decisions on the various waste types were announced in a series of Records of Decision published in the *Waste Management PEIS* (DOE 1997b). The hazardous waste Record of Decision was published on August 5, 1998 (63 FR 41810), and the low-level radioactive and mixed low-level radioactive waste Record of Decision was published on February 18, 2000 (65 FR 10061). The hazardous waste Record of Decision states that most DOE sites will continue to use offsite facilities for the treatment and disposal of major portions of the nonwastewater hazardous waste, with the Oak Ridge Reservation and the SRS continuing to treat some of their own nonwastewater hazardous waste onsite in existing facilities, where it is economically feasible. The low-level radioactive waste and mixed low-level radioactive waste Record of Decision states that, for the management of low-level radioactive waste, minimal treatment will be performed at all sites, and disposal will continue, to the extent practicable, onsite at INEEL, LANL, the Oak Ridge Reservation, and the SRS. In addition, Hanford and NTS will be available to all DOE sites for low-level radioactive waste disposal. Mixed low-level radioactive waste will be treated at Hanford, INEEL, the Oak Ridge Reservation, and the SRS and disposed of at Hanford and NTS. More detailed information concerning DOE's decisions for the future configuration of waste management facilities at LANL is presented in the hazardous waste and low-level radioactive and mixed low-level radioactive waste Records of Decision.

Table 3–17 Waste Management PEIS Records of Decision Affecting LANL

Waste Type	*Preferred Action*
Transuranic	DOE has decided to treat LANL's transuranic waste onsite prior to disposal at an offsite facility. [c]
Low-level radioactive	DOE has decided to treat LANL's low-level radioactive waste onsite and continue onsite disposal. [a]
Mixed low-level radioactive	DOE has decided to regionalize treatment of mixed low-level radioactive waste at the Hanford Site, INEEL, the Oak Ridge Reservation, and the SRS. DOE has decided to ship LANL's mixed low-level radioactive waste to either the Hanford Site or NTS for disposal. [a]
Hazardous	DOE has decided to continue to use commercial facilities for treatment of most of LANL's nonwastewater hazardous waste. [b]

[a] From the Record of Decision for low-level radioactive and mixed low-level radioactive waste (65 FR 10061).
[b] From the Record of Decision for hazardous waste (63 FR 41810).
[c] From the Record of Decision for transuranic waste (63 FR 3629).

4. ENVIRONMENTAL IMPACTS

Chapter 4 describes the environmental consequences of the proposed action to replace the Chemistry and Metallurgy Research (CMR) Building at Los Alamos National Laboratory (LANL), as well as the consequences of a No Action Alternative. Chapter 4 also describes the environmental consequences of impacts common to all alternatives, including transportation, CMR Building and CMRR Facility disposition, transition period, and sabotage as well as, cumulative impacts, mitigation measures, and resource commitments.

4.1 INTRODUCTION

The environmental impacts analysis addresses all potentially affected areas in a manner commensurate with the importance of the effects on each area. The methodologies used for preparing the assessments for the following resource areas are discussed in Appendix A of this environmental impact statement (EIS): 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; environmental justice; human health; and waste management and pollution prevention. The methodologies used to assess the human health effects from normal operations and facility accidents are presented in Appendices B and C, respectively. The environmental justice methodology is presented in Appendix D.

With the exception of the No Action Alternative, all alternatives would involve construction activities. 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 *Draft Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory* (*CMRR EIS*) addresses in detail the effects usually associated with land disturbance that construction activities would have on air and water resources and in lesser detail the effects on ecological, cultural and paleontological resources, and socioeconomic conditions.

As indicated in Chapter 2, the normal operations activities under the proposed action 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 an indication of their significance. This is also true of the assessments presented for environmental justice and waste generation.

The effects on the health and safety of workers, the public, and the environment from postulated accident conditions are presented in detail. The accidents selected for evaluation in this EIS are a subset of accidents that have been evaluated in detail and described in the *Basis for Interim*

Radiological Health Effects Risk Factors Used in this EIS

Radiation can cause a variety of adverse health effects in people. Whether from external or internal sources, health impacts of radiation exposure can be "somatic" (affecting the exposed individual) or "genetic" (affecting descendants of the exposed individual). Somatic effects include the inducement of both fatal and nonfatal cancers. It may take years after the radiation exposure for a fatal cancer to develop, so these are referred to as "latent" cancers.

The International Commission on Radiological Protection has developed estimates of the risk of somatic and genetic effects as shown below.

Risk of Health Effects from Exposure to 1 Rem of Radiation [a]

Individual [b]	*Latent Cancer Fatalities*	*Nonfatal Cancers*	*Genetic Effects*	*Total Detriment*
Worker	0.0004	0.00008	0.00008	0.00056
Public	0.0005	0.0001	0.00013	0.00073

[a] When applied to an individual, units are lifetime probability of a latent cancer fatality per rem (1,000 millirem) radiation dose. When applied to a population, units are the excess number of cancers per person-rem of radiation dose. Genetic effects as used here apply to populations, not individuals.
[b] The general public risk is greater than the worker risk due to the presence in the general public of individuals less than 18 years old who are more sensitive to radiation effects.
Source: ICRP 1991.

These risk factors represent the probability that an individual would incur the indicated health effect during his or her lifetime as a result of being exposed to a unit of radiation dose (1 rem). For purposes of comparison, this EIS presents estimated doses and the associated potential latent cancer fatalities. The risk factors used are 0.0004 potential latent cancer fatalities per rem for workers and 0.0005 potential latent cancer fatalities per rem for individuals in the general public. The risk factor for the general public is slightly higher because the public includes children who are more sensitive to radiation than adults.

Examples:

The latent cancer fatality risk for an individual (nonworker) receiving a dose of 0.1 rem would be 0.00005 (0.1 rem × 0.0005 latent cancer fatalities per rem). This risk can also be expressed as 0.005 percent chance or 1 chance in 20,000 of developing a latent cancer.

The same concept is used to calculate the latent cancer fatality risk from exposing a group of individuals to radiation. The latent cancer fatality risk for individuals in a group of 100,000, each receiving a dose of 0.1 rem, would be 0.00005, as indicated above. This individual risk, multiplied by the number of individuals in the group, expresses the number of potential latent cancer fatalities that could occur among the individuals in the group as a result of the radiation dose. In this example, the number would be 5 potential latent cancer fatalities (100,000 × 0.00005).

A number of potential latent cancer fatalities less than 1 means that the radiation exposure is not sufficient to conclude that a latent cancer fatality is likely to occur among the members of the group. In this case, the risk is expressed as a probability that a single latent cancer fatality would occur among the members of the group. For example, 0.05 potential latent cancer fatalities can be stated as a 5 percent chance or 1 chance in 20 that 1 latent cancer fatality would occur among the members of the group.

The EIS provides estimates of the probability of a latent cancer fatality occurring for the general population, an average individual, the maximally exposed offsite individual, the involved, and noninvolved workers. These categories are defined as follows:

Population—Members of the public residing within a 50-mile (80-kilometer) radius of the facility

Average individual—A member of the public receiving an average dose of radiation or exposure to hazardous chemicals

Maximally exposed offsite individual—A hypothetical member of the public residing at the site boundary who could receive the maximum dose of radiation or exposure to hazardous chemicals

Involved worker—An individual worker participating in the operation of the facilities

Noninvolved worker—An individual worker at the site other than the involved worker

Operations for the Los Alamos Chemistry and Metallurgy Research Building (*CMR BIO*) (DOE 2002f). The accidents include a spectrum of events caused by fire, explosion, criticality, natural phenomena (earthquake), and external events (aircraft crash). Specific discussions associated with the description of CMR operations and facilities, as well as the assumptions used for the health and safety impact assessments, are presented in appendices as follows:

Appendix A, Environmental Impacts Methodologies

Appendix B, Evaluation of Radiological Human Health Impacts From Routine Normal Operations

Appendix C, Evaluation of Human Health Impacts From Facility Accidents

Appendix D, Environmental Justice

Chapter 4 is organized by environmental resource areas for each alternative. These sections include discussions of construction (except for the No Action Alternative) and operations impacts on all environmental resources for these alternatives at LANL. Section 4.2 discusses the environmental consequences of the No Action Alternative. Section 4.3 discusses the environmental consequences of Alternative 1, the Preferred Alternative. Section 4.4 discusses the environmental consequences of Alternative 2, the "Greenfield" Alternative. Sections 4.5 and 4.6 discuss the environmental consequences of Alternatives 3 and 4, the "Hybrid Alternatives" at TA-55 and TA-6, respectively. For the CMRR Facility alternatives, the incremental effects of the proposed action at LANL are measured against the Expanded Operations Alternative presented in the *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory (LANL SWEIS)* (DOE 1999a).

Chapter 4 also presents a discussion of issues and impacts common to all or some of the alternatives.

Section 4.7 Impacts Common to All Alternatives—Discusses transportation impacts, the disposition of the existing CMR Building and CMRR Facility, impacts during the transition from the CMR Building to the new CMRR Facility, and radiological impacts of sabotage involving the CMRR Facility.

Other sections include:

Section 4.8 Cumulative Impacts—Discusses cumulative impacts at LANL.

Section 4.9 Mitigation Measures—Discusses mitigation measures that could reduce, minimize, or eliminate unavoidable environmental impacts.

Section 4.10 Resource Commitments—Discusses, in general, 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 commitment of resources.

4.2 ENVIRONMENTAL IMPACTS FOR THE NO ACTION ALTERNATIVE

This section presents a discussion of the environmental impacts associated with the No Action Alternative. Under the No Action Alternative, overall activities at LANL would be maintained in accordance with the Expanded Operations Alternative described in the *LANL SWEIS* and its associated Record of Decision (64 FR 50797). The existing CMR Building at TA-3 would continue to be used for CMR operations with minimal necessary structural and systems upgrades and repairs. However, as previously discussed in Chapter 1, 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. CMR Building operations and capabilities are currently being restricted to minimal levels and do not meet DOE and NNSA operational requirements. These operational restrictions preclude the full implementation of the level of CMR operations described in the *LANL SWEIS* Expanded Operations Alternative. Therefore, the impacts associated with the No Action Alternative presented below for each environmental resource area only consider the current level of CMR operations specified in the *LANL SWEIS* Record of Decision and not the level described for the Expanded Operations Alternative.

4.2.1 Land Use and Visual Resources

Since no new buildings or facilities would be built under the No Action Alternative and operations would not change, there would be no impact on land use at the laboratory. There would also be no impact on visual resources at LANL or TA-3, TA-6, or TA-55.

4.2.2 Site Infrastructure

Projected site infrastructure requirements of CMR operations under the No Action Alternative are presented in **Table 4–1**. CMR operations consume a relatively small percentage of current available site capacities for electricity and water, with operations under the No Action Alternative essentially reflecting a continuation of current activities. Thus, the net impact on infrastructure is expected to be negligible.

4.2.3 Air Quality and Noise

4.2.3.1 Air Quality

Nonradiological Releases

Under the No Action Alternative criteria and toxic air pollutants would continue to be generated from the operation of the boilers, emergency diesel generators, and other activities at TA-3. The emissions generated are considered part of the baseline concentrations (see Table 3–5). No increases in emissions or air pollutant concentrations are expected under the No Action Alternative. Therefore, a Prevention of Significant Deterioration increment analysis is not required (see Appendix A, Section A.3.1). In addition, LANL is located in an attainment area for criteria air pollutants; therefore, no conformity analysis is required (see Appendix A, Section A.3.2).

Table 4–1 Annual Site Infrastructure Requirements for LANL Operations under the No Action Alternative

Resource	*Available Site Capacity* [a]	*No Action Alternative Requirement* [b]	*Percent of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	472,414	No change	0
Peak load demand (megawatts)	24.5	No change	0
Fuel			
Natural gas (cubic feet per year)	5,540,000,000	No change	0
Water (gallons per year)	198,000,000	No change	0

[a] Capacity minus the current site requirements, a calculation based on the data provided in Table 3–2, *CMRR EIS*.
[b] The No Action Alternative is a continuation of current CMR activities and, therefore, associated infrastructure requirements are already accounted for in the "Available Site Capacity."
Source: Table 3–2, *CMRR EIS*. LANL 2002e.

Radiological Releases

It has been estimated that 0.00003 curies per year of actinides could be released to the environment from CMR Building operations at LANL if the No Action Alternative were implemented (LANL 2000d). There would be no other types of radiological releases from CMR operations. Impacts from radiological releases are discussed in Section 4.2.9.1.

4.2.3.2 Noise

Continuing CMR operations at TA-3 would not involve any new building construction, major changes in activities, or major changes in employment levels. Thus, there would be no change in noise impacts on wildlife around the area or on the public under the No Action Alternative.

4.2.4 Geology and Soils

No additional impacts on geology and soils are anticipated at LANL beyond the effects of existing and projected activities independent of this proposed action. Hazards from large-scale geologic conditions, such as earthquakes, and from other site geologic conditions with the potential to affect existing LANL facilities are summarized in Section 3.5 and further detailed in the *LANL SWEIS* (DOE 1999a). In particular, core drilling studies and geologic mapping have established a number of secondary fault features at TA-3, including a southwest to northeast trending fault trace beneath the northern portion of the CMR Building. Although the potential for ground deformation from fault rupture is relatively low, the presence of identified fault structures in association with an identified active and capable fault zone (per 10 CFR 100, Appendix A) restricts the operational capability of the existing CMR Building without substantial upgrades and repairs.

4.2.5 Surface and Groundwater Quality

No additional impacts on surface water resources and groundwater availability or quality are anticipated at LANL under the No Action Alternative beyond the effects of existing and projected activities described in the *LANL SWEIS* Record of Decision. These existing and projected activities are independent of this proposed action.

4.2.6 Ecological Resources

There would be no new impact to terrestrial and aquatic resources, wetlands, or threatened and endangered species at LANL, since no new facilities would be built under the No Action Alternative. The CMR Building at TA-3 does not produce emissions or effluent of a quality or at levels that would likely affect wildlife and other ecological resources.

4.2.7 Cultural and Paleontological Resources

Since there would be no major modifications to the CMR Building, other than minimal necessary structural and systems upgrades and repairs, and CMR operations would not change, there would be no impact on cultural and paleontological resources at LANL under this alternative.

4.2.8 Socioeconomics

Under the No Action Alternative, the current employment of approximately 200 workers at the CMR Building would continue. No new employment or in-migration of workers would be required. Therefore, there would be no additional impact on the socioeconomic conditions around LANL.

4.2.9 Human Health Impacts

4.2.9.1 Normal Operations

Radiological Impacts

Routine CMR operations at the CMR Building at TA-3 would not be expected to result in an increase in latent cancer fatalities. Under the No Action Alternative, expected radiological releases would be 0.00003 curies per year of actinides to the atmosphere (*LANL SWEIS Yearbook 1999*) and radioactive material in liquid effluents. Radioactive liquid effluents would be transferred to the Radioactive Liquid Waste Treatment Facility in TA-50 where they would be treated along with other LANL site liquid wastes. Following treatment, the liquids would be released through an existing National Pollutant Discharge Elimination System (NPDES)-permitted outfall. The treatment residues would be solidified and disposed of as radioactive waste (see Section 4.2.11).

The inventory of radioactive material released in air emissions is less for the No Action Alternative than for other alternatives. Whereas a new CMRR Facility would be designed to support the needs of the Expanded Operations Alternative of the *LANL SWEIS*, current operations at the CMR Building are limited as discussed in Chapter 2. Therefore, the inventory of radionuclides emitted for the No Action Alternative includes only actinides and none of the fission products and tritium associated with a fully operating CMRR Facility.

The air emissions would be 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. The associated calculated impacts on the public are presented in **Table 4–2** for the general public living within 50 miles (80 kilometers) of the CMR Building; an average member of the public; and a maximally exposed offsite individual (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, comparisons with natural background radiation levels are included in the table.

Table 4–2 shows that the annual collective dose to the population living within a 50-mile (80-kilometer) radius of the CMR Building is estimated to be 0.04 person-rem for the No Action Alternative. This population dose increases the annual risk of a fatal cancer in the population by 0.00002. Another way of stating this is that the likelihood of one fatal cancer occurring in the population of over 300,000 people as a result of radiological releases associated with this alternative is about 1 chance in 50,000 per year.

Table 4–2 Annual Radiological Impacts on the Public from CMR Operations under the No Action Alternative

	Population within 50 Miles (80 kilometers)	*Average Individual within 50 Miles (80 kilometers)*	*Maximally Exposed Individual*
Dose	0.04 person-rem	0.0001 mrem	0.006 mrem
Cancer fatality risk [a]	0.00002	6.6×10^{-11}	3.0×10^{-9}
Regulatory dose limit [b]	Not applicable	10 mrem	10 mrem
Dose as a percent of regulatory limit	Not applicable	0.001	0.06
Dose from background radiation [c]	136,000 person-rem	450 mrem	450 mrem
Dose as a percent of background dose	0.0007	0.00003	0.001

[a] Based on a risk estimate of 0.0005 latent cancer fatalities per person-rem (see Appendix B).
[b] 40 CFR 61 establishes an annual limit of 10 mrem 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 400 to 500 millirem (mrem) (see Section 3.11.1). The population living within 50 miles (80 kilometers) of TA-3 is estimated to be 302,120.

The average annual dose to an individual in the population is 0.0001 millirem. The corresponding increased risk of an individual developing a fatal cancer from receiving the average dose is 6.6×10^{-11}, or about 1 chance in 15 billion per year.

The maximally exposed individual member of the public would receive an estimated annual dose of 0.006 millirem. This dose corresponds to an increased annual risk of developing a fatal cancer of 3.0×10^{-9}. In other words, the likelihood of the maximally exposed individual developing a fatal cancer is about 1 chance in 300 million for each year of CMR Building operation.

Estimated annual doses to workers involved with CMR activities under the No Action Alternative are provided in **Table 4–3**. The estimated worker doses are based on historical exposure data for LANL workers (*DOE Occupational Radiation Exposure 2001 Report*). 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 operation at the CMR Building.

Table 4–3 Annual Radiological Impacts to Workers from CMR Activities under the No Action Alternative

	Individual Worker	*Worker Population* [a]
Dose [b]	110 mrem	22 person-rem
Fatal cancer risk [c]	0.00004	0.009
Dose limit [d]	5,000 mrem	Not applicable
Administrative control level [e]	500 mrem	Not applicable

[a] Based on a worker population of approximately 200 for the CMR Building. 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 1998 to 2000. A program to reduce doses to as low as reasonably achievable (ALARA) would be employed to reduce doses to the extent practicable.
[c] Based on a worker risk estimate of 0.0004 latent cancer fatalities per person-rem (see Appendix B).
[d] 10 CFR 835.202.
[e] DOE 1999b.

The average annual worker dose of 110 millirem is well below the DOE worker dose limit of 5 rem (5,000 millirem) (10 CFR 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 0.00004. In other words, the likelihood of a CMR worker developing a fatal cancer from work-related exposure is about 1 chance in 25,000 for each year of operation.

Based on a worker population of approximately 200 for the No Action Alternative, the estimated annual worker population dose would be 22 person-rem. This worker population dose would increase the likelihood of a fatal cancer within the worker population by 0.009 per year. In other words, on an annual basis there is less than 1 chance in 100 of one fatal cancer developing in the entire worker population as a result of exposures associated with this alternative.

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 routine normal operations are minor and would be 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 the No Action Alternative. Workers would be protected from 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.

4.2.9.2 Facility Accidents

This section presents a discussion of the potential health impacts to members of the public and workers from postulated accidents at the CMR Building under the No Action Alternative. Under the No Action Alternative, the CMR Building and operations would remain unchanged. Additional details supporting the information presented here are provided in Appendix C.

Radiological Impacts

Table 4–4 presents the frequencies and consequences of a postulated set of accidents for the public, represented by the maximally exposed offsite individual and the general population living within 50 miles (80 kilometers) of the CMR Building and a noninvolved worker located at a distance of 304 yards (278 meters) from the CMR Building. **Table 4–5** presents the cancer risks, obtained by multiplying each accident's consequences by the likelihood (frequency per year) that the accident would occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in Appendix C. The selection process and screening criteria used (see Appendix C) ensure that the accidents chosen for evaluation in this EIS bound the impacts of all reasonably foreseeable accidents that could occur at the existing CMR Building. Thus, in the event that any other accident that was not evaluated in this EIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated here.

The accident with the highest potential risk to the offsite population (see Table 4–5) would be an earthquake that would severely damage the CMR Building, with a risk of a latent cancer fatality for the maximally exposed offsite individual of 3.5×10^{-6}. In other words, the maximally exposed offsite individual's likelihood of developing a fatal cancer from this event is about 1 chance in 280,000. The dose to the offsite population would increase the number of fatal cancers in the entire population by 0.002. In other words, the likelihood of developing one fatal cancer from this event in the entire population would be about 1 chance in 500. Statistically, the radiological risk for the average individual in the population would be small. The risk of a latent cancer fatality to a noninvolved worker located at a distance of 304 yards (278 meters) from the CMR Building would be 0.00013, or about 1 chance in 7,000.

Table 4–4 Accident Frequency and Consequences under the No Action Alternative

Accident	*Frequency (per year)*	*Maximally Exposed Offsite Individual*		*Offsite Population* [a]		*Noninvolved Worker*	
		Dose (rem)	*Latent Cancer Fatalities* [b]	*Dose (person-rem)*	*Latent Cancer Fatalities* [c]	*Dose (rem)*	*Latent Cancer Fatalities* [b]
Wing-wide fire	0.00005	0.548	0.00027	1020	0.51	2.67	0.001
Severe earthquake	0.0024	2.92	0.002	1680	0.84	66.9	0.54
Flammable gas explosion	0.0001	0.0725	0.000036	135	0.068	0.353	0.00014
HEPA filter fire	0.01	0.116	0.000058	66.5	0.033	2.65	0.001
Fire in main vault	1×10^{-6}	2.15	0.001	4000	2.0	10.5	0.004
Propane/hydrogen transport explosion	1×10^{-6}	0.53	0.00027	304	0.152	12.1	0.005
Natural gas pipeline rupture	1×10^{-7}	0.548	0.00027	1020	0.51	2.67	0.001
Radioactive spill	0.1	0.00054	3×10^{-7}	0.31	0.00016	0.0124	5×10^{-6}

HEPA = high-efficiency particulate air filter.

a Based on a population of 302,130 persons residing within 50 miles (80 kilometers) of the site.

b Increased likelihood of a latent cancer fatality.

c Increased number of latent cancer fatalities.

Table 4–5 Annual Cancer Risks Due to Accidents under the No Action Alternative

Accident	*Maximally Exposed Offsite Individual* [a]	*Offsite Population* [b, c]	*Noninvolved Worker* [a]
Wing-wide fire	1.4×10^{-8}	0.000026	5.5×10^{-8}
Severe earthquake	3.5×10^{-6}	0.002	0.00013
Flammable gas explosion	3.6×10^{-9}	6.8×10^{-6}	1.4×10^{-8}
HEPA filter fire	5.8×10^{-7}	0.00033	0.000011
Fire in main vault	1.1×10^{-9}	2.0×10^{-6}	4.2×10^{-9}
Propane/hydrogen transport explosion	2.7×10^{-10}	1.5×10^{-7}	4.8×10^{-9}
Natural gas pipeline rupture	2.7×10^{-11}	5.1×10^{-8}	1.1×10^{-10}
Radioactive spill	3.0×10^{-8}	0.000016	5.0×10^{-7}

HEPA = high-efficiency particulate air filter.
[a] Risk of increased likelihood of a latent cancer fatality.
[b] Risk of increased number of latent cancer fatalities.
[c] Based on a population of 302,130 persons residing within 50 miles (80 kilometers) of the site.

Approximately 200 workers (including security guards) would be at the CMR Building during operations in the event of an accident. Workers near an accident could be at risk of serious injury or death. The impacts from the high-efficiency particulate air filter fire provide an indication of typical worker impacts during accident conditions. 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 in place.

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 the EPA (40 CFR 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.

4.2.9.3 Emergency Preparedness and Security Impacts

Under the No Action Alternative, there would be no change to the emergency management and response program at LANL. Security arrangements for the existing CMR Building would not change.

4.2.10 Environmental Justice

Under the No Action Alternative, CMR activities would continue in the existing CMR Building and no new facilities would be constructed. As discussed in Section 4.2.9.1, radiological and hazardous chemical risks to the public resulting from normal operations would be small. As shown in Table 4–2, the health risks associated with these releases would be small. Routine normal operations at the existing CMR Building would not be expected to cause fatalities or illness among the general population surrounding TA-3, including minority and low-income populations living within the potentially affected area.

The annual radiological risks to the offsite population that could result from accidents at the existing CMR Building are estimated to be less than 0.002 latent cancer fatalities (see Table 4–5). Hence, the annual risks of a latent cancer fatality in the entire offsite population resulting from an accident under the No Action Alternative would be less than 1 in 500 or essentially no chance of cancer for the average individual in the population.

In summary, implementation of the No Action Alternative would not pose disproportionately high or adverse health and safety risks to low-income or minority populations living in the potentially affected area surrounding the existing CMR Building.

4.2.11 Waste Management and Pollution Prevention

4.2.11.1 Waste Management

The impacts of managing waste from the existing CMR Building under the No Action Alternative would be the same as those currently experienced at LANL. This is because waste generation during CMR operations would not change due to operational restrictions and, therefore, the same types and volumes of waste would be generated. See Section 3.12.1 for waste types and quantities generated by current CMR activities.

4.2.11.2 Pollution Prevention

At the CMR Building, wastes are minimized, where feasible, by:

- Recycling;
- Processing waste to reduce its quantity, volume, or toxicity;
- Substituting materials or processes that generate hazardous wastes with materials or processes that result in fewer hazardous wastes being produced, and
- Segregating waste materials to prevent contamination of nonhazardous materials.

4.3 Environmental Impacts for Alternative 1 (Preferred Alternative)

This section presents a discussion of the environmental impacts associated with Alternative 1 (Preferred Alternative). Under Alternative 1, CMR operations at LANL would be relocated and consolidated at TA-55 in a new CMRR Facility consisting of two or three buildings. One of the new buildings would provide space for administrative offices and support activities. The other building(s) would provide secure laboratory spaces for research and analytical support activities. The buildings would be expected to operate for a minimum of 50 years, and tunnels might be constructed to connect them. The impacts from construction and operation of these proposed facilities are described below. Disposition of the existing CMR Building is discussed later in Section 4.7.2.

CMRR Facility operations at TA-55 under this alternative would be conducted at the levels of activity described for the Expanded Operations Alternative in the *LANL SWEIS*. The Expanded Operations Alternative presented in the *LANL SWEIS* provides the reference point from which incremental effects of this proposed action are measured.

4.3.1 Land Use and Visual Resources

4.3.1.1 Land Use

Construction and Operations Impacts—Total land disturbance during construction of the new CMRR Facility at TA-55, would involve 26.75 acres (10.8 hectares). Permanent disturbance, consisting of land used for buildings and parking lots, would impact 13.75 acres (5.6 hectares). The remaining 13 acres (5.26 hectares) would consist of a construction laydown area of 2 acres (0.8 hectares), an area for a concrete batch plant of 5 acres (2 hectares) maximum, and land affected by a road realignment of 6 acres (2.4 hectares). Potential development sites at 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 a new CMRR Facility at TA-55 would be consistent with both the *LANL SWEIS* and *LANL Comprehensive Site Plan* designations of the area for Research and Development and Nuclear Materials Research and Development, respectively (see Section 3.2.1).

4.3.1.2 Visual Resources

Construction and Operations Impacts—Impacts to visual resources resulting from the construction of the new CMRR Facility at TA-55 would be temporary in nature and could include increased levels of dust and human activity. Once completed, the administrative offices and support functions building would be three stories above grade. Regardless of the construction option selected under this alternative, the Hazard Category 2 and Hazard Category 3 Laboratory Building(s) would be no more than one story in height. The general appearance of the new CMRR Facility would be consistent with other buildings located within TA-55. Facilities would be readily visible from Pajarito Road and from the upper reaches of the Pajarito Plateau rim. Although the new CMRR Facility would add to the overall development at TA-55, it would not alter the industrial nature of the area. Accordingly, the current Class IV Visual Resource Contrast rating for TA-55 would not change.

4.3.2 Site Infrastructure

Annual site infrastructure requirements for current LANL operations, as well as current site infrastructure capacities, are presented in **Table 4–6**. These values provide the reference point for the LANL site infrastructure impact analyses presented in this section. The table also presents projected site infrastructure requirements that incorporate both the forecasted demands of the *LANL SWEIS* Expanded Operations Alternative and those of non-LANL users relying on the same utility systems. The *LANL SWEIS* identified that peak electrical demand could exceed site electrical capacity. In addition, whereas the *LANL SWEIS* had projected that water use would remain within DOE water rights, DOE recently conveyed 70 percent of its water rights to

Los Alamos County, and leases the remaining 30 percent to the County (see Section 3.3.4). As a result, site electric peak load and water capacities could also be exceeded at LANL in the future, even in the absence of new demands, should projected site requirements be realized. However, no infrastructure capacity constraints are anticipated in the near term, as LANL operational demands to date on key infrastructure resources (natural gas, water, and electricity) have been well below projected levels and well within the site capacities shown in Table 4–6. DOE is currently pursuing actions to increase the reliability and availability of electrical power to LANL (see Section 3.3.2). DOE could also purchase additional water from the county, if needed and available. Any potential shortfalls in available capacity would be addressed as increased site requirements are realized.

Table 4–6 Current and Projected Site Infrastructure Requirements for LANL Operations

Resource	*Site Capacity*	*Current Site Requirement*	*Projected Site Requirement* [a]	*Potential Exceeded Capacity*
Electricity [b]				
Energy (megawatt-hours per year)	963,600	491,186	898,043	0
Peak load demand (megawatts)	110	85.5	128	18
Fuel				
Natural gas (cubic feet per year)	8,070,000,000	2,530,000,000	1,840,000,000	0
Water (gallons per year)	542,000,000 [c]	344,000,000	759,000,000	217,000,000

[a] Projected requirements over 25 years under the *LANL SWEIS* Expanded Operations Alternative (DOE 1999a). Projections for electrical energy, peak load, and natural gas also include usage for other Los Alamos County users that rely upon the same utility system (DOE 1999c).

[b] Electrical site capacity and current requirements are for the entire Los Alamos Power Pool, which includes LANL and other Los Alamos County users.

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

Source: Table 3–2, *CMRR EIS*.

Construction Impacts—The projected demands on key site infrastructure resources associated with construction under this alternative on an annualized basis are presented in **Table 4–7**. Existing LANL infrastructure would easily be capable of supporting the construction requirements for the new 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 negligible.

Operations Impacts—Resources needed to support operations under Alternative 1 (Preferred Alternative) are presented in **Table 4–8**. It is projected that existing LANL infrastructure resources would be adequate to support proposed mission activities over 50 years. In general, infrastructure requirements for the new CMRR Facility under this alternative would approximate and would be bound by those of the Expanded Operations Alternative presented in the *LANL SWEIS* for the CMR Building.

Table 4–7 Site Infrastructure Requirements for Facility Construction under Alternative 1 (Preferred Alternative)

Resource	*Available Site Capacity* [a]	*Total Requirement* [b]	*Percent of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	472,414	312.5	0.07
Peak load demand (megawatts)	24.5	0.3	1.2
Fuel			
Natural gas (cubic feet per year)	5,540,000,000	0	0
Water (gallons per year)	198,000,000	3,745,300	1.9

a Capacity minus the current site requirements, a calculation based on the data provided in Table 3–2, *CMRR EIS*.
b Total estimated infrastructure requirements for the projected construction period.
Source: Table 2–1, Table 3–2, *CMRR EIS*.

Table 4–8 Annual Site Infrastructure Requirements for Facility Operations under Alternative 1 (Preferred Alternative)

Resource	*Available Site Capacity* [a]	*Requirement*	*Percent of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	472,414	19,272	4.1
Peak load demand (megawatts)	24.5	2.6	10.6
Fuel			
Natural gas (cubic feet per year)	5,540,000,000	Not available	Not available
Water (gallons per year)	198,000,000	10,400,000	5.3

a Capacity minus the current site requirements, a calculation based on the data provided in Table 3–2, *CMRR EIS*.
Sources: Table 2–2, Table 3–2, *CMRR EIS*.

4.3.3 Air Quality and Noise

Overall air quality at LANL would remain within standards during construction and operation of the new CMRR Facility. In addition, overall noise levels at LANL during construction and operation would also remain within regulatory limits.

4.3.3.1 Air Quality

Nonradiological Releases

Construction Impacts—Construction of a new CMRR Facility 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 new CMRR Facility at TA-55 and compared to the most stringent standards (**Table 4–9**). The maximum ground-level concentrations offsite 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 less than or equal to 10 microns in aerodynamic diameter (PM_{10}), and total suspended particulates. However, the public would not be allowed access to this section of road during construction. Actual criteria pollutant concentrations are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts. The maximum short-term concentrations for construction would occur at the eastern site boundary for points at which the public has regular access. Air quality modeling considered particulate emissions from construction activities in an area of 20.75 acres (8.4 hectares) and emissions from various earthmoving and material-handling equipment. This is the area consisting of land that would be used for building and parking lot construction (13.75 acres [5.6 hectares]) and laydown and the concrete batch plant (7 acres [2.8 hectares]). The maximum annual criteria pollutant concentrations occur at a receptor located to the north at the Royal Crest Trailer Park.

Table 4–9 Nonradiological Air Quality Concentrations at the Site Boundary at TA-55 (Alternative 1, Preferred Alternative) – Construction

Criteria Pollutant	*Averaging Period*	*Most Stringent Standard or Guideline (micrograms per cubic meter)* [a]	*Maximum Incremental Concentration (micrograms per cubic meter)* [b]
Carbon monoxide	8 hours 1 hour	7,800 11,700	22.8 182
Nitrogen dioxide	Annual 24 hours	73.7 147	0.86 23.1
PM_{10}	Annual 24 hours	50 150	2.02 34.4
Sulfur dioxide	Annual 24 hours 3 hours	41 205 1,030	0.079 2.26 18.1
Total suspended particulates	Annual 24 hours	60 150	3.96 66.7

PM_{10} = particulate matter less than or equal to 10 microns in diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The National Ambient Air Quality Standards (NAAQS) (40 CFR 50), other than those for ozone, particulate matter, and lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million (ppm). These values have been converted to micrograms per cubic meter ($\mu g/m^3$) with appropriate corrections for temperature (21 degrees C [60 degrees F]) and pressure (elevation 7,005 feet [2,135 meters]) following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

[b] The annual concentrations were analyzed at locations to which the public has access – the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

Source: DOE 1999a.

Operations Impacts—Under Alternative 1 (Preferred Alternative), criteria and toxic air pollutants would be generated from operation and testing of an emergency generator at TA-55. **Table 4–10** summarizes the concentrations of criteria pollutants from CMR operations at TA-55. The concentrations are compared to their corresponding ambient air quality standards. The maximum ground-level concentrations that would result from CMR 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 receptors at the Royal Crest Trailer Park and north of TA-55 at the LANL site boundary. No major change in emissions or air pollutant concentrations at LANL are expected under this alternative.

Table 4–10 Nonradiological Air Quality Concentrations at the Site Boundary at TA-55 (Alternative 1, Preferred Alternative) – Operations

Criteria Pollutant	*Averaging Period*	*Most Stringent Standard or Guideline (micrograms per cubic meter)* [a]	*Maximum Incremental Concentration (micrograms per cubic meter)* [b]
Carbon monoxide	8 hours 1 hour	7,800 11,700	53.2 23.9
Nitrogen dioxide	Annual 24 hours	73.7 147	0.0182 45.1
PM_{10}	Annual 24 hours	50 150	0.001 1.39
Sulfur dioxide	Annual 24 hours 3 hours	41 205 1,030	0.0113 28.1 207
Total suspended particulates	Annual 24 hours	60 150	0.001 2.43

PM_{10} = particulate matter less than or equal to 10 microns in diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, and lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million (ppm). These values have been converted to micrograms per cubic meter ($\mu g/m^3$) with appropriate corrections for temperature (21 degrees C [60 degrees F]) and pressure (elevation 7,005 feet [2,135 meters]) following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

[b] The annual concentrations were analyzed at locations to which the public has access – the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

Source: DOE 1999a.

Radiological Releases

Construction Impacts—While no radiological releases to the environment would be expected in association with construction activities at TA-55, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the extent and nature of contamination and would be required to remediate contamination in accordance with procedures established under LANL's environmental restoration program and LANL's Hazardous Waste Facility Permit.

Operations Impacts—Approximately 0.00076 curies per year of actinides and 2,645 curies of fission products and tritium would be released to the environment from relocated CMR operations at TA-55 (DOE 1999a, LANL 2000d). Releases of radiological air pollutants are discussed in section 4.3.9.1.

4.3.3.2 Noise

Construction Impacts—Construction of the new CMRR Facility 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 from CMRR Facility operations at TA-55 would be similar to those 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 to the public outside of LANL as a result of moving CMR activities to TA-55.

4.3.4 Geology and Soils

Construction Impacts—Construction of the CMRR Facility under this alternative would be expected to disturb a total of 26.75 acres (10.8 hectares) of land at TA-55. Aggregate and other geologic resources would be required to support construction activities at TA-55, but these resources are abundant in Los Alamos County. Relatively deep sub-surface excavation would be required to construct below-grade portions of the new CMRR Facility.

A site survey and foundation study would be conducted as necessary to confirm site geologic characteristics for facility engineering purposes. The potential also exists for contaminated soils to be encountered during excavation and other site activities. Prior to commencing ground disturbance, NNSA would survey potentially affected contaminated areas to determine the extent and nature of any contamination and required remediation in accordance with procedures established under the LANL environmental restoration program. Other buried objects would be surveyed and removed as appropriate.

As discussed in Section 3.5, LANL is located in a region of low to moderate seismicity overall. Ground shaking of Modified Mercalli Intensity (MMI) VII (see Appendix A, Table A–6) associated with postulated earthquakes is possible and supported by the historical record for the region. MMI VII would be expected to primarily affect the integrity of inadequately designed or nonreinforced structures, but damage to properly designed or specially designed or upgraded facilities would not be expected. The Rendija Canyon Fault terminates approximately 0.8 miles (1.3 kilometers) northwest of TA-55, but may extend further south near TA-6 (see Section 3.5.1.3). However, the new CMRR Facility proposed under this alternative would be designed and constructed in accordance with DOE Order 420.1A and other applicable DOE orders and standards (DOE Standard 1020-2002) to ensure that workers, the public, and the environment are protected from any adverse impacts caused by the CMRR Facility from natural phenomena including earthquakes.

Operations Impacts—CMR operations under this alternative would not impact geologic and soil resources at LANL. As discussed above, new buildings would be designed and constructed in accordance with DOE Order 420.1A and sited to minimize the risk from geologic hazards. Thus, site geologic conditions would be unlikely to affect the facilities over the 50-year operational life expectancy.

4.3.5 Surface and Groundwater Quality

4.3.5.1 Surface Water

Construction Impacts—There are no natural surface water drainages in the vicinity of the Plutonium Facility at 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 discharge of sanitary wastewater and no impact on surface waters. Waste generation and management activities are detailed in Section 4.3.11.

Storm water runoff from construction areas could potentially impact downstream surface water quality. Appropriate soil erosion and sediment control measures (such as sediment fences, stacked hay bales, 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. An NPDES General Permit Notice of Intent would be filed to address storm water discharges associated with construction activity. Also, development and implementation of a Storm Water Pollution Prevention Plan would be required for the construction activity, and the existing Storm Water Pollution Prevention Plan for the TA-55 Plutonium Facility would have to be updated before construction is completed. TA-55 is not in an area prone to flooding and the nearest floodplains are located in Mortandad and Two Mile Canyon to the north and south, respectively.

Operations Impacts—No impacts on surface water resources 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. It is planned that this wastewater would be collected and conveyed by an expanded TA-55 sanitary sewer system for ultimate disposal via appropriate wastewater treatment facilities. Radioactive liquid waste would be transported via a radioactive liquid waste pipeline to the existing TA-50 Radioactive Liquid Waste Treatment Facility. Waste generation and management activities are detailed in Section 4.3.11. The design and operation of new buildings would incorporate appropriate storm water management controls to safely collect and convey storm water from facilities while minimizing washout and soil erosion. Overall, operational impacts on site surface waters and downstream water quality would be expected to be negligible.

4.3.5.2 Groundwater

Construction Impacts—Groundwater would be required to support construction activities at TA-55. It is estimated that construction activities under Alternative 1 (Preferred Alternative) would require approximately 3.7 million gallons (14 million liters) of groundwater (see Table 4–7). 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. Also, appropriate spill prevention controls, countermeasures, and procedures would be employed to minimize the potential for releases of materials 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 Alternative 1 (Preferred 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 (see Table 4–8). Therefore, no additional impact on regional groundwater availability would be anticipated.

No sanitary or industrial effluent would be discharged directly to the surface or subsurface. Waste generation and management activities are detailed in Section 4.3.11. Thus, no operational impacts on groundwater quality would be expected.

4.3.6 Ecological Resources

4.3.6.1 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. However, several potential sites for locating the new CMRR Facility at TA-55 contain small patches of woodland. Since the specific building locations within TA-55 would be established based on site-studies that would not occur until NNSA reached its decision on the CMRR Facility, it is not possible to determine how much of the 26.75 acres (10.8 hectares) of land to be disturbed during construction is wooded. Where construction would occur on previously disturbed land, there would be little or no impact to 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 of the area into which they move. If the area were at its carrying capacity, displaced animals would not be likely to survive. Indirect impacts from 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. 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 minimum impact on terrestrial resources within or adjacent to TA-55. Since 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 that it would be adversely affected by similar types of activity involved with CMRR Facility operations what about loss of physical space occupied by 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.

4.3.6.2 Wetlands

Construction and Operations Impacts—Although there are three areas of wetlands located within TA-55, none are present in the proposed CMRR Facility construction area. Thus, there would be no direct impacts to wetlands. Further, indirect impacts to these wetlands due to erosion should not occur since water from the site drains into the Pajarito watershed and not the Mortandad watershed in which these wetlands are located. Further, a sediment and erosion control plan would be implemented to control stormwater runoff during construction and operation, thus preventing impacts to wetlands located further down Pajarito Canyon.

4.3.6.3 Aquatic Resources

Construction and Operations Impacts—As noted in Section 3.7.3, the only aquatic resources present at TA-55 are small pools associated with wetlands. There would be no impact to these resources from the construction or operation of a new CMRR Facility.

4.3.6.4 Threatened and Endangered Species

Construction Impacts—As noted in Section 3.7.4, areas of environmental interest (AEIs) have been established for the Mexican spotted owl, bald eagle, and southwestern willow flycatcher. Portions of TA-55 include both core and buffer zones for the Federally threatened Mexican spotted owl (see Section 3.7.4); however, surveys have not identified the spotted owl within these zones. Construction of the new CMRR Facility would not be expected to directly affect individuals of this species but could remove a small portion of the Mexican spotted owl habitat area. Core and buffer zones for the bald eagle and southwestern willow flycatcher do not overlap TA-55.

Operation Impacts—CMRR Facility operations at TA-55 would not directly affect any endangered, threatened, or special status species. Noise levels associated with a new CMRR Facility would be low and human disturbance would be similar to that which already occurs within TA-55; however, parking activities at the CMRR Facility could be in close proximity to the Mexican spotted owl critical habitat area and may indirectly affect that potential habitat. In addition, nighttime lighting at the parking lot could also indirectly affect prey species activities.

4.3.7 Cultural and Paleontological Resources

4.3.7.1 Prehistoric Resources

Construction and Operations Impacts—As noted in Section 3.8.1, there are no prehistoric sites located within TA-55; therefore, construction and CMR operations would not impact these resources. If unexpected prehistoric resources were uncovered during construction, work would stop and appropriate assessment, regulatory compliance, and recovery measures would be undertaken.

4.3.7.2 Historic Resources

Construction and Operations Impacts— Adverse impacts to historic resources at TA-55 from construction and operation of the CMRR Facility would not be expected. However, some of the 10 historic sites located within TA-55 could be disturbed by the construction of the new CMRR Facility, the extent of which would not be determined until planning details were finalized. Consultation with the State Historic Preservation Officer would be undertaken, if necessary, in order to determine the eligibility of any potentially disturbed sites for listing on the National Register of Historic Places and, if appropriate, data and artifact recovery would be conducted.

4.3.7.3 Traditional Cultural Properties

Construction and Operations Impacts—The area at TA-55 proposed to house the new CMRR Facility has not been surveyed for traditional cultural properties. Prior to construction, a traditional cultural properties consultation would be undertaken and, if needed, site removal or avoidance would be conducted. If any traditional cultural properties were located during construction, work would stop while appropriate action would be undertaken.

4.3.7.4 Paleontological Resources

Construction and Operations Impacts—As noted in Section 3.8.4, there are no known paleontological resources present at TA-55 at LANL. Thus, there would be no impacts to these resources.

4.3.8 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 60 months of construction. It would have little or no noticeable impact on the socioeconomic conditions of the region of influence.

Operations Impacts—As previously noted in Section 2.7.4, the operational characteristics of the CMRR Facility are based on the level of CMR operations required to support the Expanded Operations Alternative analyzed in the *LANL SWEIS*. As noted in Table 2–2, CMRR Facility operations would require a workforce of approximately 550 workers. This would be an increase of 346 workers over currently restricted CMR operational requirements, but approximately equal to the number of CMR workers projected for the Expanded Operations Alternative in the *LANL SWEIS*. The *LANL SWEIS* presents a discussion of the socioeconomic impacts from an increase in total employment at LANL under the Expanded Operations Alternative, which includes the contributory affect of expanded CMR operations and an increase in workforce.

Nevertheless, the increase in the number of workers in support of expanded CMR operations would have little or no noticeable impact on socioeconomic conditions in the LANL Tri-County region of influence. Workers assigned to the new CMRR Facility would be drawn for the most part from existing LANL missions, including consolidated AC and MC activities. The contributory effect of the remaining new employment, in combination with the potential effects from other industrial and economic sectors within the regional economic area, would serve to reduce or mask any effect on the regional economy. New LANL employees hired to support CMRR facilities would comprise a small fraction of the LANL workforce (more than 9,000 in 1996), and an even smaller fraction of the regional workforce (more than 92,000 in 1999).

4.3.9 Human Health Impacts

4.3.9.1 Construction and 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 were kept as low as is reasonably achievable.

Operations Impacts—Routine operation of the CMRR Facility at TA-55 would not be expected to result in an increase in latent cancer fatalities. Under this alternative, the radiological releases to the atmosphere from the new CMRR Facility at TA-55 would be those shown in **Table 4–11**. 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. Liquid radiological effluents would be routed through an existing pipeline to the TA-50 Radioactive Liquid Waste Treatment Facility where they would be treated along with other LANL site liquid wastes. Following treatment, the liquid would be released through an existing NPDES-permitted outfall. The treatment residues would be solidified and disposed of as radioactive waste (see Section 4.3.11).

Table 4–11 Emission from the CMRR Facility under Alternative 1

Nuclide	*Emission (curies per year)*
Actinides	0.00076
Krypton-85	100
Xenon-131m	45
Xenon-133	1,500
H-3 (Tritium) [a]	1,000

[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 1999a, LANL 2000d.

Table 4–12 shows that the annual collective dose to the population living within a 50-mile (80-kilometer) radius of the new CMRR Facility at TA-55 is estimated to be 1.9 person-rem for Alternative 1. This population dose increases the annual risk of a fatal cancer in the population by 0.001. Another way of stating this is that the likelihood of one fatal cancer occurring in the population as a result of radiological releases associated with this alternative is about 1 chance in 1,000 per year. Statistically, latent cancer fatalities would not be expected to occur in the population from CMR operations at TA-55.

Table 4–12 Annual Radiological Impacts on the Public from CMRR Operations under Alternative 1

	Population within 50 Miles (80 kilometers)	*Average Individual within 50 Miles (80 kilometers)*	*Maximally Exposed Individual*
Dose	1.9 person-rem	0.006 mrem	0.33 mrem
Cancer fatality risk [a]	0.001	3.1×10^{-9}	1.7×10^{-7}
Regulatory dose limit [b]	Not applicable	10 mrem	10 mrem
Dose as a percent of the regulatory limit	Not applicable	0.06	3.3
Dose from background radiation [c]	139,000 person-rem	450 mrem	450 mrem
Dose as a percent of background dose	0.0014	0.0014	0.07

[a] Based on a risk estimate of 0.0005 latent cancer fatalities per person-rem (see Appendix B).
[b] 40 CFR 61 establishes an annual limit of 10 mrem 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 400 to 500 millirem (see Section 3.11.1). The population living within 50 miles (80 kilometers) of TA-3 is estimated to be 309,143.

The average annual dose to an individual in the population is 0.006 millirem. The corresponding increased risk of an individual developing a fatal cancer from receiving the average dose is 3.1×10^{-9} or about 1 chance in 300 million per year.

The maximally exposed individual 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 1.7×10^{-7}. In other words, the likelihood of the maximally exposed individual developing a fatal cancer is about 1 chance in 6 million for each year of operation.

Estimated annual doses to workers involved with CMRR Facility operations under Alternative 1 are provided in **Table 4–13**. The estimated worker doses are based on historical exposure data for LANL workers (*DOE Occupational Radiation Exposure 2001 Report*). 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 operation at the new CMRR Facility at TA-55.

The average annual worker dose of 110 millirem is well below the DOE worker dose limit of 5 rem (5,000 millirem) (10 CFR 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 0.00004 for each year of operation. In other words, the likelihood of a worker at the new CMRR Facility developing a fatal cancer from annual work-related exposure is about 1 chance in 25,000.

Table 4–13 Annual Radiological Impacts to Workers from CMRR Facility Operations under Alternative 1

	Individual Worker	*Worker Population* [a]
Dose [b]	110 mrem	61 person-rem
Fatal cancer risk [c]	0.00004	0.02
Dose limit [d]	5,000 mrem	Not available
Administrative control level [e]	500 mrem	Not available

[a] Based on a worker population of 550 for the new CMRR Facility at TA-55. Dose limits and administrative control levels do not exist for worker populations.
[b] Based on the average dose to LANL workers that received a measurable dose in the period 1998 to 2000. A program to reduce doses to as low as reasonably achievable (ALARA) would be employed to reduce doses to the extent practicable.
[c] Based on a worker risk estimate of 0.0004 latent cancer fatalities per person-rem (see Appendix B).
[d] 10 CFR 835.202.
[e] DOE 1999b.

Based on a worker population of 550 for Alternative 1, 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 0.02 per year. In other words, on an annual basis there is less than 1 chance in 50 of one fatal cancer developing in the entire worker population as a result of exposures associated with this alternative.

Hazardous Chemicals Impacts

No chemical-related health impacts to the public would be associated with this alternative. As stated in the *LANL SWEIS*, the laboratory quantities of chemicals that could be released to the atmosphere during routine 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.

4.3.9.2 Facility Accidents

This section presents a discussion of the potential health impacts to members of the public and workers from postulated accidents at the new CMRR Facility under Alternative 1. Additional details supporting the information presented here are provided in Appendix C.

Under Alternative 1, the CMR Building capabilities and materials would be relocated to a new CMRR Facility to be constructed at LANL TA-55. The new CMRR Facility would include safety features that would reduce the risks of accidents that currently exist under the No Action Alternative. From an accident perspective, the proposed CMRR Facility would be designed to meet the Performance Category 3 seismic requirements, and have a full confinement system that includes tiered pressure zone ventilation and high-efficiency particulate air filters.

Radiological Impacts

Table 4–14 presents the frequencies and consequences of the postulated set of accidents for a noninvolved worker and the public (maximally exposed offsite individual and the general population living within 50 miles [80 kilometers] of the facility), and a noninvolved worker located at a distance of 239 yards (219 meters) from the CMRR Facility. **Table 4–15** presents the accident risks, obtained by multiplying each accident's consequences by the likelihood (frequency per year) that the accident would occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in Appendix C. The selection process and screening criteria used (see Appendix C) ensure that the accidents chosen for evaluation in this EIS bound the impacts of all reasonably foreseeable accidents that could occur at the new CMRR Facility at TA-55. Conservative estimates were also made for data used to calculate the source terms for low frequency – high consequence accidents (e.g., facility-wide fire) for CMRR Facility alternatives. These included assumptions that the most hazardous form of the radioactive material (e.g., metal, liquid or powder depending on the accident conditions) was present at the time of the accident, all of the material at risk was damaged in the accident (damage ratio = 1.0) and containment and filtration of airborne radioactive material was lost (leak path factor = 1.0). Thus, in the event that any other accident that was not evaluated in this EIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 4–14 Accident Frequency and Consequences under Alternative 1

Accident	Frequency (per year)	Maximally Exposed Offsite Individual		Offsite Population [a]		Noninvolved Worker	
		Dose (rem)	Latent Cancer Fatalities [b]	Dose (person-rem)	Latent Cancer Fatalities [c]	Dose (rem)	Latent Cancer Fatalities [b]
Facility-wide fire	5.0×10^{-6}	7.0	0.0035	17,029	8.5	51.4	0.041
Process fire	0.001	0.004	2.0×10^{-6}	9.78	0.0049	0.03	0.000012
Fire in the main vault	1.0×10^{-6}	5.92	0.003	14,500	7.25	43.88	0.035
Process explosion	0.001	0.0036	1.8×10^{-6}	2.5	0.0013	0.15	0.000059
Process spill	0.1	0.0046	2.3×10^{-6}	3.19	0.0016	0.19	0.000076
Seismic-induced laboratory spill	0.0001	12.1	0.0061	8,394	4.2	495	0.4
Seismic-induced fire	0.00001	2.5	0.0013	6,125	3.1	18.5	0.0074
Facility-wide spill	5.0×10^{-6}	243.1	0.24	167,705	83.9	9,352	1.0

[a] Based on a population of 309,154 persons residing within 50 miles (80 kilometers) of the site.
[b] Increased likelihood of latent cancer fatality for an individual assuming the accident occurs.
[c] Increased number of latent cancer fatalities for the offsite population assuming the accident occurs.

Table 4–15 Annual Cancer Risks Due to Accidents under Alternative 1

Accident	Maximally Exposed Offsite Individual [a]	Offsite Population [b,c]	Noninvolved Worker [a]
Facility-wide fire	1.7×10^{-8}	0.000043	2.1×10^{-7}
Process fire	2.0×10^{-9}	4.9×10^{-6}	1.2×10^{-8}
Fire in the main vault	3.0×10^{-9}	7.3×10^{-6}	3.5×10^{-8}
Process explosion	1.8×10^{-9}	1.3×10^{-6}	5.9×10^{-8}
Process spill	2.3×10^{-7}	0.00016	7.6×10^{-6}
Seismic-induced laboratory spill	6.4×10^{-7}	0.00044	4.2×10^{-6}
Seismic-induced Fire	1.3×10^{-8}	0.000031	7.4×10^{-8}
Facility-wide spill	1.2×10^{-6}	0.00042	0.000038

[a] Risk of increased likelihood of a latent cancer fatality.
[b] Risk of increased number of latent cancer fatalities.
[c] Based on a population of 309,154 persons residing within 50 miles (80 kilometers) of the site.

The accident with the highest potential risk to the offsite population (see Table 4–15) would be a facility-wide spill caused by an earthquake that would severely damage the CMRR Facility with a risk of a latent cancer fatality for the maximally exposed offsite individual of 1.2×10^{-6}. In other words, the maximally exposed offsite individual's likelihood of developing a fatal cancer from this event is about 1 chance in 800,000. The dose to the offsite population would increase the number of fatal cancers in the entire population by 0.00042; the likelihood of developing one fatal cancer from this event in the entire population would be about 1 chance in 2,380. Statistically, latent cancer fatalities would not be expected to occur in the population. The risk of a latent cancer fatality to a noninvolved worker located at a distance of 239 yards (219 meters) from the new CMRR Facility would be 0.000038 or about 1 chance in 26,000.

Involved Worker Impacts – Approximately 550 workers (including security guards) would be at the new CMRR Facility during operations. Workers near an accident could be at risk of serious injury or death. The impacts from a process spill accident provides an indication of typical worker impacts during accident conditions. 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 in place.

Hazardous Chemicals and Explosives Impacts

Some of the chemicals used in LANL CMR operations are toxic and carcinogenic. The quantities of the regulated hazardous chemicals and explosive materials stored and used in the new CMRR Facility would be well below threshold quantities set by the EPA (40 CFR 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.

4.3.9.3 Emergency Preparedness and Security Impacts

There would be no impacts on the emergency management and response program at LANL from the construction and operation of the new CMRR Facility at TA-55. Existing memoranda of understanding between NNSA, Los Alamos County, and the State of New Mexico to provide mutual assistance during emergencies and to provide open access to medical facilities would continue with minor administrative updates. Equipment and procedures used to respond to emergencies would continue to be maintained by NNSA.

4.3.10 Environmental Justice

Construction Impacts—Under Alternative 1, a new administration building and new laboratory buildings would be constructed at TA-55. As discussed throughout the other subsections of Section 4.4, environmental impacts due to construction for all of the construction options would be temporary and would not extend beyond the boundary of LANL. Under Alternative 1, construction at TA-55 would not result in adverse environmental impacts on the public living within the potentially affected area surrounding TA-55, including low-income and minority populations.

Operations Impacts—As discussed in Section 4.3.9.1, radiological and hazardous chemical risks to the public resulting from normal operations would be small. Table 4–12 shows the health risks associated with these releases would be small. Routine normal operations at the new CMRR Facility would not be 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.

Radiological risks to the public that could result from accidents at new laboratory buildings are estimated to be less than 0.0042 latent cancer fatalities (see Table 4–15). Hence, the likelihood of a latent cancer fatality resulting from an accident under Alternative 1 would be less than 1 in 238. As described in Section 4.3.9.2, accidents involving hazardous chemicals or explosives would not result in airborne or water-borne contamination beyond the LANL boundary that would be hazardous to human health.

Residents of Pueblo San Ildefonso have expressed concern that pollution from CMR operations could contaminate Mortandad Canyon, which drains onto Pueblo land and sacred areas. As discussed in Sections 4.3.3, 4.3.5, and 4.3.9, CMR operations under this alternative would not be expected to adversely affect air or water quality, or result in contamination of Tribal lands adjacent to the LANL boundary. In summary, implementation of Alternative 1 would not pose disproportionately high or adverse environmental risks to low-income or minority populations living in the potentially affected area around the new CMRR Facility at TA-55.

4.3.11 Waste Management and Pollution Prevention

This section presents an analysis of waste management and pollution prevention impacts for Alternative 1.

4.3.11.1 Waste Management

Construction Impacts—Before construction activities would begin at TA-55, LANL's Environmental Restoration Project would perform a radiological survey of the construction area to determine whether the Potential Release Sites are located in the construction area. Based on these survey results, further actions, including appropriate documentation and contaminate removal, if necessary, would be completed by the LANL Environmental Restoration Project in accordance with LANL's Hazardous Waste Facility Permit. Potential wastes generated from such remediation activities have not been included in this impact analysis, because the type and amount of waste are unknown and cannot be adequately projected. Impacts from waste disposal of contaminated soil could be similar to the waste management impacts from CMRR Facility operation.

Only nonhazardous waste would be generated from the construction activities to relocate CMR operations and materials to a new facility at TA-55. No radioactive or hazardous waste would be generated during construction activities.

Solid nonhazardous waste generated from construction activities associated with the new CMRR Facility would be disposed of at the Los Alamos County Landfill located at LANL or its replacement facility. Approximately 578 tons (524 metric tons) of solid nonhazardous waste, consisting primarily of gypsum board, wood scraps, non-recyclable scrap metals, concrete, steel, and other construction waste would be generated from the construction activities. This represents about 20 percent of the current annual solid nonhazardous waste generation rate at LANL of 2,860 tons (2,600 metric tons) per year. 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. This additional construction waste would only increase LANL's total wastes going to the landfill by 3 percent.

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 expected waste generation rates for the new CMRR Facility at TA-55 would be consistent with the Expanded Operations Alternative as described in the *LANL SWEIS* (DOE 1999a) for 10 years of continued operations (from 2000 to 2010). These waste generation rates are compared with LANL' s treatment, storage, and disposal capacities in the following sections for each category of waste. 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 4–16** for CMR operations and overall LANL activities. Radioactive solid and liquid wastes from CMR operations would constitute only a portion of the total amounts of these wastes generated, treated, and/or disposed of at LANL (see Table 4–16). The radiological and chemical impacts on workers and the public from managing CMRR radioactive wastes have been evaluated along with the other LANL site wastes in other environmental documentation (DOE 1999a).

Table 4–16 Selected Waste Generation Rates from CMR Operations and LANL Activities

Waste Type	*Units*	*CMR Generation Rate*	*LANL Generation Rate*
Transuranic	Cubic yards per year	61 [a]	556 [a]
Mixed Transuranic	Cubic yards per year	27 [a]	160 [a]
Low-level radioactive	Cubic yards per year	2,433 [a]	16,009 [a]
Mixed low-level radioactive	Cubic yards per year	26 [a]	828 [a]
Hazardous	Pounds per year	24,692 [a, b]	7,163,407 [a, b]
Sanitary	Gallons per day	27,500 [c]	250,000 [d]

[a] *LANL SWEIS* DOE 1999a, Expanded Operations Alternative.
[b] This waste type also includes biomedical waste and Toxic Substance Control Act waste.
[c] Calculated assuming 550 CMR workers, each generating 50 gallons per day.
[d] TA-18 Relocation EIS (DOE 2002e).
Note: The generation rates are attributed to facility operations and do not include the waste generated from environmental restoration actions.

Transuranic Waste

Analytical, processing, fabrication, and research and development activities at the new CMRR Facility would generate transuranic waste. Approximately 61 cubic yards (47 cubic meters) of transuranic waste would be generated each year. This transuranic waste represents about 2.2 percent of the current transuranic and mixed transuranic waste compactions and volume reduction capacity of 2,786 cubic yards (2,130 cubic meters) per year at LANL. Transuranic waste would be compacted at the new CMRR Facility. Any TRU waste generated by CMRR Facility operations would be treated and packaged in accordance with the WIPP Waste Acceptance Criteria and transported to WIPP or a similar facility for disposition. Transuranic waste volumes generated through CMRR operations over the life of the facility are estimated to be less than two percent of the Waste Isolation Pilot Plant capacity. Offsite disposal capacities for transuranic waste are expected to be adequate for LANL, including CMR operations, disposal needs.

Mixed Transuranic Waste

Approximately 27 cubic yards (20 cubic meters) of mixed transuranic waste would be generated each year. This would represent about 1.0 percent of the current transuranic and mixed transuranic waste compactions and volume reduction capacity of 2,786 cubic yards (2,130 cubic meters) per year at LANL. Most mixed transuranic waste would continue to be disposed of at the Waste Isolation Pilot Plant.

Low-Level Radioactive Waste

Solid low-level radioactive waste generated from CMR operations at TA-55 would continue to be characterized and packaged for disposal at the onsite Low-Level Radioactive Waste Disposal Facility at TA-54, Area G. About 2,433 cubic yards (1,860 cubic meters) of solid low-level radioactive waste would be generated each year. This would represent about 0.7 percent of the current disposal capacity of 330,257 cubic yards (252,500 cubic meters) in the TA-54 Area G Low-Level Radioactive Waste Disposal Facility. As part of the implementation of the Record of Decision for the *LANL SWEIS*, the disposal capacity of the TA-54 Area G Low-Level Radioactive Waste Disposal Facility will be expanded into Zones 4 and 6 at Area G. The impacts of managing this waste at LANL would be minimal.

Mixed Low-level Radioactive Waste

Mixed low-level radioactive waste generated from CMR operations at TA-55 would continue to be surveyed and decontaminated on site, if possible. The remaining waste would be stored and processed at TA-54, Area G or Area L, and transported to a commercial or DOE offsite treatment and disposal facility. This waste would be managed in accordance with the LANL Site Treatment Plan. About 26 cubic yards (20 cubic meters) of mixed low-level radioactive waste would be generated each year. This represents about 3.4 percent of the current mixed low-level radioactive waste storage capacity at LANL. The impacts of managing this waste at LANL would be minimal.

Hazardous Waste

Hazardous waste generated from CMR operations at TA-55 would continue to be decontaminated or recycled, if possible. The remaining waste would be packaged and shipped to offsite Resource Conservation and Recovery Act (RCRA)-permitted treatment and disposal facilities. Typically, hazardous waste is not held in long-term storage at LANL. Approximately 24,692 pounds (11,200 kilograms) of hazardous waste would be generated each year. This represents about 1.3 percent of the annual hazardous waste generation rate of 1,896,000 pounds (860,000 kilograms) for the entire LANL site. The impacts of managing this waste at LANL would be minimal.

Nonhazardous Waste

Sanitary wastewater generated from CMR operations at TA-55 would continue to be sent to the Sanitary Wastewater Systems Consolidation Plant. Approximately 27,500 gallons per day (for 260 working days per year) of sanitary wastewater would be generated. This would represent about 4.6 percent of the 600,000 gallons-per-day (2.27 million liters-per-day) design capacity of the Sanitary Wastewater Systems Consolidation Plant.

4.3.11.2 Pollution Prevention

At the new CMRR Facility, wastes would be minimized, where feasible, by:

- Recycling;
- Processing waste to reduce its quantity, volume or toxicity;
- Substituting materials or processes that generate hazardous wastes with materials or processes that result in less hazardous wastes being produced, and
- Segregating waste materials to prevent contamination of nonhazardous materials.

4.4 ENVIRONMENTAL IMPACTS FOR ALTERNATIVE 2 (THE "GREENFIELD" ALTERNATIVE)

This section presents a discussion of the environmental impacts associated with Alternative 2 ("Greenfield" Alternative). Under the Greenfield Alternative, CMR operations at LANL would be relocated and consolidated at TA-6 in a new CMRR Facility consisting of two or three buildings. One of the new buildings would provide space for administrative offices and support functions activities. The other building(s) would provide secure laboratory spaces for research and analytical support activities. The buildings would be expected to operate for a minimum of 50 years, and roads would be constructed to connect them. The impacts from construction and operation of these proposed facilities are described below. Deposition of the existing CMR Building is discussed later in Section 4.7.2.

CMR operations at TA-6 under this alternative would be conducted at the levels of activity described for the Expanded Operations Alternative in the *LANL SWEIS*. The Expanded

Operations Alternative presented in the *LANL SWEIS* provides the reference point from which incremental effects of this proposed action are measured.

4.4.1 Land Use and Visual Resources

4.4.1.1 Land Use

Construction and Operations Impacts—The new CMRR Facility would be constructed within the north central wooded portion of TA-6. The area to be disturbed during construction, would be 26.75 acres (10.8 hectares). During CMR operations, 15.25 acres (6.2 hectares) would be permanently disturbed at TA-6 including building footprints, parking lot, and access road. The remaining 11.5 acres (4.65 hectares) would consist of a construction laydown area of 2 acres (0.8 hectares), an area for a concrete batch plant of 5 acres (2 hectares) maximum, trenching for utility lines of 1.5 acres (0.6 hectares), and trenching for a potential radioactive liquid waste pipeline of 3 acres (1.2 hectares). Most of the acreage to be disturbed within TA-6 is covered with native vegetation including many mature trees, which would have to be cleared prior to construction. As noted in Section 3.2.1, TA-6 falls within the *LANL SWEIS* defined Research and Development/Waste Disposal land use category and is designated in the *LANL Comprehensive Site Plan* for Experimental Science and High-Explosives Research and Development. Therefore, the use of TA-6 for CMR operations would be consistent with both the *LANL SWEIS* and *LANL Comprehensive Site Plan* designations for the area.

As noted above, in order to provide access to the new CMRR Facility at TA-6, it would be necessary to construct an access road from Pajarito Road into the site. In addition, it would be necessary to bring utilities into the site. Electric power service, communications lines, potable water, sewage, and radioactive liquid waste pipelines would all be brought to the site.

4.4.1.2 Visual Resources

Construction and Operations Impacts—Due to the undeveloped nature of TA-6, construction activity and CMRR Facility operations would alter the existing visual character of the proposed site from natural woodland to an industrial site. Impacts to visual resources resulting from construction activity would be temporary in nature and would include increased levels of dust and human activity. Once completed, the administrative offices and support functions building would be three stories above grade while the Hazard Category 2 and 3 laboratory buildings would be no more than one story in height. All buildings would be readily visible from Pajarito Road and the upper reaches of the Pajarito Plateau rim. At night, security lighting would add to the overall glow produced by facilities at LANL. Construction of the new CMRR Facility would result in a change in the Visual Resource Contrast rating of TA-6 from Class III to Class IV.

While most of the utilities would be placed underground and not impact visual resources, the access road would alter the visual environment and would change the Visual Resource Contrast rating of the area from Class III to Class IV.

4.4.2 Site Infrastructure

Construction Impacts—The projected demands on key site infrastructure resources associated with construction under this alternative are presented in **Table 4–17**. Existing LANL infrastructure would easily be capable of supporting the construction requirements for the new 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 negligible.

Table 4–17 Site Infrastructure Requirements for Facility Construction under Alternative 2 (Greenfield Alternative)

Resource	*Available Site Capacity* [a]	*Total Requirement* [b]	*Percent of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	472,414	312.5	0.07
Peak load demand (megawatts)	24.5	0.3	1.2
Fuel			
Natural gas (cubic feet per year)	5,540,000,000	0	0
Water (gallons per year)	198,000,000	3,745,300	1.9

[a] Capacity minus the current site requirements, a calculation based on the data provided in Table 3–2, *CMRR EIS*.
[b] Total estimated infrastructure requirements for the projected construction period.
Sources: Table 2–1, Table 3–2, *CMRR EIS*.

Operations Impacts—Resources needed to support operations under Alternative 2 (Greenfield Alternative) are presented in **Table 4–18**. It is projected that existing LANL infrastructure resources would be adequate to support proposed mission activities over 50 years. In general, CMR infrastructure requirements under this alternative would approximate those of the Expanded Operations Alternative presented in the *LANL SWEIS* for the CMR Building.

Table 4–18 Annual Site Infrastructure Requirements for Facility Operations under Alternative 2 (Greenfield Alternative)

Resource	*Available Site Capacity* [a]	*Requirement*	*Percent of Available Site Capacity*
Electricity			
Energy (megawatt-hours per year)	472,414	19,272	4.1
Peak load demand (megawatts)	24.5	2.6	10.6
Fuel			
Natural gas (cubic feet per year)	5,540,000,000	Not available	Not available
Water (gallons per year)	198,000,000	10,400,000	5.3

[a] Capacity minus the current site requirements, a calculation based on the data provided in Table 3–2, *CMRR EIS*.
Sources: Table 2–2, Table 3–2, *CMRR EIS*.

4.4.3 Air Quality and Noise

4.4.3.1 Air Quality

Overall air quality at LANL would remain within standards during construction and operation of the new CMRR Facility. In addition, overall noise levels at LANL during construction and operation would also remain within regulatory limits.

Nonradiological Releases

Construction Impacts—Construction of the new CMRR Facility at TA-6 would result in temporary emissions from construction equipment, trucks, and employee vehicles. Criteria pollutant concentrations were modeled for the construction of the new CMRR Facility at TA-6 and compared to the most stringent standards (**Table 4–19**). The maximum ground-level concentrations offsite or along the perimeter road to which the public has regular access would be below the ambient air quality standards. Concentrations along Pajarito Road north and east of the construction area would be higher and could exceed the 24-hour ambient standards for particulate matter less than or equal to 10 microns in aerodynamic diameter (PM_{10}) and total suspended particulates. However, the public would not be allowed access to this section of road during construction. Actual criteria pollutant concentrations are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts. The maximum short-term and annual criteria pollutant concentrations for construction would occur north of the construction site along Highway 501 and at the Royal Crest Trailer Park. Air quality modeling considered particulate emissions from construction activities in an area of 20.75 acres (8.4 hectares) and emissions from various earthmoving and material-handling equipment. This is the area consisting of land that would be used for building and parking lot construction (13.75 acres [5.6 hectares]) and laydown and the concrete batch plant (7 acres [2.8 hectares]).

Operations Impacts—Under Alternative 2 (Greenfield Alternative), criteria and toxic air pollutants would be generated from operation and testing of an emergency generator at TA-6. **Table 4–20** summarizes the concentrations of criteria pollutants from CMR operations at TA-6. The concentrations are compared to their corresponding ambient air quality standards. The maximum ground-level concentrations that would result from CMR operations at TA-6 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 north of the proposed TA-6 CMRR Facility operations area along Highway 501. The maximum short-term concentrations would also occur north of the CMRR Facility along Highway 501 and to the south along the LANL site boundary. Concentrations along Pajarito Road north of the proposed CMRR Facility would be higher and could exceed the 24-hour ambient standards for nitrogen dioxide. However, the public would not be allowed access to this section of road for periods of that duration. No major change in emissions or air pollutant concentrations at LANL are expected under this alternative.

Table 4–19 Nonradiological Air Quality Concentrations at the Site Boundary at TA-6 (Alternative 2, Greenfield Alternative) – Construction

Criteria Pollutant	*Averaging Period*	*Most Stringent Standard or Guideline (micrograms per cubic meter)* [a]	*Maximum Incremental Concentration (micrograms per cubic meter)* [b]
Carbon monoxide	8 hours 1 hour	7,800 11,700	96.9 775
Nitrogen dioxide	Annual 24 hours	73.7 147	0.92 24.1
PM_{10}	Annual 24 hours	50 150	2.11 35
Sulfur dioxide	Annual 24 hours 3 hours	41 205 1,030	0.084 2.33 18.7
Total suspended particulates	Annual 24 hours	60 150	4.14 67.8

PM_{10} = particulate matter less than or equal to 10 microns in diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, and lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million (ppm). These values have been converted to micrograms per cubic meter ($\mu g/m^3$) with appropriate corrections for temperature (21 degrees C [60 degrees F]) and pressure (elevation 7,005 feet [2,135 meters]) following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

[b] The annual concentrations were analyzed at locations to which the public has access – the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

Source: DOE 1999a.

Table 4–20 Nonradiological Air Quality Concentrations at the Site Boundary at TA-6 (Alternative 2, Greenfield Alternative) – Operations

Criteria Pollutant	*Averaging Period*	*Most Stringent Standard or Guideline (micrograms per cubic meter)* [a]	*Maximum Incremental Concentration (micrograms per cubic meter)* [b]
Carbon monoxide	8 hours 1 hour	7,800 11,700	71.4 414
Nitrogen dioxide	Annual 24 hours	73.7 147	0.0141 56.3
PM_{10}	Annual 24 hours	50 150	0.0004 1.74
Sulfur dioxide	Annual 24 hours 3 hours	41 205 1,030	0.0088 35 260
Total suspended particulates	Annual 24 hours	60 150	0.0008 3.03

PM_{10} = particulate matter less than or equal to 10 microns in diameter.

[a] The more stringent of the Federal and state standards is presented if both exist for the averaging period. The NAAQS (40 CFR 50), other than those for ozone, particulate matter, and lead, and those based on annual averages, are not to be exceeded more than once per year. The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. Standards and monitored values for pollutants other than particulate matter are stated in parts per million (ppm). These values have been converted to micrograms per cubic meter ($\mu g/m^3$) with appropriate corrections for temperature (21 degrees C [60 degrees F]) and pressure (elevation 7,005 feet [2,135 meters]) following New Mexico dispersion modeling guidelines (revised 1998) (NMAQB 1998).

[b] The annual concentrations were analyzed at locations to which the public has access – the site boundary and nearby sensitive areas. Short-term concentrations were analyzed at the site boundary and at the fence line of the technical area to which the public has short-term access.

Source: DOE 1999a.

Radiological Releases

Construction Impacts—While no radiological releases to the environment would be expected in association with construction activities at TA-6, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the extent and nature of any contamination and would remediate any contamination in accordance with procedures established under LANL's environmental restoration program and LANL's Hazardous Waste Facility Permit.

Operations Impacts—Approximately 0.00076 curies per year of actinides and 2,645 curies of fission products and tritium would be released to the environment from relocated CMR operations at TA-6 (DOE 1999a, LANL 2000d). Releases of radiological air pollutants are discussed in Section 4.4.9.1.

4.4.3.2 Noise

Construction Impacts—Construction of the new CMRR Facility at TA-6 would result in some temporary increase in noise levels near the area from construction equipment and activities. Some disturbance to wildlife near the area may 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 and materials shipment. Noise sources associated with construction at TA-6 are not expected to include loud impulsive sources such as from blasting.

Operations Impacts—Noise impacts from CMR operations at TA-6 would increase from those at existing operations at TA-6. There would be an increase in traffic and equipment noise (such as heating and cooling systems) in the area. The increase of noise from CMR operations at TA-6 would impact wildlife in the area. There would be little or no change in noise impacts to the public outside of LANL as a result of moving CMR activities to TA-6.

4.4.4 Geology and Soils

Construction Impacts—Construction of the CMRR Facility under this alternative would be expected to disturb a total of approximately 26.75 acres (10.8 hectares) of land in north central TA-6. Aggregate and other geologic resources would be required to support construction activities at TA-6, but these resources are abundant in Los Alamos County. Relatively deep sub-surface excavation would be required to construct below-grade portions of the new CMRR Facility. In addition, excavation and trenching would be required to extend utilities to the site and to remove and replace some existing utility systems. However, as explosives blasting should not be necessary and the land area to be disturbed is relatively limited, the impact on geologic and soil resources would be relatively minor.

A site survey and foundation study would be conducted as necessary to confirm site geologic characteristics for facility engineering purposes. The potential also exists for contaminated soils to be encountered during excavation and other site activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the extent and nature of any contamination and required remediation in accordance with procedures established under the LANL environmental restoration program. Other buried objects would be surveyed and removed as appropriate.

As discussed in Section 3.5, LANL is located in a region of low to moderate seismicity overall. Ground shaking of MMI VII (see Appendix A, Table A–6) associated with postulated earthquakes is possible and supported by the historical record for the region. MMI VII would be expected to affect primarily the integrity of inadequately designed or nonreinforced structures, but damage to properly designed or specially designed or upgraded facilities would not be expected. The Rendija Canyon Fault terminates approximately 1 mile (1.6 kilometers) north of TA-6 but may extend further south encroaching on the northern portion of TA-6 (see Section 3.5.1.3). However, the new CMRR Facility proposed under this alternative would be designed and constructed in accordance with applicable DOE orders and standards (DOE Standard 1020-2002 that implements DOE Order 420.1A) to provide criteria for the design of new structures, systems, and components and for evaluation, modification, or upgrade of existing structures, systems, and components so that DOE facilities safely withstand the effects of natural phenomena, such as earthquakes. As stated in DOE Order 420.1A, DOE is required to ensure that nuclear and nonnuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from any adverse impacts caused by the CMRR Facility from natural phenomena hazards, including earthquakes.

Operations Impacts—CMR operations under this alternative would not impact geologic and soil resources at LANL. As discussed above, new buildings would be designed and constructed in accordance with DOE Order 420.1A and sited to minimize the risk from geologic hazards. Thus, site geologic conditions would be unlikely to affect the facilities over the 50-year operational life expectancy.

4.4.5 Surface and Groundwater Quality

4.4.5.1 Surface Water

Construction Impacts—There are no natural surface water drainages in the vicinity of the TA-6 construction site on South Mesa 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 discharge of sanitary wastewater and no impact on surface waters. Waste generation and management activities are detailed in Section 4.4.11.

Storm water runoff from construction areas could potentially impact downstream surface water quality. Appropriate soil erosion and sediment control measures (sediment fences, stacked hay bales, 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. An NPDES General Permit Notice of Intent would be filed to address storm water discharges associated with construction activity. Also, development and implementation of a Storm Water Pollution Prevention Plan would be required for the construction activity. TA-6 is not in an area prone to flooding, and no floodplains exist in the immediate vicinity of the proposed construction site.

Operations Impacts—No impacts on surface water resources are expected as a result of CMR operations at TA-6 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 as a result of facility operations stemming from facility staff use of lavatory, shower, and break room facilities and from miscellaneous potable and sanitary uses. This wastewater would be collected and conveyed by a new sanitary sewer system for ultimate disposal via appropriate wastewater treatment facilities. Radioactive liquid waste would either be contained onsite and transported by truck to the existing TA-50 Radioactive Liquid Waste Treatment Facility, or transported via a radioactive liquid waste pipeline extended to the site. An NPDES Permit and Storm Water Pollution Prevention Plan for facility operations would also be required to address storm water discharges associated with the operation of the new CMRR Facility. Waste generation and management activities are detailed in Section 4.4.11. The design and operation of new buildings would incorporate appropriate storm water management controls to safely collect and convey storm water from facilities while minimizing washout and soil erosion. Overall, operational impacts on site surface waters and downstream water quality would be expected to be negligible.

4.4.5.2 Groundwater

Construction Impacts—Groundwater would be required to support construction activities at TA-6. It is estimated that construction activities under Alternative 2 (Greenfield Alternative) would require approximately 3.7 million gallons (14 million liters) of groundwater (see Table 4–17). 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. Appropriate spill prevention controls, countermeasures, and procedures would be employed to minimize the potential for releases of materials to the surface or subsurface. No impact on groundwater availability or quality is anticipated from construction activities in TA-6.

Operations Impacts—Relocated CMR operations and activities at TA-6 under Alternative 2 (Greenfield 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 (see Table 4–18). Therefore, no additional impact on regional groundwater availability would be anticipated.

No sanitary or industrial effluent would be discharged directly to the surface or subsurface. Waste generation and management activities are detailed in Section 4.4.11. Thus, no operational impacts on groundwater quality would be expected.

4.4.6 Ecological Resources

4.4.6.1 Terrestrial Resources

Construction Impacts—As noted in Section 3.7.1, TA-6 lies within both the mixed conifer forest and ponderosa pine forest zones of LANL. However, since the new CMRR Facility would be placed in the north central portion of the area, only ponderosa pine forest would be removed during clearing operations. The total area to be cleared, including the access road and utility corridors would require 26.75 acres (10.8 hectares). Following construction, 13.75 acres (5.6 hectares) for building and parking lot construction would be permanently disturbed. Clearing operations would result in the loss of less mobile wildlife such as reptiles and small mammals, and cause more mobile species such as birds or large mammals to be displaced. The success of displaced animals would depend on the carrying capacity of the area into which they move. If the area were at its carrying capacity, displaced animals would likely survive. Indirect impacts from construction, such as from noise or human disturbance, could also impact wildlife living adjacent to the construction zone. Although temporary, such disturbance would span the construction period. The work area would be clearly marked to prevent construction equipment and workers from disturbing adjacent natural habitat.

Operations Impacts—CMR operations would have minimal impact on terrestrial resources within or adjacent to TA-6. Since wildlife residing in the area would not have previously adjusted to the noise and human disturbance associated with CMR operations, some species could be permanently displaced. However, many animals would become accustomed to the disturbance and would return to the vicinity of the CMRR Facility following construction. Since the CMRR Facility would be permanently fenced, larger mammals would be excluded from future use of developed portions of TA-6. Areas not permanently disturbed by the new CMRR Facility (for example, construction laydown area) would be landscaped. While this would provide some habitat for wildlife, it is likely that species composition would differ from preconstruction conditions.

4.4.6.2 Wetlands

Construction and Operations Impacts—As noted previously in Section 3.7.2, there are no wetlands located within TA-6. Therefore, impacts to wetlands would not occur. Although some riparian habitat exists along stream channels, it would not be impacted by the project since all construction would take place on the mesa tops. In order to prevent indirect impacts, a sediment and erosion control plan would be implemented to control stormwater runoff during construction and operations.

4.4.6.3 Aquatic Resources

Construction and Operations Impacts—There are no aquatic resources at TA-6. Therefore, no aquatic resources would be impacted by this alternative.

4.4.6.4 Threatened and Endangered Species

Construction Impacts—As noted in Section 3.7.4, AEIs have been established at LANL for the Mexican spotted owl, bald eagle, and southwestern willow flycatcher. However, core and buffer areas for the Federally threatened Mexican spotted owl do not overlap the proposed location of the new CMRR Facility within TA-6. Core and buffer areas for the Federally threatened bald eagle and Federally endangered southwestern willow flycatcher also do not overlap any portion of TA-6. Therefore, neither individual animals of these three species nor their designated habitat areas would be impacted by the implementation of this alternative.

Operations Impacts—CMR operations at TA-6 would not affect any Federally endangered or threatened species since none of these species occur within the area to be developed. Noise levels associated with CMRR Facilities would be low and would be similar to other technical areas at LANL.

4.4.7 Cultural and Paleontological Resources

4.4.7.1 Prehistoric Resources

Construction and Operations Impacts—Adverse impacts to prehistoric resources from construction and operation of the new CMRR Facility at TA-6 would not be expected. However, as noted in Section 3.8.1, one prehistoric site has been identified within TA-6. The extent to which this site may be disturbed cannot be determined until planning details for the new CMRR Facility are finalized. If unexpected prehistoric resources were uncovered during construction, work would stop and appropriate assessment, regulatory compliance, and recovery measures would be undertaken.

4.4.7.2 Historic Resources

Construction and Operations Impacts—Adverse impacts to historic resources from construction and operation of the new CMRR Facility at TA-6 would not be expected. However, some of the 20 historic sites located within TA-6 may be disturbed by the construction of the new CMRR Facility, the extent of which would not be determined until planning details were finalized. Consultation with the State Historic Preservation Officer, if necessary, would be undertaken in order to determine the eligibility of any potentially disturbed sites for listing on the National Register of Historic Places and, if appropriate, data and artifact recovery would be conducted.

4.4.7.3 Traditional Cultural Properties

Construction and Operations Impacts—The area at TA-6 proposed to house the new CMRR Facility has not been surveyed for traditional cultural properties. Prior to construction, a traditional cultural properties consultation would be undertaken and site removal or avoidance, if needed, would be conducted. If any traditional cultural properties were located during construction, work would stop while appropriate action would be undertaken.

4.4.7.4 Paleontological Resources

Construction and Operations Impacts—As noted in Section 3.8.4, there are no known paleontological resources present at TA-6 at LANL. Thus, there would be no impacts to these resources.

4.4.8 Socioeconomics

Construction Impacts—Construction of new buildings at TA-6 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 60 months of construction. It would have little or no noticeable impact on the socioeconomic conditions of the region of influence.

Operations Impacts—As previously noted in Section 2.7.4, the operational characteristics of the CMRR Facility are based on the level of CMR operations required to support the Expanded Operations Alternative analyzed in the *LANL SWEIS*. As noted in Table 2–2, CMRR Facility operations would require a workforce of approximately 550 workers. This would be an increase of 346 workers over currently restricted CMR operational requirements, but approximately equal to the number of CMR workers projected for the Expanded Operations Alternative in the *LANL SWEIS*. The *LANL SWEIS* presents a discussion of the socioeconomic impacts from an increase in total employment at LANL under the Expanded Operations Alternative, which includes the contributory affect of expanded CMR operations and an increase in workforce.

Nevertheless, the increase in the number of workers in support of expanded CMR operations would have little or no noticeable impact on socioeconomic conditions in the LANL Tri-County region of influence. Workers assigned to the new CMRR Facility would be drawn for the most part from existing LANL missions, including consolidated AC and MC activities. The contributory effect of the remaining new employment, in combination with the potential effects from other industrial and economic sectors within the regional economic area, would serve to reduce or mask any effect on the regional economy. New LANL employees hired to support CMRR facilities would comprise a small fraction of the LANL workforce (more than 9,000 in 1996), and an even smaller fraction of the regional workforce (more than 92,000 in 1999).

4.4.9 Human Health Impacts

4.4.9.1 Construction and 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 near the site. However, these workers would be protected through appropriate training, monitoring, and management controls. Their exposure would be limited to ensure that doses were kept as low as is reasonably achievable.

Operations Impacts—Routine operation of the CMRR Facility at TA-6 would not be expected to result in an increase in latent cancer fatalities. Under this alternative, the radiological releases to the atmosphere from the CMRR Facility would be those shown in **Table 4–21**. The actinide emissions listed in this table are in the form of plutonium, uranium, thorium, and americium isotopes. In estimating the human health impacts for actinides, 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. Liquid radioactive effluents would be transported by tanker truck or routed through a new pipeline to the TA-50 Radioactive Liquid Effluent Treatment Facility where they would be treated along with other LANL site liquid wastes. Following treatment, the liquid would be released through an existing NPDES-permitted outfall. The treatment residues would be solidified and disposed of as solid waste (see Section 4.4.11).

Table 4–21 Emissions from the CMRR Facility under Alternative 2

Nuclide	*Emissions (curies per year)*
Actinides	0.00076
Kr-85	100
Xe-131m	45
Xe-133	1,500
H-3 (Tritium) [a]	1,000

[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. Therefore, all of the tritium release has been modeled as if it were tritium oxide.

Source: DOE 1999a, LANL 2000d.

Table 4–22 shows that the annual collective dose to the population living within a 50-mile (80-kilometer) radius of the CMRR Facility is estimated to be 2.0 person-rem for Alternative 2. This population dose increases the annual risk of a fatal cancer in the population by 0.001. Another way of stating this is that the likelihood of one fatal cancer occurring in the population as a result of radiological releases associated with this alternative is about 1 chance in 1,000 per year. Statistically, latent cancer fatalities would not be expected to occur in the population from CMR operations at TA-6.

The average annual dose to an individual in the population is 0.006 millirem. The corresponding increased risk of an individual developing a fatal cancer from receiving the average dose is 3.2×10^{-9} or about 1 chance in 300 million per year.

The maximally exposed individual member of the public would receive an estimated annual dose of 0.35 millirem. This dose corresponds to an increased annual risk of developing a fatal cancer of 1.8×10^{-7}. In other words, the likelihood of the maximally exposed individual developing a fatal cancer is about 1 chance in 6 million during each year of operation.

Table 4–22 Annual Radiological Impacts on the Public from CMRR Facility Operations under Alternative 2

	Population within 50 Miles (80 kilometers)	*Average Individual within 50 Miles (80 kilometers)*	*Maximally Exposed Individual*
Dose	2.0 person-rem	0.006 mrem	0.35 mrem
Cancer fatality risk [a]	0.001	3.2×10^{-9}	1.8×10^{-7}
Regulatory dose limit [b]	Not available	10 mrem	10 mrem
Dose as a percentage of the regulatory limit	Not available	0.06	3.5
Dose from background radiation [c]	139,000 person-rem	450 mrem	450 mrem
Dose as a percentage of background dose	0.0014	0.0014	0.08

[a] Based on a risk estimate of 0.0005 latent cancer fatalities per person-rem (see Appendix B).
[b] 40 CFR 61 establishes an annual limit of 10 mrem 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 400 to 500 millirem (see Section 3.11.1). The population living within 50 miles (80 kilometers) of TA-3 is estimated to be 308,062.

Estimated annual doses to workers involved with CMR activities under Alternative 2 are provided in **Table 4–23**. Estimated worker doses are based on historical exposure data for LANL workers (*DOE Occupational Radiation Exposure 2001 Report*). 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 operation at the new CMRR Facility.

Table 4–23 Annual Radiological Impacts to Workers from CMRR Facility Operations under Alternative 2 (Greenfield Alternative)

	Individual Worker	*Worker Population [a]*
Dose [b]	110 mrem	61 person-rem
Fatal cancer risk [c]	0.00004	0.02
Dose limit [d]	5,000 mrem	Not available
Administrative control level [e]	500 mrem	Not available

[a] Based on a worker population of 550 for the new CMRR Facility. 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 1998 to 2000. A program to reduce doses to as low as reasonably achievable (ALARA) would be employed to reduce doses to the extent practicable.
[c] Based on a worker risk estimate of 0.0004 latent cancer fatalities per person-rem (see Appendix B).
[d] 10 CFR 835.202.
[e] DOE 1999b.

The average annual worker dose of 110 millirem is well below the DOE worker dose limit of 5 rem (5,000 millirem) (10 CFR 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 0.00004. In other words, the likelihood of a worker at the CMRR Facility developing a fatal cancer from work-related exposure is about 1 chance in 25,000 for each year of operation.

Based on a worker population of 550 for Alternative 2 (Greenfield Alternative), the estimated annual worker population dose would be 61 person-rem. This worker population dose would increase the likelihood of a fatal cancer within the worker population by 0.02 per year. In other words, on an annual basis there is less than 1 chance in 50 of one fatal cancer developing in the entire worker population as a result of exposures associated with this alternative.

Hazardous Chemicals Impacts

No chemical-related health impacts to the public would be associated with this alternative. As stated in the *LANL SWEIS*, the laboratory quantities of chemicals that could be released to the atmosphere during routine normal operations are minor quantities and would be 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 as a result of the alternative. Construction 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.

4.4.9.2 Facility Accidents

This section presents a discussion of the potential health impacts to members of the public and workers from postulated accidents at the new CMRR Facility under the Alternative 2 (Greenfield Alternative). Additional details supporting the information presented here are provided in Appendix C.

Under the Alternative 2 (Greenfield Alternative), CMR capabilities and materials would be relocated to a new CMRR Facility to be constructed at LANL TA-6. The new CMRR Facility would include safety features that would reduce the risks of accidents that currently exist under the No Action Alternative. From an accident perspective, the proposed CMRR Facility would be designed to meet the performance Category 3 seismic requirements, and have a full confinement system that would include tiered pressure zone ventilation and high-efficiency particulate air filters.

Radiological Impacts

Table 4–24 shows the frequencies and consequences of the postulated set of accidents for the public, represented by the maximally exposed offsite individual and the general population living within 50 miles (80 kilometers) of the CMRR Facility, and a noninvolved worker located at a distance of 264 yards (241 meters) from the CMRR Facility**. Table 4–25** presents the accident risks, obtained by multiplying each accident's consequences by the likelihood (frequency per year) that the accident would occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in Appendix C. The selection process and screening criteria used (see Appendix C) ensure that the accidents chosen for evaluation in this EIS bound the impacts of all reasonably foreseeable accidents that could occur at existing CMRR Facility. Conservative estimates were also made for data used to calculate the source terms for low frequency – high consequence accidents (e.g., facility-wide fire) for CMRR Facility alternatives. These included assumptions that the most hazardous form of the radioactive material (e.g., metal, liquid or powder depending on the accident conditions) was present at the time of the accident, all of the material at risk was damaged in the accident (damage ratio = 1.0) and containment and filtration of airborne radioactive material was lost (leak path factor = 1.0). Thus, in the event that any other accident that was not evaluated in this EIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 4–24 Accident Frequency and Consequences under Alternative 2 (Greenfield Alternative)

Accident	Frequency (per year)	Maximally Exposed Offsite Individual		Offsite Population [a]		Noninvolved Worker	
		Dose (rem)	Latent Cancer Fatalities [b]	Dose (person-rem)	Latent Cancer Fatalities [c]	Dose (rem)	Latent Cancer Fatalities [b]
Facility-wide fire	5.0×10^{-6}	4.0	0.002	15,173	7.58	44.98	0.036
Process fire	0.001	0.0023	1.1×10^{-6}	8.71	0.0044	0.026	0.00001
Fire in the main vault	1.0×10^{-6}	3.41	0.0017	12,938	6.47	38.3	0.031
Process explosion	0.001	0.0017	8.3×10^{-7}	2.37	0.0012	0.08	0.000032
Process spill	0.1	0.002	1.1×10^{-6}	3.01	0.0015	0.172	0.000069
Seismic-induced laboratory spill	0.0001	5.54	0.0028	7,920	3.96	453	0.36
Seismic-induced fire	0.00001	1.44	0.00072	5,440	2.72	16.1	0.0065
Facility-wide spill	5.0×10^{-6}	111.3	0.11	158,000	79.2	9,100	1.0

[a] Based on a population of 315,296 persons residing within 50 miles (80 kilometers) of the site.
[b] Increased likelihood of a latent cancer fatality.
[c] Increased number of latent cancer fatalities.

Table 4–25 Accident Risks under Alternative 2 (Greenfield Alternative)

Accident	Risk of Latent Cancer Fatality		
	Maximally Exposed Offsite Individual [a]	Offsite Population [b, c]	Noninvolved Worker [a]
Facility-wide fire	1.0×10^{-8}	0.000038	1.8×10^{-7}
Process fire	1.2×10^{-9}	4.4×10^{-6}	1.0×10^{-8}
Fire in the main vault	1.7×10^{-9}	6.5×10^{-6}	3.1×10^{-8}
Process explosion	8.3×10^{-10}	1.2×10^{-6}	3.2×10^{-8}
Process spill	1.1×10^{-7}	0.00015	6.9×10^{-6}
Seismic-induced laboratory spill	2.8×10^{-7}	0.00038	0.000036
Seismic-induced fire	7.2×10^{-9}	0.000027	6.5×10^{-8}
Facility-wide spill	5.6×10^{-7}	0.0004	0.000036

[a] Risk of increased likelihood of a latent cancer fatality to the individual.
[b] Risk of the increased number of latent cancer fatalities for the offsite population.
[c] Based on a population of 315,296 persons residing within 50 miles (80 kilometers) of the site.

The accident with the highest potential risk to the offsite population (see Table 4–25) would be a facility-wide spill caused by an earthquake that would severely damage the new CMRR Facility, resulting in with a risk of a latent cancer fatality for the maximally exposed offsite individual of 5.6×10^{-7}. In other words, the maximally exposed offsite individual's likelihood of developing a fatal cancer from this event is about 1 chance in 1.8 million. The dose to the offsite population would increase the number of fatal cancers in the entire population by 0.0004; the likelihood of developing one fatal cancer from this event in the entire population would be about 1 chance in 2,500. Statistically, latent cancer fatalities would not be expected to occur in the population. The risk of a latent cancer fatality to a noninvolved worker located at a distance of 264 yards

(241 meters) from the new CMRR Facility would be 0.000036 or about 1 chance in 27,000 of a latent cancer fatality.

Involved Worker Impacts – Approximately 550 workers (including security guards) would be at CMRR Facilities during operations. Workers near an accident could be at risk of serious injury or death. The impacts from a process spill accident provides an indication of typical worker impacts during accident conditions. 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 CMR operations are toxic and carcinogenic. The quantities of the regulated hazardous chemicals and explosive materials stored and used in the new CMRR Facility would be well below the threshold quantities set by the EPA (40 CFR 68), and would pose minimal potential hazards to 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.

4.4.9.3 Emergency Preparedness and Security Impacts

There would be no impacts on the emergency management and response program at LANL from the construction and operation of the new CMRR Facility at TA-6. Existing memoranda of understanding among NNSA, Los Alamos County, and the State of New Mexico to provide mutual assistance during emergencies and to provide open access to medical facilities would continue with minor administrative updates. Equipment and procedures used to respond to emergencies would continue to be maintained by NNSA.

4.4.10 Environmental Justice

Construction Impacts—Under Alternative 2 (Greenfield Alternative), a new CMRR Facility would be constructed at TA-6. As discussed throughout the other subsections of Section 4.5, environmental impacts under all of the construction options would be temporary and would not extend beyond the boundary of LANL. Under Alternative 2, construction at TA-6 would not result in adverse environmental impacts on the public living within the potentially affected area surrounding TA-6, including low-income and minority populations.

Operations Impacts—As discussed in Section 4.4.9.1, radiological and hazardous chemical risks to the public resulting from normal operations would be small. As shown in Table 4–22, the health risks associated with these releases would be small. Routine normal operations at the new CMRR Facility would not be expected to cause fatalities or illness among the general population surrounding TA-6, including minority and low-income populations living within the potentially affected area.

Radiological risks to the public that could result from accidents at new laboratory buildings are estimated to be less than 0.004 latent cancer fatalities (see Table 4–25). Hence, the likelihood of a latent cancer fatality resulting from an accident under Alternative 2 (Greenfield Alternative) would be less than 1 in 250. As described in Section 4.4.9.2, accidents involving hazardous chemicals or explosives would not result in airborne or water-borne contamination beyond the LANL boundary that would be hazardous to human health.

Residents of Pueblo San Ildefonso have expressed concern that pollution from CMR operations could contaminate Mortandad Canyon, which drains onto Pueblo land and sacred areas. As discussed in Sections 4.4.3, 4.4.5, and 4.4.9, CMR operations under this alternative would not be expected to adversely affect air or water quality, or result in contamination of Tribal lands adjacent to the LANL boundary. In summary, implementation of Alternative 2 (Greenfield Alternative) would not pose disproportionately high or adverse environmental risks to low-income or minority populations living in the potentially affected area around the new CMRR Facility at TA-6.

4.4.11 Waste Management and Pollution Prevention

This section presents an analysis of waste management and pollution prevention impacts for Alternative 2 (Greenfield Alternative).

4.4.11.1 Waste Management

Construction Impacts—Before construction activities would begin at TA-6, LANL's Environmental Restoration Project would perform a radiological survey of the area to determine whether the Potential Release Sites are located in the construction area. Based on these survey results, further actions, including appropriate documentation, and contaminate removal, if necessary, would be completed by the LANL Environmental Restoration Project in accordance with LANL's Hazardous Waste Facility Permit. Potential wastes generated from such remediation activities have not been included in this impact analysis, because the type and amount of waste are unknown and cannot be adequately projected. Impacts from the disposal of contaminated soil could be similar to waste management impacts from CMRR Facility operations.

Only nonhazardous waste would be generated from the construction activities to relocate CMR operations and materials to a new CMRR Facility at TA-6. No radioactive or hazardous waste would be generated during construction activities.

Solid nonhazardous waste generated from construction activities associated with the new CMRR Facility would be disposed of at the Los Alamos County Landfill located at LANL or its replacement facility. Approximately 578 tons (524 metric tons) of solid nonhazardous waste, consisting primarily of gypsum board, wood scraps, scrap metals, concrete, steel and other construction waste would be generated from the construction activities. This waste represents about 20 percent of the current annual solid nonhazardous waste generation rates at LANL of 2,860 tons (2,600 metric tons) per year. 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. The construction debris would be collected in appropriate waste containers and transported to the landfill on a regular basis. This additional construction waste would only increase LANL's proportion of total wastes going to the landfill by three percent.

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 of managing waste associated with relocated CMR operations under this Alternative are assumed to be the same as for Alternative 1 (Preferred Alternative). This is because waste generation by CMRR Facility operations would not be affected by the relocation of these activities to new facilities and, therefore, the same types and volumes of waste would be generated. See Section 4.3.11.1, Table 4–16, for waste types and quantities generated by CMR activities. Small quantities of waste would be generated during the transition phase to the new CMRR Facility, resulting from the shutdown of operations in the existing CMR Building, decontamination of equipment prior to movement, packaging of SNM, and preoperational testing activities.

Locating the new CMRR Facility at TA-6 would result in new impacts related to management of radioactive liquid wastes generated during CMR operations. Radioactive liquid wastes would be transferred to the Radioactive Liquid Waste Treatment Facility in TA-50 by truck transport or via a new pipeline across Two Mile Canyon. Possible transportation impacts arise from additional truck trips on public roads. Possible pipeline impacts include construction costs and disturbance of the pipeline corridor.

4.4.11.2 Pollution Prevention

At the new CMRR Facility, wastes would be minimized, where feasible, by:

- Recycling;
- Processing waste to reduce its quantity, volume or toxicity;
- Substituting materials or processes that generate hazardous wastes with materials or processes that result in less hazardous wastes being produced; and
- Segregating waste materials to prevent contamination of nonhazardous materials.

4.5 ENVIRONMENTAL IMPACTS FOR ALTERNATIVE 3 (THE "HYBRID ALTERNATIVE AT TA-55")

This section presents a discussion of the environmental impacts associated with Alternative 3 (the Hybrid Alternative at TA-55). Under Alternative 3, CMR administrative offices and support functions activities would remain in a portion of the existing CMR Building at TA-3, with only necessary structural and system upgrades and repairs. The balance of CMR operations at LANL would be relocated to TA-55 in a new CMRR Facility consisting of one or two buildings that would provide secure laboratory spaces for research and analytical support activities. The buildings would be expected to operate for a minimum of 50 years, and tunnels could or might be constructed to connect the buildings. The impacts from construction and operation of these proposed facilities are described below. Disposition of the remaining unused portions of the CMR Building is discussed later in Section 4.7.2.

CMR operations at TA-55 under this alternative would be conducted at the levels of activity described for the Expanded Operations Alternative in the *LANL SWEIS*. The Expanded Operations Alternative presented in the *LANL SWEIS* provides the reference point from which incremental effects of this proposed action are measured.

4.5.1 Land Use and Visual Resources

4.5.1.1 Land Use

Construction and Operations Impacts—Under this alternative, space within Wings 1, 3, 5, and 7 of the existing CMR Building at TA-3 would be used for the administrative offices and support functions building. Wings 2 and 4 would be decommissioned and used for storage. Since this would not represent a change in the present use of those portions of the building, and would be consistent with current *LANL SWEIS* and *LANL Comprehensive Site Plan* designations of the area for Research and Development, and Nuclear Materials Research and Development, respectively (see Section 3.2.1), there would be no impact on land use under this alternative.

In addition, new CMRR Facility laboratory building(s) would be constructed at TA-55. This would disturb 22.75 acres (9.2 hectares) of land during construction. During CMR operations, 9.75 acres (3.9 hectares) would be permanently disturbed at TA-55. Impacts to land use at TA-55 from this alternative would be the same as those addressed in Section 4.3.1.1.

4.5.1.2 Visual Resources

Construction and Operations Impacts—Under this alternative, there would be no external change to the present CMR Building at TA-3. Thus, there would be no impact to visual resources or the current Class IV Visual Resource Contrast rating.

Visual impacts related to the construction of the new CMRR laboratory building(s) at TA-55 would be the same as those described in Section 4.3.1.2, except the three-story administrative offices and support functions building would not be constructed. The Class IV Visual Resource Contrast rating for the area would remain unchanged.

4.5.2 Site Infrastructure

Construction Impacts—The projected demands on key site infrastructure resources associated with construction under this alternative would be the same as, but less than, those presented for construction under Alternative 1 (Section 4.3.2). Existing LANL infrastructure would easily be capable of supporting the construction requirements for the new CMRR Facility laboratory building(s) 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. Impacts on the local transportation network are expected to be negligible.

Operations Impacts—Resources needed to support operations under Alternative 3 would be the same as those presented for Alternative 1 operations. As such, it is likewise projected that existing LANL infrastructure resources would be adequate to support proposed mission activities over 50 years, and that CMR infrastructure requirements under this hybrid alternative would generally approximate those of the Expanded Operations Alternative presented in the *LANL SWEIS* for the CMR Building.

4.5.3 Air Quality and Noise

4.5.3.1 Air Quality

No change to overall air quality would result from the construction and operation of the proposed new CMRR Facility laboratory building(s).

Nonradiological Releases

Construction Impacts—Construction of the new CMRR Facility laboratory building(s) at TA-55 would result in temporary emissions from construction equipment, trucks, and employee vehicles. Construction activities would be the same as those described for Alternative 1, except that the administrative offices and support functions building would not be constructed. Criteria pollutant concentrations from construction would be less than for Alternative 1.

Operations Impacts—Under this alternative, criteria and toxic pollutants would be generated from operation and testing of an emergency generator at TA-55. Air emissions from CMR operations at TA-55 under Alternative 3 are expected to be similar to or slightly less than for Alternative 1. Air emissions from the existing CMR Building at TA-3 would likely be reduced.

Radiological Releases

Construction Impacts—While no radiological releases to the environment would be expected in association with construction activities at TA-55, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the extent and nature of any contamination and would be required to remediate any contamination in accordance with procedures established under LANL's environmental restoration program and in accordance with LANL's Hazardous Waste Facility Permit.

Operations Impacts—Releases of radionuclides under this alternative would be the same as those described for Alternative 1 (see Section 4.3.3.1).

4.5.3.2 Noise

Construction Impacts—Construction of the new CMRR Facility laboratory building(s) at TA-55 would result in some temporary increase in noise levels near the area from construction equipment and activities. Some disturbance of wildlife near the area could occur as a result of the operation of construction equipment. Noise impacts from construction under this alternative would be similar to those described for Alternative 1 (see section 4.3.3.2).

Operations Impacts—Noise impacts from CMRR Facility operations at TA-55 are expected to be similar to existing operations at TA-55. Although there will be a small increase in traffic noise 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 to the public outside of LANL as a result of moving these activities to TA-55. Noise impacts would be similar to those described for Alternative 1.

4.5.4 Geology and Soils

Construction and Operations Impacts—Construction of the CMRR Facility and its operation would not impact geologic resources at LANL. As discussed previously, new buildings would be designed and constructed in accordance with DOE Order 420.1A and sited to minimize the risk from geologic hazards. Thus, site geologic conditions would be unlikely to affect the facilities over the 50-year operational life expectancy.

The potential also exists for contaminated soils to be encountered during excavation and other site activities. Prior to commencing ground disturbance, NNSA would survey potentially affected contaminated areas to determine the extent and nature of any contamination and required remediation in accordance with procedures established under the LANL environmental restoration program.

4.5.5 Surface and Groundwater Quality

4.5.5.1 Surface Water

Construction Impacts—Impacts to surface water associated with construction of Alternative 3 would be the same as those presented for Alternative 1 (Section 4.3.5.1). There are no natural surface water drainages in the vicinity of the TA-55 Plutonium Facility Complex and no surface water would be used to support facility construction. It is also expected that portable toilets would be used for construction personnel, resulting in no onsite discharge of sanitary wastewater and no impact on surface waters. Although storm-water runoff from construction areas could potentially impact downstream surface water quality, appropriate soil erosion and sediment control measures and spill prevention practices would similarly be employed during construction to minimize potential water quality impacts.

Operations Impacts—Impacts to surface water associated with operation of Alternative 3 would be identical to those presented for Alternative 1 (Section 4.3.5.1). Overall, operational impacts on site surface waters and downstream water quality would be expected to be negligible.

4.5.5.2 Groundwater

Construction Impacts—Groundwater required to support construction activities for Alternative 3 would be similar to, but less than, that presented for Alternative 1 (Section 4.3.5.2). The volume of groundwater required for construction of this hybrid alternative would also be small compared to site availability and historic usage, and there would be no onsite discharge of wastewater to the surface or subsurface. Appropriate spill prevention controls, countermeasures, and procedures would similarly be employed, and no impact on groundwater availability or quality from construction activities in TA-55 would be anticipated.

Operations Impacts—Under Alternative 3, buildings housing CMR operations and activities at TA-3 and TA-55 would use the same volume of groundwater as used to support Alternative 1. Therefore, no additional impact on regional groundwater availability would be anticipated. Similarly, no sanitary or industrial effluent would be discharged directly to the surface or subsurface, and no operational impacts on groundwater quality would be expected.

4.5.6 Ecological Resources

Construction and Operations Impacts—Since the existing CMR Building would continue to be used for administrative offices and support functions, there would be no new development within the already highly developed TA-3. Thus, impacts to ecological resources would not occur within TA-3.

Although less acreage would be disturbed, impacts on terrestrial resources, wetlands, aquatic resources, and threatened and endangered species from the construction and operation of new CMRR Facility laboratory building(s) at TA-55 would be the same as those described in Section 4.3.6.

4.5.7 Cultural and Paleontological Resources

4.5.7.1 Prehistoric Resources

Construction and Operations Impacts—As previously noted in Section 3.8.1, there are two prehistoric sites located within TA-3. However, these prehistoric sites, which the New Mexico State Historic Preservation Office has determined to be not eligible for the National Register of Historic Places, would not be affected by the continued use of the existing CMR Building under this alternative.

There are no prehistoric sites located within TA-55; therefore, construction and operation of the new CMRR Facility laboratory building(s) would not impact these resources. If unexpected prehistoric resources were uncovered during construction, work would stop and appropriate assessment, regulatory compliance, and recovery measures would be undertaken.

4.5.7.2 Historic Resources

Construction and Operations Impacts—The use of the existing CMR Building under this alternative would involve internal modifications to the existing structure, which has been modified and changed over the last 60 years. There would be no adverse impacts to historic resources at TA-3.

As noted in Section 3.8.2, there are 10 historic sites located within TA-55. Adverse impacts to historic resources at TA-55 from construction or operation of the CMRR Facility would not be expected. Potential impacts from the construction and operation of new CMRR Facility laboratory building(s) to these historic resources would be similar to those described for Alternative 1 in Section 4.3.7.2.

4.5.7.3 Traditional Cultural Properties

Construction and Operations Impacts—Under this alternative, the existing CMR Building at TA-3 would continue to be used. Thus, there would be no impact to traditional cultural properties within the TA-3 area.

The area at TA-55 proposed to house the new CMRR Facility laboratory building(s) has not been surveyed for traditional cultural properties. Prior to construction, traditional cultural properties consultations would be undertaken and site removal or avoidance, if needed, would be conducted. If any traditional cultural properties were located during construction, work would stop while appropriate action would be undertaken.

4.5.7.4 Paleontological Resources

Construction and Operations Impacts—As noted in Section 3.8.4, there are no paleontological resources present at TA-55 or TA-3. Thus, there would be no impacts to these resources from the use of the existing CMR building at TA-3 and the construction and operation of new CMRR Facility laboratory building(s) at TA-55.

4.5.8 Socioeconomics

Construction Impacts—Construction of new buildings at TA-55 to house CMR activities under Alternative 3 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 34 months of construction. Under Alternative 3, fewer new buildings would be constructed at TA-55 than under Alternative 1 (the Preferred Alternative), but the peak number of construction workers would remain the same, while the duration of construction activities would be shorter. As such, little or no noticeable impact on the socioeconomic conditions of the region of influence would be expected.

Operations Impacts—As previously noted in Section 2.7.4, the operational characteristics of the CMRR Facility are based on the level of CMR operations required to support the Expanded

Operations Alternative analyzed in the *LANL SWEIS*. As noted in Table 2–2, CMRR Facility operations would require a workforce of approximately 550 workers. This would be an increase of 346 workers over currently restricted CMR operational requirements, but approximately equal to the number of CMR workers projected for the Expanded Operations Alternative in the *LANL SWEIS*. The *LANL SWEIS* presents a discussion of the socioeconomic impacts from an increase in total employment at LANL under the Expanded Operations Alternative, which includes the contributory affect of expanded CMR operations and an increase in workforce.

Nevertheless, the increase in the number of workers in support of expanded CMR operations would have little or no noticeable impact on socioeconomic conditions in the LANL Tri-County region of influence. Workers assigned to the new CMRR Facility would be drawn for the most part from existing LANL missions, including consolidated AC and MC activities. The contributory effect of the remaining new employment, in combination with the potential effects from other industrial and economic sectors within the regional economic area, would serve to reduce or mask any effect on the regional economy. New LANL employees hired to support CMRR facilities would comprise a small fraction of the LANL workforce (more than 9,000 in 1996), and an even smaller fraction of the regional workforce (more than 92,000 in 1999).

4.5.9 Human Health Impacts

4.5.9.1 Construction and Normal Operations

Radiological Impacts

Alternative 3 involves the continued use of the existing CMR Building in addition to the construction of new CMRR Facility laboratory building(s) at TA-55. The activities to be moved to TA-55 would include most of the activities that would result in routine normal radiological releases identified for Alternative 1. The activities that would remain at the existing CMR Building would be primarily administrative and support functions activities. Therefore, there is no difference between the human health impacts from normal operations associated with this alternative and Alternative 1. These impacts are summarized in Section 4.3.9.1.

Hazardous Chemicals and Explosives Impacts

No chemical-related health impacts to the public would be associated with Alternative 3. As stated in the *LANL SWEIS*, the laboratory quantities of chemicals that could be released to the atmosphere during routine normal operations are minor quantities and would be below the screening levels used to determine the need for additional analysis. There would also be no construction and operational increase in the use of chemicals as a result of this hybrid alternative. Construction 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.

4.5.9.2 Facility Accidents

This section addresses the potential impacts to workers at the facility and others onsite and the public due to accidents for Alternative 3. Additional details supporting the information presented here are provided in Appendix C.

Under Alternative 3, the existing CMR Building would continue to be used for administrative offices and support functions together with construction and operation of the new CMRR Facility laboratory building(s) at TA-55 where CMR capabilities and materials would be relocated. The new CMRR Facility would include safety features that would reduce the risks of accidents that currently exist under the No Action Alternative. From an accident perspective, the proposed CMRR Facility would be designed to meet the performance category 3 seismic requirements, and have a full confinement system that includes tiered pressure zone ventilation and high-efficiency particulate air filters.

Radiological Impacts

The frequencies and consequences of potential accidents are the same as those described for the new CMRR Facility under Alternative 1 in Section 4.3.9.2. Continued used of the CMR Building for administrative offices and support functions purposes would involve small quantities of radioactive materials, and the consequences of any accident would be dominated by the consequences of postulated accidents at the new CMRR Facility.

Hazardous Chemicals and Explosives Impacts

Some of the chemicals used in LANL CMR operations are toxic and carcinogenic. The quantities of the regulated hazardous chemicals and explosive materials stored and used in the CMRR Facility would be well below the threshold quantities set by the EPA (40 CFR 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.

4.5.9.3 Emergency Preparedness and Security Impacts

There would be no impacts on the emergency management and response program at LANL from the construction and operation of the new CMRR Facility laboratory building(s) at TA-55. Existing memoranda of understanding among NNSA, Los Alamos County, and the State of New Mexico to provide mutual assistance during emergencies and to provide open access to medical facilities would continue with minor administrative updates. Equipment and procedures used to respond to emergencies would continue to be maintained by NNSA. Security arrangements for the existing CMR Building would not change.

4.5.10 Environmental Justice

Construction Impacts—Under Alternative 3, CMR administrative offices and support activities would continue in the existing CMR Building, and new CMRR Facility laboratory building(s) would be constructed in TA-55. Construction impacts would be less than those presented for Alternative 1 because no new administration building would be constructed. Thus, under Alternative 3, construction at TA-55 would not result in adverse environmental impacts on the public living within the potentially affected area surrounding TA-55, including low-income and minority populations.

Operations Impacts—Environmental impacts due to normal operations at the new CMRR Facility laboratory building(s) at TA-55 would be identical to those presented for Alternative 1. Routine normal operations at the new CMRR Facility laboratory building(s) would not be 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.

Radiological risks to the public that could result from accidents at the new CMRR Facility laboratory building(s) at TA-55 would also be identical to those presented for Alternative 1. Accidents that could occur under implementation of this hybrid alternative would therefore not pose adverse environmental risks to low-income or minority populations living in the potentially affected area surrounding TA-55.

Residents of Pueblo San Ildefonso have expressed concern that pollution from CMR operations could contaminate Mortandad Canyon, which drains onto Pueblo land and sacred areas. As discussed in Sections 4.5.3, 4.5.5, and 4.5.9, CMR operations under this alternative would not be expected to adversely affect air or water quality, or result in contamination of Tribal lands adjacent to the LANL boundary. In summary, implementation of Alternative 3 would not pose disproportionately high or adverse environmental risks to low-income or minority populations living in the potentially affected area around the new CMRR Facility laboratory building(s) at TA-55.

4.5.11 Waste Management and Pollution Prevention

This section presents an analysis of waste management and pollution prevention impacts for Alternative 3 (Hybrid Alternative at TA-55).

4.5.11.1 Waste Management

Construction Impacts—Before construction activities would begin at TA-55, LANL's Environmental Restoration Project would perform a radiological survey of the construction area to determine whether the Potential Release Sites are located in the construction area. Based on these survey results, further actions, including appropriate documentation, and contaminate removal, if necessary, would be completed by the LANL Environmental Restoration Project in accordance with LANL's Hazardous Waste Facility Permit. Potential wastes generated from such remediation activities have not been included in this impact analysis, because the type and amount of waste are unknown and cannot be adequately projected. Impacts from the disposal of contaminated soil could be similar to waste management impacts from CMRR Facility operations.

Only nonhazardous waste would be generated from the construction activities to relocate CMR operations and materials to new CMRR Facility laboratory building(s) at TA-55. No radioactive or hazardous waste would be generated during construction activities.

Solid nonhazardous waste generated from construction activities associated with new CMRR Facility laboratory building(s) would be disposed of at the Los Alamos County Landfill located at LANL or its replacement facility. Approximately 263 tons (239 metric tons) of solid nonhazardous waste, consisting primarily of gypsum board, wood scraps, scrap metals, concrete, steel and other construction waste would be generated from the construction activities for the new laboratory facilities. This waste represents about 9 percent of the current annual solid nonhazardous waste generation rates at LANL of 2,860 tons (2,600 metric tons) per year. 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. The construction debris would be collected in appropriate waste containers and transported to the landfill on a regular basis. This additional construction waste would only increase LANL's proportion of total wastes going to the landfill by three percent.

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 of managing waste associated with relocated CMR operations under this Alternative are assumed to be the same as for Alternative 1 (Preferred Alternative). This is because waste generation by CMRR Facility operations would not be affected by the relocation of these activities to new facilities, and therefore, the same types and volumes of waste would be generated. See Section 4.3.11.1, Table 4–16, for waste types and quantities generated by CMR activities. Small quantities of waste would be generated during the transition phase to the new CMRR Facility laboratory building(s) at TA-55, resulting from the shutdown of operations in the existing CMR Building, decontamination of equipment prior to movement, packaging of SNM, and preoperational testing activities.

4.5.11.2 Pollution Prevention

At the new CMRR Facility, wastes would be minimized, where feasible, by:

- Recycling;
- Processing waste to reduce its quantity, volume or toxicity;
- Substituting materials or processes that generate hazardous wastes with materials or processes that will result in less hazardous wastes being produced; and
- Segregating waste materials to prevent contamination of nonhazardous materials.

4.6 Environmental Impacts for Alternative 4 (the "Hybrid Alternative at TA-6")

This section presents a discussion of the environmental impacts associated with Alternative 4 (the Hybrid Alternative at TA-6). Under Alternative 4, CMR administrative offices and support functions activities would remain in a portion of the existing CMR Building at TA-3 with only necessary structural and systems upgrades and repairs. The balance of CMR operations at LANL would be relocated to TA-6 in a new CMRR Facility consisting of one or two buildings that would provide secure laboratory spaces for research and analytical support activities. The buildings would be expected to operate for a minimum of 50 years, and roads would be constructed to connect the buildings. The impacts from construction and operation of these proposed facilities are described below. Disposition of the remaining unused portions of the CMR Building is discussed later in Section 4.7.2.

CMR operations at TA-6 under this alternative would be conducted at the levels of activity described for the Expanded Operations Alternative in the *LANL SWEIS*. The Expanded Operations Alternative presented in the *LANL SWEIS* provides the reference point from which incremental effects of this proposed action are measured.

4.6.1 Land Use and Visual Resources

4.6.1.1 Land Use

Construction and Operations Impacts—Under this alternative, space within Wings 1, 3, 5, and 7 of the existing CMR Building at TA-3 would be used for the administrative offices and support functions building. Wings 2 and 4 would be decommissioned and used for storage. Since this would not represent a change in the present use of those portions of the building, and would be consistent with current *LANL SWEIS* and *LANL Comprehensive Site Plan* designations of the area for Research and Development and Nuclear Materials Research and Development, respectively (see Section 3.2.1), there would be no impact on land use under this alternative.

In addition, new CMRR Facility laboratory building(s) would be constructed on undeveloped land within the north central portion of TA-6. This would disturb 22.75 acres (9.2 hectares) of land during construction. During CMR operations, 11.25 acres (4.55 hectares) would be permanently disturbed at TA-6. Impacts to land use at TA-6 from this alternative would be the same as those previously addressed in Section 4.4.1.1.

4.6.1.2 Visual Resources

Construction and Operations Impacts—Under this alternative, there would be no external change to the present CMR Building at TA-3. Thus, there would be no impact to visual resources or the current Class IV Visual Resource Contrast rating.

Visual impacts related to the construction of the CMRR Facility laboratory building(s) at TA-6 would be the same as those described in Section 4.4.1.2, except the three-story administrative offices and support functions building would be not constructed. The Visual Resource Contrast rating for the area would change from Class III to Class IV.

4.6.2 Site Infrastructure

Construction Impacts—The projected demands on key site infrastructure resources associated with construction under this alternative would be similar to, but less than, those presented for construction of Alternative 2 (Section 4.4.2). Existing LANL infrastructure would easily be capable of supporting the construction requirements for the new CMRR Facility laboratory building(s) at TA-6 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. Impacts on the local transportation network are expected to be negligible.

Operations Impacts—Resources needed to support operations under Alternative 4 would be the same as those presented for Alternative 2 operations. As such, it is likewise projected that existing LANL infrastructure resources would be adequate to support proposed mission activities over 50 years, and that CMR infrastructure requirements under this hybrid alternative would generally approximate those of the Expanded Operations Alternative presented in the *LANL SWEIS* for the CMR Building.

4.6.3 Air Quality and Noise

4.6.3.1 Air Quality

No changes to overall air quality would result from the construction and operation of the proposed new CMRR Facility laboratory building(s).

Nonradiological Impacts

Construction Impacts—Construction of the new CMRR Facility laboratory building(s) at TA-6 would result in temporary emissions from construction equipment, trucks, and employee vehicles. Construction activities would be the same as those for Alternative 2, except that the administrative offices and support functions building would not be constructed. Criteria pollutant concentrations from construction would be less than for Alternative 2.

Operations Impacts—Under this alternative, criteria and toxic pollutants would be generated from operation and testing of an emergency generator at TA-6. Air emissions from CMR operations at TA-6 under Alternative 4 are expected to be similar to or slightly less than for Alternative 2. Air emissions from the existing CMR Building at TA-3 would be reduced.

Radiological Releases

Construction Impacts—While no radiological releases to the environment would be expected in association with construction activities at TA-6, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site activities. Prior to commencing ground disturbance, NNSA would survey potentially affected areas to determine the extent and nature of any contamination and would be required to remediate any contamination in accordance with procedures established under LANL's environmental restoration program and in accordance with LANL's Hazardous Waste Facility Permit.

Operations Impacts—Releases of radionuclides under this alternative would be the same as those described for Alternative 2 (see Section 4.4.3.1).

4.6.3.2 Noise

Construction Impacts—Construction of the new CMRR Facility laboratory building(s) at TA-6 would result in some temporary increase in noise levels near the area from construction equipment and activities. Some disturbance of wildlife near the area could occur as a result of the operation of construction equipment. Noise impacts from construction under this alternative would be similar to those described for Alternative 2 (see Section 4.4.3.2).

Operations Impacts—Noise impacts from CMR operations at TA-6 would increase from those at existing operations at TA-6. There would be an increase in traffic and equipment noise (such as heating and cooling systems) in the area. The increase of noise from CMR operations at TA-6 could impact wildlife in the area. There would be little or no change in noise impacts to the public outside of LANL as a result of moving CMR activities to TA-6. These impacts would be similar to those for Alternative 2.

4.6.4 Geology and Soils

Construction and Operations Impacts—Construction of the CMRR Facility and its operation would not impact geologic resources at LANL. As discussed previously, new buildings would be designed and constructed in accordance with DOE Order 420.1A and sited to minimize the risk from geologic hazards. No known fault traces are located within the potential TA-6 site for the proposed new CMRR Facility. Thus, site geologic conditions would be unlikely to affect the facilities over the 50-year operational life expectancy.

The potential also exists for contaminated soils to be encountered during excavation and other site activities. Prior to commencing ground disturbance, NNSA would survey potentially affected contaminated areas to determine the extent and nature of any contamination and required remediation in accordance with procedures established under the LANL environmental restoration program.

4.6.5 Surface and Groundwater Quality

4.6.5.1 Surface Water

Construction Impacts—Impacts to surface water associated with construction of Alternative 4 would be the same as those presented for Alternative 2 (Section 4.4.5.1). There are no natural surface water drainages in the vicinity of the TA-6 construction site, 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 discharge of sanitary wastewater and no impact on surface waters. Although storm water runoff from construction areas could potentially impact downstream surface water quality, appropriate soil erosion and sediment control measures and spill prevention practices would similarly be employed during construction to minimize potential water quality impacts.

Operations Impacts—Impacts to surface water associated with operation of Alternative 4 would be identical to those presented for Alternative 2 (Section 4.4.5.1). Overall, operational impacts on site surface waters and downstream water quality would be expected to be negligible.

4.6.5.2 Groundwater

Construction Impacts—Groundwater required to support construction activities for Alternative 4 would be similar to, but less than, those presented for Alternative 2 (Section 4.4.5.2). The volume of groundwater required for construction would also be small compared to site availability and historic usage, and there would be no onsite discharge of wastewater to the surface or subsurface. Appropriate spill prevention controls, countermeasures, and procedures would similarly be employed, and no impact on groundwater availability or quality from construction activities in TA-6 would be anticipated.

Operations Impacts—Under Alternative 4, buildings housing CMR operations and activities at TA-3 and TA-6 would use the same volume of groundwater as used to support Alternative 2. Therefore, no additional impact on regional groundwater availability would be anticipated. Similarly, no sanitary or industrial effluent would be discharged directly to the surface or subsurface, and no operational impacts on groundwater quality would be expected.

4.6.6 Ecological Resources

Construction and Operations Impacts—Since the existing CMR Building would be used for lite laboratory/office functions, there would be no new development within the already highly developed TA-3 area. Thus, impacts to ecological resources would not occur.

Although less acreage would be disturbed, impacts to terrestrial resources, wetlands, aquatic resources, and threatened and endangered species would be the same as those described in Section 4.4.6 from the construction and operation of new CMRR Facility laboratory building(s) at TA-6.

4.6.7 Cultural and Paleontological Resources

4.6.7.1 Prehistoric Resources

Construction and Operations Impacts—As previously noted in Section 3.8.1, there are two prehistoric sites located within TA-3. However, these prehistoric sites, which the New Mexico State Historic Preservation Office has determined to be not eligible for the National Register of Historic Places, would not be affected by the continued use of the existing CMR Building under this alternative.

As noted in Section 3.8.1, one prehistoric site exists within TA-6. Adverse impacts to this prehistoric resource from construction and operation of the new CMRR Facility laboratory building(s) at TA-6 would not be expected. Potential impacts to this resource from the construction and operation of new CMRR Facility laboratory building(s) would be the same as those described for Alternative 2 in Section 4.4.7.1. If unexpected prehistoric resources were uncovered during construction, work would stop and appropriate assessment, regulatory compliance, and recovery measures would be undertaken.

4.6.7.2 Historic Resources

Construction and Operations Impacts—The use of the existing CMR Building under this alternative would only involve internal modifications to the existing structure, which has been modified and changed over the last 60 years. There would be no adverse impacts to historic resources at TA-3.

As noted in Section 3.8.2, there are 20 historic sites located within TA-6. Adverse impacts to historic resources at TA-6 from construction and operation of the new CMRR Facility laboratory building(s) would not be expected. Potential impacts to these historic resources from the construction and operation of new CMRR Facility laboratory building(s) would be the same as those described for Alternative 2 in Section 4.4.7.2.

4.6.7.3 Traditional Cultural Properties

Construction and Operations Impacts—Under this alternative, the existing CMR Building at TA-3 would continue to be used. Thus, there would be no impact to traditional cultural properties within the area.

The area at TA-6 proposed to house the new CMRR Facility laboratory building(s) has not been surveyed for traditional cultural properties. Prior to construction, a traditional cultural properties would be undertaken and site removal or avoidance, if needed, would be conducted. If any traditional cultural properties were located during construction, work would stop while appropriate action would be undertaken.

4.6.7.4 Paleontological Resources

Construction and Operations Impacts—As noted in Section 3.8.4, there are no paleontological resources present at TA-3 or TA-6. Thus, there would be no impacts to these resources from the use of the existing CMR Building at TA-3 and the construction of new CMRR Facility laboratory building(s) at TA-6.

4.6.8 Socioeconomics

Construction Impacts—Construction of new buildings at TA-6 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 34 months of construction. Under Alternative 4, fewer new buildings would be constructed at TA-6 than under Alternative 2 (Greenfield Alternative), but the peak number of construction workers would remain the same while the duration of construction activities would be shorter. Similarly, little or no noticeable impact on the socioeconomic conditions of the region of influence would be expected.

Operations Impacts—As previously noted in Section 2.7.4, the operational characteristics of the CMRR Facility are based on the level of CMR operations required to support the Expanded Operations Alternative analyzed in the *LANL SWEIS*. As noted in Table 2–2, CMRR Facility operations would require a workforce of approximately 550 workers. This would be an increase of 346 workers over currently restricted CMR operational requirements, but approximately equal to the number of CMR workers projected for the Expanded Operations Alternative in the *LANL SWEIS*. The *LANL SWEIS* presents a discussion of the socioeconomic impacts from an increase in total employment at LANL under the Expanded Operations Alternative, which includes the contributory affect of expanded CMR operations and an increase in workforce.

Nevertheless, the increase in the number of workers in support of expanded CMR operations would have little or no noticeable impact on socioeconomic conditions in the LANL Tri-County region of influence. Workers assigned to the new CMRR Facility would be drawn for the most part from existing LANL missions, including consolidated AC and MC activities. The contributory effect of the remaining new employment, in combination with the potential effects from other industrial and economic sectors within the regional economic area, would serve to reduce or mask any effect on the regional economy. New LANL employees hired to support CMRR facilities would comprise a small fraction of the LANL workforce (more than 9,000 in 1996), and an even smaller fraction of the regional workforce (more than 92,000 in 1999).

4.6.9 Human Health Impacts

4.6.9.1 Construction and Normal Operations

Radiological Impacts

Alternative 4 involves the continued use of the existing CMR Building in addition to the construction of new CMRR Facility laboratory building(s) at TA-6. The activities to be moved to TA-6 would include most of the activities that would result in routine normal radiological releases identified for Alternative 2. The activities that would remain at the existing CMR Building would be primarily administrative and support functions activities. Therefore, the human health impacts from routine normal operations associated with this alternative would be the same as those associated with Alternative 2. These impacts are summarized in Section 4.4.9.1.

Hazardous Chemicals and Explosives Impacts

No chemical-related health impacts to the public would be associated with Alternative 4. As stated in the *LANL SWEIS*, the laboratory quantities of chemicals that could be released to the atmosphere during routine normal operations are minor quantities and would be below the screening levels used to determine the need for additional analysis. There would also be no construction and operational increase in the use of chemicals as a result of this hybrid alternative. Construction 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.

4.6.9.2 Facility Accidents

This section addresses the potential impacts to workers at the facility and others onsite and the public due to accidents for Alternative 4. Additional details supporting the information presented here are provided in Appendix C.

Under Alternative 4, the existing CMR Building would continue to be used for administrative offices and support functions together with construction and operation of the new CMRR Facility laboratory building(s) at TA-6 where CMR capabilities and materials would be relocated. The new CMRR Facility would include safety features that would reduce the risks of accidents that currently exist under the No Action Alternative. From an accident perspective, the proposed CMRR Facility would be designed to meet performance Category 3 seismic requirements, and have a full confinement system that includes tiered pressure zone ventilation and high-efficiency particulate air filters.

Radiological Impacts

The frequency and consequences of potential accidents are the same as those described for the new CMRR Facility under Alternative 2 in Section 4.4.9.2. Continued use of the CMR Building for administrative offices and support functions purposes would involve small quantities of radioactive materials and the consequences of any accident would be dominated by the consequences of postulated accidents at the new CMRR Facility laboratory building(s).

Hazardous Chemicals and Explosives Impacts

Some of the chemicals used in LANL CMR operations are toxic and carcinogenic. The quantities of the regulated hazardous chemicals and explosive materials stored and used in the new CMRR Facility would be well below the threshold quantities set by the EPA (40 CFR 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.

4.6.9.3 Emergency Preparedness and Security Impacts

There would be no impacts on the emergency management and response program at LANL from the construction and operation of the new CMRR Facility laboratory building(s) at TA-6. Existing memoranda of understanding among NNSA, Los Alamos County, and the State of New Mexico to provide mutual assistance during emergencies and to provide open access to medical facilities would continue with minor administrative updates. Equipment and procedures used to respond to emergencies would continue to be maintained by NNSA. Security arrangements for the existing CMR Building would not change.

4.6.10 Environmental Justice

Construction Impacts—Under Alternative 4, CMR administrative offices and support functions activities would continue in the existing CMR Building, and new CMRR Facility laboratory building(s) would be constructed in TA-6. Construction impacts would be less than those presented for Alternative 2 because no new administration building would be constructed. Thus, under Alternative 4, construction at TA-6 would not result in adverse environmental impacts on the public living within the potentially affected area surrounding TA-6, including low-income and minority populations.

Operations Impacts—Environmental impacts due to normal operations at the new CMRR Facility laboratory building(s) at TA-6 would be identical to those presented for Alternative 2. Routine normal operations at the new CMRR Facility would not be expected to cause fatalities or illness among the general population surrounding TA-6, including minority and low-income populations living within the potentially affected area.

Radiological risks to the public that could result from accidents at the new CMRR Facility laboratory building(s) at TA-6 would also be identical to those presented for Alternative 2, and would not pose adverse environmental risks to low-income or minority populations living in the potentially affected area surrounding TA-6.

Residents of Pueblo San Ildefonso have expressed concern that pollution from CMR operations could contaminate Mortandad Canyon, which drains onto Pueblo land and sacred areas. As discussed in Sections 4.6.3, 4.6.5, and 4.6.9, CMR operations under this alternative would not be expected to adversely affect air or water quality, or result in contamination of Tribal lands adjacent to the LANL boundary. In summary, implementation of Alternative 4 would not pose disproportionately high or adverse environmental risks to low-income or minority populations living in the potentially affected area around the new CMRR Facility laboratory building(s) at TA-6.

4.6.11 Waste Management and Pollution Prevention

This sections presents an analysis of waste management and pollution prevention impacts for Alternative 4 (Hybrid Alternative at TA-6).

4.6.11.1 Waste Management

Construction Impacts—Before construction activities would begin at TA-6, LANL's Environmental Restoration Project would perform a radiological survey of the construction area to determine whether the Potential Release Sites are located in the construction area. Based on these survey results, further actions, including appropriate documentation, and contaminate removal, if necessary, would be completed under the LANL Environmental Restoration Project in accordance with LANL's Hazardous Waste Facility Permit. Potential wastes generated from such remediation activities have not been included in this impact analysis, because the type and amount of waste are unknown and cannot be adequately projected. Impacts from the disposal of contaminated soil could be similar to waste management impacts from CMRR Facility operations.

Only nonhazardous waste would be generated from construction activities to relocate CMR operations and materials to new CMRR Facility laboratory building(s) at TA-6. No radioactive or hazardous waste would be generated during construction activities.

Solid nonhazardous waste generated from construction activities associated with new CMRR Facility laboratory building(s) would be disposed of at the Los Alamos County Landfill located at LANL or its replacement facility. Approximately 263 tons (239 metric tons) of solid nonhazardous waste, consisting primarily of gypsum board, wood scraps, scrap metals, concrete, steel and other construction waste would be generated from the construction activities for the new laboratory facilities. This waste represents about 9 percent of the current annual solid nonhazardous waste generation rates at LANL of 2,860 tons (2,600 metric tons) per year. 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.

The construction debris would be collected in appropriate waste containers and transported to the landfill on a regular basis. This additional construction waste would only increase LANL's proportion of total wastes going to the landfill by three percent.

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 of managing waste associated with relocated CMR operations under this Alternative are assumed to be the same as for Alternative 1 (Preferred Alternative). This is because waste generation by CMRR Facility operations would not be affected by the relocation of these activities to new facilities, and therefore, the same types and volumes of waste would be generated. See Section 4.3.11.1, Table 4–16, for waste types and quantities generated by CMR activities. Small quantities of waste would be generated during the transition phase to the new CMRR Facility, resulting from the shutdown of operations in the existing CMR Building, decontamination of equipment prior to movement, packaging of SNM, and preoperational testing activities.

Locating new CMRR Facility laboratory building(s) at TA-6 would result in new impacts related to management of radioactive liquid wastes generated during CMR operations. Radioactive liquid wastes would be transferred to the Radioactive Liquid Waste Treatment Facility in TA-50 by truck transport or via a new pipeline installed across Two Mile Canyon. Possible transportation impacts arise from additional truck trips on public roads. Possible pipeline impacts include construction costs and disturbance of the pipeline corridor.

4.6.11.2 Pollution Prevention

At the new CMRR Facility, wastes would be minimized, where feasible, by:

- Recycling;
- Processing waste to reduce its quantity, volume or toxicity;
- Substituting materials or processes that generate hazardous wastes with materials or processes that would result in less hazardous wastes being produced; and
- Segregating waste materials to prevent contamination of nonhazardous materials.

4.7 Impacts Common to All Alternatives

As previously stated in Chapter 2, overall CMR operational characteristics at LANL would not change, regardless of the ultimate location of the replacement facility and the alternative implemented. Sampling methods and mission support operations associated with AC and MC would not change and, therefore, would not result in any additional environmental or health and safety impacts at LANL. Each of the alternatives would generally have the same number of operational impacts. In other words, all of the alternatives would have the same levels of emissions and releases into the environment, infrastructure requirements would be the same, and the same levels of radioactive and nonradioactive waste would be generated from CMR operations regardless of the ultimate location of the new CMRR Facility at LANL.

Other impacts not previously discussed in this chapter that would also be common to each of the proposed alternatives include transportation impacts (see Section 4.7.1), CMR Building disposition impacts (see Section 4.7.2), CMRR Facility disposition impacts (see Section 4.7.3), impacts during the transition from the CMR Building to the new CMRR Facility (see Section 4.7.4), and radiological impacts of sabotage involving the CMRR Facility (see Section 4.7.5). 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 ultimately the CMRR Facility when no longer needed, would result from the decontamination and demolition of the building and the transport and disposal of radiological and nonradiological waste materials. Radiological impacts of sabotage involving the CMRR Facility could result in building damage, loss of material containment and confinement, dispersion of radioactive materials, and population exposure.

4.7.1 Transportation Impacts

A transportation impact assessment was conducted for: (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. The results of this impact assessment are presented below for incident-free and transportation accident impacts to the public and workers.

One-time Movement of SNM, Equipment, and Other Materials—Under each alternative, SNM, equipment, and other materials would be moved during the transition from the existing CMR Building to the new CMRR Facility. Transport would be conducted within the LANL site. Movement distances would vary among the alternatives, from a very short distance, (about 100 to 300 feet [30 to 90 meters]) for Alternative 1 (Preferred Alternative) and Alternative 3 at TA-55, to about 3 to 5 miles (5 to 8 kilometers) for Alternatives 2 and 4 at TA-6. Movement of SNM outside of TA-55 would occur on DOE-controlled roads. DOE procedures and U.S. Nuclear Regulatory Commission regulations do not require the use of certified Type B casks within DOE sites. However, DOE procedures require closing the roads and stopping traffic for shipment of material (fissile or SNM) in noncertified packages. Shipment using certified packages, or smaller quantities of radioactive materials and SNM, could be performed while site roads are open. Under current LANL security procedures, the roads used to transport SNM and other radioactive materials under this EIS would have limited public access capability.

Routine Onsite Shipment of AC and MC Samples—Under each alternative, small quantities of radioactive materials and SNM samples would be shipped from the Plutonium Facility at TA-55 to the new CMRR Facility for AC and MC operations at either TA-55 or TA-6. This movement of samples would be performed on DOE-controlled roads, or on limited public access roads under current LANL security procedures.

4.7.1.1 Incident-free Transportation Impacts

One-time Movement of SNM, Equipment, and Other Materials—Transport of SNM, equipment, and other materials currently located at the CMR Building to a new CMRR Facility at TA-55 or TA-6 would occur over a period of 2 to 4 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 workers could receive a minimal dose from shipping and handling of SNM during the transition from the existing CMR Building to the new CMRR Facility. Based on a review of radiological exposure information in calendar year 2001, the average dose to CMR workers (including material handlers) is about 110 millirem per year. Since the transition to operations at the new CMRR Facility would occur over a 2- to 4-year period, the material handler worker dose would be similar to those for routine operations currently performed at the CMR Building.

Routine Onsite Shipment of AC and MC Samples—The public would not be 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 new CMRR Facility. These include metal, liquid, or powder samples of weapons-grade plutonium, plutonium-238, uranium-235, uranium-233, and other actinide isotopes.

CMR workers routinely receive minimal doses from the shipping and handling of SNM samples between the Plutonium Facility at TA-55 and the CMR Building. Estimates of radiation doses likely to be received by CMRR Facility workers (which includes handling, packaging, loading, and unloading) were based on a review of workforce doses at CMR and TA-55 facilities. As previously noted, based on a review of radiological exposure information in calendar year 2001, the average dose to CMR workers (including material handlers) is about 110 millirem per year. Since the distance for shipping small quantities of radioactive material and samples between the Plutonium Facility at TA-55 and the existing CMR Building at TA-3 and shipping to TA-6 are not that different, additional worker dose impacts would not be expected.

4.7.1.2 Impacts From 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 new CMRR Facility would be bounded in frequency and consequence by other facility accidents, for each alternative presented earlier in this Chapter. Once a shipment is prepared for low-speed movement, the likelihood and consequence of any foreseeable accident are considered to be very small.

Routine Onsite Shipment of AC and MC Samples—For all alternatives, sample quantities of SNM transported between the Plutonium Facility at TA-55 and the new CMRR Facility would be small. These include metal, liquid, or powder samples of weapons-grade plutonium, plutonium-238, uranium-235, uranium-233, and other actinide isotopes. The *LANL SWEIS* included a bounding transportation accident scenario involving shipments of liquid plutonium-238 samples between the Plutonium Facility at TA-55 and the existing CMR Building at TA-3, which resulted in a calculated dose of 8.7 rem to a maximally exposed individual standing very close to the evaporating liquid for 10 minutes. Under this scenario, a truck accident rate for a closed road under administrative controls was also estimated to be 8.59×10^{-9} per kilometer (*LANL SWEIS*, DOE 1999a). Therefore the accident rate for a 5-mile (8-kilometer) distance (such as the movement of SNM between TA-55 and TA-6) would be 7.16×10^{-8} per trip. The estimate provided for the Expanded Operations Alternative in the *LANL SWEIS*, assumed that there would be about 240 shipments of liquid plutonium-238 per year. Using this data, the onsite transportation accident risk to the maximally exposed individual member of the public is presented in **Table 4–26** below.

Table 4–26 Transportation Accident Impacts to the Maximally Exposed Individual Member of the Public

Factor	*No Action*	*Alternatives 1 and 3 at TA-55*	*Alternatives 2 and 4 at TA-6*
Accident frequency (per year)	8.85×10^{-8} [a]	0 [b]	0.0000172
Dose (rem per year)	7.7×10^{-7} [a]	0 [b]	0.00015
Risk (latent cancer fatality per year)	3.1×10^{-10} [a]	0 [b]	6.0×10^{-8}

[a] Values are taken from *LANL SWEIS* under no Action Alternative.
[b] The distance between the Plutonium Facility and the new CMRR Facility at TA-55 would be very short, and no truck would be used.

4.7.2 CMR Building Disposition Impacts

As previously discussed in Chapter 2, certain areas within the existing CMR Building, pieces of equipment, and building systems have become contaminated over the past 50 years of operation, with radioactive material and operations involving SNM. These areas include about 3,100 square feet (290 square meters) of contaminated conveyors, gloveboxes, hoods and other equipment items; 760 cubic feet (20 cubic meters) of contaminated ducts; 580 square feet (50 square meters) of contaminated hot cell floor space; and 40,320 square feet (3,750 square meters) of laboratory floor space.

The disposition options for the existing CMR Building include:

- *Disposition Option 1:* reuse of the building for administrative and other activities appropriate to the physical conditions of the structure with the performance of necessary structural and systems upgrades and repairs. No demolition of any portions of the CMR Building would occur under this option.

- *Disposition Option 2:* decontamination, decommission and demolition of selected parts of the existing CMR Building with some reuse of portions of the CMR Building.

- *Disposition Option 3:* decontamination, decommission and demolition of the entire existing CMR Building.

For the purpose of this EIS only Disposition Option 3 is discussed in detail with regard to its potential impacts, because activities associated with this option would have the greatest potential environmental consequence, including generating the largest volume of waste material.

Disposition impacts from the demolition of the CMR Building are discussed qualitatively below for air quality and noise, surface and groundwater quality, ecological resources, human health, and transportation. Quantitative information has not been presented for these resource areas, since project-specific work plans have not been prepared nor has the CMR Building been completely characterized with regards to types and locations of contamination. Preliminary estimates on the amount of waste material that could be generated by the demolition of the CMR Building are discussed in waste management in this section.

Air Quality and Noise

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

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

Surface and Groundwater Quality

Little or no effect on water resources would be anticipated. The demolition of the CMR Building would not disturb surface water or generate liquid effluents that would be released to the surrounding environment. Silt fences, hay bales, or other appropriate Best Management Practices would be employed to ensure that fine particulates are not transported by stormwater into surface water features in the vicinity of the CMR Building. Potable water use at the site would be limited to that necessary for washing equipment, dust control, and sanitary facilities for workers.

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 it is mostly roads, parking areas, and concrete pads. Wildlife in the vicinity could be disturbed by demolition activity and noise when the building is razed, building foundation and buried utilities removed, contaminated soils excavated, and waste trucked to disposal sites.

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 demolition process. The only radiological effect on noninvolved workers or members of the public would be from radiological air emissions. Any emissions of contaminated particulates would be reduced by the use of plastic draping and contaminate containment coupled with HEPA filters. Contaminate releases of radioactive particulate from disposition activities are expected to be lower than releases from past CMR operations.

The demolition of the CMR Building would also involve the removal of some asbestos-contaminated material. Removal of asbestos-contaminated material would be conducted according to existing asbestos management programs at LANL in compliance with strict asbestos abatement guidelines. Workers would be protected by personal protective equipment and other engineered and administrative controls, and no asbestos would likely be released that could be inhaled by members of the public.

Transportation

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

Waste Management

The amount and type of waste material that would be generated by the demolition of the CMR Building would be expected to be within the capacity of existing waste management systems, and would not be expected to substantially impact existing waste management disposal operations at LANL. Waste minimization and pollution prevention principles would be used to the maximum extent practicable under DOE policy. It is anticipated that the majority of waste material produced by the demolition of the CMR Building would be solid waste and recyclable materials (about 20,000 cubic yards [15,300 cubic meters]). The amount of radioactive waste material is anticipated to be slightly less (about 16,000 cubic yards [12,200 cubic meters]) (LANL 2003 - *Preliminary Chemistry and Metallurgy Research Building Disposition Study*, February 11, 2003, LA-UR-03-1122). Solid waste would be disposed of at the Los Alamos County landfill at LANL or at a replacement facility. It is expected that most of the low-level radioactive waste could be transported offsite to commercially-licensed facilities for disposal and the remainder would be disposed of onsite at LANL's TA-54, Area G. For the purposes of this discussion, NNSA has evaluated using both onsite and offsite disposal options for low-level radioactive waste and that the potential environmental consequences of these two waste management disposition options would be bounding.

It is anticipated that most of the low level radioactive waste, including concrete, soil, steel, and personal protective equipment, could be accepted at commercially-licensed offsite waste disposal facilities, and that NNSA would likely pursue this offsite disposal. Some of the low level radioactive waste would be disposed of at LANL's TA-54, Area G. It is anticipated that this amount of material would not affect Area G operations. Therefore, most of the low-level radioactive waste generated by the demolition of the CMR Building, would likely be disposed of at facilities at the Nevada Test Site and the existing commercial facility at Clive, Utah with the capacity to accept this low-level radioactive waste. Using either of these two offsite facilities (or other facilities that may become available in the future when NNSA makes a decision on the disposition of the CMR Building) would result in only a small impact on LANL's TA-54, Area G low-level radioactive waste disposal capacity.

All other wastes generated by the CMR Building disposition activities would be handled, managed, packaged, and disposed of in the same manner as the same wastes generated by other activities at LANL (see Section 3.12). Any contaminated debris that would be characterized as mixed low-level radioactive waste would also be stored onsite at TA-54, Area G pending identification of an offsite treatment and disposal facility. Currently, most of LANL's mixed low-level radioactive waste is sent offsite to other DOE or commercial facilities for treatment and disposal. It is anticipated that the demolition of the CMR Building would likely generate an amount of mixed low-level radioactive waste that would be within the current disposal capacity of both the Nevada Test Site and the commercial facility at Clive, Utah. If either of these sites were closed by the time of the CMR Building demolition, alternate waste disposal facilities would be sought.

Asbestos contaminated radioactive material from the demolition of the CMR Building would be disposed of in a disposal cell in TA-54, Area G, which is dedicated to the disposal of radioactively contaminated asbestos waste. It is anticipated that the amount of this material would be within the current capacity of the disposal cell. Asbestos that is not radiologically contaminated would be packaged and sent to the LANL asbestos transfer station for shipment offsite to a permitted asbestos disposal facility along with other asbestos waste generated at LANL. It is anticipated that the amount of asbestos generated by the demolition of the CMR Building would not exceed the disposal capacity of existing facilities.

Some of the wastes generated from the CMR Building disposition activities would be considered residual radioactive material. Some of these materials can be recycled or reused as backfill, or topsoil cover. Steel and lead could be stored, reused, or recycled at LANL to the extent practicable and in accordance with DOE policy. It is not expected that the amount of lead would be beyond the management or storage capacity at LANL. Any radioactive liquid waste generated during disposition activities would be transferred to the RLWTF at TA-50 at LANL for treatment. It is anticipated that the amount of radioactive liquid waste from the demolition of the CMR Building would be well within the treatment and disposal capacity of the RLWTF. No affect on RLWTF is anticipated.

Although not anticipated, any hazardous waste generated during the demolition of the CMR Building would be handled, packaged, and disposed of according to LANL's hazardous waste management program. The amount is expected to be well within the management capacity of LANL's hazardous waste management and disposal program.

4.7.3 Disposition of the CMRR Facility

The ultimate disposition of the new CMRR Facility would be considered at the end of its design life-time operation of at least 50 years. It is anticipated that the impacts from the disposition of the CMRR Facility would be similar to those discussed for the disposition of the existing CMR Building.

4.7.4 Impacts During the Transition from the CMR Building to the New CMRR Facility

During a four-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. Transportation impacts from the one-time movement of SNM, equipment, and other materials from the CMR Building to the new CMRR Facility and the routine onsite shipment of AC and MC samples are discussed in Section 4.7.1. 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 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 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. Transportation accident impacts from the one-time movement of SNM, equipment, and other materials from the CMR Building to the new CMRR Facility and the routine onsite shipment of AC and MC samples are discussed in Section 4.7.1.2.

4.7.5 Radiological Impacts of Sabotage Involving the CMRR Facility

An act of sabotage involving the CMRR Facility is not predictable, although the possibility cannot be dismissed. Furthermore, the nature of such an act and the extent of damage can be postulated to cover a wide range of possibilities. If an act of sabotage were directed at the CMRR Facility with the intent of releasing radioactive materials, it could involve building damage including loss of material containment and confinement followed by the dispersion of radioactive materials and exposure of the population.

The consequences of an act of sabotage have not been analyzed in this EIS. However, the consequences of a facility-wide spill and facility-wide fire involving the entire CMRR Facility's radioactive material inventory have been provided. These accidents, along with a vault spill accident, were determined to have the greatest potential consequences. To the extent that an act of sabotage could involve the entire CMRR Facility's radioactive material inventory, it would be expected that the consequences would be similar. In addition, there would be no large inventories of hazardous chemicals at the CMRR Facility. A discussion of severe accident scenarios and their consequences for the CMRR Facility can be found in Appendix C.4 and C.5, respectively.

4.8 CUMULATIVE IMPACTS

As previously discussed in Chapter 4, impacts associated with the Expanded Operations Alternative presented in the *LANL SWEIS* provide the reference point from which incremental effects of the proposed action at LANL are measured. In this section, the projected incremental environmental impacts of constructing a new CMRR Facility at TA-55 were added to the environmental impacts of other present and reasonably foreseeable future actions to determine cumulative impacts at LANL.

Most present and reasonably foreseeable future actions planned for LANL were addressed in the *LANL SWEIS* and were included in the impacts discussed for Alternative 1 presented in Section 4.4. However, a number of NNSA proposed actions affecting LANL and TA-55 have been identified since the publication of the *LANL SWEIS* in January 1999. Impacts resulting from these actions were addressed in the following environmental documents:

- *Special Environmental Analysis for the Department of Energy, National Nuclear Security Administration: Actions Taken in Response to the Cerro Grande Fire at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/SEA-03) (DOE 2000b)
- *Environmental Assessment for the Proposed Construction and Operation of a New Interagency Emergency Operations Center at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EA-1376) (DOE 2001)
- *Environmental Assessment of the Proposed Disposition of the Omega West Facility at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EA-1410) (DOE 2002a)
- *Environmental Assessment for the Proposed Future Disposition of Certain Cerro Grande Fire Flood and Sediment Retention Structures at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EA-1408) (DOE 2002c)
- *Environmental Assessment for Proposed Access Control and Traffic Improvements at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EA-1429) (DOE 2002d)
- *Environmental Assessment for the Installation and Operation of Combustion Turbine Generators at Los Alamos National Laboratory, Los Alamos, New Mexico* (DOE/EA-1430) (DOE 2002g)
- *Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at the Los Alamos National Laboratory* (DOE/EIS-319) (DOE 2002e)
- *Environmental Assessment for Conversion of an Existing Building into a Proposed Radiography Facility at TA-55 at Los Alamos National Laboratory, Los Alamos, New Mexico*

In addition, DOE NNSA recently issued a Notice of Intent to prepare a *Supplemental Programmatic EIS on Stockpile and Stewardship for a Modern Pit Facility* (67 FR 59577). This Supplemental EIS will support two decisions: (1) whether to proceed with the Modern Pit Facility, and (2) if so, where to locate the Modern Pit Facility. LANL is one of the potential locations for the Modern Pit Facility, evaluated in this Supplemental EIS. The Supplemental EIS will also evaluate the reasonability of upgrading existing LANL facilities to increase pit production capacity. The contributory effect of this action at LANL is discussed in this section.

These completed and ongoing actions at LANL were identified and discussed in Sections 1.6.1 and 1.6.2, respectively. Impacts from these actions were factored into the estimates of total cumulative impacts, where possible, for the 50-year operating period for the potentially affected resource areas presented in this section. The potential cumulative impacts of present and reasonably foreseeable future actions at LANL in the area of TA-3, TA-6, and TA-55 are discussed below. The cumulative impacts of relocating CMR operations to TA-55 are not expected to exceed the level of operations and impacts described by the Expanded Operations Alternative in the *LANL SWEIS*.

In this section, cumulative site impacts are presented only for those "resources" that reasonably could be expected to be affected by the proposed action. These include site infrastructure requirements, air quality, human health, and waste management. The methodology for assessing cumulative impacts is presented in Appendix A.

Site Infrastructure Requirement Impacts—As previously discussed in Section 4.4.2, site electrical capacity in terms of peak load demand and available site water capacity could be exceeded in the future, even in the absence of any new demands associated with expanded CMR operations. This potential exists based on the projected infrastructure requirements of the *LANL SWEIS* Expanded Operations Alternative and the forecasted demands of other non-LANL users. Should these projections be fully realized over the 50-year timeframe analyzed in this document, LANL could cumulatively require 118 percent of the current peak load capacity, 95 percent of its total available electrical capacity, and 142 percent of the available water capacity. Thus, additional peak load and water supply capacity would be needed.

Implementation of Alternative 1 (Preferred Alternative) would account for about two percent of the site's use of electric peak load capacity, total electrical capacity, and water supply, respectively. The Modern Pit Facility, if located at LANL, could require another 2 percent of the available electrical load and water supply. No infrastructure capacity constraints are anticipated in the near term, as LANL operational demands to date on key infrastructure resources, including electricity and water, have been well below projected levels and well within site capacities.

DOE and NNSA are currently pursuing actions to increase the reliability and availability of electric power at LANL including the construction and installation of new gas-fired combustion turbine generators at the TA-3 Co-generation Complex. This project would increase LANL's onsite electric generation capacity by 20 megawatts by the end of fiscal year 2004 and by an additional 20 megawatts after fiscal year 2007 (see Section 3.3.2). 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. Los Alamos County is currently pursuing the use of San Juan-Chama Transmountain Diversion Project water to secure additional water rights and supply for its remaining water customers. Any potential shortfalls in available capacity would be addressed as increased site requirements are realized.

Air Quality Impacts—Cumulative impacts on air quality at LANL from expanded CMR operations would be the same as analyzed in the *LANL SWEIS*. As such, LANL would remain in compliance with all Federal and state ambient air quality standards. Criteria pollutant air emissions from the Modern Pit Facility and other proposed actions at LANL would not result in cumulatively significant impacts. Effects on air quality from associated construction and excavation activities would be temporary and localized.

Public and Occupational Health and Safety – Normal Operations Impacts—Cumulative impacts in terms of radiation exposure to the public and workers at LANL would be expected to remain within the level of impacts forecasted under the Expanded Operations Alternative described in the *LANL SWEIS*. There would be no increase expected in the number of latent cancer fatalities in the population from site operations if CMR and Modern Pit Facility operations were both located at LANL. The dose limits for individual members of the public are given in DOE Order 5400.5. As discussed in that Order, the dose limit from airborne emissions is 10 millirem per year, as required by the Clean Air Act; the dose limit from drinking water is 4 millirem per year, as required by the Safe Drinking Water Act; and the dose limit from all pathways combined is 100 millirem per year. Therefore, the dose to the maximally exposed offsite individual would be expected to remain well within the regulatory limits. No increase in the number of latent cancer fatalities among onsite workers would be expected due to radiation from CMR and Modern Pit Facility operations, regardless of location, over the 50-year operating period. The contribution to cumulative public and occupational health and safety impacts from other proposed actions at LANL is expected to be minor.

Waste Management Impacts—Cumulative amounts of waste generated at LANL from CMR operations would remain within the level of impacts forecast under the Expanded Operations Alternative described in the *LANL SWEIS*. It is unlikely that increased CMR and Modern Pit Facility or upgraded plutonium facility operations would have a major impact on waste management at LANL, because sufficient capacity exists to manage waste from these operations. However, 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. Solid wastes would be disposed of at the Los Alamos County Landfill or other appropriate permitted solid waste landfills. Demolition wastes would similarly be disposed of at appropriate facilities.

Transuranic wastes generated during the operational phases of the CMRR Facility would be within the level of impacts forecast under the Expanded Operations Alternative described in the *LANL SWEIS*, however Modern Pit Facility operations over 50 years, depending upon the manufacturing level, could result in the generation of very large amounts of TRU waste. 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 TRU waste from CMRR, Modern Pit Facility, and other DOE facility operations.

4.9 MITIGATION MEASURES

Following the completion of an EIS and its associated Record of Decision, NNSA is required to prepare a Mitigation Action Plan that addresses any mitigation commitments expressed in the Record of Decision (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 Record of Decision. 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 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 to 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.

4.10 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.

4.10.1 Unavoidable Adverse Environmental Impacts

Implementing the alternatives considered in this EIS would result in unavoidable adverse impacts on the human environment. In general, these impacts are expected to be minimal and would come from incremental impacts attributed to the operations of either the existing CMR Building or new CMRR buildings at LANL.

CMR operations at LANL would result in unavoidable radiation exposure to workers and the general public. Workers would be exposed to radiation and other chemicals associated with analytical chemistry, and materials characterization, uranium processing, actinide research and processing and fabrication and metallography. The incremental annual dose contribution from CMR operations to the maximally exposed offsite individual, general population, and workers is discussed in Sections 4.2.9, 4.3.9, 4.4.9, 4.5.9, and 4.6.9.

The generation of fission products would also be unavoidable. Any other waste generated during operations would be collected, treated and stored, and eventually removed for suitable recycling or disposal in accordance with applicable EPA regulations.

CMR operations in new CMRR Facility buildings at LANL have minimal unavoidable adverse impacts related to air emissions. Air emissions would include various chemical or radiological constituents in the routine emissions typical of nuclear facility operations, although CMR activities do not release major emissions to the atmosphere at the laboratory. Air emissions at LANL would occur regardless of CMR activities. These routine 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 EIS. The decontamination and decommissioning of the CMR Building would result in the one-time generation of radioactive and non-radioactive 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.

Temporary construction impacts associated with the construction of the new CMRR Facility at LANL would also be unavoidable. These impacts would include the generation of fugitive dust, noise, and increased construction vehicle traffic.

4.10.2 Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Implementation of the alternatives, including the No Action Alternative, would cause short-term commitments of resources and would permanently commit certain resources (such as energy). For 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 No Action Alternative, environmental resources have already been committed to operations at the CMR Building. This commitment would serve to maintain existing environmental conditions with little or no impact on the long-term productivity of the environment.

Under the proposed action, overall CMR operations would not change from those operations described by the *LANL SWEIS* Expanded Operations Alternative for the CMR Building. Therefore, each of the alternatives would exhibit similar relationships between local short-term uses of the environment and the maintenance and enhancement of long-term productivity, with minimal differences in resource commitments. The short-term use of environmental resources at LANL would be greater than for the No Action Alternative. The short-term commitments of resources would include the space and materials required to construct new buildings, the commitment of new operations support facilities, transportation, and other disposal 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 operations and the associated materials, including process emissions and the handling of waste from equipment refurbishment.

Regardless of location, air emissions associated with the new CMRR Facility would introduce small amounts of radiological and nonradiological constituents to the air of the regions around LANL. Over the 50-year operating period, these emissions would result in additional loading 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 life would require a small increase in energy and space at LANL treatment, storage, or disposal facilities or their replacement offsite disposal facilities. Regardless of the location, the land required to meet the solid waste needs would require a long-term commitment of terrestrial resources. Upon the closure of the CMR Building and the new CMRR Facility, NNSA could decontaminate and decommission the buildings and equipment and restore them to brown-field sites, which could be available for future reuse.

Regardless of location, 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 operate the new CMRR Facility at LANL would not affect the long-term productivity of the laboratory.

4.10.3 Irreversible and Irretrievable Commitments of Resources

Irreversible and irretrievable commitments of resources for each alternative, including the No Action Alternative, potentially would include mineral resources during the life of the project and energy and water used in operating the existing CMR Building and the new CMRR Facility. The commitments of capital, energy, labor, and materials during the implementation of the alternatives generally would be irreversible.

Energy expended would be in the form of fuel for equipment and vehicles, electricity for facility operations, and human labor. The energy consumption of facilities to support CMR operations would be a small fraction of the total energy used at the laboratory. None of the alternatives evaluated in this EIS would require significantly higher or lower energy consumption. CMR operations would generate nonrecyclable waste steams, such as radiological and nonradiological solid waste and some wastewater. However, certain materials and equipment used during operations could be recycled when the buildings are decontaminated and decommissioned.

The implementation of the alternatives considered in this EIS, including the No Action Alternative, would require water, electricity, and diesel fuel. Water would be obtained from onsite sources. Electricity and diesel fuel would be purchased from commercial sources. These commodities are readily available and the amounts required would not have an appreciable impact on available supplies or capacities. From a material and energy resource commitment perspective, resource requirements would be minimal.

The disposal of hazardous and radioactive waste would also cause irreversible and irretrievable commitments of land, mineral, and energy resources. Hazardous waste and low-level radioactive waste disposal would irreversibly and irretrievably commit land for its disposal. For each of the alternatives analyzed in this document, the No Action Alternative would require the least commitment of land, mineral, and energy resources.

5. APPLICABLE LAWS, REGULATIONS, AND OTHER REQUIREMENTS

Chapter 5 presents the applicable laws, regulations, and other requirements that apply to the proposed action and alternatives. Federal laws and regulations are summarized in Section 5.3; Executive Orders in Section 5.4; U.S. Department of Energy (DOE) regulations and orders in Section 5.5; and New Mexico laws and agreements in Section 5.6. Emergency management and response laws, regulations, and Executive Orders are discussed in Section 5.7. Consultations with Federal, state, and local agencies and federally-recognized American Indian Nations are discussed in Section 5.8.

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 result in a violation of any Federal, state, or local law or requirement [40 *Code of Federal Regulations* (CFR)1508.27] or require a permit, license, or other entitlement (40 CFR 1502.25). This chapter provides a baseline summary assessment of major environmental requirements, agreements, and permits that relate to consolidation and relocation of mission-critical chemistry and metallurgy research (CMR) capabilities.

There are a number of Federal environmental laws that affect environmental protection, health, safety, compliance, and/or consultation at every DOE location. In addition, certain environmental requirements have been delegated to state authorities for enforcement and implementation. Furthermore, state legislatures have adopted 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, orders, and other requirements.

The various action alternatives analyzed in this *Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory (CMRR EIS)* 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 and New Mexico state requirements may depend on whether a facility is newly built (preoperational) or is incorporated in whole or in part into an existing facility. Section 2.5 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, legislatures of the affected states, 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 (DOT), 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. These would be satisfied through the legal/regulatory process, including the preparation of the *CMRR EIS*, 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 (affecting polychlorinated biphenyl transformers and other designated substances); the Federal Insecticide, Fungicide, and Rodenticide Act (affecting pesticide/herbicide applications); the Hazardous Materials Transportation Act; and (if there were to be a spill of a hazardous substance) the Comprehensive Environmental Response, Compensation, and Liability Act (Superfund).

Executive Orders establish policies and requirements for Federal agencies. Executive Orders are applicable to Executive branch agencies, but do not have the force of law or regulation.

In addition to implementing some Federal programs, state legislatures develop their own laws. State statutes supplement as well as implement Federal laws for protection of air and water quality and for groundwater. 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 a level of protection of the public, 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 are all within the state of New Mexico. Each of the alternatives is located on Los Alamos National Laboratory (LANL) property controlled by DOE. For a broader review of environmental regulations and compliance issues at LANL, see the 1999 *Final Los Alamos National Laboratory Site-Wide Environmental Impact Statement* (DOE/EIS-0238).

DOE has authority to regulate some environmental activities, as well as the health and safety aspects of nuclear facilities 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 regulations and Orders 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 emergency management and response laws, regulations, and Executive Orders. Consultations with applicable agencies and federally-recognized American Indian Nations are discussed in Section 5.8.

5.3 APPLICABLE FEDERAL LAWS AND REGULATIONS

This section describes the Federal environmental, safety, and health laws and regulations that could apply to the proposed action and alternatives.

National Environmental Policy Act of 1969, as amended (42 *United States Code* [U.S.C.] 4321 *et seq.*)—NEPA establishes a national policy promoting awareness of the environmental consequences of human activity on the environment and consideration of environmental impacts during the planning and decisionmaking stages of a project. It requires Federal agencies to prepare a detailed EIS for any major Federal action with potentially significant environmental impact.

This EIS has been prepared in accordance with NEPA requirements, Council on Environmental Quality regulations (40 CFR 1500 *et seq*.), and DOE (10 CFR 1021, DOE Order 451.1B) provisions for implementing the procedural requirements of NEPA. It discusses reasonable alternatives and their potential environmental consequences.

Atomic Energy Act of 1954 (42 U.S.C. 2011 *et seq.*)—The Atomic Energy Act authorizes DOE to establish standards to protect health or minimize dangers to life or property for activities under DOE's jurisdiction. Through a series of DOE Orders, an extensive system of standards and requirements has been established to ensure safe operation of DOE facilities. DOE regulations are found in 10 CFR.

The Atomic Energy Act establishes regulatory control of the disposal of radioactive waste as well as production, possession, and use of three types of radioactive material: source, special nuclear, and byproduct materials. The Atomic Energy Act authorizes DOE to set radiation protection standards for itself and its contractors at DOE nuclear facilities and provides exclusions from U.S. Nuclear Regulatory Commission (NRC) licensing for defense production facilities.

The Atomic Energy Act authorizes DOE to establish standards that protect health and minimize danger to life and property from activities under DOE's jurisdiction. DOE manages its facilities through regulations (set forth in 10 CFR 830) and issuance of DOE Orders and associated standards and guidance. Requirements for environmental protection, safety, and health are implemented at DOE sites primarily through contractual mechanisms that establish the applicable DOE requirements for management and operating contractors.

Nuclear safety regulations are found in CFR. Several nuclear safety rules and environmental procedural rules are in effect (for example, 10 CFR 835, "Occupational Radiation Protection"), and more are in final stages of development. Nuclear safety regulations are effective under the schedule and implementing requirements of each rule, regardless of whether they are included in DOE contracts. DOE contractors are also required to comply with all applicable external laws and regulations, regardless of contract language.

Chapter 4 discusses the application of DOE procedures to the management and control of radioactive waste for each alternative. Potential occupational radiation doses and doses to the general public would be well within DOE limits.

Clean Air Act of 1970, as amended (42 U.S.C. 7401 *et seq.*)—The Clean Air 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" with regard to the control and abatement of air pollution.

The Clean Air Act: (1) requires EPA to establish National Ambient Air Quality Standards as necessary to protect the public health, with an adequate margin of safety, from any known or anticipated adverse effects of a regulated pollutant (42 U.S.C. 7409 *et seq.*); (2) requires establishment of national standards of performance for new or modified stationary sources of atmospheric pollutants (42 U.S.C. 7411); (3) requires specific emission increases to be evaluated so as to prevent a significant deterioration in air quality (42 U.S.C. 7470 *et seq.*); and (4) requires specific standards for releases of hazardous air pollutants (including radionuclides) (42 U.S.C. 7412). These standards are implemented through implementation plans developed by each state with EPA approval. The Clean Air Act requires sources to meet standards and obtain permits to satisfy those standards.

Emissions of air pollutants are regulated by EPA under 40 CFR Parts 50 through 99. Radionuclide emissions from DOE facilities are regulated under the National Emission Standards for Hazardous Air Pollutants Program under 40 CFR 61. Approval to construct a new facility or to modify an existing one may be required by these regulations under 40 CFR 61.07.

Chapter 4 compares expected releases at each site with applicable standards. Some releases would result from construction activities at those alternatives requiring construction. During operation, small releases would result during testing of emergency diesel generators and from other sources. At both of the potential construction sites, it was found that the magnitude of the releases would not warrant a Prevention of Significant Deterioration analysis.

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 or runoff of pollutants to surface waters to comply with Federal, state, interstate, and local requirements.

The Clean Water Act provides water quality standards for the Nation's waterways, guidelines and limitations for effluent discharges from point-source discharges, and the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES program is administered by EPA, pursuant to regulations in 40 CFR 122 *et seq.* Sections 401 through 405 of the Water Quality Act of 1987 added Section 402(p) to the Clean Water Act requiring that EPA establish regulations for permits for storm water discharges associated with industrial activities. Storm water provisions of the NPDES program are set forth at 40 CFR 122.26. Permit modifications are required if discharge effluent is altered. Section 404 of the Clean Water Act requires permits for the discharge of dredge or fill materials into navigable waters.

Chapter 3 discusses existing waste water treatment facilities and the NPDES status at each site. Chapter 4 discusses management of waste water during construction and operation at each of the alternatives. Sanitary waste would be managed by use of portable toilet facilities during construction. During operation, sanitary wastes would be processed through existing facilities under all of the alternatives. It is anticipated that there would be no new discharges at TA-55 (Alternatives 1 and 3) requiring a new NPDES permit. If the new CMRR facility were to be located at TA-6 (Alternatives 2 and 4), new storm water discharge structures would be constructed requiring a new NPDES permit.

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 of drinking water. The implementing regulations, administered by EPA unless delegated to 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 that have at least 15 service connections used by year-round residents or regularly serve at least 25 year-round residents. The EPA regulations implementing the Safe Drinking Water Act are found at 40 CFR 100 through 149. For radioactive material, the regulations specify that the average annual concentration of 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 beta activity (40 CFR Section 141.16[a]). 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.

Chapter 3 discusses groundwater resources and current groundwater protection programs at each site. Chapter 4 discusses protection of groundwater for each alternative. No alternative would involve a direct discharge to the surface or subsurface of sanitary or industrial effluent.

Low-Level Radioactive Waste Policy Act of 1980, as amended (42 U.S.C. 2021 *et seq.*)—This legislation amended the Atomic Energy Act to specify that the Federal Government is responsible for disposal of low-level radioactive waste generated by its activities, and that states are responsible for disposal of other low-level radioactive waste. It provides for and encourages interstate compacts to carry out the state responsibilities.

Low-level radioactive waste is expected to be generated from activities conducted under all of the alternatives.

Chapter 3 discusses existing programs for management of low-level waste at each site. Chapter 4 discusses the volume of low-level radioactive waste and its management for each of the alternatives.

Solid Waste Disposal Act of 1965, as amended by the Resource Conservation and Recovery Act of 1976 and the Hazardous and Solid Waste Amendments of 1984 (42 U.S.C. 6901 *et seq.*)—The Solid Waste Disposal Act of 1965, as amended, governs the transportation, treatment, storage, and disposal of hazardous and nonhazardous waste. Under the Resource Conservation and Recovery Act of 1976 (RCRA), that 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.

Regulations imposed on a generator or on a treatment, storage, and/or disposal facility vary according to the type and quantity of material or waste generated, treated, stored, and/or disposed. The method of treatment, storage, and/or disposal also impacts the extent and complexity of the requirements.

Chapter 3 provides information on the management of hazardous and mixed radioactive waste for each of the alternative sites. Chapter 4 discusses the management of this waste for each of the alternatives.

Federal Facility Compliance Act of 1992 (42 U.S.C. 6961 *et seq.*)—The Federal Facility Compliance Act, enacted on October 6, 1992, amended RCRA. Section 102(a)(3) of the Federal

Facility Compliance Act waives sovereign immunity for Federal facilities from fines and penalties for violations of RCRA, state, interstate, and local hazardous and solid waste management requirements. This waiver was delayed for 3 years following enactment for violations of the land disposal restrictions on storage and prohibition (RCRA Section 3004[j]) involving mixed radioactive waste at DOE facilities. This legislation further delays the waiver of sovereign immunity beyond the 3-year period at a facility if DOE is in compliance with an approved plan for developing treatment capacity and technologies for mixed radioactive waste generated or stored at the facility, as well as a DOE Order requiring compliance with the plan.

The Waste Management sections of Chapter 3 and 4 provide information on the generation and management of mixed radioactive waste and the site-specific Orders for each of the alternatives.

Pollution Prevention Act of 1990 (42 U.S.C. 13101 *et seq.*)—The Pollution Prevention 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 is to achieve a 33-percent reduction (from a 1993 baseline) in the release of 17 priority chemicals by 1997. On November 12, 1999, U.S. Secretary of Energy Bill Richardson issued 14 pollution prevention and energy efficiency goals for DOE. These goals were designed to build environmental accountability and stewardship into DOE's decisionmaking process. Under these goals, DOE will strive 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.

Radioactive, hazardous, and nonhazardous waste types may be generated from all the alternatives; if so, efforts would be made to minimize their generation. As discussed in the Waste Management sections of Chapter 3, waste minimization programs are in place at each site to reduce waste and to recycle where possible.

Toxic Substances Control Act of 1976 (15 U.S.C. 2601 *et seq.*)—The Toxic Substances Control 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. The Toxic Substances Control Act requires compliance with inventory reporting and chemical control provisions of the legislation to protect the public from the risks of exposure to chemicals. The Toxic Substances Control Act also imposes strict limitations on the use and disposal of polychlorinated biphenyls, chlorofluorocarbons, asbestos, dioxins, certain metal-working fluids, and hexavalent chromium.

Activities under all the alternatives would need to be conducted in compliance with the Toxic Substances Control Act.

Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136 *et seq*.)—This legislation 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 165 [proposed regulation]) and worker protection standards (40 CFR 170).

Activities under all of the alternatives would need to be conducted in compliance with this act.

National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 *et seq*.)—The National Historic Preservation Act provides that sites with significant national historic value be placed on the *National Register of Historic Places*, maintained by the Secretary of the Interior. The major provisions of the 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 with emphasis on ongoing management of historic preservation sites and activities at Federal facilities. No permits or certifications are required under the act.

Section 106 requires the head of any Federal agency having 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 and/or Tribal Historic Preservation Officers and may include other organizations and individuals such as local governments, Native American tribes, and Native Hawaiian organizations. 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 30 CFR 800, were revised on December 12, 2000 (65 FR 77697), and became effective January 11, 2001. This revision modified the process by which Federal agencies consider the effects of their undertakings on historic properties and provides the Advisory Council on Historic Preservation with a reasonable opportunity to comment with regard to such undertakings, as required by Section 106 of the National Historic Preservation Act. In promulgating the new regulations, the Council has 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, Native Americans and Native Hawaiians, industry, and the public.

Chapter 3 describes cultural and paleontological resources at each alternative site. Chapter 4 discusses the potential impacts to those resources of each alternative.

American Antiquities Act of 1906, as amended (16 U.S.C. 431 to 433)—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.

Chapter 3 describes cultural and paleontological resources at each alternative site. Chapter 4 discusses the potential impacts to those resources of each alternative.

Archaeological and Historic Preservation Act of 1974, as amended (16 U.S.C. 469 to 469c)—This act protects sites that have historic and prehistoric importance.

Chapter 3 describes cultural and paleontological resources at each alternative site. Chapter 4 discusses the potential impacts to those resources of each alternative.

Archaeological and Resources Protection Act of 1979, as amended (16 U.S.C. 470 *et seq.*)—This act requires a permit for any excavation or removal of archaeological resources from Federal or Native American lands. Excavations must be undertaken for the purpose of furthering archaeological knowledge in the public interest, and resources removed remain the property of the United States. The law requires that whenever any Federal agency finds that its activities may cause irreparable loss or destruction of significant scientific, prehistoric, or archaeological data, the agency must notify the U.S. Department of the Interior and may request that the Department undertake the recovery, protection, and preservation of such data. Consent must be obtained from the Native American tribe or the Federal agency having authority over the land on which a resource is located before issuance of a permit; the permit must contain the terms and conditions requested by the tribe or Federal agency.

Chapter 3 describes cultural and paleontological resources at each alternative site. Chapter 4 discusses the potential impacts to those resources of each alternative.

Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq*.)—The Endangered Species Act is intended to prevent the further decline of endangered and threatened species and to restore those species and their critical habitats. Section 7 of the act requires Federal agencies having reason to believe that a prospective action may affect an endangered or threatened species or its critical 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 that the action does not jeopardize the species or destroy its habitat (50 CFR 17). Despite reasonable and prudent measures to avoid or minimize such impacts, if the species or its habitat would be jeopardized by the action, a formal review process is specified.

Threatened or endangered species in the regions of each alternative have been identified and listed in Chapter 3. Chapter 4 discusses the potential impact to these species.

Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703 *et seq.*)—The Migratory Bird Treaty Act, as amended, is intended to protect birds that have common migration patterns between the United States and Canada, Mexico, Japan, and Russia. It regulates the harvest of migratory birds by specifying conditions such as the mode of harvest, hunting seasons, and bag limits. The act stipulates that it is unlawful at any time, by any means, or in any manner, to "kill ... any migratory bird unless and except as permitted by regulation." Although no permit for this project is required under the act, DOE is required to consult with the USFWS regarding impacts to migratory birds, and to avoid or minimize these effects in accordance with the USFWS Mitigation Policy. Chapter 3 identifies species known at each alternative site. Chapter 4 discusses impacts to ecological resources for each alternative.

Bald and Golden Eagle Protection Act of 1973, as amended (16 U.S.C. 668 through 668d)—The Bald and Golden Eagle Protection Act, as amended, makes it unlawful to take, pursue, molest, or disturb bald (American) and golden eagles, their nests, or their eggs anywhere in the United States (Section 668, 668c). 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.

The bald eagle occupies or uses portions of LANL. Chapter 4 discusses the impacts to ecological resources of each alternative.

Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq*.)—The Fish and Wildlife Coordination Act promotes more effectual planning and cooperation among 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 the USFWS on the possible effects on wildlife if there is construction, modification, or control of bodies of water in excess of 10 acres in surface area.

Chapter 3 describes the water resources at each of the alternative sites.

Farmland Protection Policy Act of 1981 (7 U.S.C. 4201 *et seq*.)—The Farmland Protection Policy 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 657).

Chapter 3 identifies agricultural activities at each alternative site. No cultivated farming is reported.

American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996)—This act reaffirms Native American religious freedom under the First Amendment and sets U.S. policy to protect and preserve the inherent and constitutional right of Native Americans to believe, express, and exercise their traditional religions. The act requires that Federal actions avoid interfering with access to sacred locations and traditional resources that are integral to the practice of religions.

Chapter 3 describes Traditional Cultural Properties resources known to exist at each site. Chapter 4 discusses the potential impacts to Traditional Cultural Properties resources of each alternative.

Religious Freedom Restoration Act of 1993 (42 U.S.C. 2000(bb) *et seq*.)—This act prohibits the U.S. Government, including Federal Departments, from substantially burdening the exercise of religion unless the Government demonstrates a compelling Governmental interest, the action furthers a compelling Governmental interest, and the action is the least restrictive means of furthering that interest.

Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001)—This act establishes a means for Native Americans to request the return or repatriation of human remains and other cultural items presently held by Federal agencies or federally-assisted museums or institutions. The act also contains provisions regarding the intentional excavation and removal of, inadvertent discovery of, and illegal trafficking in Native American human remains and cultural items. Major actions under this law include: (a) establishing a review committee with monitoring and policymaking responsibilities; (b) developing regulations for repatriation, including procedures for identifying lineal descent or cultural affiliation needed for claims; (c) providing oversight of museum programs designed to meet the inventory requirements and deadlines of this law; and (d) developing procedures to handle unexpected discoveries of graves or grave goods during activities on Federal or tribal lands. All Federal agencies that manage land and/or are responsible for archaeological collections obtained from their lands or generated by their activities must comply with the act. DOE managers of ground-disturbing activities on Federal and tribal lands should make themselves aware of the statutory provisions treating inadvertent discoveries of Native American remains and cultural objects. Regulations implementing the act are found at 43 CFR 10.

Chapter 3 describes Native American resources known to exist at each site. Chapter 4 discusses the potential impacts to Native American resources of each alternative.

Occupational Safety and Health Act of 1970 (29 U.S.C. 651 *et seq.*)—The Occupational Safety and Health Act establishes standards for safe and healthful working conditions in places of employment throughout the United States. The act is administered and enforced by the Occupational Safety and Health Administration (OSHA), a U.S. Department of Labor agency. Although OSHA and EPA both have a mandate to reduce exposures to toxic substances, OSHA's jurisdiction is limited to safety and health conditions that exist in the workplace environment.

Under the act, it is the duty of each employer to provide a workplace free of recognized hazards that are likely to cause death or serious physical harm. Employees have a duty to comply with the occupational safety and health standards and rules, regulations, and orders issued under the act. OSHA regulations (29 CFR 1910) establish specific standards telling employers what must be done to achieve a safe and healthful working environment. Government agencies, including DOE, are not technically subject to OSHA regulations, but are required under 29 U.S.C. 668 to establish their own occupational safety and health programs for their places of employment consistent with OSHA standards. DOE emphasizes compliance with these regulations at its facilities and prescribes, through DOE Orders, the OSHA standards that contractors must meet, as applicable to their work at Government-owned, contractor-operated facilities (DOE Order 440.1A). DOE keeps and makes available the various records of minor illnesses, injuries, and work-related deaths as required by OSHA regulations.

Activities under all the alternatives would be conducted in compliance with this act.

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 in a manner that furthers a national policy of promoting an environment free from noise jeopardizing health and welfare.

DOE programs to promote control of noise at the alternative sites are discussed in Chapter 3. Chapter 4 discusses the potential noise impact of each of the alternatives.

5.4 APPLICABLE EXECUTIVE ORDERS

Executive Order 11514 (Protection and Enhancement of Environmental Quality, March 5, 1970)—This Order (regulated by 40 CFR 1500 through 1508) 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 the Federal plans and programs that may have potential environmental impacts so that the views of interested parties can be obtained. DOE has issued regulations (10 CFR 1021) and DOE Order 451.1B for compliance with this Executive Order.

As previously discussed in Section 5.3, this EIS has been prepared in accordance with NEPA requirements (specifically, 40 CFR 1500 through 1508, 10 CFR 1021, and DOE Order 451.1B).

Executive Order 11593 (National Historic Preservation, May 13, 1971)—This Order directs Federal agencies to locate, inventory, and nominate qualified properties under their jurisdiction or control to the *National Register of Historic Places*. This process requires DOE to provide the Advisory Council on Historic Preservation the opportunity to comment on the possible impacts of the proposed activity on any potential eligible or listed resources.

Chapter 3 identifies historic resources at each of the alternative sites. Chapter 4 discusses potential impacts to historic resources at each site.

Executive Order 11988 (Floodplain Management, May 24, 1977)—This Order (regulated by 10 CFR 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 be avoided to the extent practicable.

Chapter 3 identifies the delineated floodplains at each of the alternative sites.

Executive Order 11990 (Protection of Wetlands, May 24, 1977)—This Order (regulated by 10 CFR 1022) requires Federal agencies to avoid any short- or long-term adverse impacts on wetlands wherever there is a practicable alternative.

Chapter 3 identifies the wetlands at each alternative site. Chapter 4 discusses the measures to be taken to protect wetlands where applicable.

Executive Order 12088 (Federal Compliance with Pollution Control Standards, October 13, 1978, as amended by Executive Order 12580, Federal Compliance with Pollution Control Standards, January 23, 1987)—This Order directs Federal agencies to comply with applicable administrative and procedural pollution control standards established by, but not limited to, the Clean Air Act, Noise Control Act, Clean Water Act, Safe Drinking Water Act, Toxic Substances Control Act, and RCRA.

Activities under all of the alternatives would need to be conducted to comply with this Order.

Executive Order 12580 (Superfund Implementation, August 28, 1996)—This Order delegates to the heads of Executive Departments and agencies the responsibility of undertaking remedial actions for releases or threatened releases that are not on the National Priorities List and for removal actions, other than emergencies, where the release is from any facility under the jurisdiction or control of Executive Departments and agencies.

Activities under all of the alternatives would need to be conducted in compliance with this Order.

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, February 11, 1994)—This Order requires each Federal agency to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

The Environmental Justice sections of Chapters 3 and 4 and Appendix F of this EIS provide information that demonstrates compliance with this Order.

Executive Order 13007 (Indian Sacred Sites, May 24, 1996)—This Order requires: "In managing Federal lands, each executive branch agency with statutory or administrative responsibility for the management of Federal lands shall, to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions, (1) accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and (2) avoid adversely affecting the physical integrity of such sacred sites. Where appropriate, agencies shall maintain the confidentiality of sites."

Chapter 3 identifies Native American resources at each alternative site. Chapter 4 discusses the potential impacts to Native American resources. A TCP consultation for the selected site would be conducted prior to any construction activity.

Executive Order 13101 (Greening the Government through Waste Prevention, Recycling, and Federal Acquisition, September 14, 1998)—This Order requires each Federal agency to incorporate waste prevention and recycling in its daily operations and to work to increase and expand markets for recovered materials. It also states that it is national policy to prefer pollution prevention, whenever feasible. Pollution that cannot be prevented should be recycled; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner. Disposal should be employed only as a last resort.

Activities under all of the alternatives would need to be conducted to comply with this Order.

Executive Order 13112 (Invasive Species, February 3, 1999)—This 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.

Activities under all of the alternatives would need to be conducted to comply with this Order.

Executive Order 13123 (Greening the Government through Efficient Energy Management, June 3, 1999)—This Order directs Federal agencies to improve energy management in order to save taxpayer dollars and reduce emissions that contribute to air pollution and global climate change.

Activities under all of the alternatives would need to be conducted to comply with this Order.

Executive Order 13148 (Greening the Government through Leadership in Environmental Management, April 21, 2000)—This Order sets new goals for pollution prevention, requires all Federal facilities to have an environmental management system, and requires compliance or environmental management system audits.

Activities under all of the alternatives would need to be conducted to comply with this Order.

5.5 Applicable U.S. Department of Energy Regulations and Orders

The Atomic Energy Act authorizes DOE to establish standards to protect health and/or 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 10 CFR. These regulations address such areas as energy conservation, administrative requirements and procedures, nuclear safety, and classified information. For the purpose of this EIS, relevant regulations include: "Procedural Rules for DOE Nuclear Activities" (10 CFR 820), "Nuclear Safety Management" (10 CFR 830), "Occupational Radiation Protection" (10 CFR 835), "Compliance with the National Environmental Policy Act" (10 CFR 1021), and "Compliance with Floodplains/Wetlands Environmental Review Requirements" (10 CFR 1022).

DOE Orders are issued in support of environmental, safety, and health programs. Many DOE Orders have been revised and reorganized to reduce duplication and eliminate obsolete provisions. The new DOE Directives System is organized by series, with each Order identified by three digits, and is intended to include all DOE Orders, policies, manuals, requirement documents, notices, and guides. Existing DOE Orders, that are identified by four digits, are expected to be revised and converted to the new DOE numbering system. The major DOE Orders pertaining to the alternatives of this EIS are listed in **Table 5–1**.

Table 5–1 Applicable DOE Orders and Directives

DOE Order/Number	*Subject (Date)*
Leadership/Management/Planning	
O 151.1A	Comprehensive Emergency Management System (11/01/00)
Information and Analysis	
O 231.1	Environment, Safety, and Health Reporting (09/30/95; Change 2, 11/07/96)
O 232.1A	Occurrence Reporting and Processing of Operations Information (07/21/97)
Work Process	
O 411.1-1B	Safety Management Functions, Responsibilities, and Authorities Manual (05/22/01)
O 413.3	Program and Project Management for the Acquisition of Capital Assets (10/13/00)
O 414.1A	Quality Assurance (09/29/99; Change 1, 07/12/01)
O 420.1	Facility Safety (10/13/95; Change 3, 11/22/00)
O 430.1A	Life Cycle Asset Management (10/14/98)
O 433.1	Maintenance Management Program for DOE Nuclear Facilities (06/01/01)
O 435.1	Radioactive Waste Management (07/09/99; Change 1, 08/28/01)
O 440.1A	Worker Protection Management for DOE Federal and Contractor Employees (03/27/98)
O 451.1B	National Environmental Policy Act Compliance Program (10/26/00)
O 460.1A	Packaging and Transportation Safety (10/02/96)
O 460.2	Departmental Materials Transportation and Packaging Management (09/27/95; Change 1, 10/26/95)
O 461.1	Packaging and Transfer or Transportation of Materials of National Security Interest (09/29/00)
O 470.1	Safeguards and Security Program (09/28/95; Change 1, 06/21/96)
O 470.2A	Security and Emergency Management Independent Oversight and Performance Assurance Program (03/01/00)
O 473.2	Protective Force Program (06/30/00)
O 474.1A	Control and Accountability of Nuclear Materials (11/22/00)
External Relationships	
1230.2	American Indian Tribal Government Policy (04/08/92)
Personnel Relations and Services	
3790.1B	Federal Employee Occupational Safety and Health Program (01/07/93)
Environmental Quality and Impact	
5400.1	General Environmental Protection Program (11/09/88; Change 1, 06/29/90)
5400.5	Radiation Protection of the Public and the Environment (02/08/90; Change 2, 01/07/93)
5480.4	Environmental Protection, Safety, and Health Protection Standards (05/15/84; Change 4, 01/07/93)
5480.19	Conduct of Operations Requirements for DOE Facilities (07/09/90; Change 1, 05/18/92; Change 2, 10/23/01)
5480.20A	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities (11/15/94; Change 2, 07/12/01)
5480.30	Nuclear Reactor Safety Design Criteria (01/19/93; Change 1, 03/14/01)
Emergency Preparedness	
5530.3	Radiological Assistance Program (01/14/92; Change 1, 04/10/92)
5530.5	Federal Radiological Monitoring and Assessment Center (07/10/92; Change 1, 12/02/92)
Office of National Nuclear Security Administration	
5632.1C	Protection and Control of Safeguards and Security Interests (07/15/94)
5660.1B	Management of Nuclear Materials (05/26/94)

5.6 Applicable State of New Mexico 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 of New Mexico laws, regulations, and agreements is provided in **Table 5–2**.

Table 5–2 Applicable State of New Mexico Laws, Regulations, and Agreements

Law/Regulation/Agreement	*Citation*	*Requirements*
New Mexico Air Quality Control Act	New Mexico Statutes Annotated (NMSA), Chapter 74, Environmental Improvement, Article 2, Air Pollution, and Implementing Regulations at New Mexico Administrative Code (NMAC) Title 20, Environmental Protection, Chapter 2, Air Quality	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 Radiation Protection Act	NMSA, Chapter 74, Article 3, Radiation Control	Establishes state requirements for worker protection.
New Mexico Water Quality Act	NMSA, Chapter 74, Article 6, Water Quality, and Implementing Regulations Found in NMAC, Title 20, Chapter 6, Water Quality	Establishes water quality standards and requires a permit prior to the construction or modification of a water discharge source.
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 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	Requires permit prior to construction or modification of a solid waste disposal facility.
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	Requires a permit prior to construction or modification of a hazardous waste disposal facility.
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.
New Mexico Wildlife Conservation Act	NMSA, Chapter 17, Game and Fish, Article 2, Hunting and Fishing Regulations, Part 3, Wildlife Conservation Act	Requires permit and coordination if a project may disturb habitat or otherwise affect threatened or endangered species.
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 Endangered Plant Species Act	NMSA, Chapter 75, Miscellaneous Natural Resource Matters, Article 6, Endangered Plants	Requires coordination with the state.

Law/Regulation/Agreement	***Citation***	***Requirements***
Threatened and Endangered Species of New Mexico	NMAC, Title 19, Natural Resources and Wildlife, Chapter 33, Endangered and Threatened Species, 19.33.6.8	Establishes the list of threatened and endangered species.
Endangered Plant Species	NMAC, Title 19, Chapter 21, Endangered Plants	Establishes plant species list and rules for collection.
New Mexico Cultural Properties Act	NMSA, Chapter 18, Libraries and Museums, Article 6, Cultural Properties	Establishes State Historic Preservation Office and requirements to prepare an archaeological and historic survey and consult with the State Historic Preservation Office.
Environmental Oversight and Monitoring Agreement	Agreement in Principle Between DOE and the State of New Mexico, renewed October 1, 2000	Provides DOE support for state activities in environmental oversight, monitoring, access, and emergency response.
Pueblo Accords	DOE 1992 Cooperative Agreements with each of four Pueblos	Sets forth the government-to-government relationship between DOE and the four closest Pueblos.
Los Alamos County Noise Restrictions	Los Alamos County Code, Chapter 8.28	Imposes noise restrictions and makes provisions for exceedances.
Federal Facility Compliance Order	October 1995 (issued to both DOE and LANL)	Requires compliance with the site treatment plan that documents the development of treatment capacities and technologies or use of offsite facilities for treating mixed radioactive waste.
Draft Corrective Action Order	May 2, 2002 (issued to DOE and LANL)	Investigation and cleanup requirements for waste sites at LANL

5.7 EMERGENCY MANAGEMENT AND RESPONSE LAWS, REGULATIONS, AND EXECUTIVE ORDERS

This section discusses the laws, regulations, and Executive Orders that address the protection of public health and worker safety and require the establishment of emergency plans. These laws, regulations, and Executive Orders relate to the operation of facilities, including DOE facilities, that engage directly or indirectly in the production of special nuclear material.

5.7.1 Federal Emergency Management and Response Laws

Emergency Planning and Community Right-to-Know Act of 1986 (U.S.C. 11001 *et seq.*) (also known as "SARA Title III")—This act requires emergency planning and notice to communities and government agencies concerning the presence and release of specific chemicals. EPA implements this act under regulations found in 40 CFR 355, 370, and 372. Under Subtitle A of this act, Federal facilities are required to provide various information (such as inventories of specific chemicals used or stored and releases that occur from these sites) to the state emergency response commission and to the local emergency planning committee to ensure that emergency plans are sufficient to respond to unplanned releases of hazardous substances. Implementation of the provisions of this act began voluntarily in 1987, and inventory and annual emissions reporting began in 1988. DOE requires compliance with Title III as a matter of DOE policy at its contractor-operated facilities.

Chapter 3 describes emergency planning for each alternative site at LANL. LANL has established an emergency management program that would be activated in the event of an accident. The 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 plan includes emergency planning, training, preparedness, and response.

Chapter 4 discusses the impacts of potential accidents for each alternative.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 9604(I) (also know as "Superfund")—This act provides authority for Federal and state governments to respond directly to hazardous substance incidents. The act requires reporting of spills, including radioactive spills, to the National Response Center.

It will be necessary to comply with this requirement for any alternative.

Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (42 U.S.C. 5121)—This act, as amended, 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, 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.

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. The act defines the term "law enforcement emergency" as an uncommon situation which requires law enforcement, which 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.

Price-Anderson Act (42 U.S.C. 2210)—This act allows DOE to indemnify its contractors if the contract involves the risk of public liability from a nuclear incident.

5.7.2 Federal Emergency Management and Response Regulations

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 5500.3A, "Planning and Preparedness for Operational Emergencies." The "Federal Radiological Emergency Response Plan," dated November 1995, primarily discusses offsite Federal response in support of state and local governments with jurisdiction during a peacetime radiological emergency.

Chapter 3 describes emergency preparedness for each alternative.

Occupational Safety and Health Administration Emergency Response, Hazardous Waste Operations, and Worker Right to Know (29 CFR 1910)—This regulation establishes OSHA 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.

Chapter 3 describes DOE emergency programs.

Emergency Management and Assistance (44 CFR Section 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.

Hazardous Materials Tables and Communications, Emergency Response Information Requirements (49 CFR 172)—This regulation defines the regulatory requirements for marking, labeling, placarding, and documenting hazardous material shipments. The regulation also specifies the requirements for providing hazardous material information and training.

Chapter 4 discusses transportation impacts for each alternative.

5.7.3 Emergency Response and Management Executive Orders

Executive Order 12148 (Federal Emergency Management, July 20, 1979)—This Order transfers functions and responsibilities associated with Federal emergency management to the Director of the Federal Emergency Management Agency. The 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 agencies.

Executive Order 12656 (Assignment of Emergency Preparedness Responsibilities, November 18, 1988)—This Order assigns emergency preparedness responsibilities to Federal Departments and agencies.

Executive Order 12938 (Proliferation of Weapons of Mass Destruction, November 14, 1994)—This Order states that the proliferation of nuclear, biological, and chemical weapons ("weapons of mass destruction") and the means of delivering such weapons constitutes 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.

5.8 CONSULTATIONS WITH AGENCIES AND FEDERALLY-RECOGNIZED AMERICAN INDIAN NATIONS

Certain laws, such as the Endangered Species Act, the Fish and Wildlife Coordination Act, and the National Historic Preservation Act, require consultation and coordination by DOE with other governmental entities including other Federal agencies, state and local agencies, and federally-recognized American Indian 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 American Indian 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. American Indian consultations are concerned with the sovereign rights of tribal Nations pertaining to the potential for disturbance of ancestral American Indian sites and the traditional practices of American Indians.

With respect to biotic resources, DOE 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 1998b), however, informal consultation by NNSA is necessary to comply with the provisions of 50 CFR 402, Interagency Cooperation - Endangered Species Act of 1973, as amended.

With respect to cultural resources, LANL staff would perform a historic building eligibility assessment of the CMR Building, which is over 50 years old. The building would be evaluated for adverse effects, and the evaluation would be sent to the State Historic Preservation Office and Advisory Council on Historic Preservation for concurrence. After issuance of the Record of Decision on this EIS, DOE would work with these organizations and the public to develop the resolution of adverse effects and a Memorandum of Agreement, if needed.

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7. GLOSSARY

***absorbed dose* —** For ionizing radiation, the energy imparted to matter by ionizing radiation per unit mass of the irradiated material (e.g., biological tissue). The units of absorbed dose are the rad and the gray. (See *rad* and *gray*.)

***accident sequence* —** In regard to nuclear facilities, an initiating event followed by system failures or operator errors, which can result in significant core damage, confinement system failure, and/or radionuclide releases.

***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* —** The exposure incurred during and shortly after a radiological release. Generally, the period of acute exposure ends when long-term interdiction is established, as necessary. For convenience, the period of acute exposure is normally assumed to end one week after the inception of a radiological accident.

***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.

***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 activity* —** The emission of alpha particles by radioactive materials.

***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 three common types of ionizing radiation (alpha, beta, and gamma). Even the most energetic alpha particle generally fails to penetrate the dead layers of 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*.)

***ambient* —** Surrounding.

***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.

***aquatic* —** Living or growing in, on, or near water.

***aquifer* —** An underground geologic formation, group of formations, or part of a formation capable of yielding a significant amount of water to wells or springs.

***aquitard* —** A less-permeable geologic unit that inhibits the flow of water.

***archaeological sites (resources)* —** Any location where humans have altered the terrain or discarded artifacts during either prehistoric or historic times.

***artifact* —** An object produced or shaped by human workmanship of archaeological or historical interest.

***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 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 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 on 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 *National 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 that material to a nuclear explosive device.

***background radiation* —** Radiation from (1) cosmic sources; (2) naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material); (3) global fallout as it exists in the environment (e.g., from the testing of nuclear explosive devices); (4) air travel; (5) consumer and industrial products; and (6) diagnostic x-rays and nuclear medicine.

***badged worker* —** A worker equipped with an individual dosimeter who has the potential to be exposed to radiation.

***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 the proposed action and its alternatives can be compared. For this EIS, the environmental baseline is the site environmental conditions as they exist or are estimated to exist in the absence of the proposed action.

***becquerel* —** A unit of radioactivity equal to one disintegration per second. Thirty-seven billion becquerels equal 1 curie.

***BEIR V* —** Biological Effects of Ionizing Radiation; referring to the fifth in a series of committee reports from the National Research Council.

***beryllium* —** An extremely lightweight element with the atomic number 4. It is metallic and is used in reactors as a neutron reflector.

***best available control technology (BACT)* —** A term used in the Federal Clean Air Act that means the most stringent level of air pollutant control considering economics for a specific type of source based on demonstrated technology.

***beta emitter* —** A radioactive substance that decays by releasing a beta particle.

***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.

***beyond-design-basis accident* —** An accident postulated for the purpose of generating large consequences by exceeding the functional and performance requirements for safety structures, systems, and components. (See *design-basis accident*.)

***beyond-design-basis events* —** Postulated disturbances in process variables due to external events or multiple component or system failures that can potentially lead to beyond-design-basis accidents. (See *design-basis events*.)

***block* —** U.S. Bureau of the Census 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.

***burial ground* —** In regard to radioactive waste, a place for burying unwanted radioactive materials in which the earth acts as a receptacle to prevent the escape of radiation and the dispersion of waste into the environment.

***Cambrian* —** The earliest geologic time period of the Paleozoic era, spanning between about 570 and 505 million years ago.

***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.

***canister* —** A general term for a container, usually cylindrical, used in handling, storage, transportation, or disposal of waste.

***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; (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.

***capacity factor* —** The ratio of the annual average power production of a power plant to its rated capacity.

***carbon dioxide* —** A colorless, odorless gas that is a normal component of ambient air; it results from fossil fuel combustion and is an expiration product.

***carbon monoxide* —** A colorless, odorless, poisonous gas produced by incomplete fossil fuel combustion.

***carcinogen* —** An agent that may cause cancer. Ionizing radiations are physical carcinogens; there are also chemical and biological carcinogens and 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.

***cation* —** A positively charged ion.

***cell* —** See *hot cell*.

***chain reaction* —** A reaction that initiates its own repetition. In nuclear fission, a chain reaction occurs when a neutron induces a nucleus to fission and the fissioning nucleus releases one or more neutrons, which induce other nuclei to fission.

***cladding* —** The outer metal jacket of a nuclear fuel element or target. It prevents fuel corrosion and retains fission products during reactor operation and subsequent storage, as well as providing structural support. Zirconium alloys, stainless steel, and aluminum are common cladding materials. In general, a metal coating bonded onto another metal.

***Class I areas* —** A specifically designated area 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 a regulatory-mandated impacts review.

***classified information* —** (1) information that has been determined pursuant to Executive Order 12958, any successor order, or the Atomic Energy Act of 1954 (42 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.

***clastic* —** Refers to rock or sediment made up primarily of broken fragments of preexisting rocks or minerals.

***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.

***colluvium (colluvial)* —** A loose deposit of rock debris accumulated at the base of a cliff or slope.

***committed dose equivalent* —** The dose equivalent to organs or tissues that will be received by an individual during the 50-year period following the intake of radioactive material. It does not include contributions from external radiation sources. Committed dose equivalent is expressed in units of rem or sieverts.

***committed effective dose equivalent* —** The dose value obtained by (1) multiplying the committed dose equivalents for the organs or tissues that are irradiated and the weighting factors applicable to those organs or tissues, and (2) summing all the resulting products. Committed effective dose equivalent is expressed in units of rem or sieverts. (See *committed dose equivalent* and *weighting factor*.)

***committed equivalent dose* —** The committed dose in a particular organ or tissue accumulated in a specific period after intake of a radionuclide.

***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 are exposed to industry that stimulates unwanted noise, smell, industrial traffic, particulate matter, or other nonaesthetic impacts.

***Comprehensive Test Ban Treaty (CTBT)* —** A proposed treaty prohibiting nuclear tests of all magnitudes.

***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 the 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, expeditious attainment of such standards, and that such activities will not: (1) cause or contribute to any new violation of any standard in any area; (2) increase the frequency or severity of any existing violation of any standard in any area; or (3) 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 (e.g., waste with a surface dose rate not greater than 200 millirem per hour). (See *remote-handled waste*.)

***container* —** In regard to 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 10 CFR 60.

***contamination* —** The deposition of undesirable radioactive material on the surfaces of structures, areas, objects, or personnel.

***cooperating agency* —** Any Federal agency other than a lead agency that has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major Federal action significantly affecting the quality of the human environment.

***credible accident* —** An accident that has a probability of occurrence greater than or equal to once in a one-million-year time period.

***Cretaceous* —** The final geologic time period of the Mesozoic era, spanning between about 144 and 66 million years ago. The end of this period also marks the end of dinosaur life on Earth.

***criteria pollutants* —** Six air pollutants for which the National Ambient Air Quality Standards are established by the U.S. Environmental Protection Agency under Title I of the Federal Clean Air Act: sulfur dioxide, nitrogen oxides, carbon monoxide, ozone, lead, and two size classes of particulate matter, less than or equal to 10 micrometers (0.0004 inch) in diameter, and less than or equal to 2.5 micrometers (0.0001 inch) in diameter. New pollutants may be added to, or removed from, the list of criteria pollutants as more information becomes available.

***critical assembly* —** A critical assembly is a system of fissile material (uranium-233, uranium-235, plutonium-239, or plutonium-241) with or without a moderator in a specific proportion and shape. The critical assembly can be gradually built up by adding additional fissile material and/or moderator until this system achieves the dimensions necessary for a criticality condition. A continuous neutron source is placed at the center of this assembly to measure the fission rate of the critical assembly as it approaches and reaches criticality.

***critical habitat* —** Defined in the Endangered Species Act of 1973 as "specific areas within the geographical area occupied by [an endangered or threatened] species..., essential to the conservation of the species and which may require special management considerations or protection; and specific areas outside the geographical area occupied by the species...that are essential for the conservation of the species."

***critical mass* —** The smallest mass of fissionable material that will support a self-sustaining nuclear fission chain reaction.

***criticality* —** The condition in which a system is capable of sustaining a nuclear fission chain reaction.

***cultural resources* —** Archaeological sites, historical sites, architectural features, traditional use areas, and Native American sacred sites.

***cumulative impacts* —** The impacts on the environment that result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions, regardless of the agency or person who 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).

***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.

***decay (radioactive)* —** The decrease in the amount of any radioactive material with the passage of time, due to spontaneous nuclear disintegration (i.e., emission from atomic nuclei of charged particles, photons, or both).

***decibel (dB)* —** A unit for expressing the relative intensity of sounds on a logarithmic scale where 0 is below human perception and 130 is above the threshold of pain to humans. For traffic and industrial noise measurements, the A-weighted decibel, a frequency-weighted noise unit, is widely used. The A-weighted decibel 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 C (degrees Celsius)* —** A unit for measuring temperature using the centigrade scale in which the freezing point of water is 0 degrees and the boiling point is 100 degrees.

***degrees F (degrees Fahrenheit)* —** A unit for measuring temperature using the Fahrenheit scale in which the freezing point of water is 32 degrees and the boiling point is 212 degrees.

***delayed critical devices* —** A critical assembly designed to reach the condition of delayed supercriticality. Delayed criticality is the nuclear physics supercriticality condition, where the neutron multiplication factor of the assembly is between 1 (critical) and 1 plus the delayed neutron fraction. (See *multiplication factor* and *delayed neutrons.*)

***delayed neutrons* —** Neutrons emitted from fission products by beta decay following fission by intervals of seconds to minutes. Delayed neutrons account for approximately 0.2 to 0.7 percent of all fission neutrons. For uranium-235, the delayed neutron fraction is about 0.007; for plutonium-239, it is about 0.002.

***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: (1) restraints derived from generally accepted state-of-the-art practices for achieving functional goals; (2) 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 (3) requirements derived from Federal safety objectives, principles, goals, or requirements.

***design-basis accident* —** An accident postulated for the purpose of establishing functional and performance requirements for safety structures, systems, and components.

***design-basis events* —** Postulated disturbances in process variables that can potentially lead to design-basis accidents.

***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*.)

***dewatering* —** The removal of water. Saturated soils are "dewatered" to make construction of building foundations easier.

***direct economic effects* —** The initial increases in output from different sectors of the economy resulting from some new activity within a predefined geographic region.

***direct jobs* —** The number of workers required at a site to implement an alternative.

***diversion* —** The unauthorized removal of nuclear material from its approved use or authorized location.

***dolostone* —** A carbonate rock made up predominately of the mineral dolomite, $CaMg(C0_3)_2$.

***dose (radiological)* —** A generic term meaning absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or committed equivalent dose, as defined elsewhere in this glossary. It is a measure of the energy imparted to matter by ionizing radiation. The unit of dose is the rem or 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.

***dose rate* —** The radiation dose delivered per unit of time (e.g., rem per year).

***dosimeter* —** A small device (instrument) carried by a radiation worker that measures cumulative radiation dose (e.g., a film badge or ionization chamber).

***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.

***ecology* —** A branch of science dealing with the interrelationships of living organisms with one another and with their nonliving environment.

***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. (See *committed dose equivalent* and *committed effective dose equivalent*.)

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.

electron — An elementary particle with a mass of 9.107×10^{-28} gram (or 1/1,837 of a proton) and a negative charge. Electrons surround the positively charged nucleus and determine the chemical properties of the atom.

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 424).

engineered safety features — For a nuclear facility, features that prevent, limit, or mitigate the release of radioactive material from its primary containment.

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, natural uranium,* and *highly enriched uranium.*)

Environment, Safety, and Health Program — In the context of 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 for a proposed major Federal action significantly affecting the quality of the human environment. A DOE EIS is prepared in accordance with applicable requirements of the Council on Environmental Quality National Environmental Policy Act regulations in 40 CFR 1500–1508 and the DOE National Environmental Policy Act regulations in 10 CFR 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 stream* —** A stream that flows only after a period of heavy precipitation.

***epidemiology* —** Study of the occurrence, causes, and distribution of disease or other health-related states and events in human populations, often as related to age, sex, occupation, ethnicity, and economic status, to identify and alleviate health problems and promote better health.

***exposure limit* —** The level of exposure to a hazardous chemical (set by law or a standard) at which or below which adverse human health effects are not expected to occur.

> *Reference dose* is the chronic-exposure dose (milligrams or kilograms per day) for a given hazardous chemical at which or below which adverse human noncancer health effects are not expected to occur.
>
> *Reference concentration* is the chronic exposure concentration (milligrams per cubic meter) for a given hazardous chemical at which or below which adverse human noncancer health effects are not expected to occur.

***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.

***fissile materials* —** An isotope that readily fissions after absorbing a neutron of any energy. Fissile materials are uranium-233, uranium-235, plutonium-239, and plutonium-241. Uranium-235 is the only naturally occurring fissile isotope.

***fission* —** The splitting of the nucleus of a heavy atom into two lighter nuclei. It is accompanied by the release of neutrons, gamma rays, and kinetic energy of fission products.

***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.

***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, piles of stored material (e.g., coal); and road construction areas or other areas where earthwork is occurring.

***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.

***genetic effects* —** Inheritable changes (chiefly mutations) produced by exposure of the parts of cells that control biological reproduction and inheritance to ionizing radiation or other chemical or physical agents.

***GENII* —** A computer code used to predict the radiological impacts on individuals and populations associated with the release of radioactive material into the environment during normal operations and postulated accidents.

***geology* —** The science that deals with the Earth: the materials, processes, environments, and history of the planet, including rocks and their formation and structure.

***gigaelectron volts* —** 1,000 million electron volts (MeV). (See *MeV*.)

***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 acrylic/lead 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.

***gray* —** The International System of Units (SI) unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule per kilogram (1 gray is equal to 100 rad). (The joule is the SI unit of energy.) (See *absorbed dose*.)

***ground shine* —** The radiation dose received from an area on the ground where radioactivity has been deposited by a radioactive plume or cloud.

***groundwater* —** Water below the ground surface in a zone of saturation.

***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 radioactive isotope disintegrate to another nuclear form. Half-lives vary from millionths of a second to billions of years.

***Hazard Index* —** A summation of the Hazard Quotients for all chemicals being used at a site and those proposed to be added to yield cumulative levels for a site. A Hazard Index value of 1.0 or less means that no adverse human health effects (noncancer) are expected to occur.

***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 National Ambient Air Quality Standards but which 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 188 pollutants to be regulated or renewed under 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 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, which 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. To be considered hazardous, a waste must be a solid waste under the Resource Conservation and Recovery Act and must exhibit at least one of four characteristics described in 40 CFR 261.20 through 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 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 is determined, consistent with existing law, to require permanent isolation.

***high-multiplication devices* —** A critical assembly for producing nondestructive superprompt critical nuclear excursions. These types of devices are sometimes called prompt burst devices.

***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 *natural uranium*, *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.

***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.

***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.

***joule* —** A metric unit of energy, work, or heat, equivalent to 1 watt-second, 0.737 foot-pounds, or 0.239 calories.

***latent cancer fatalities* —** Deaths from cancer occurring some time after, and postulated to be due to, exposure to ionizing radiation or other carcinogens.

***limestone* —** A sedimentary rock composed mostly of the mineral calcite, $CaCO_3$.

***long-lived radionuclides* —** Radioactive isotopes with half-lives greater than 30 years.

***low-income population* —** Low-income populations, defined in terms of U.S. Bureau of the Census 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 waste, transuranic waste, spent nuclear fuel, or by-product tailings from processing of uranium or thorium ore. Low-level waste is generated in many physical and chemical forms and levels of contamination.

***Magnitude* —** A number that reflects the relative strength or size of an earthquake. Magnitude is based on the logarithmic measurement of the maximum motion recorded by a seismograph. An increase of one unit of magnitude (for example, from 4.6 to 5.6) represents a 10-fold increase in wave amplitude on a seismograph recording or approximately a 30-fold increase in the energy released. Several scales have been defined, but the most commonly used are (1) local magnitude (ML), commonly referred to as "Richter magnitude," (2) surface-wave magnitude (Ms), (3) body-wave magnitude (Mb), and (4) moment magnitude (Mw). Each is valid for a particular type of seismic signal varying by such factors as frequency and distance. These magnitude scales will yield approximately the same value for any given earthquake within each scale's respective range of validity.

***material access area* —** A type of security area that is authorized to contain a security Category I quantity of special nuclear material and which has specifically defined physical barriers, is located within a Protected Area, and is subject to specific access controls.

***material characterization* —** The measurement of basic material properties, and the change in those properties as a function of temperature, pressure, or other factors.

***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.

***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.

***maximally exposed offsite 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).

***maximum contaminant level* —** The designation for U.S. Environmental Protection Agency 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. The primary maximum contaminant levels (40 CFR 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 143) are set by the U.S. Environmental Protection Agency 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 relating to weather.

***MeV (million electron volts)* —** A unit used to quantify energy. In this EIS, it describes a particle's kinetic energy, which is an indicator of particle speed.

***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.

***minority population* —** Minority populations exist where either: (a) the minority population of the affected area exceeds 50 percent, or (b) the minority population percentage of the affected area is meaningfully greater than in the general population or other appropriate unit of geographic analysis (such as a governing body's jurisdiction, a neighborhood, census tract, or other similar unit). "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*.)

***Miocene* —** An epoch of the upper Tertiary period, spanning between about 24 and 5 million years ago.

***mitigate* —** Mitigation includes: (1) avoiding an impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; or (5) compensating for an impact by replacing or providing substitute resources or environments.

***mixed waste* —** Waste that contains both nonradioactive hazardous waste and radioactive waste, as defined in this glossary.

***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.

***multiplication factor (k_{eff})* —** For a chain-reacting system, the mean number of fission neurons produced by a neutron during its life within the system. For the critical system, the multiplication factor is equal to 1. If the multiplication factor is less than 1, the system is called "subcritical." Conversely, if the multiplication factor is greater than 1, the system is called "supercritical."

***National Emission Standards for Hazardous Air Pollutants* —** Standards set by the U.S. Environmental Protection Agency for air pollutants that are not covered by 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 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 60.

***natural uranium* —** Uranium with the naturally occurring distribution of uranium isotopes (approximately 0.7-weight percent uranium-235 with the remainder essentially uranium-238). (See *uranium*, *depleted uranium, enriched uranium*, *highly enriched uranium*, and *low-enriched uranium*.)

***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.

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 will be prepared and considered. The notice is intended to briefly: (1) describe the proposed action and possible alternatives; (2) describe the agency's proposed scoping process including whether, when, and where any scoping meeting will be held; and (3) state the name and address of a person within the agency who can answer questions about the proposed action and the environmental impact statement.

nuclear 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 DOE 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 to the employees or the general public.

nuclear grade — Material of a quality adequate for use in a nuclear application.

nuclear material — Composite term applied to: (1) special nuclear material; (2) source material such as uranium, thorium, or ores containing uranium or thorium; and (3) 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 radiation* —** Particles (alpha, beta, neutrons) or photons (gamma) emitted from the nucleus of unstable radioactive atoms as a result of radioactive decay.

***nuclear weapon* —** The general name given to any weapon in which the explosion results from the energy released by reactions involving atomic nuclei, either fission, fusion, or both.

***Nuclear Regulatory Commission* —** The Federal agency that regulates the civilian nuclear power industry in the United States.

***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 DOE complex site.

***onsite* —** The term denotes a location or activity occurring within the boundary of a DOE 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 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.

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.

Pennsylvanian — A geologic time period of the Paleozoic era, spanning between about 320 and 286 million years ago.

perched aquifer/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 (Sv).

PIDAS (Perimeter Intrusion Detection and Assessment System) — A mutually supporting combination of barriers, clear zones, lighting, and electronic intrusion detection, assessment, and access control systems constituting the perimeter of the Protected Area and designed to detect, impede, control, or deny access to the Protected Area.

pit — The central core of a primary assembly in a nuclear weapon typically composed of plutonium-239 and/or highly-enriched uranium and other materials.

placer — A surficial mineral deposit formed by mechanical concentration of valuable minerals from weathered debris, usually through the action of stream currents or waves.

playa — A dry lake bed in a desert basin or a closed depression that contains water on a seasonal basis.

Pleistocene — The geologic time period of the earliest epoch of the Quaternary period, spanning between about 1.6 million years ago and the beginning of the Holocene epoch at 10,000 years ago. It is characterized by the succession of northern glaciations and also called the "Ice Age."

plume — The elongated pattern of contaminated air or water originating at a source, such as a smokestack or a hazardous waste disposal site.

***plutonium* —** A heavy, radioactive, metallic element with the atomic number 94. It is produced artificially by neutron bombardment of uranium. Plutonium has 15 isotopes with atomic masses ranging from 232 to 246 and half-lives from 20 minutes to 76 million years.

***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.

***population dose* —** See *collective dose*.

***Precambrian* —** All geologic time before the beginning of the Paleozoic era. This includes about 90 percent of all geologic time and spans the time from the beginning of the Earth, about 4.5 billion years ago, to about 570 million years ago.

***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* —** Regulations required by the 1977 Clean Air Act amendments to limit increases in criteria air pollutant concentrations above baseline in areas that already meet the National Ambient Air Quality Standards. Cumulative increases in pollutant 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. (See *National Ambient Air Quality Standards*.)

***probabilistic risk assessment* —** 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.

***Protected Area* —** A type of security area defined by physical barriers (i.e., walls or fences), to which access is controlled, used for protection of security Category II special nuclear materials and classified matter and/or to provide a concentric security zone surrounding a Material Access Area (security Category I nuclear materials) or a Vital Area.

proton — An elementary nuclear particle with a positive charge equal in magnitude to the negative charge of the electron; it is a constituent of all atomic nuclei, and the atomic number of an element indicates the number of protons in the nucleus of each atom of that element.

pulsed assemblies — A critical assembly designed to produce a brief emission of neutrons and gamma radiation associated with a critical condition that lasts a fraction of a second.

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.

rad — See *radiation absorbed dose*.

radiation (ionizing) — See *ionizing radiation*.

radiation absorbed dose (rad) — The basic unit of absorbed dose equal to the absorption of 0.01 joules per kilogram (100 ergs per gram) of absorbing material.

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 *isotopes*.)

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 — A document prepared in accordance with the requirements of 40 CFR 1505.2 and 10 CFR 1021.315 that provides a concise public record of DOE's decision on a proposed action for which an EIS was prepared. A Record of Decision identifies the alternatives considered in reaching the decision; the environmentally preferable alternative; factors balanced by DOE in making the decision; and whether all practicable means to avoid or minimize environmental harm have been adopted, and, if not, the reasons they were not.

***reference concentration* —** An estimate of a toxic chemical daily inhalation of the human population (including sensitive subgroups) likely to be without an appreciable risk of harmful effects during a lifetime. Those effects are both to the respiratory system (portal-of-entry) and the peripheral to the respiratory system (extra-respiratory effects). It is expressed in units of micrograms per cubic meter.

***region of influence* —** 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.

***regulated substances* —** A general term used to refer to materials other than radionuclides that may be regulated by other applicable Federal, state, or local requirements.

***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 *absorbed dose* and *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 (e.g., waste with a dose rate of 200 millirem per hour or more at the surface of the waste package). (See *contact-handled waste*.)

***rhyolite* —** A fine-grained silica-rich igneous rock, the extrusive equivalent of granite.

***rightsizing* —** Facility modification, rearrangement, and refurbishment necessary to size future weapon manufacturing facilities appropriately for the workload to be accomplished. In general, rightsizing involves reduction in the size of facilities, but not in their capabilities. Rightsizing is not driven by assumptions about future DOE 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.

***risk assessment (chemical or radiological)* —** The qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and/or the environment by the presence or potential presence and/or use of specific chemical or radiological materials.

roentgen — A unit of exposure to ionizing x-ray or gamma radiation equal to or producing one electrostatic unit of charge per cubic centimeter of air. It is approximately equal to 1 rad.

runoff — The portion of rainfall, melted snow, or irrigation water that flows across the ground surface and eventually enters streams.

safe, secure trailer — A specially modified semitrailer, pulled by an armored tractor truck, that DOE uses to transport nuclear weapons, nuclear weapons components, or special nuclear material over public highways.

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 DOE nuclear facilities and as a part of applications for U.S. Nuclear Regulatory Commission licenses. The U.S. Nuclear Regulatory Commission 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*.)

sandstone — A sedimentary rock composed mostly of sand-size particles cemented usually by calcite, silica, or iron oxide.

sanitary waste — Waste generated by normal housekeeping activities, liquid or solid (includes sludge), which are not hazardous or radioactive.

scope — In a document prepared pursuant to the National Environmental Policy Act of 1969, 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 EIS 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. The public scoping process is that portion of the process where the public is invited to participate, and includes holding at least one public meeting and requesting written comments on issues and environmental concerns that an EIS should address. DOE also conducts an early internal scoping process for environmental assessments or EISs. For EISs, 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 DOE contractor facilities, property, and equipment.

***seismic* —** Earth vibration caused by an earthquake or an explosion.

***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.

***short-lived activation products* —** An element formed from neutron interaction that has a relatively short half-life that is not produced from the fission reaction (e.g., a cobalt isotope formed from impurities in the metal of the reactor piping).

***short-lived nuclides* —** Radioactive isotopes with half-lives no greater than about 30 years (e.g., cesium-137 and strontium-90).

***shutdown* —** For a 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 International System of Units (SI) unit of radiation dose equivalent. The dose equivalent in sieverts equals the absorbed dose in grays multiplied by the appropriate quality factor (1 sievert is equal to 100 rem). (See *gray*.)

***silica gel* —** An amorphous, highly adsorbent form of silicon dioxide.

***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.

***somatic effect* —** Any effect that may manifest in the body of the exposed individual over his or her lifetime.

***source material* —** Depleted uranium, normal uranium, thorium, or any other nuclear material determined, pursuant to Section 61 of the Atomic Energy Act of 1954, as amended, to be source material, or ores containing one or more of the foregoing materials in such concentration as may be determined by regulation.

***source term* —** The amount of a specific pollutant (e.g., chemical, radionuclide) emitted or discharged to a particular environmental medium (e.g., air, water) from a source or group of sources. It is usually expressed as a rate (i.e., amount per unit time).

***special nuclear materials* —** 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 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.

***spectral characteristics* —** The natural property of a structure as it relates to the multidimensional temporal accelerations.

***staging* —** The process of using several layers to achieve a combined effect greater than that of one layer.

***START I and II* —** Terms that refer to negotiations between the United States and Russia (formerly the Soviet Union) during Strategic Arms Reduction Treaty (START) I negotiations aimed at limiting and reducing nuclear arms. START I discussions began in 1982 and eventually led to a ratified treaty in 1988. START II protocol, which has not been fully ratified, will attempt to further reduce the acceptable levels of nuclear weapons ratified in START I.

***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 by 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.

***Tertiary* —** The first geologic time period of the Cenozoic era (after the Mesozoic era and before the Quaternary period), spanning between about 66 and 1.6 million years ago. During this period, mammals became the dominant life form on Earth.

***threat-1* —** (1) A person, group, or movement with intentions to use extant or attainable capabilities to undertake malevolent actions against DOE 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 424). (See *endangered species*.)

threshold limit values — The recommended highest concentrations of contaminants to which workers may be exposed according to the American Conference of Governmental Industrial Hygienists.

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.

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 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 U.S. Nuclear Regulatory Commission testing criteria for Type B package designs (10 CFR 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.

uranium — A radioactive, metallic element with the atomic number 92; one of the heaviest naturally occurring elements. 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 *natural uranium*, *enriched uranium*, *highly enriched uranium*, and *depleted uranium*.)

vault (special nuclear material) — A penetration-resistant, windowless enclosure having an intrusion alarm system activated by opening the door and which also has: (1) walls, floor, and ceiling substantially constructed of materials that afford forced-penetration resistance at least equivalent to that of 20-centimeter- (8-inch-) thick reinforced concrete; and (2) 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 DOE 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 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, such as 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 U.S. Environmental Protection Agency administrator as having negligible photochemical reactivity.

waste classification — Waste is classified according to DOE Order 435.1, *Radioactive Waste Management* and includes high-level radioactive, transuranic, and low-level radioactive waste.

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 will be 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*.)

weapons grade — Fissionable material in which the abundance of fissionable isotopes is high enough that the material is suitable for use in thermonuclear weapons.

weighting factor — Generally, a method of attaching different importance values to different items or characteristics. In the context of radiation protection, the proportion of the risk of effects resulting from irradiation of a particular organ or tissue to the total risk of effects when the whole body is irradiated uniformly (e.g., the organ dose weighting factor for the lung is 0.12, compared to 1.0 for the whole body). Weighting factors are used for calculating the effective dose equivalent.

wetland — Wetlands are "... 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).

whole-body dose — In regard to radiation, dose resulting from the uniform exposure of all organs and tissues in a human body. (See *effective dose equivalent*.)

wind rose — A circular diagram showing, for a specific location, the percentage of the time the wind is from each compass direction. A wind rose for use in assessing consequences of airborne releases also shows the frequency of different wind speeds for each compass direction.

X/Q (Chi/Q) — The relative calculated air concentration due to a specific air release; units are seconds per cubic meter (sec/m^3).

yield — The force in tons of TNT of a nuclear or thermonuclear explosion.

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10. DISTRIBUTION LIST

The U.S. Department of Energy is providing copies of the *Draft Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory (CMRR EIS)* (or Summary) to Federal, state, and local elected and appointed officials and agencies of government; Native American representatives; Federal, state, and local environmental and public interest groups; and other organizations and individuals listed in this Chapter. Approximately 160 copies of the draft *CMRR EIS* and 30 copies of the Summary of the draft *CMRR EIS* were sent to interested parties. Copies will be provided to others upon request.

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Joe Barton, Subcommittee on Energy and Air Quality
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Nuclear Regulatory Commission
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Thomas Cochran, Natural Resources Defense Council
Doug Melklejohn, New Mexico Environmental Law Center
Steve Schmidt, New Mexico Green Party

Steven Dolley, Nuclear Control Institute
Jay Coghlan, Nuclear Watch of New Mexico
Peggy Prince, Peace Action New Mexico
Virginia Miller, People for Peace
Robert Musil, Physicians for Social Responsibility
Juan Montes, Rural Alliance for Military Accountability
Alice Roos, Sanctuary Foundation
Chris Timm, Serg, Inc.
Myron M. Kaczmarsky, Shaw Environmental & Infrastructure
Sisters of Loretto
Michael Guerrero, Southwest Organizing Project
William Robinson, Southwest Research and Information Center
Don Hancock, Southwest Research and Information Center
Gilbert Sanchez, Tribal Environmental Watch Alliance
Alden Meyer, Union of Concerned Scientists
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APPENDIX A
ENVIRONMENTAL IMPACTS METHODOLOGIES

This appendix briefly describes the methods used to assess the potential direct, indirect, and cumulative effects of the alternatives in this *Environmental Impact Statement for the Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory (CMRR EIS).* Included are impact assessment methods for land use and visual resources, site infrastructure, air quality, noise, geology and soils, surface and groundwater, water quality, ecological resources, cultural and paleontological resources, socioeconomics, waste management and pollution prevention, and cumulative impacts. Each section includes descriptions of the affected resources, region of influence, and impact assessment methods. Descriptions of the methods for the evaluation of human health effects from normal operations, facility accidents, and environmental justice are presented in Appendices B, C, and D, respectively.

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 EIS are consistent with the Expanded Operations Alternative described in the *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory* (*LANL SWEIS*) (DOE 1999) and also consider present actions at the site. The No Action Alternative was used as the basis for the comparison of impacts that would occur under implementation of the other alternatives.

A.1 LAND USE AND VISUAL RESOURCES

A.1.1 Land Use

A.1.1.1 Description of Affected Resources and Region of Influence

Land use includes the land on and adjacent to each candidate site, the physical features that influence current or proposed uses, pertinent land use plans and regulations, and land ownership and availability. The region of influence 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.

A.1.1.2 Description of Impact Assessment

The amount of land disturbed and conformity with existing land use were considered in order to evaluate impacts at each candidate site from construction and operation (see **Table A–1**). Both factors were considered for each of the action alternatives. However, since new construction would not take place under the No Action Alternative, only conformity with existing land use was evaluated for this alternative. Land-use impacts could vary considerably from site to site, depending on the extent of new construction and where it would take place (that is, on undeveloped land or within a previously disturbed area).

Table A–1 Impact Assessment Protocol for Land Resources

	Required Data		
Resource	***Affected Environment***	***Alternative***	***Measure of Impact***
Land area used	Site acreage	Facility location and acreage requirement	Acreage converted to project use
Compatibility with existing or future facility land use	Existing facility land use configurations	Location of facility on the site; expected modifications of facility activities and missions to accommodate the alternatives	Incompatibility with existing or future facility land use
Visual resources	Current Visual Resource Management classification	Location of facility on the site; facility dimensions and appearance	Change in Visual Resource Management classification

A.1.2 Visual Resources

A.1.2.1 Description of Affected Resources and Region of Influence

Visual resources are the natural and human-created 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 region of influence for visual resources includes the geographic area from which the candidate facilities may be seen.

A.1.2.2 Description of Impact Assessment

Impacts to visual resources from construction and operation of the proposed action at LANL may be determined by evaluating whether the Bureau of Land Management Visual Resource Management classifications of the candidate sites would change as a result of the proposed action (DOI 1986) (see Table A–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 determined. In order to determine the range of potential visual effects from new facilities, the analysis considered potential impacts from construction and operation in light of the aesthetic quality of surrounding areas, as well as the visibility of the proposed action from public vantage points.

A.2 SITE INFRASTRUCTURE

A.2.1 Description of Affected Resources and Region of Influence

Site infrastructure includes the physical resources required to support the construction and operation of the candidate facilities. It includes the capacities of onsite road and rail transportation networks; electric power and electrical load capacities; natural gas capacities; and water supply system capacities.

The region of influence is generally limited to the boundaries of the candidate technical areas at LANL. However, should infrastructure requirements exceed technical area or site capacities, the region of influence would be expanded (for analysis) to include the sources of additional supply. For example, if electrical demand at LANL (with added facilities) exceeded availability, then the region of influence would be expanded to include the likely source of additional power.

A.2.2 Description of Impact Assessment

In general, infrastructure impacts were assessed by evaluating the requirements of each alternative against the technical area capacities. An impact assessment was made for each resource (transportation, electricity, fuel, and water) for the various alternatives (see **Table A–2**). Local transportation impacts were addressed qualitatively, as transportation infrastructure requirements under the proposed action were considered negligible. Tables reflecting site availability and infrastructure requirements were developed for each alternative. Data for these tables were obtained from reports describing the existing infrastructure at the sites, and from the data reports for each alternative. If necessary, design mitigation considerations conducive to reduction of the infrastructure demand were also identified.

Table A–2 Impact Assessment Protocol for Infrastructure

	Required Data		
Resource	***Affected Environment***	***Alternative***	***Measure of Impact***
Transportation - Roads (kilometers) - Railroads (kilometers)	Technical area/site capacity and current usage	Facility requirements	Additional requirement (with added facilities) exceeding technical area/site capacity
Electricity - Energy consumption (megawatt-hours per year) - Peak load (megawatts)	Technical area/site capacity and current usage	Facility requirements	Additional requirement (with added facilities) exceeding technical area/site capacity
Fuel - Natural gas (cubic meters per year)	Technical area/site capacity and current usage	Facility requirements	Additional requirement (with added facilities) exceeding technical area/site capacity
Water (liters per year)	Technical area/site capacity and current usage	Facility requirements	Additional requirement (with added facilities) exceeding technical area/site capacity

Any projected demand for infrastructure resources exceeding site availability can be regarded as an indicator of environmental impact. Whenever projected demand approaches or exceeds capacity, further analysis for 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, provided the potential for impact is identified early. Similarly, a dramatic spike or surge in peak demand for electricity can sometimes be mitigated by changes to operational procedures or parameters.

A.3 AIR QUALITY

A.3.1 Description of Affected Resources and Region of Influence

Air pollution refers to the introduction, directly or indirectly, of any substance into the air that could:

- endanger human health
- harm living resources and ecosystems
- damage material property
- impair or interfere with the comfortable enjoyment of life and other legitimate uses of the environment.

For the purpose of this *CMRR EIS*, only outdoor air pollutants were addressed. They 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 with the appropriate standards. Ambient air quality standards have been established by Federal and state agencies, allowing an adequate margin of safety for the protection of public health and welfare from the adverse effects of pollutants in the ambient air. Pollutant concentrations higher than the corresponding standards are considered unhealthy; those below such standards, 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 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 U.S.C. 7401 et seq.), those regulated by the National Emissions Standards for Hazardous Air Pollutants (40 CFR 61), and those that have been proposed or adopted for regulation by the applicable state, or are listed in state guidelines. States may set ambient standards that are more stringent than the national ambient air quality standards. The more stringent of the state or Federal standards for each site is shown in this document.

Areas with air quality better than the National Ambient Air Quality Standards (NAAQS) for criteria air pollutants are designated as being in attainment, while areas with air quality worse than the NAAQS for such pollutants are designated as nonattainment. Areas may be designated as unclassified when sufficient data for attainment status designation are lacking. 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 Sections 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, with the criteria established, in the Clean Air Act. Class I areas include national wilderness areas, 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 not designated as Class I. No Class III areas have been designated (42 U.S.C. 7472, Title I, Section 162). Although LANL is in a Class II area, it is adjacent to the Bandelier National Monument and Wilderness Area Class I area (DOE 1999).

The region of influence for air quality encompasses an 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 which concentrations of criteria pollutants would increase more than a significant amount in a Class II area (on the basis of averaging period and pollutant: one 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}); five micrograms per cubic meter for the 24-hour average for sulfur dioxide and PM_{10}; 500 micrograms per cubic meters for the eight-hour average for carbon monoxide; 25 micrograms per cubic meter for the three-hour average for sulfur dioxide; and 2,000 micrograms for the one-hour average for carbon monoxide [40 CFR Section 51.165]). Generally, this covers a few kilometers downwind from the source. Further, 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 one microgram per cubic meter (24-hour average). The area of the region of influence depends on emission source characteristics, pollutant types, emission rates, and meteorological and topographical conditions. For the purpose of this analysis, impacts were evaluated at the site boundary and roads within the sites 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 pollutant concentrations modeled for existing sources at each candidate site and background air pollutant concentrations measured near the sites. For this analysis, concentrations for existing sources were obtained from the *LANL SWEIS* and from modeling of concentrations using recent emissions inventories and the Industrial Source Complex (ISCST3) model (EPA 1995, EPA 2000).

A.3.2 Description of Impact Assessment

Potential air quality impacts of pollutant emissions from construction and normal operations were evaluated for each alternative. This assessment included a comparison of pollutant concentrations from each alternative with applicable Federal and state ambient air quality standards (see **Table A–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.

For each alternative, contributions to offsite air pollutant concentrations were modeled on the basis of guidance presented in EPA's "Guidelines on Air Quality Models" (40 CFR Part 51, Appendix W). The EPA-recommended model ISCST3 (EPA 1995) was selected as an appropriate model to perform the air dispersion modeling because it is designed to support the EPA regulatory modeling program and predicts conservative worst-case impacts.

The modeling analysis incorporated conservative assumptions, which tend to overestimate pollutant concentrations. The maximum modeled concentration for each pollutant and averaging time was selected for comparison with the applicable standard. The concentrations evaluated were the maximum 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 one year of representative hourly meteorological data was used.

Table A–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 site	Emission rate (kilograms per year) of air pollutants from facility; source characteristics (stack height and diameter, exit temperature and velocity)	Concentration of alternative and total site concentration of each pollutant at or beyond site boundary, or within boundary on public road compared to applicable standard
Toxic and hazardous air pollutants [b]	Measured and modeled ambient concentrations (micrograms per cubic meter) from existing sources at site	Emission rate (kilograms per year) of pollutants from facility; source characteristics (stack height and diameter, exit temperature and velocity)	Concentration of alternative and total site concentration of each pollutant at or beyond site boundary, or within boundary on public road used to calculate hazard quotient or cancer risk

[a] Carbon monoxide; hydrogen fluoride; lead; nitrogen oxides; ozone; particulate matter with an aerodynamic diameter less than or equal to 10 microns; sulfur dioxide; total suspended particulates.

[b] Clean Air Act, Section 112, hazardous air pollutant; pollutants regulated under the National Emissions Standard for Hazardous Air Pollutants; and other state-regulated pollutants.

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), 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 as 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 the implementation, maintenance, and enforcement of NAAQS for the six criteria pollutants: sulfur dioxide, particulate matter with an aerodynamic diameter less than or equal to 10 microns, carbon monoxide, ozone, nitrogen dioxide, and lead. Its purpose is to eliminate or reduce the severity and number of violations of NAAQS and to expedite the attainment of these standards. No department, agency, or instrumentality of the Federal Government shall engage in or support in any way (provide financial assistance for, license or permit, or approve) any activity that does not conform to an applicable implementation plan. The final rule for "Determining Conformity of General Federal Actions to State or Federal Implementation Plans" (58 FR 63214) took effect on January 31, 1994. LANL is within an area currently designated as attainment for criteria air pollutants. Therefore, the alternatives being considered in this *CMRR EIS* are not affected by the provisions of the conformity rule.

Emissions of potential stratospheric ozone-depleting compounds such as chlorofluorocarbons were not evaluated, as no emissions of these pollutants were identified in the conceptual engineering design reports.

A.4 NOISE

A.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 (dB), or in the case of A-weighted measurements, decibels A-weighted (dBA). 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 region of influence 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.

A.4.2 Description of Impact Assessment

Noise impacts associated with the alternatives may result from construction and operation of facilities and from increased traffic (see **Table A–4**). Impacts from 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 noise impacts from traffic were based on the likely increase in traffic volume. Possible impacts to wildlife were evaluated based on the possibility of sudden loud noises occurring during facility construction or modification and operation.

Table A–4 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

A.5 GEOLOGY AND SOILS

A.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, which are 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 by the alternatives, as well as those geologic and soil conditions that could affect each alternative. Thus, the region of influence for geology and soils includes the project site and nearby offsite areas subject to disturbance by facility construction, modification, and operations under the alternatives, and 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.

A.5.2 Description of Impact Assessment

Facility construction and operations for the *CMRR EIS* alternatives 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, key factors in the analysis were the land area to be disturbed during construction and occupied during operations (see **Table A–5**). The assessment included an analysis of constraints to siting new CMRR Facilities over unstable soils prone to subsidence, liquefaction, shrink-swell, or erosion.

Table A–5 Impact Assessment Protocol for Geology and Soils

Resource	*Required Data*		*Measure of Impact*
	Affected Environment	*Alternative*	
Geologic hazards	Presence of geologic hazards within the region of influence	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 region of influence	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 region of influence	Location of facility on the site	Conversion of important farmland soils to nonagricultural use

The geology and soils impact analysis (see Table A–5) also considered the risks to existing and new facilities of 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 on the potential for impacts on site facilities from local and large-scale geologic conditions. Historical seismicity within a given radius of each facility site was reviewed as a means of assessing the potential for future earthquake activity. As used in this EIS, earthquakes are described in terms of several parameters as presented in **Table A–6**.

Probabilistic earthquake ground motions in terms of peak ground acceleration and spectral (response) acceleration were determined in order to provide a comparative assessment of seismic hazard. The U.S. Geological Survey National Seismic Mapping Project uses both parameters. The U.S. Geological Survey's latest National Earthquake Hazards Reduction Program (NEHRP) maps are based on spectral acceleration and have been adapted for use in the *International Building Code* (ICC 2000) and depict maximum considered earthquake ground motion of 0.2- and 1.0-second spectral acceleration, respectively, 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.

An evaluation also determined if 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 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 the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.) process, the main purpose being 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).

Table A–6 The Modified Mercalli Intensity Scale of 1931, with Generalized Correlations to Magnitude, and Peak Ground Acceleration

Modified Mercalli Intensity [a]	*Observed Effects of Earthquake*	*Approximate Magnitude* [b]	*Peak Ground Acceleration* [c]*(g)*
I	Usually not felt except by a very few under very favorable conditions.	Less than 3	Less than 0.0017
II	Felt only by a few persons at rest, especially on the upper floors of buildings.	3 to 3.9	0.0017 to 0.014
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck.		
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy object striking building. Standing motor cars rock noticeably.	4 to 4.9	0.014 to 0.039
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.		0.039 to 0.092
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.	5 to 5.9	0.092 to 0.18
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.	6 to 6.9	0.18 to 0.34
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.	7 to 7.9	0.34 to 0.65
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.		0.65 to 1.24
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.		1.24 and higher
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.	8 and higher	
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.		

[a] Intensity is a unitless expression of observed effects from earthquake-produced ground shaking. Effects may vary greatly between locations based on earthquake magnitude, distance from the earthquake, and local subsurface geology. The descriptions given are abbreviated from the Modified Mercalli Intensity Scale of 1931.

[b] Magnitude is an exponential function of seismic wave amplitude, related to the energy released. There are several "magnitude" scales in common use including local "Richter" magnitude, body-wave magnitude, surface wave magnitude, and moment magnitude. Each has applicability for measuring particular aspects of seismic signals and may be considered equivalent within each scale's respective range of validity.

[c] Acceleration is expressed as a percent relative to the earth's gravitational acceleration (g) (g = 980 centimeters per second squared). Given values are correlated to Modified Mercalli Intensity based on measurements of California earthquakes only (Wald et al. 1999).

Sources: Compiled from Wald et al. 1999, USGS 2002.

A.6 SURFACE AND GROUNDWATER QUALITY

A.6.1 Description of Affected Resources and Region of Influence

Water resources are surface and groundwater suitable for human consumption, aquatic or wildlife propagation, agricultural purposes, irrigation, or industrial/commercial purposes. The region of influence used for water resources encompasses those site and adjacent surface water and groundwater systems that could be impacted by water withdrawals, effluent discharges, and spills or stormwater runoff associated with facility construction and operational activities under the relocation alternatives.

A.6.2 Description of Impact Assessment

Determination of the impacts of the *CMRR EIS* alternatives on surface and groundwater quality consisted of a comparison of site-generated data and professional estimates regarding water use and effluent discharge with applicable regulatory standards, design parameters and standards commonly used in the water and wastewater engineering fields, and recognized measures of environmental impact. Certain assumptions were made to facilitate the impacts assessment: (1) that all water supply (production and treatment) and effluent treatment facilities would be approved by the appropriate permitting authority; (2) that the effluent treatment facilities would meet the effluent limitations imposed by the respective National Pollutant Discharge Elimination System permits; and (3) that any stormwater runoff from construction and operation activities would be handled in accordance with the regulations of the appropriate permitting authority. It was also assumed that, during construction, sediment fencing or other erosion control devices would be used to mitigate short-term adverse impacts from sedimentation, and that, as appropriate, stormwater holding ponds would be constructed to lessen the impacts of runoff on surface water quality.

A.6.2.1 Water Use and Availability

This analysis involved the review of engineering estimates of expected surface water and/or groundwater use and effluent discharge associated with facility construction and operation activities for each alternative, and the impacts on local and regional water availability in terms of quantity and quality. Impacts on water use and availability were generally assessed by determining changes in the volume of current water usage and effluent discharge as a result of the proposed activities (**Table A–7**). For facilities intending to use surface water, no credit was taken for effluent discharges back to surface waters or to the subsurface. The impact of discharging withdrawn groundwater to surface waters or back to the subsurface was also considered, as appropriate.

If the determination of impacts reflected an increase in water use or effluent discharge, then an evaluation of the design capacity of the water supply production and treatment facilities and the effluent treatment facilities, respectively, was made to determine whether the design capacities would be exceeded by the additional flows. If the combined flow (the existing flow plus those from the proposed activities) was less than the design capacity of the water supply systems and effluent treatment plants, then it was assumed that there would be no impact on water availability for local users, or on receiving surface waters or groundwater from effluent discharges. Further, a separate analysis (see Section A.6.2.2) was performed as necessary to determine the potential for effluent discharge impacts on ambient surface water or groundwater quality based on the results of the effluent treatment capacity analysis.

Table A–7 Impact Assessment Protocol for Water Use and Availability

Resource	Required Data		Measure of Impact
	Affected Environment	Facility Design	
Surface water availability	Surface waters near the facilities, including average flow and current usage	Volume of withdrawals from, and discharges to, surface waters	Changes in availability to local/ downstream users of water for human consumption, irrigation, or animal feeding
Groundwater availability	Groundwater near the facilities, including existing water rights for major water users and current usage	Volume of withdrawals from, and discharges to, groundwater	Changes in availability of groundwater for human consumption, irrigation, or animal feeding

Because water withdrawals and effluent discharges from the site facilities were generally found not to exceed the design capacity of existing water supply systems or effluent treatment facilities, additional analyses were not performed.

A.6.2.2 Water Quality

The water quality impact assessment analyzed how effluent discharges to surface water, as well as discharges reaching groundwater, from the facilities under each alternative would directly affect current water quality. The determination of the impacts of the alternatives is summarized in **Table A–8** and 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 A–8 Impact Assessment Protocol for Water Quality

Resource	Required Data		Measure of Impact
	Affected Environment	Facility Design	
Surface water quality	Surface waters near the facilities in terms of stream classifications and changes in water quality	Expected contaminants and contaminant concentrations in discharges to surface waters	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 quality of groundwater	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 surface water quality impacts focused on the quality and quantity of any effluents (including stormwater) to be discharged and the quality of the receiving stream upstream and downstream from the discharges. The evaluation of effluent quality featured 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 or applicable state discharge permit. Parameters of concern include total suspended solids, metals, organic and inorganic chemicals, and any other constituents that could affect the local environment. Any 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 modification or construction, ground disturbing activities could impact surface waters through increased runoff and sedimentation. Such impacts relate to the amount of land disturbed, the type of soil at the site, the topography, and weather conditions. They would be minimized by application of standard management practices for stormwater and erosion control (sediment fences, mulching disturbed areas).

During operations, surface waters could be affected by increased 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 management practices, the design of holding facilities, the topography, and adjacent land use. Data from existing water quality databases were compared with expected discharges from the facilities to determine the potential for and the relative impacts on surface waters.

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 of each alternative. Also evaluated were the consequences of groundwater use and effluent discharge on other site groundwater conditions.

A.6.2.3 Waterways and Floodplains

The locations of waterways (ponds, lakes, streams) and the 100- and 500-year floodplains were identified from maps and other existing documents to assess the potential for impacts from facility construction and operation activities, including direct effects on hydrologic characteristics or secondary effects such as sedimentation (see Surface Water Quality in Section A.6.2.2.). All activities would be conducted to avoid delineated floodplains and to ensure compliance with Executive Order 11988, *Floodplain Management*. However, for any facilities proposed for location in a floodplain, a floodplain assessment would be prepared.

A.7 ECOLOGICAL RESOURCES

A.7.1 Description of Affected Resources and Region of Influence

Ecological resources include terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. The region of influence for the ecological resource analysis encompassed the site and adjacent areas potentially disturbed by construction and operation of the candidate facilities.

Terrestrial resources are defined as those plant and animal species and communities that are most closely associated with the land; 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 Section 328.3).

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 threatened and endangered species. They also maintain a list of "candidate" species for which they have evidence that listing may be warranted, but for which listing is currently precluded by the need to list species more in need of Endangered Species Act protection. 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. Critical habitat for threatened and endangered species is designated by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service. Critical habitat is defined as specific areas that contain physical and biological features essential to the conservation of species and that may require special management consideration or protection. States may also designate species as endangered, threatened, sensitive protected, in need of management, of concern, monitored, or species of special concern.

A.7.2 Description of Impact Assessment

Impacts to ecological resources may occur as a result of land disturbance, water use, air and water emissions, human activity, and noise associated with project implementation (see **Table A–9**). Each of these factors was considered when evaluating potential impacts from the proposed action. For those alternatives involving construction of new facilities, direct impacts to ecological resources was based on the acreage of land disturbed by construction. Indirect impacts from factors such as human disturbance and noise were evaluated qualitatively. Indirect impacts to ecological resources, including wetlands, from construction due to erosion were evaluated qualitatively, recognizing that standard erosion and sediment control practices would be followed. Impacts to 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. The determination of impacts to threatened and endangered species was based on similar factors as noted above for terrestrial resources, wetlands, and aquatic resources.

Table A–9 Impact Assessment Protocol for Ecological Resources

Resource	*Required Data*		*Measure of Impact*
	Affected Environment	*Alternative*	
Terrestrial resources	Vegetation and wildlife within vicinity of facilities	Facility location and acreage requirement, air and water emissions, and noise	Loss or disturbance to terrestrial habitat; emissions and noise values above levels shown to cause impacts to terrestrial resources
Wetlands	Wetlands within vicinity of facilities	Facility location and acreage requirement, air and water emissions, and wastewater discharge quantity and location	Loss or disturbance to wetlands; discharge to wetlands
Aquatic resources	Aquatic resources within vicinity of facilities	Facility air and water emissions, water source and quantity, and wastewater discharge location and quantity	Discharges above levels shown to cause impacts to aquatic resources; changes in water withdrawals and discharges
Threatened and endangered species	Threatened and endangered species and critical habitats within vicinity of facilities	Facility location and acreage requirement, 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

A.8 CULTURAL AND PALEONTOLOGICAL RESOURCES

A.8.1 Description of Affected Resources and Region of Influence

Cultural resources are the 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 EIS*, potential impacts were assessed separately for each of the three general categories of cultural resources: prehistoric, historic, and Native American. 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 action in much the same manner.

Prehistoric resources are 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. Historic resources consist of 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. Ordinarily, sites less than 50 years old are not considered historic, but exceptions can be made for such properties if they are of particular importance, such as structures associated with Cold War themes. Native American resources are sites, areas, and materials important to Native Americans for religious or heritage reasons. Such resources may include geographical features, plants, animals, cemeteries, battlefields, trails, and environmental features. The region of influence for the cultural and paleontological resource analysis encompassed the site and areas adjacent to the site that are potentially disturbed by construction and operation of the candidate facilities.

A.8.2 Description of Impact Assessment

The analysis of impacts to cultural and paleontological resources addressed potential direct and indirect impacts at each candidate site from construction and operation (see **Table A–10**). Direct impacts include those resulting from groundbreaking activities associated with new construction and possibly building modifications. 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 A–10 Impact Assessment Protocol for Cultural and Paleontological Resources

Resource	*Required Data*		*Measure of Impact*
	Affected Environment	*Alternative*	
Prehistoric resources	Prehistoric resources within the vicinity of facilities	Facility location and acreage requirement	Potential for loss, isolation, or alteration of the character of prehistoric resources; introduction of visual, audible, or atmospheric elements out of character
Historic resources	Historic resources within the vicinity of facilities	Facility location and acreage requirement	Potential for loss, isolation, or alteration of the character of historic resources; introduction of visual, audible, or atmospheric elements out of character
Native American resources	Native American resources within the vicinity of facilities	Facility location and acreage requirement	Potential for loss, isolation, or alteration of the character of Native American resources; introduction of visual, audible or atmospheric elements out of character
Paleontological resources	Paleontological resources within the vicinity of facilities	Facility location and acreage requirement	Potential for loss, isolation or alteration of paleontological resources

A.9 SOCIOECONOMICS

A.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 action 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 impact public services; and (2) operation-related jobs, which would last for the duration of the proposed project, and thus could create additional service requirements in the region of influence.

The region of influence 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 regions of influence were identified as those counties in which approximately 90 percent or more of the site's workforce reside. 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.

A.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 in order to measure their possible effect on these socioeconomic conditions. Although workforce requirements may be able to be filled by employees already working at LANL, it was assumed that new employees would be hired to ensure that the maximum impact was assessed. Census statistics were also compiled on population, housing demand, and community services. U.S. Census Bureau population forecasts for the region of influence were combined with overall projected workforce requirements for each of the alternatives being considered to determine the extent of impacts on housing demand and levels of community services (see **Table A–11**).

Table A–11 Impact Assessment Protocol for Socioeconomics

	Required Data		
Resource	***Affected Environment***	***Alternative***	***Measure of Impact***
Regional Economic Characteristics			
Workforce requirements	Site workforce projections	Estimated construction and operating staff requirements and time frames	Workforce requirements added to sites' workforce projections
Region of influence civilian labor force	Labor force estimates	Estimated construction and operating staff requirements and time frames	Workforce requirements as a percentage of the civilian labor force
Employment	Latest available employment in counties surrounding sites	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 and Community Services			
Housing – percent of occupied housing units	Latest available ratios from the U.S. Census Bureau	Estimated housing unit requirements	Potential change in housing unit availability
Education - Total enrollment - Teacher-to-student ratio	Latest available information from the U.S. Department of Education	Estimated effect on enrollment and teacher-student ratio	Potential change in student enrollment Potential change in teacher-student ratio
Health care – number of hospital beds and physicians per 1,000 residents	Latest available rates from the U.S. Census Bureau	Estimated effect on ratio	Potential change in the availability of hospital beds/physicians-population ratio

A.10 WASTE MANAGEMENT AND POLLUTION PREVENTION

A.10.1 Description of Affected Resources and Region of Influence

Depending on the alternative, construction and operation of the candidate facilities would generate several types of waste. Such wastes may include the following:

- 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 that contains radioactivity and is not classified as high-level radioactive waste, transuranic waste, or spent nuclear fuel, or the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material. Test specimens of fissionable material irradiated for research and development only, and 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: Low-level radioactive waste that also contains hazardous components regulated under the Resource Conservation and Recovery Act (42 U.S.C. 6901 et seq.).

- Hazardous: Under the Resource Conservation and Recovery Act, a waste that, because of its characteristics, may (1) cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness, or (2) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. Hazardous wastes appear on special EPA lists or possess at least one of the following characteristics: ignitability, corrosivity, reactivity, or toxicity. 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).

- Nonhazardous: Discarded material including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and 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.).

The alternatives could have an impact on existing LANL facilities devoted to the treatment, storage, and disposal of these categories of waste. Waste management activities in support of the proposed action would be contingent on Records of Decision issued for the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste (Waste Management PEIS)* (DOE 1997). In its Record of Decision for the Treatment and Management of Transuranic Waste (63 FR 3629), and subsequent revisions to this Record of Decision (65 FR 82985, 66 FR 38646, and

67 FR 56989, respectively), 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 Record of Decision for hazardous waste, released on August 5, 1998 (63 FR 41810), DOE sites evaluated in this *CMRR EIS* will continue to use offsite facilities for the treatment and disposal of major portions of their nonwastewater hazardous waste. Based on the Record of Decision 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 practical, onsite disposal of low-level radioactive waste will continue. Hanford and NTS will be made available to all DOE sites for the disposal of low-level radioactive waste. Mixed low-level radioactive waste analyzed in the *Waste Management PEIS* will be treated at Hanford, the Idaho National Engineering and Environmental Laboratory, the Oak Ridge Reservation, and the Savannah River Site and will be disposed of at Hanford and NTS.

A.10.2 Description of Impact Assessment

Waste management impacts were assessed by comparing the projected waste stream volumes generated from the proposed activities with LANL's waste management capacities and generation rates (see **Table A–12**). Only the impacts relative to the capacities of waste management facilities were considered; other environmental impacts of waste management facility operations (human health effects) are evaluated in other sections of this *CMRR EIS*, or in other facility-specific or sitewide NEPA documents. Projected waste generation rates for the proposed activities were compared with site processing rates and capacities of those treatment, storage, and disposal facilities likely to be involved in managing the additional waste. The waste generation rates were provided by the sites' technical personnel. Potential impacts from waste generated as a result of site environmental restoration activities are not within the scope of this analysis.

Table A–12 Impact Assessment Protocol for Waste Management

Resource	*Required Data*		*Measure of Impact*
	Affected Environment	*Alternative*	
Waste management capacity - Transuranic waste - Mixed transuranic waste - Low-level radioactive waste - Mixed low-level radioactive waste - Hazardous waste - Nonhazardous waste	Site generation rates (cubic meters per year) for each waste type Site management capacities (cubic meters) or rates (cubic meters per year) for potentially affected treatment, storage, and disposal facilities for each waste type	Generation rates (cubic meters per year) from facility operations for each waste type	Combination of facility waste generation volumes and other site generation volumes in comparison to the capacities of applicable waste management facilities

A.11 CUMULATIVE IMPACTS

Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR Section 1508.7). The cumulative impact analysis for this *CMRR EIS* involved combining the impacts of the alternatives (including the No Action Alternative) with the impacts of other present and reasonably foreseeable activities in the regions of influence. The key resources are identified in **Table A–13**.

In general, 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 action (or no action), and other future actions. Quantifiable information was incorporated to the degree available. Factors were weighed against the appropriate impact indicators (site capacity or number of fatalities) to determine the potential for impact (see **Table A–14**).

Table A–13 Key Resources and Associated Regions of Influence

Resources	*Region of Influence*
Resource use	The site
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 100 kilometers
Human health	The site, offsite areas within 80 kilometers of the site, and the transportation corridors among the sites where worker and general population radiation, radionuclide, and hazardous chemical exposures may occur
Waste management	The site

Table A–14 Selected Indicators of Cumulative Impact

Category	*Indicator*
Resource use	- Workers required compared with existing workforce - Electricity use compared with site capacity - Water use compared with site capacity
Air quality	Criteria pollutant concentrations and comparisons with standards or guidelines
Human health	Public - Maximally exposed offsite individual dose - Offsite population dose - Fatalities Workers - Total dose - Fatalities
Waste	- Low-level radioactive waste generation rate compared with existing management capacities and generation rate - Mixed low-level radioactive waste generation rate compared with existing management capacities and generation rate - Hazardous waste generation rate compared with existing management capacities and generation rate - Nonhazardous waste generation rate compared with existing management capacities and generation rate

The analysis focused on the potential for cumulative impacts at LANL from DOE actions under detailed consideration at the time of this *CMRR EIS*, as well as cumulative impacts associated with transportation. The *LANL SWEIS* was used to establish baseline conditions upon which incremental cumulative impacts were assessed.

It is assumed that construction impacts would not be cumulative because construction is typically short in duration, and construction impacts are generally temporary.

A.12 REFERENCES

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APPENDIX B
EVALUATION OF RADIOLOGICAL HUMAN HEALTH IMPACTS FROM ROUTINE NORMAL OPERATIONS

B.1 INTRODUCTION

This appendix provides a brief general discussion on radiation and its health effects. It also describes the methods and assumptions used for estimating the potential impacts and risks to individuals and the general public from exposure to releases of radioactivity during normal operations and postulated accidents at facilities used to perform Chemistry and Metallurgy Research (CMR) operations.

This appendix presents numerical information using engineering and/or scientific notation. For example, the number 100,000 also can be expressed as 1×10^5. The fraction 0.001 also can be expressed as 1×10^{-3}. The following chart defines the equivalent numerical notations that may be used in this appendix.

FRACTIONS AND MULTIPLES OF UNITS

Multiple	*Decimal Equivalent*	*Prefix*	*Symbol*
1×10^6	1,000,000	mega-	M
1×10^3	1,000	kilo-	k
1×10^2	100	hecto-	h
1×10	10	deka-	da
1×10^{-1}	0.1	deci-	d
1×10^{-2}	0.01	centi-	c
1×10^{-3}	0.001	milli-	m
1×10^{-6}	0.000001	micro-	μ

B.2 RADIOLOGICAL IMPACTS ON HUMAN HEALTH

Radiation exposure and its consequences are topics of interest to the general public. For this reason, this environmental impact statement (EIS) places emphasis on the consequences of exposure to radiation, provides the reader with information on the nature of radiation, and explains the basic concepts used in the evaluation of radiation health effects.

B.2.1 Nature of Radiation and Its Effects on Humans

What Is Radiation?

Radiation is energy transferred in the form of particles or waves. Globally, human beings are exposed constantly to radiation from the solar system and the Earth's rocks and soil. This radiation contributes to the natural background radiation that always surrounds us. Manmade sources of radiation also exist, including medical and dental x-rays, household smoke detectors, and materials released from nuclear and coal-fired power plants.

All matter in the universe is composed of atoms. Radiation comes from the activity of tiny particles within an atom. An atom consists of a positively charged nucleus (central part of an atom) with a number of negatively charged electron particles in various orbits around the nucleus. There are two types of particles in the nucleus: neutrons that are electrically neutral and protons that are positively charged. Atoms of different types are known as elements. There are more than 100 natural and manmade elements. An element has equal numbers of electrons and protons. When atoms of an element differ in their number of neutrons, they are called isotopes of that element. All elements have three or more isotopes, some or all of which could be unstable (i.e., decay with time).

Unstable isotopes undergo spontaneous change, known as radioactive disintegration or radioactive decay. The process of continuously undergoing spontaneous disintegration is called radioactivity. The radioactivity of a material decreases with time. The time it takes a material to lose half of its original radioactivity is its half-life. An isotope's half-life is a measure of its decay rate. For example, an isotope with a half-life of eight days will lose one-half of its radioactivity in that amount of time. In eight more days, one-half of the remaining radioactivity will be lost, and so on. Each radioactive element has a characteristic half-life. The half-lives of various radioactive elements may vary from millionths of a second to millions of years.

As unstable isotopes change into more stable forms, they emit electrically charged particles. These particles may be either an alpha particle (a helium nucleus) or a beta particle (an electron), with various levels of kinetic energy. Sometimes these particles are emitted in conjunction with gamma rays. The alpha and beta particles are frequently referred to as ionizing radiation. Ionizing radiation refers to the fact that the charged particle energy force can ionize, or electrically charge, an atom by stripping off one of its electrons. Gamma rays, even though they do not carry an electric charge as they pass through an element, can ionize atoms by ejecting electrons. Thus, they cause ionization indirectly. Ionizing radiation can cause a change in the chemical composition of many things, including living tissue (organs), which can affect the way they function.

When a radioactive isotope of an element emits a particle, it changes to an entirely different element, one that may or may not be radioactive. Eventually a stable element is formed. This transformation, which may take several steps, is known as a decay chain. For example, radium, which is a member of the radioactive decay chain of uranium, has a half-life of 1,622 years. It emits an alpha particle and becomes radon, a radioactive gas with a half-life of only 3.8 days. Radon decays first to polonium, then through a series of further decay steps to bismuth, and ultimately to a stable isotope of lead. Meanwhile, the decay products will build up and eventually die away as time progresses.

The characteristics of various forms of ionizing radiation are briefly described below and in the box at right (see Chapter 7 for further definitions):

Radiation Type	Typical Travel Distance in Air	Barrier
α	Few centimeters	Sheet of paper or skin's surface
β	Few meters	Thin sheet of aluminum foil or glass
γ	Very large	Thick wall of concrete, lead, or steel
n	Very large	Water, paraffin, graphite

Alpha (α)—Alpha particles are the heaviest type of ionizing radiation. They can travel only a few centimeters in air. Alpha particles lose their energy almost as soon as they collide with anything. They can be stopped easily by a sheet of paper or by the skin's surface.

Beta (β)—Beta particles are much (7,330 times) lighter than alpha particles. They can travel a longer distance than alpha particles in the air. A high-energy beta particle can travel a few meters in the air. Beta particles can pass through a sheet of paper, but may be stopped by a thin sheet of aluminum foil or glass.

Gamma (γ)—Gamma rays (and x-rays), unlike alpha or beta particles, are waves of pure energy. Gamma rays travel at the speed of light. Gamma radiation is very penetrating and requires a thick wall of concrete, lead, or steel to stop it.

Neutrons (n)—Neutrons are particles that contribute to radiation exposure both directly and indirectly. The most prolific source of neutrons is a nuclear reactor. Indirect radiation exposure occurs when gamma rays and alpha particles are emitted following neutron capture in matter. A neutron has about one-quarter the weight of an alpha particle. It will travel in the air until it is absorbed in another element.

Units of Radiation Measure

During the early days of radiological experience, there was no precise unit of radiation measure. Therefore, a variety of units were used to measure radiation. These units were used to determine the amount, type, and intensity of radiation. Just as heat can be measured in terms of its intensity or effects using units of calories or degrees, amounts of radiation or its effects can be measured in units of curies, radiation absorbed dose (rad), or dose equivalent (roentgen equivalent man, or rem). The following summarizes those units (see also the definitions in Chapter 7).

Curie—The curie, named after the French scientists Marie and Pierre Curie, describes the "intensity" of a sample of radioactive material. The rate of decay of 1 gram of radium was the basis of this unit of measure. Because the measured decay rate kept changing slightly as measurement techniques became more accurate, the curie was subsequently defined as exactly 3.7×10^{10} disintegrations (decays) per second.

Radiation Units and Conversions to International System of Units

1 curie = 3.7×10^{10} disintegrations per second
= 3.7×10^{10} becquerels
1 becquerel = 1 disintegration per second
1 rad = 0.01 gray
1 rem = 0.01 sievert
1 gray = 1 joule per kilogram

Rad—The rad is the unit of measurement for the physical absorption of radiation. The total energy absorbed per unit quantity of tissue is referred to as absorbed dose (or simply dose). As sunlight heats pavement by giving up an amount of energy to it, radiation similarly gives up energy to objects in its path. One rad is equal to the amount of radiation that leads to the deposition of 0.01 joule of energy per kilogram of absorbing material.

Rem—A rem is a measurement of the dose equivalent from radiation based on its biological effects. The rem is used in measuring the effects of radiation on the body as degrees centigrade are used in measuring the effects of sunlight heating pavement. Thus, 1 rem of one type of radiation is presumed to have the same biological effects as 1 rem of any other kind of radiation. This allows comparison of the biological effects of radionuclides that emit different types of radiation.

The units of radiation measure in the International System of Units are: becquerel (a measure of source intensity [activity]), gray (a measure of absorbed dose), and sievert (a measure of dose equivalent).

An individual may be exposed to ionizing radiation externally (from a radioactive source outside the body) or internally (from ingesting or inhaling radioactive material). The external dose is different from the internal dose because an external dose is delivered only during the actual time of exposure to the external radiation source, while an internal dose continues to be delivered as long as the radioactive source is in the body. The dose from internal exposure is calculated over 50 years following the initial exposure. Both radioactive decay and elimination of the radionuclide by ordinary metabolic processes decrease the dose rate with the passage of time.

Sources of Radiation

The average American receives a total of approximately 360 millirem per year from all sources of radiation, both natural and manmade, of which approximately 300 millirem per year are from natural sources. The sources of radiation can be divided into six different categories: (1) cosmic radiation, (2) terrestrial radiation, (3) internal radiation, (4) consumer products, (5) medical diagnosis and therapy, and (6) other sources (NCRP 1987). These categories are discussed in the following paragraphs.

Cosmic Radiation—Cosmic radiation is ionizing radiation resulting from energetic charged particles from space continuously hitting the Earth's atmosphere. These particles and the secondary particles and photons they create comprise cosmic radiation. Because the atmosphere provides some shielding against cosmic radiation, the intensity of this radiation increases with the altitude above sea level. The average dose to people in the United States from this source is approximately 27 millirem per year.

External Terrestrial Radiation—External terrestrial radiation is the radiation emitted from the radioactive materials in the Earth's rocks and soils. The average dose from external terrestrial radiation is approximately 28 millirem per year.

Internal Radiation—Internal radiation results from the human body metabolizing natural radioactive material that has entered the body by inhalation or ingestion. Natural radionuclides in the body include isotopes of uranium, thorium, radium, radon, polonium, bismuth, potassium, rubidium, and carbon. The major contributor to the annual dose equivalent for internal radioactivity is the short-lived decay products of radon, which contribute approximately 200 millirem per year. The average dose from other internal radionuclides is approximately 39 millirem per year.

Consumer Products—Consumer products also contain sources of ionizing radiation. In some products, such as smoke detectors and airport x-ray machines, the radiation source is essential to the product's operation. In other products, such as televisions and tobacco, the radiation occurs as the products function. The average dose from consumer products is approximately 10 millirem per year.

Medical Diagnosis and Therapy—Radiation is an important diagnostic medical tool and cancer treatment. Diagnostic x-rays result in an average exposure of 39 millirem per year. Nuclear medical procedures result in an average exposure of 14 millirem per year.

Other Sources—There are a few additional sources of radiation that contribute minor doses to individuals in the United States. The dose from nuclear fuel cycle facilities (e.g., uranium mines, mills, and fuel processing plants) and nuclear power plants has been estimated to be less than 1 millirem per year. Radioactive fallout from atmospheric atomic bomb tests, emissions from certain mineral extraction facilities, and transportation of radioactive materials contribute less than 1 millirem per year to the average dose to an individual. Air travel contributes approximately 1 millirem per year to the average dose.

Exposure Pathways

As stated earlier, an individual may be exposed to ionizing radiation both externally and internally. The different ways that could result in radiation exposure to an individual are called exposure pathways. Each type of exposure is discussed separately in the following paragraphs.

External Exposure—External exposure can result from several different pathways, all having in common the fact that the radiation causing the exposure is external to the body. These pathways include exposure to a cloud of radiation passing over the receptor (an exposed individual), standing on ground that is contaminated with radioactivity, and swimming or boating in contaminated water. If the receptor departs from the source of radiation exposure, the dose rate will be reduced. It is assumed that external exposure occurs uniformly during the year. The appropriate dose measure is called the effective dose equivalent.

Internal Exposure—Internal exposure results from a radiation source entering the human body through either inhalation of contaminated air or ingestion of contaminated food or water. In contrast to external exposure, once a radiation source enters the body, it remains there for a period of time that varies depending on decay and biological half-life. The absorbed dose to each organ of the body is calculated for a period of 50 years following the intake. The calculated absorbed dose is called the committed dose equivalent. Various organs have different susceptibilities to harm from radiation. The quantity that takes these different susceptibilities into account is called the committed effective dose equivalent, and it provides a broad indicator of the risk to the health of an individual from radiation. The committed effective dose equivalent is a weighted sum of the committed dose equivalent in each major organ or tissue. The concept of committed effective dose equivalent applies only to internal pathways.

Radiation Protection Guides

Various organizations have issued radiation protection guides. The responsibilities of the main radiation safety organizations, particularly those that affect policies in the United States, are summarized below.

International Commission on Radiological Protection—This Commission has the responsibility for providing guidance in matters of radiation safety. The operating policy of this organization is to prepare recommendations to deal with basic principles of radiation protection and to leave to the various national protection committees the responsibility of introducing the detailed technical regulations, recommendations, or codes of practice best suited to the needs of their countries.

National Council on Radiation Protection and Measurements—In the United States, this Council is the national organization that has the responsibility for adapting and providing detailed technical guidelines for implementing the International Commission on Radiological Protection recommendations. The Council consists of technical experts who are specialists in radiation protection and scientists who are experts in disciplines that form the basis for radiation protection.

National Research Council/National Academy of Sciences—The National Research Council is an organization within the National Academy of Sciences that associates the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the Federal Government.

Environmental Protection Agency—The Environmental Protection Agency (EPA) has published a series of documents, *Radiation Protection Guidance to Federal Agencies*. This guidance is used as a regulatory benchmark by a number of Federal agencies, including the U.S. Department of Energy (DOE), in the realm of limiting public and occupational work force exposures to the greatest extent possible.

Limits of Radiation Exposure

Limits of exposure to members of the public and radiation workers are derived from International Commission on Radiological Protection recommendations. The EPA uses the National Council on Radiation Protection and Measurements and the International Commission on Radiological Protection recommendations and sets specific annual exposure limits (usually less than those specified by the Commission) in *Radiation Protection Guidance to Federal Agencies* documents. Each regulatory organization then establishes its own set of radiation standards. The various exposure limits set by DOE and the EPA for radiation workers and members of the public are given in **Table B–1**.

Table B–1 Exposure Limits for Members of the Public and Radiation Workers

Guidance Criteria (Organization)	*Public Exposure Limits at the Site Boundary*	*Worker Exposure Limits*
10 CFR 835 (DOE)	—	5,000 millirem per year [a]
10 CFR 835.1002 (DOE)	—	1,000 millirem per year [b]
DOE Order 5400.5 (DOE) [c]	10 millirem per year (all air pathways) 4 millirem per year (drinking water pathway) 100 millirem per year (all pathways)	—
40 CFR 61 (EPA)	10 millirem per year (all air pathways)	—
40 CFR 141 (EPA)	4 millirem per year (drinking water pathways)	—

[a] Although this is a limit (or level) that is enforced by DOE, worker doses must be managed in accordance with as low as is reasonably achievable principles. Refer to footnote b.

[b] This is a control level. It was established by DOE to assist in achieving its goal to maintain radiological doses as low as is reasonably achievable. DOE recommends that facilities adopt a more limiting 500 millirem per year Administrative Control Level (DOE 1999b). Reasonable attempts have to be made by the site to maintain individual worker doses below these levels.

[c] Derived from 40 CFR 61, 40 CFR 141, and 10 CFR 20.

B.2.2 Health Effects

Radiation exposure and its consequences are topics of interest to the general public. To provide the background for discussions of impacts, this section explains the basic concepts used in the evaluation of radiation effects.

Radiation can cause a variety of damaging health effects in people. The most significant effects are induced cancer fatalities. These effects are referred to as “latent” cancer fatalities because the cancer may take many years to develop. In the discussions that follow, all fatal cancers are considered latent; therefore, the term “latent” is not used.

The National Research Council’s Committee on the Biological Effects of Ionizing Radiation (BEIR) has prepared a series of reports to advise the U.S. Government on the health consequences of radiation exposures. *Health Effects of Exposure to Low Levels of Ionizing Radiation*, BEIR V (National Research Council 1990), provides the most current estimates for excess mortality from leukemia and other cancers that are expected to result from exposure to ionizing radiation. BEIR V provides estimates that are consistently higher than those in its predecessor, BEIR III. This increase is attributed to several factors, including the use of a linear dose response model for cancers other than leukemia, revised dosimetry for the Japanese atomic bomb survivors, and additional followup studies of the atomic bomb survivors and associated others. BEIR III employs constant, relative, and absolute risk models, with separate coefficients for each of several sex and age-at-exposure groups. BEIR V develops models in which the excess relative risk is expressed as a function of age at exposure, time after exposure, and sex for each of several cancer categories. The BEIR III models were based on the assumption that absolute risks are comparable between the atomic bomb survivors and the U.S. population. BEIR V models were based on the assumption that the relative risks are comparable. For a disease such as lung cancer, where baseline risks in the United States are much larger than those in Japan, the BEIR V approach leads to larger risk estimates than the BEIR III approach.

The models and risk coefficients in BEIR V were derived through analyses of relevant epidemiologic data that included the Japanese atomic bomb survivors, ankylosis spondylitis patients, Canadian and Massachusetts fluoroscopy (breast cancer) patients, New York postpartum mastitis (breast cancer) patients, Israeli tinea capitis (thyroid cancer) patients, and Rochester thymus (thyroid cancer) patients. Models for leukemia, respiratory cancer, digestive cancer, and other cancers used only the atomic bomb survivor data, although results of analyses of the ankylosis spondylitis patients were considered. Atomic bomb survivor analyses were based on revised dosimetry, with an assumed relative biological effectiveness of 20 for neutrons, and were restricted to doses less than 400 rads. Estimates of risks of fatal cancers, other than leukemia, were obtained by totaling the estimates for breast cancer, respiratory cancer, digestive cancer, and other cancers.

The National Council on Radiation Protection and Measurements (NCRP 1993), based on the radiation risk estimates provided in BEIR V and the International Commission on Radiological Protection Publication 60 recommendations (ICRP 1991), has estimated the total detriment resulting from low dose[1] or low dose rate exposure to ionizing radiation to be 0.00056 per rem for the working population and 0.00073 per rem for the general population. The total detriment includes fatal and nonfatal cancers as well as severe hereditary (genetic) effects. The major contribution to the total detriment is from fatal cancer which is estimated to be 0.0004 and 0.0005 per rem for radiation workers and the general population, respectively. The breakdowns of the risk estimators for both workers and the general population are given in **Table B–2**. Nonfatal cancers and genetic effects are less probable consequences of radiation exposure. To simplify the presentation of the impacts, estimated effects of radiation are calculated only in terms of cancer fatalities. For higher doses to an individual (20 rem or more), as could be associated with postulated accidents, the risk estimators given in Table B–2 are doubled.

Table B–2 Nominal Health Risk Estimators Associated with Exposure to 1 Rem of Ionizing Radiation

Exposed Individual	*Fatal Cancer* [a, c]	*Nonfatal Cancer* [b]	*Genetic Disorders* [b]	*Total*
Worker	0.0004	0.00008	0.00008	0.00056
Public	0.0005	0.0001	0.00013	0.00073

[a] For fatal cancer, the health effect coefficient is the same as the probability coefficient. When applied to an individual, the units are the lifetime probability of a cancer fatality per rem of radiation dose. When applied to a population of individuals, the units are the excess number of fatal cancers per person-rem of radiation dose.

[b] In determining a means of assessing health effects from radiation exposure, the International Commission on Radiological Protection has developed a weighting method for nonfatal cancers and genetic effects.

[c] For high individual exposures (greater than or equal to 20 rem), the health factors are multiplied by a factor of 2.

Source: NCRP 1993.

[1] *Low dose is defined as the dose level where DNA repair can occur in a few hours after irradiation-induced damage. Currently, a dose level of about 0.2 grays (20 rad), or a dose rate of 0.1 milligrays (0.01 rad) per minute is considered low enough to allow the DNA to repair itself in a short period (EPA 1999).*

The numerical estimates of fatal cancers presented in this EIS were obtained using a linear extrapolation from the nominal risk estimated for lifetime total cancer mortality that results from a dose of 0.1 gray (10 rad). Other methods of extrapolation to the low-dose region could yield higher or lower numerical estimates of fatal cancers. 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, and the possibility of no risk cannot be excluded (CIRRPC 1992).

Health Effect Risk Estimators Used in This EIS

Health impacts from radiation exposure, whether from external or internal sources, generally are identified as “somatic” (i.e., affecting the exposed individual) or “genetic” (i.e., affecting descendants of the exposed individual). Radiation is more likely to produce somatic effects than genetic effects. The somatic risks of most importance are induced cancers. Except for leukemia, which can have an induction period (time between exposure to carcinogen and cancer diagnosis) of as little as two to seven years, most cancers have an induction period of more than 20 years.

For a uniform irradiation of the body, the incidence of cancer varies among organs and tissues; the thyroid and skin demonstrate a greater sensitivity than other organs. Such cancers, however, also produce relatively low mortality rates because they are relatively amenable to medical treatment. Because fatal cancer is the most probable serious effect of environmental and occupational radiation exposures, estimates of cancer fatalities rather than cancer incidence are presented in this EIS. The numbers of fatal cancers can be used to compare the risks among the various alternatives.

Based on the preceding discussion and the values presented in Table B–2, the number of fatal cancers in the general public during normal operations and for postulated accidents in which individual doses are less than 20 rem are calculated using a health risk estimator of 0.0005 per person-rem. For workers, a risk estimator of 0.0004 excess fatal cancers per person-rem is used. (The risk estimators are lifetime probabilities that an individual would develop a fatal cancer per rem of radiation received.) The lower value for workers reflects the absence of children (who are more radiosensitive than adults) in the workforce. The risk estimators associated with nonfatal cancer and genetic disorders among the public are 20 and 26 percent, respectively, of the fatal cancer risk estimator. For workers, these health risk estimators are both 20 percent of the fatal cancer risk estimator. The nonfatal cancer and genetic disorder risk estimators are not used in this EIS.

For individual doses of 20 rem or more, as could be associated with postulated accidents, the risk estimators used to calculate health effects to the general public and to workers are double those given in the previous paragraph, which are associated with doses of less than 20 rem.

The fatal cancer estimators are used to calculate the statistical expectation of the effects of exposing a population to radiation. For example, if 100,000 people were each exposed to a one-time radiation dose of 100 millirem (0.1 rem), the collective dose would be 10,000 person-rem. The exposed population would then be expected to experience five additional cancer fatalities from the radiation (10,000 person-rem times 0.0005 lifetime probability of cancer fatalities per person-rem = five cancer fatalities).

Calculations of the number of excess fatal cancers associated with radiation exposure do not always yield whole numbers. These calculations may yield numbers less than one, especially in environmental impact applications. For example, if a population of 100,000 were exposed to a total dose of only 0.001 rem per person, the collective dose would be 100 person-rem (100,000 persons times 0.001 rem = 100 person-rem). The corresponding estimated number of cancer fatalities would be 0.05 (100 person-rem times 0.0005 cancer fatalities per person-rem = 0.05 cancer fatalities). The 0.05 means that there is 1 chance in 20 that the exposed population would experience one fatal cancer. In other words, the 0.05 cancer fatalities is the *expected* number of deaths that would result if the same exposure situation were applied to many different groups of 100,000 people. In most groups, no person would incur a fatal cancer from the 0.001 rem dose each member would have received. In a small fraction of the groups, one cancer fatality would result; in exceptionally few groups, two or more cancer fatalities would occur. The *average* expected number of deaths over all the groups would be 0.05 cancer fatalities (just as the average of 0, 0, and 0, added to 1 is 1/4, or 0.25). The most likely outcome is no cancer fatalities.

The same concept is applied to estimate the effects of radiation exposure on an individual member of the public. Consider the effects of an individual's exposure to a 360 millirem (0.36 rem) annual dose from all radiation sources. The probability that the individual will develop a fatal cancer from continuous exposure to this radiation over an average life of 72 years (presumed) is 0.013 (1 person times 0.36 rem per year times 72 years times 0.005 cancer fatalities per person-rem = 0.013). This corresponds to 1 chance in 77 that the individual would develop a fatal cancer in a lifetime.

B.3 METHODOLOGY FOR ESTIMATING RADIOLOGICAL IMPACTS

B.3.1 GENII Computer Code, a Generic Description

The radiological impacts from releases during normal operation of the facilities used to perform CMR operations were calculated using Version 1.485 of the GENII computer code (PNL 1988). Site-specific input data were used, including location, meteorology, population, and source terms. This section briefly describes GENII and outlines the approach used for normal operations.

B.3.1.1 Description of the Code

The GENII computer model, developed by Pacific Northwest National Laboratory, is an integrated system of various computer modules that analyze environmental contamination resulting from acute or chronic releases to, or initial contamination in, air, water, or soil. The model calculates radiation doses to individuals and populations. The GENII computer model is well documented for assumptions, technical approach, method, and quality assurance issues. The GENII computer model has gone through extensive quality assurance and quality control steps, including comparing results from model computations with those from hand calculations and performing internal and external peer reviews (PNL 1988).

The GENII code consists of several modules for various applications as described in the code manual (PNL 1988). For this EIS, only the ENVIN, ENV, and DOSE computer modules were used. The output of one module is stored in a file that can be used by the next module in the system. The functions of the three GENII computer modules used in this EIS are discussed below.

ENVIN

The ENVIN module of the GENII code controls the reading of input files and organizes the input for optimal use in the environmental transport and exposure module, ENV. The ENVIN code interprets the basic input, reads the basic GENII data libraries and other optional input files, and organizes the input into sequential segments based on radionuclide decay chains.

A standardized file that contains scenario, control, and inventory parameters is used as input to ENVIN. Radionuclide inventories can be entered as functions of releases to air or water, concentrations in basic environmental media (air, soil, or water), or concentrations in foods. If certain atmospheric dispersion options have been selected, this module would generate tables of atmospheric dispersion parameters that are used in later calculations. If the finite plume air submersion option is selected in addition to the atmospheric dispersion calculations, preliminary energy-dependent finite plume dose factors can be prepared as well. The ENVIN module prepares the data transfer files that are used as input by the ENV module; ENVIN generates the first portion of the calculation documentation—the run input parameters report.

ENV

The ENV module calculates the environmental transfer, uptake, and human exposure to radionuclides that result from the chosen scenario for the user-specified source term. The code reads the input files from ENVIN and then, for each radionuclide chain, sequentially performs the precalculations to establish the conditions at the start of the exposure scenario. Environmental concentrations of radionuclides are established at the beginning of the scenario by assuming decay of pre-existing sources, considering biotic transport of existing subsurface contamination, and defining soil contamination from continuing atmospheric or irrigation depositions. For each year of postulated exposure, the code then estimates the air, surface soil, deep soil, groundwater, and surface water concentrations of each radionuclide in the chain. Human exposures and intakes of each radionuclide are calculated for: (1) pathways of external exposure from finite or infinite atmospheric plumes; (2) inhalation; (3) external exposure from contaminated soil, sediments, and water; (4) external exposure from special geometries; and (5) internal exposures from consumption of terrestrial foods, aquatic foods, drinking water, animal products, and inadvertent intake of soil. The intermediate information on annual media concentrations and intake rates is written to data transfer files. Although these may be accessed directly, they are usually used as input to the DOSE module of GENII.

DOSE

The DOSE module reads the intake and exposure rates defined by the ENV module and converts the data to radiation dose.

B.3.1.2 Data and General Assumptions

To perform the dose assessments for this EIS, different types of data were collected and generated. This section discusses the various data, along with the assumptions made for performing the dose assessments.

Dose assessments were performed for members of the general public at Los Alamos National Laboratory (LANL) to determine the incremental doses that would be associated with the alternatives addressed in this EIS. Incremental doses for members of the public were calculated (via GENII) for two different types of receptors:

- Maximally Exposed Offsite Individual—The maximally exposed offsite individual was assumed to be an individual member of the public located at a position on the site boundary that would yield the highest impacts during normal operations.

- Population—The general population living within 50 miles (80 kilometers) of the facility. An average dose to a member of this population is also calculated.

Meteorological Data

The meteorological data used for all normal operational scenarios discussed in this EIS were in the form of joint frequency data files. A joint frequency data file is a table listing the fractions of time the wind blows in a certain direction, at a certain speed, and within a certain atmospheric stability class. The joint frequency data files were based on measurements taken over a period of several years at LANL.

Population Data

Population distributions were based on U.S. Department of Commerce state population census numbers (DOC 2001). Estimates were determined for the year 2000 for areas within 50 miles (80 kilometers) of the release locations at LANL. The estimated site-specific population in 2000 was used in the impact assessments. The population was spatially distributed on a circular grid with 16 directions and 10 radial distances up to 50 miles (80 kilometers). The grid was centered at the location from which the radionuclides were assumed to be released.

Source Term Data

The source terms used to calculate the impacts of normal operations are provided in Section B.4.

Food Production and Consumption Data

Generic food consumption rates are available as default values in GENII. The default values are comparable to those established in the U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 1.109 (NRC 1977). This regulatory guide provides guidance for evaluating ingestion doses from consuming contaminated terrestrial and animal food products using a standard set of assumptions for crop and livestock growth and harvesting characteristics.

Basic Assumptions

To estimate annual radiological impacts to the public from normal operations, the following additional assumptions and factors were considered in using GENII:

- Radiological airborne emissions were assumed to be released to the atmosphere at a height of 52 feet (16 meters).
- Emission of the plume was assumed to continue throughout the year. Plume and ground deposition exposure parameters used in the GENII model for the exposed offsite individual and the general population are provided in **Table B–3**.
- The exposed individual or population was assumed to have the characteristics and habits of an adult human.
- A semi-infinite plume model was used for the air immersion doses.

Table B–3 GENII Parameters for Exposure to Plumes (Normal Operations)

Maximally Exposed Offsite Individual				*General Population*			
External Exposure		*Inhalation of Plume*		*External Exposure*		*Inhalation of Plume*	
Plume (hours)	*Ground Contamination (hours)*	*Exposure Time (hours)*	*Breathing Rate (cubic centimeters per second)*	*Plume (hours)*	*Ground Contamination (hours)*	*Exposure Time (hours)*	*Breathing Rate (cubic centimeters per second)*
6,136	6,136	8,766	270	4,383	4,383	8,766	270

Sources: PNL 1988, NRC 1977.

Worker doses associated with CMR operations were determined from historical data. Refer to Section B.4 for a further discussion of worker impacts.

B.3.1.3 Uncertainties

The sequence of analyses performed to generate the radiological impact estimates from normal operations include: (1) selection of normal operational modes, (2) estimation of source terms, (3) estimation of environmental transport and uptake of radionuclides, (4) calculation of radiation doses to exposed individuals, and (5) estimation of health effects. There are uncertainties associated with each of these steps. Uncertainties exist in the way the physical systems being analyzed are represented by the computational models and in the data required to exercise the models (due to measurement, sampling, or natural variability).

In principle, one can estimate the uncertainty associated with each source and predict the remaining uncertainty in the results of each set of calculations. Thus, one can propagate the uncertainties from one set of calculations to the next and estimate the uncertainty in the final results. However, conducting such a full-scale quantitative uncertainty analysis is neither practical nor a standard practice for a study of this type. Instead, the analysis is designed to ensure—through judicious selection of release scenarios, models, and parameters—that the results represent the potential risks. This is accomplished by making conservative assumptions in the calculations at each step. The models, parameters, and release scenarios used in the calculations are selected in such a way that most intermediate results and, consequently, the final estimates of impacts are greater than would be expected. As a result, even though the range of uncertainty in a quantity might be large, the value calculated for the quantity would be close to one of the extremes in the range of possible values, so the chance of the actual quantity being greater than the calculated value would be low. The goal of the radiological assessment for normal operation in this study is to produce results that are conservative in order to capture any uncertainties in operation at the new CMRR Facility.

The human health impacts from routine normal CMR activities may have different impacts on specific populations such as American Indians or Hispanics whose cultural heritage can result in special pathways of exposure that are different than those modeled to evaluate the doses to the general population and maximally exposed individual. Although the analyses performed to evaluate the public impacts of the CMR alternatives did include normally significant pathways and were designed to be conservative, no pathways were included to specifically address local population use of local resources. Therefore, there is potentially more uncertainty in the effects of CMR activities on these specific population groups. A qualitative evaluation of the potential impacts to these specific groups was performed based on the nuclides emitted and an understanding of the most significant pathways.

Parameter selection and practices of the population and maximally exposed individual were chosen to be conservative. For example, it was assumed that the population breathed contaminated air all the time (spent no time away from the local area) and that all food was produced in the potentially affected area (no food from outside the local area). The dose to a member of the public was dominated by internal exposures from inhalation and ingestion. Typically, about one third of the dose was from inhalation and two thirds was from ingestion. Inhalation of ambient air and the resulting dose would be about the same for a all members of population surrounding LANL. Since the diet of the general population was modeled as coming completely from the local area, the most significant difference to the American Indian or Hispanic population would be the portions of the diet that come from different food groups than those modeled. The *LANL SWEIS* (DOE 1999a) evaluated potential impacts associated with special pathways associated with subsistence hunting, fishing, gathering, and consumption of tea (cota) made from local flora. **Table B–4** summarizes the results of the special pathways analysis.

As noted in the *LANL SWEIS*, the dose associated with these special pathways is primarily due to existing levels of radioactive materials in the environment. Although not quantitatively evaluated, the incremental impact of the alternatives evaluated in this EIS are judged to be minimal with respect to these special pathways. Additionally, the impacts would be roughly proportional to the doses to the general public so they would not provide a discriminator among the alternatives.

Table B–4 Worst-Case Public Radiological Dose and Potential Consequences by Ingestion Pathways For Special Pathways Receptors, All Alternatives [a]

	Special Pathways Receptors [b]	
Exposure Pathway	*Dose (millirem per year)*	*Chance of an Excess Latent Cancer Fatality Per Year*
Fish	0.46	1 in 4,300,000
Elk Heart and Liver	0.034	1 in 59,000,000
Piñon Nuts	0.13	1 in 15,000,000
Indian Tea (Cota)	2.60	1 in 770,000
Total	3.22	1 in 620,000

[a] Because almost all public ingestion is from naturally occurring radionuclides, weapons testing fallout, and contamination from past operations, the ingestion dose is not affected by the alternatives (DOE 1999b, Section 5.1.6).
[b] Special pathways receptors are those with traditional Native American or Hispanic lifestyles.

B.4 Radiological Releases During Routine Normal Operations

The estimated radiological releases to the environment associated with routine normal CMR operations are discussed below and are based on the methodology provided in Section B.3.1. The resulting impacts to the public and to workers associated with each alternative are presented and discussed in Chapter 4 of this EIS.

Routine radiological releases during normal CMR operations under the No Action Alternative and Alternatives 1 through 4 are presented in **Table B–5**. The actinide releases consist of plutonium, uranium, thorium, and americium isotopes. Of these isotopes, plutonium-239 has the highest equivalent dose in curies. Therefore, plutonium-239 was used for modeling purposes to conservatively represent all of the actinides released. By using plutonium-239, the estimated dose for members of the public presented in this EIS are higher than what would be experienced if the actual actinides were used in the model calculations.

Table B–5 Normal Operations Radiological Release

	No Action Alternative (curies per year)	*Alternatives 1-4 (curies per year)*
Actinides	0.00003	0.00076
Fission Products Kr-85 Xe-131m Xe-133	 — — —	 100 45 1,500
Tritium	—	1,000

Source: DOE 1999a.

Under the No Action Alternative, air emissions of actinides (with no measurable releases of fission products or tritium) would continue from the existing CMR Building at current restricted operational levels. For Alternatives 1 through 4, the amount of anticipated radiological releases from CMR operations at the new CMRR Facility would be the same as that projected under the Expanded Operations Alternative in the *LANL SWEIS* Record of Decision.

B.5 References

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APPENDIX C
EVALUATION OF HUMAN HEALTH IMPACTS FROM FACILITY ACCIDENTS

C.1 INTRODUCTION

Accident analyses were performed to estimate the impacts to workers and the public from reasonably foreseeable accidents for the Los Alamos National Laboratory (LANL) Chemistry and Metallurgy Research Building Replacement (CMRR) project alternatives. 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 computer code, Version 1.12 (MACCS2). A detailed description of the MACCS model is provided in NUREG/CR-6613. The enhancements incorporated in MACCS2 are described in the *MACCS2 Users Guide* (NRC 1998). This section presents the MACCS2 data specific to the accident analyses. Additional information on the MACCS2 code is provided in Section C.8.

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 environmental impact statement (EIS). These pathways have been studied and found to contribute less significantly to the dosage 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 EIS 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 each candidate site for the new CMRR Facility and the existing CMR Building, as well as a maximally exposed offsite individual, and noninvolved worker. The impacts to 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. 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 state population projections (DOC 1999). State and county population estimates were examined to interpolate the data to the year 2002. 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 offsite population within 50 miles (80 kilometers) of TA-3 was estimated to be 302,130 persons (No Action Alternative); 309,154 persons for TA-55 (Alternative 1 [Preferred Alternative] and Alternative 3); and 315,296 persons for TA-6 (Alternatives 2 and 4). For this analysis, no credit was taken for emergency response evacuations and other mitigative actions such as temporary relocation of the public.

The maximally exposed offsite individual is defined as a hypothetical individual member of the public who would receive the maximum dose from an accident. This individual is usually assumed located at a site boundary. However, because there are public sites within the LANL site boundary, the maximally exposed individual could be at an onsite location.

The maximally exposed offsite individual location was determined for each alternative. The maximally exposed individual location can vary at LANL based on accident conditions. For this analysis, the maximally exposed offsite individual is located 0.75 miles (1.2 kilometers) north-northeast from TA-3, 1.1 miles (1.7 kilometers) north-northeast from TA-55, and 1.2 miles (1.9 kilometers) east-northeast from TA-6.

A noninvolved worker is defined as an onsite worker who is not directly involved in facility activities where the accident occurs. The noninvolved worker is conservatively assumed to be exposed to the full release, without any protection, located at a distance of 304 yards (278 meters) from TA-3, 240 yards (219 meters) from TA-55, and 264 yards (241 meters) from TA-6. Workers would respond to a site emergency alarm 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 maximally exposed offsite individual, and a noninvolved worker were calculated based on site-specific meteorological conditions. Site-specific meteorology is described by one year of hourly wind speed atmospheric stability and by rainfall recorded at each 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.

As discussed in Appendix B, the probability coefficients for determining the likelihood of a latent cancer fatality for low doses or dose rates are 0.0004 and 0.0005 fatal cancers per rem, applied to individual workers and maximum exposed offsite individual, respectively. For high doses or dose rates, respective probability coefficients of 0.0008 and 0.001 fatal cancers per rem were applied for any individual. The higher-probability coefficients apply where individual doses are above 20 rem.

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). Industrial accidents were evaluated and the results are presented in Section C.7.

C.3 ACCIDENT SCENARIO SELECTION PROCESS

In accordance with DOE NEPA guidelines, this EIS contains to the extent applicable, a representative set of accidents that include 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*, July 2002 (DOE 2002a), provides guidance for preparing accident analyses in environmental impact statements. The guidance clarifies and supplements *Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements*, which the Office of NEPA Oversight issued in May 1993 (DOE 1993).

The accident scenario selection was based on evaluation of accidents reported in the *CMR Basis for Interim Operations* (*CMR BIO)* (LA-CP-98-142) (DOE 2002b) and data provided by LANL (LANL 2002). 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 1994a). The accident selection process for this EIS is described in Sections C.3.1 through C.3.3 for Steps 1 through 3, respectively.

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 then 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 new CMRR Facility were identified by reviewing data in source documents (*CMR BIO* and LANL 2002), assessing their applicability to the existing CMR Building, and identifying the potential hazards posed by the CMR activities that would be carried out in the new CMRR Facility.

Hazards analyses were prepared by UC at LANL, which involved collecting and reviewing documentation pertinent to CMR operations. Twenty-seven CMR processes were examined. **Table C–1** indicates the range of CMR processes investigated and assessed for inclusion in the hazards analysis.

Table C–1 CMR Activities Evaluated in the Hazards Analysis

Process	*Process*
Mass Spectroscopy	Mixed Oxide Fuel Pin Fabrication
Gas Generation Matrix Depletion	Plutonium Rolling
Seal-Tube Neutron Generator Operations	Radioactive Source Recovery Process
Uranium Process Chemistry	Material Receipt, Storage, and Transfer
Synthesis of Nonradioactive, Inorganic Compounds	Waste Handling
Magnetic Isotope Separation	Plutonium Assay
Target Fabrication	Actinide Spectroscopy
Hanford Site Tank Remediation	Material Characterization
Glass Encapsulation	Waste Handling
Uranium Hexafluoride	Waste Compaction
Mechanical Testing of Pu and Pu Alloys	Enriched Uranium Foundry
Trace Element Analysis	Standards Laboratory
Special Furnace Operations	Enriched Uranium Extrusion
Thermal Processing/Dilatometry and Immersion	

The result of the hazards identification step was the preparation of hazard tables containing 326 potential hazards applicable to CMR processes.

C.3.2 Hazard Evaluation – Step 2

The subset of approximately 326 major radiological hazards developed in Step 1 was subsequently screened. Using a hazards analysis process based on guidance provided by the *Nonreactor SAR Preparation Guide* (DOE 1994a), the major hazards were reduced to 21 major accidents. The process ranks the risk of each hazard based on estimated frequency of occurrence and potential consequences to screen out low-risk hazards.

C.3.3 Accidents Selected for This Evaluation – Step 3

The subset of 21major accidents was further screened to select a spectrum of accident scenarios for the *CMRR EIS* alternatives. Screening criteria used in the selection process included, but were not limited to: (1) consideration of the impacts to 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 only reasonably foreseeable accidents. In addition, hazards and accident analyses for the alternatives were reviewed to determine the potential for accidents initiated by external events (e.g., aircraft crash, and explosions in collocated facilities) and natural phenomena (e.g., external flooding, earthquake, extreme winds, and missiles). Accident scenarios initiated by human error are also evaluated in this EIS.

The results of the Step-3 selection process are presented below.

Fire—Fires that occur in the facility can lead to the release of radioactive materials with potential impacts to 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 can 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 HEPA filter can also occur due to an exothermic reaction involving reactive salts and other materials.

Explosion—Explosions that occur in the facility can lead to the release of radioactive materials with potential impacts to 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 can disperse nuclear material as well as initiate fires that can propagate throughout the facility. An explosion of methane gas followed by a fire in a laboratory area can potentially propagate to other laboratory areas and affect the entire facility.

Spills—Spills of radioactive and/or chemical materials can be initiated by failure of process equipment and/or human error, natural phenomenal or external events. Radioactive and chemical materials spills typically involve laboratory room quantities of materials that are relatively small compared to releases caused by fires and explosions. Laboratory room spills could impact 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 impact the public, its effects are primarily associated with workers near the accident. For the *CMRR EIS* alternatives, the likelihood of an unsafe configuration and criticality is sufficiently small to exclude it from detailed consideration in the EIS.

Natural Phenomena—The potential accidents associated with natural phenomena include earthquakes, high winds, flooding and similar naturally occurring events. For *CMRR EIS* alternatives, a severe earthquake can 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 glove boxes 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 quantities of regulated chemicals used and stored in the facility are well below the threshold quantities set by the EPA (40 CFR 68), and pose minimal potential hazards to the public health and the environment in an accident condition. Accidents involving small laboratory quantities of chemicals are primarily a risk to the involved worker in the immediate vicinity of the accident. There will be no bulk quantities of chemicals stored at the new CMRR Facility.

Airplane Crash—The potential exists for an airplane crash into the new CMRR Facility. The probability of an airplane crash during over flight is less than 10^{-6} and under DOE NEPA guidelines does not have to be considered in the EIS. During landing and takeoff operations at the local Los Alamos airport, there is a reasonable probability of a small commercial or military airplane crashing into the facility. However, the impacts of a small airplane crash into the facility are bounded by other accidents addressed in this EIS.

C.4 ACCIDENT SCENARIO DESCRIPTIONS AND SOURCE TERM

This section describes the accident scenarios and corresponding source term developed for the *CMRR EIS* alternatives. The spectrum of accidents described in this section was used to determine, for workers and the public, the consequences and associated risks for each alternative. Assumptions were made when further information was required to clarify the accident condition, update some of the 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:

Source term = material at risk × damage ratio × airborne release fraction × respirable fraction × leak path factor

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 for 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 *CMR BIO*, data supplied by LANL (LANL 2002), or the *DOE Handbook* on airborne release fractions (DOE 1994b).

The respirable fraction is the fraction of the material with a 0.0004 inches (10-microns) or less aerodynamic-equivalent diameter particle size that could be retained in the respiratory system following inhalation. The respirable fraction values are also taken from the *CMR BIO*, data supplied by LANL (LANL 2002), or the *DOE Handbook* on airborne release fractions (DOE 1994b).

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. A leak path factor of 1.0 (no reduction) is assigned in accident scenarios involving a major failure of confinement barriers. Leak path factors were obtained from the *CMR BIO*, data supplied by LANL (LANL 2002), 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 New CMRR Facility Alternatives

The accidents described in this section pertain to the new CMRR Facility at TA-55 and TA-6.

Facility-Wide Fire—The accident scenario postulates that combustible material near an ignition source are ignited in a laboratory area or vault containing large amounts of radioactive materials. 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 and the entire facility. The material at risk is estimated to be approximately 13,228 pounds (6,000 kilograms) of plutonium-239 equivalent in the form of metal (95 percent) and liquid (5 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 and 0.002 for liquid. The source term for radioactive material released to the environment is 3.14 pounds (1.43 kilograms) of plutonium-239 metal and 1.32 pounds (0.6 kilograms) of plutonium-239 liquid. The frequency of the accident is estimated to be less than 0.000005 and is conservatively assumed at 5.0×10^{-6} per year for risk calculation purposes.

Process Fire—The accident scenario postulates combustibles near an ignition source are ignited in a laboratory area containing radioactive materials. The fire is assumed to propagate uncontrolled and without suppression throughout the laboratory area but does not propagate to other laboratory areas. The material at risk is estimated to be 66.15 pounds (30 kilograms) of plutonium-239 equivalent in the form of liquid. The scenario conservatively assumes the damage ratio is 1.0. The leak path factor is 0.016, and the released respirable fraction (airborne release fraction times respirable fraction) is estimated to be 0.002. The resulting source term of radioactive material released to the environment is estimated to be 0.034 ounces (0.96 grams) of plutonium-239 liquid. The frequency of the accident is estimated to be in the range of 0.0001 to 0.001 per year and is conservatively assumed to be 0.001 per year for risk calculation purposes.

Fire in the Main Vault—This accident postulates a fire in the main vault. In this scenario, the main vault door is accidentally left open and a fire inside the vault or propagating to the main vault engulfs the entire contents of plutonium. The material at risk is estimated to be 12,568 pounds (5,700 kilograms) of plutonium-239 equivalent in metal 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 to be 0.00025. The resulting source term of radioactive material released to the environment is estimated to be 3.14 pounds (1.43 kilograms) of plutonium-239 metal. The frequency of the accident is estimated to be 0.000001.

Process Explosion—This accident postulates an explosion of methane gas present in the process followed by a fire in a laboratory area containing radioactive materials. The material at risk is 15.88 pounds (7.2 kilograms) of plutonium equivalent in powder form. The damage ratio is conservatively assumed at 1.0. The leak path factor is estimated to be 0.016. The released respirable fraction (airborne release fraction times respirable fraction) is estimated at 0.0015. The resulting source term of radioactive material released to the environment is estimated at 0.006 ounces (0.17 grams) of plutonium-239 powder. The frequency of the accident is estimated to be in the range of 0.0001 to 0.001 per year and is conservatively assumed to be 0.001 per year for risk calculation purposes.

Process Spill—This accident postulates a spill of radioactive material in the process area caused by human error or equipment failure. The material at risk is estimated at 15.88 pounds (7.2 kilograms) of plutonium-239 equivalent in powder form. The damage ratio is assumed to be 1.0. The leak path factor estimated to be 0.016. The released respirable fraction (airborne release fraction times respirable fraction) is estimated at 0.002. The resulting source term of radioactive material released to the environment is estimated at 0.0081 ounces (0.23 grams) of plutonium-239 powder. The frequency of the accident is estimated to be in the range of 0.05 and 0.1 per year and is conservatively assumed to be 0.1 per year for risk calculation purposes.

Seismic-Induced Laboratory Spill—An earthquake is postulated to occur that exceeds the Performance Category-3 design capability of the facility. Internal enclosures topple and are damaged by falling debris. The material at risk is estimated to be 661.5 pounds (300 kilograms) of plutonium-239 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 0.002 for powder. The source term for radioactive material released to the environment is 1.32 pounds (0.6 kilograms) of plutonium-239 powder. The frequency of the accident is estimated to be in the range of 0.00001 to 0.0001 per year and is conservatively assumed to be 0.0001 per year for risk calculation purposes.

Seismic-Induced Fire—An earthquake is postulated to occur that exceeds the Performance Category-3 design capability of the facility. Internal enclosures topple and are damaged by falling debris. Combustibles in the facility are ignited and the fire engulfs radioactive material in the laboratory area. The material at risk is estimated to be 661.5 pounds (300 kilograms) of plutonium-239 in liquid 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 0.002 for liquid. The source term for radioactive material released to the environment is 1.32 pounds (0.6 kilograms) of plutonium-239 liquid. The frequency of the accident is estimated to be in the range of 0.000001 to 0.00001 per year and is conservatively assumed to be 0.00001 per year for risk calculation purposes.

Facility-Wide Spill—An earthquake is postulated to occur that exceeds the Performance Category-3 design capability of the facility. A vault and process areas containing radioactive material are severely damaged and their plutonium-239 contents in the form of powder spills. The material at risk is estimated to be 13,230 pounds (6,000 kilograms) of plutonium-239 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 0.002 for powder. The source term for radioactive material released to the environment is 26.461 pounds (12 kilograms) of plutonium-239 powder. The frequency of the accident is estimated to be less than 5.0×10^{-6} and is conservatively assumed at 5.0×10^{-6} per year for risk calculation purposes.

C.4.2 No Action Alternative

The accidents described in this section pertain to the No Action Alternative.

Wing-Wide Fire—The accident scenario postulates combustibles in the vicinity of an ignition source are ignited in a laboratory area containing the largest amounts of radioactive materials. The fire is assumed to propagate uncontrolled and without suppression to adjacent laboratory areas an entire facility wing. The material at risk is estimated at 13.23 pounds (6 kilograms) of plutonium-239 equivalent in the form of metal (20 percent), powder (40 percent) and solution (40 percent). The scenario conservatively assumes the damage ratio and leak path factors are 1.0, and the released respirable fraction (airborne release fraction times respirable fraction) is estimated at 0.017. The frequency of the accident is estimated to be 0.00005 per year.

HEPA Filter Fire—A fire or deflagration is assumed to occur in the HEPA filters due to an exothermic reaction involving reactive lasts or other materials. Two filters containing 0.18 ounces (5 grams) of plutonium-239 equivalent each are affected. The material at risk is estimated at 0.35 ounces (10 grams) of plutonium-239 equivalent in the form of oxide particles. The damage ratio and leak path factors are conservatively assumed at 1.0 and the released respirable fraction (airborne release fraction times respirable fraction) is estimated at 0.4. The resulting source term of radioactive material released to the environment is estimated at 0.14 ounces (4 grams) of plutonium-239 equivalent. The frequency of the accident is estimated to be in the range of 0.0001 to 0.01 and is conservatively assumed to be 0.01 per year for risk calculation purposes.

Fire in the Main Vault—This accident postulates a fire in the main vault. In this scenario, the main vault door is accidentally left open and a fire inside the vault or propagating to the main vault engulfs the entire contents of plutonium. The material at risk is estimated at 440.92 pounds (200 kilograms) of plutonium-239 equivalent. The damage ratio and leak path factors are conservatively assumed at 1.0 and the released respirable fraction (airborne release fraction times respirable fraction) is estimated at 0.002. The resulting source term of radioactive material released to the environment is estimated at 14.11 ounces (400 grams) of plutonium-239 equivalent. The frequency of the accident is estimated to be less than 1.0×10^{-6} per year and is conservatively assumed to be 1.0×10^{-6} per year for risk calculation purposes.

Flammable Gas Explosion—This accident postulates an explosion of methane gas followed by a fire in a laboratory area containing radioactive materials. The material at risk is 8.75 pounds (3.97 kilograms) of plutonium-239 equivalent. The damage ratio is conservatively assumed at 1.0. The leak path factor is assumed at 0.68. The released respirable fraction (airborne release fraction times respirable fraction) is estimated at 0.005. The resulting source term of radioactive material released to the environment is estimated at 0.48 ounces (13.5 grams) of plutonium-239 equivalent. The frequency of the accident is estimated to be in the range of 1.0×10^{-6} to 0.0001 per year and is conservatively assumed to be 0.0001 per year for risk calculation purposes.

Propane/Hydrogen Transport Explosion—An accidental explosion is postulated to occur during the onsite transportation of propane or hydrogen near the CMR Building. The vehicle accident results in the breach of gas containers followed by ignition and explosion of the gas causing damage to the facility and affecting some radioactive materials. The material at risk is estimated at 26.90 pounds (12.2 kilograms) of plutonium-239 equivalent. The damage ratio is conservatively assumed at 1.0 and the leak path factor is 0.3. The released respirable fraction (airborne release fraction times respirable fraction) is estimated at 0.005. The resulting source term of radioactive material released to the environment is estimated at 0.65 ounces (18.3 grams) of plutonium-239 equivalent. The frequency of the accident is estimated to be less than 1.0×10^{-6} per year and is conservatively assumed to be 1.0×10^{-6} per year for risk calculation purposes.

Radioactive Spill—This accident postulates a spill of radioactive material caused by human error. The accident involves the spill of plutonium-238 while work is done outside of confinement. The accident potentially impacts workers as well as the public. The material at risk for public impacts is estimated at 0.0000529 ounces (0.0015 grams) of plutonium-238. The damage ratio and leak path factor are conservatively assumed at 1.0. The released respirable fraction (airborne release fraction times respirable fraction) is estimated at 0.05. The resulting source term of radioactive material released to the environment is estimated at 2.65×10^{-6} ounces (0.000075 grams) of plutonium-238. The frequency of the accident is estimated at 0.1 per year.

Natural Gas Pipeline Rupture—This accident postulates the accidental rupture of a natural gas pipeline near the CMR Building. The released natural gas initiates a flammable gas explosion and a wing-wide fire. The material at risk is 13.23 pounds (6 kilograms) of plutonium-239 equivalent. The damage ratio and leak path factor are conservatively assumed at 1.0. The released respirable fraction (airborne release fraction times respirable fraction) is estimated at 0.017. The source term for radioactive material released to the environment 3.56 ounces (101 grams) of plutonium-239 equivalent. The frequency of the accident is estimated at 1.0×10^{-7} per year.

Severe Earthquake—A large earthquake is postulated to occur that exceeds design capability of the facility. It is assumed that all internal enclosures topple and are damage by falling debris and that the hot cells fail. All radioactive material in the hot cells is at risk of being released. The material at risk is estimated at 44.53 pounds (20.2 kilograms) of plutonium-239 equivalent composed of metal (20 percent), powder (40 percent), and solution (40 percent). The released respirable fraction (airborne release fraction times respirable fraction) is estimated at 0.005. The source term for radioactive material released to the environment 3.56 ounces (101 grams) of plutonium-239 equivalent. The frequency of the accident is estimated at 0.0024 per year.

C.5 Accident Analyses Consequences and Risk Results

The consequences of a radiological accident to workers and the public can be measured in a number of ways depending on the application. Three measures are used in this EIS. 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 latent cancer fatality for an exposed individual or the expected number of latent cancer fatalities 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 accident consequences 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 latent cancer fatality consequences. Risk is calculated as follows:

$R_i = D_i \times F \times P$ for an individual
$R_p = D_p \times F \times P$ for the population

where,

R_i – is the risk of a latent cancer fatality for an individual receiving a dose D_i
R_p – is the risk of a number of latent cancer fatalities for a population receiving a dose D_p
D_i – the dose in rem to an individual or a worker
D_p – the dose in person-rem to a population of individuals or workers
F = dose-to-latent cancer fatality conversion factor which is 0.0005 latent cancer fatalities per rem or person-rem for members of the public and 0.0004 latent cancer fatalities per rem or person-rem for workers
P = 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 the maximally exposed individual is 10 rem, the probability of a latent cancer fatality for an individual is 10 × 0.0005 = 0.005, where 0.0005 is the dose-to-latent cancer fatality conversion factor. If the maximally exposed individual receives a dose exceeding 20 rem, the dose-to-latent cancer fatality conversion factor is doubled to 0.001. Thus, if the maximally exposed individual receives a dose of 30 rem, the probability of a latent cancer fatality is 30 × 0.001 = 0.03. For an individual, the calculated probability of a latent cancer fatality is in addition to the probability of cancer from all other causes.

For a noninvolved worker, the dose-to-latent cancer fatality conversion factor is 0.0004, rather than the 0.0005 factor used for the public, reflecting the differences in work force composition compared to the public. If a noninvolved worker receives a dose of 10 rem, the probability of a latent cancer fatality is 10 × 0.0004 = 0.004. As with the maximally exposed individual, if the dose exceeds 20 rem, the latent cancer probability factor doubles to 0.008.

For the population, the same dose-to-latent cancer fatality conversion factors are used to determine the estimated number of latent cancer fatalities. The calculated number of latent cancer fatalities 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 then applies the appropriate dose-to-latent cancer fatality conversion factor to estimate the latent cancer fatality consequences. In other words, 0.0005 for doses less than 20 rem or 0.001 for doses greater than or equal to 20 rem. Therefore, for some accidents, the estimated number of latent cancer fatalities will involve both dose-to-latent cancer fatality conversion factors. This indicates that some members of the population received doses in excess of 20 rem.

The following tables provide the accident consequences for each alternative. For each alternative, there are two tables showing the impacts. The first table presents the consequences (doses and latent cancer fatality and latent cancer fatalities) assuming the accident occurs, that is, not reflecting the frequency of accident occurrence. The second shows accident risks that are obtained by multiplying the latent cancer fatality and latent cancer fatalities values in the first table by the frequency of each accident listed in the first table.

Table C–2 Accident Frequency and Consequences under the No Action Alternative

Accident	Frequency (per year)	Maximally Exposed Offsite Individual		Offsite Population [a]		Noninvolved Worker	
		Dose (rem)	Latent Cancer Fatality [b]	Dose (person-rem)	Latent Cancer Fatalities [c]	Dose (rem)	Latent Cancer Fatality [b]
Wing-wide fire	0.00005	0.55	0.00027	1020	0.51	2.67	0.0011
Severe earthquake	0.0024	2.92	0.0015	1680	0.84	66.9	0.054
Flammable gas explosion	1.0×10^{-6} to 0.0001	0.073	0.000036	135	0.068	0.35	0.00014
HEPA filter fire	0.0001 to 0.01	0.12	0.000058	66.5	0.033	2.65	0.0011
Fire in main vault	$< 1.0 \times 10^{-6}$	2.15	0.0011	4000	2.0	10.5	0.0042
Propane/hydrogen transport explosion	$< 1.0 \times 10^{-6}$	0.53	0.00027	304	0.15	12.1	0.0048
Natural gas pipeline rupture	1.0×10^{-7}	0.55	0.00027	1020	0.51	2.67	0.0011
Radioactive spill	0.1	0.00054	3.0×10^{-7}	0.31	0.00016	0.012	5.0×10^{-6}

a Based on a population of 302,130 persons residing within 50 miles (80 kilometers) of the site.
b Increased likelihood of latent cancer fatality for an individual assuming the accident occurs.
c Increased number of latent cancer fatalities for the offsite population assuming the accident occurs.

Table C–3 Accident Risks under the No Action Alternative

Accident	Risk of Latent Cancer Fatality		
	Maximally Exposed Offsite Individual [a]	Offsite Population [b, c]	Noninvolved Worker [a]
Wing-wide fire	1.4×10^{-8}	0.000026	5.5×10^{-8}
Severe earthquake	3.5×10^{-6}	0.002	0.00013
Flammable gas explosion	3.6×10^{-9}	6.8×10^{-6}	1.4×10^{-8}
HEPA filter fire	5.8×10^{-7}	0.00033	0.000011
Fire in main vault	1.1×10^{-9}	2.0×10^{-6}	4.2×10^{-9}
Propane/hydrogen transport explosion	2.7×10^{-10}	1.5×10^{-7}	4.8×10^{-9}
Natural gas pipeline rupture	2.7×10^{-11}	5.1×10^{-8}	1.1×10^{-10}
Radioactive spill	3.0×10^{-8}	0.000016	5.0×10^{-7}

a Risk of increased likelihood of a latent cancer fatality to the individual.
b Risk of the increased number of latent cancer fatalities for the offsite population.
c Based on a population of 302,130 persons residing within 50 miles (80 kilometers) of the site.

Table C–4 Accident Frequency and Consequences under Alternative 1

Accident	Frequency (per year)	Maximally Exposed Offsite Individual		Offsite Population [a]		Noninvolved Worker	
		Dose (rem)	Latent Cancer Fatality [b]	Dose (person-rem)	Latent Cancer Fatalities [c]	Dose (rem)	Latent Cancer Fatality [b]
Facility-wide fire	5.0×10^{-6}	7.0	0.0035	17,029	8.5	51.4	0.041
Process fire	0.001	0.004	2.0×10^{-6}	9.78	0.0049	0.03	0.000012
Fire in the main vault	1.0×10^{-6}	5.92	0.003	14,500	7.25	43.88	0.035
Process explosion	0.001	0.0036	1.8×10^{-6}	2.5	0.0013	0.15	0.000059
Process spill	0.1	0.0046	2.3×10^{-6}	3.19	0.0016	0.19	0.000076
Seismic-induced laboratory spill	0.0001	12.1	0.0061	8,394	4.2	495	0.4
Seismic-induced fire	0.00001	2.5	0.0013	6,110	3.1	18.5	0.0074
Facility-wide spill	5.0×10^{-6}	243.1	0.24	167,705	83.9	9,352	1.0

a Based on a population of 309,154 persons residing within 50 miles (80 kilometers) of the site.
b Increased likelihood of latent cancer fatality for an individual assuming the accident occurs.
c Increased number of latent cancer fatalities for the offsite population assuming the accident occurs.

Table C–5 Accident Risks under Alternative 1

Accident	*Risk of Latent Cancer Fatality*		
	Maximally Exposed Offsite Individual [a]	*Offsite Population* [b, c]	*Noninvolved Worker* [a]
Facility-wide fire	1.7×10^{-8}	0.000043	2.1×10^{-7}
Process fire	2.0×10^{-9}	4.9×10^{-6}	1.2×10^{-8}
Fire in the main vault	3.0×10^{-9}	7.3×10^{-6}	3.5×10^{-8}
Process explosion	1.8×10^{-9}	1.3×10^{-6}	5.9×10^{-8}
Process spill	2.3×10^{-7}	0.00016	7.6×10^{-6}
Seismic-induced laboratory spill	6.4×10^{-7}	0.00044	4.2×10^{-6}
Seismic-induced fire	1.3×10^{-8}	0.000031	7.4×10^{-8}
Facility-wide spill	1.2×10^{-6}	0.00042	0.000038

[a] Risk of increased likelihood of a latent cancer fatality to the individual.
[b] Risk of the increased number of latent cancer fatalities for the offsite population.
[c] Based on a population of 309,154 persons residing within 50 miles (80 kilometers) of the site.

Table C–6 Accident Frequency and Consequences under Alternative 2

Accident	*Frequency (per year)*	*Maximally Exposed Offsite Individual*		*Offsite Population* [a]		*Noninvolved Worker*	
		Dose (rem)	*Latent Cancer Fatality* [b]	*Dose (person-rem)*	*Latent Cancer Fatalities* [c]	*Dose (rem)*	*Latent Cancer Fatality* [b]
Facility-wide fire	5.0×10^{-6}	4.0	0.002	15,173	7.58	44.98	0.036
Process fire	0.001	0.0023	1.1×10^{-6}	8.71	0.0044	0.026	0.00001
Fire in the main vault	1.0×10^{-6}	3.41	0.0017	12,938	6.47	38.3	0.031
Process explosion	0.001	0.0017	8.3×10^{-7}	2.37	0.0012	0.08	0.000032
Process spill	0.1	0.002	1.1×10^{-6}	3.01	0.0015	0.172	0.000069
Seismic-induced laboratory spill	0.0001	5.54	0.0028	7,920	3.96	453	0.36
Seismic-induced fire	0.00001	1.44	0.00072	5,440	2.72	16.1	0.0065
Facility-wide Spill	5.0×10^{-6}	111.3	0.11	158,000	79.20	9,100	1.0

[a] Based on a population of 315,296 persons residing within 50 miles (80 kilometers) of the site.
[b] Increased likelihood of latent cancer fatality for an individual assuming the accident occurs.
[c] Increased number of latent cancer fatalities for the offsite population assuming the accident occurs.

Table C–7 Accident Risks under Alternative 2

Accident	*Risk of Latent Cancer Fatality*		
	Maximally Exposed Offsite Individual [a]	*Offsite Population* [b, c]	*Noninvolved Worker* [a]
Facility-wide fire	1.0×10^{-8}	0.000038	1.8×10^{-7}
Process fire	1.2×10^{-9}	4.4×10^{-6}	1.0×10^{-8}
Fire in the main vault	1.7×10^{-9}	6.5×10^{-6}	3.1×10^{-8}
Process explosion	8.3×10^{-10}	1.2×10^{-6}	3.2×10^{-8}
Process spill	1.1×10^{-7}	0.00015	6.9×10^{-6}
Seismic-induced laboratory spill	2.8×10^{-7}	0.00038	0.000036
Seismic-induced fire	7.2×10^{-9}	0.000027	6.5×10^{-8}
Facility-wide spill	5.6×10^{-7}	0.0004	0.000036

[a] Risk of increased likelihood of a latent cancer fatality to the individual.
[b] Risk of the increased number of latent cancer fatalities for the offsite population.
[c] Based on a population of 315,296 persons residing within 50 miles (80 kilometers) of the site.

Table C–8 Accident Frequency and Consequences under Alternative 3 (TA-55 Hybrid Alternative)

Accident	Frequency (per year)	Maximally Exposed Offsite Individual		Offsite Population [a]		Noninvolved Worker	
		Dose (rem)	Latent Cancer Fatality [b]	Dose (person-rem)	Latent Cancer Fatalities [c]	Dose (rem)	Latent Cancer Fatality [b]
Facility-wide fire	5.0×10^{-6}	7.0	0.0035	17,029	8.5	51.4	0.041
Process fire	0.001	0.004	2.0×10^{-6}	9.78	0.0049	0.03	0.000012
Fire in the main vault	1.0×10^{-6}	5.92	0.003	14,500	7.25	43.88	0.035
Process explosion	0.001	0.0036	1.8×10^{-6}	2.5	0.0013	0.15	0.000059
Process spill	0.1	0.0046	2.3×10^{-6}	3.19	0.0016	0.19	0.000076
Seismic-induced laboratory spill	0.0001	12.1	0.0061	8,394	4.2	495	0.4
Seismic-induced fire	0.00001	2.5	0.0013	6,125	3.1	18.5	0.0075
Facility-wide spill	5.0×10^{-6}	243.1	0.24	167,705	83.9	9,352	1.0

[a] Based on a population of 309,154 persons residing within 50 miles (80 kilometers) of the site.
[b] Increased likelihood of latent cancer fatality for an individual assuming the accident occurs.
[c] Increased number of latent cancer fatalities for the offsite population assuming the accident occurs.

Table C–9 Accident Risks under Alternative 3 (TA-55 Hybrid Alternative)

Accident	Risk of Latent Cancer Fatality		
	Maximally Exposed Offsite Individual [a]	Offsite Population [b, c]	Noninvolved Worker [a]
Facility-wide fire	1.7×10^{-8}	0.000043	2.1×10^{-7}
Process fire	2.0×10^{-9}	4.9×10^{-6}	1.2×10^{-8}
Fire in the main vault	3.0×10^{-9}	7.3×10^{-6}	3.5×10^{-8}
Process explosion	1.8×10^{-9}	1.3×10^{-6}	5.9×10^{-8}
Process spill	2.3×10^{-7}	0.00016	7.6×10^{-6}
Seismic-induced laboratory spill	6.4×10^{-7}	0.00044	4.2×10^{-6}
Seismic-induced fire	1.3×10^{-8}	0.000031	7.4×10^{-8}
Facility-wide spill	1.2×10^{-6}	0.00042	0.000038

[a] Risk of increased likelihood of a latent cancer fatality to the individual.
[b] Risk of the increased number of latent cancer fatalities for the offsite population.
[c] Based on a population of 309,154 persons residing within 50 miles (80 kilometers) of the site.

Table C–10 Accident Frequency and Consequences under Alternative 4 (TA-6 Hybrid Alternative)

Accident	Frequency (per year)	Maximally Exposed Offsite Individual		Offsite Population [a]		Noninvolved Worker	
		Dose (rem)	Latent Cancer Fatality [b]	Dose (person-rem)	Latent Cancer Fatalities [c]	Dose (rem)	Latent Cancer Fatality [b]
Facility-wide fire	5.0×10^{-6}	4.0	0.002	15,173	7.58	44.98	0.036
Process fire	0.001	0.0023	1.1×10^{-6}	8.71	0.0044	0.026	0.00001
Fire in the main vault	1.0×10^{-6}	3.41	0.0017	12,938	6.47	38.3	0.031
Process explosion	0.001	0.0017	8.3×10^{-7}	2.37	0.0012	0.08	0.000032
Process spill	0.1	0.002	1.1×10^{-6}	3.01	0.0015	0.172	0.000069
Seismic-induced laboratory spill	0.0001	5.54	0.0028	7,920	3.96	453	0.36
Seismic-induced fire	0.00001	1.44	0.00072	5,440	2.72	16.1	0.0065
Facility-wide spill	5.0×10^{-6}	111.3	0.11	158,000	79.2	9,100	1.0

[a] Based on a population of 315,296 persons residing within 50 miles (80 kilometers) of the site.
[b] Increased likelihood of latent cancer fatality for an individual assuming the accident occurs.
[c] Increased number of latent cancer fatalities for the offsite population assuming the accident occurs.

Table C–11 Accident Risks under Alternative 4 (TA-6 Hybrid Alternative)

Accident	Risk of Latent Cancer Fatality		
	Maximally Exposed Offsite Individual [a]	Offsite Population [b, c]	Noninvolved Worker [a]
Facility-wide fire	1.0×10^{-8}	0.000038	1.8×10^{-7}
Process fire	1.2×10^{-9}	4.4×10^{-6}	1.0×10^{-8}
Fire in the main vault	1.7×10^{-9}	6.5×10^{-6}	3.1×10^{-8}
Process explosion	8.3×10^{-10}	1.2×10^{-6}	3.2×10^{-8}
Process spill	1.1×10^{-7}	0.00015	6.9×10^{-6}
Seismic-induced laboratory spill	2.8×10^{-7}	0.00038	0.000036
Seismic-induced fire	7.2×10^{-9}	0.000027	6.5×10^{-8}
Facility-wide spill	5.6×10^{-7}	0.0004	0.000036

[a] Risk of increased likelihood of a latent cancer fatality to the individual.
[b] Risk of the increased number of latent cancer fatalities for the offsite population.
[c] Based on a population of 315,296 persons residing within 50 miles (80 kilometers) of the site.

C.6 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 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.

Of particular interest are the uncertainties in the estimates of cancer fatalities from exposure to radioactive materials. The numerical values of the health risk estimators used in this EIS were obtained by linear extrapolation from the nominal risk estimate for lifetime total cancer mortality resulting from exposures of 10 rad. Because the health risk estimators are multiplied by conservatively calculated radiological doses to predict fatal cancer risks, the fatal cancer values presented in this EIS are expected to be conservative estimates.

C.7 INDUSTRIAL SAFETY

Estimates of potential industrial impacts on workers during construction and operations were evaluated based on DOE and U.S. Bureau of Labor Statistics. Impacts are classified into two groups, total recordable cases and fatalities. A recordable case includes work-related fatality, illness, or injury that resulted in loss of consciousness, restriction of work or motion, transfer to another job, or required medical treatment beyond first aid.

DOE and contractor total recordable cases and fatality incidence rates were obtained from the CAIRS database (DOE 2000a, 2000b). The CAIRS database is used to collect and analyze DOE and DOE contractor reports of injuries, illnesses, and other accidents that occur during DOE operations. The five-year average (1995 through 1999) rates were determined for average construction total recordable cases, average operations total recordable cases, and average operations fatalities. The average construction fatality rate was obtained from the Bureau of Labor Statistics (Toscano and Windau 1998).

Table C–12 presents the average occupational total recordable cases and fatality rates for construction and operations activities.

Table C–12 Average Occupational Total Recordable Cases and Fatality Rates (per worker year)

Labor Category	*Total Recordable Cases*	*Fatalities*
Construction	0.053	0.00014
Operations	0.033	0.000013

Expected annual construction and operations impacts on workers for each alternative are presented in **Table C–13**.

Table C–13 Industrial Safety Impacts from Construction and Operations (per year)

Alternative	*Estimated Number of Construction Workers*	*Estimated Number of Operations Workers*	*Construction Injuries*	*Construction Fatalities*	*Operations Injuries*	*Operations Fatalities*
No Action	0	204	0	0	6.7	0.003
TA-55 New Facility	300 (peak)	550	15.9	0.042	18	0.007
TA-6 New Facility	300 (peak)	550	15.9	0.042	18	0.007
Hybrid Facility at TA-55	300 (peak)	550	15.9	0.042	18	0.007
Hybrid Facility at TA-6	300 (peak)	550	15.9	0.042	18	0.007

As expected, the incidence of impacts, above and beyond those requiring first aid, do indeed exceed impacts from radiation accidents evaluated in this analysis. However, no fatalities would be expected from either construction or operations of any facility.

C.8 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. Three phases are 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, 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 it can range between one and seven 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 cloud (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. 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 one 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 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 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, È) grid system centered on the location of the release. The radius, r, represents downwind distance. The angle, È, 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 (e.g., 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.9 REFERENCES

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APPENDIX D
ENVIRONMENTAL JUSTICE

D.1 INTRODUCTION

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629), directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse health or environmental effects of their programs, policies, and activities on minority populations and low-income populations.

The Council on Environmental Quality (CEQ) has oversight responsibility for documentation prepared in compliance with the National Environmental Policy Act (NEPA). In December 1997, CEQ released its guidance on environmental justice under NEPA (CEQ 1997). The CEQ guidance was adopted as the basis for the analysis of environmental justice contained in this *Environmental Impact Statement for the Chemistry Metallurgy Research Building Replacement Project at Los Alamos National Laboratory (CMRR EIS).*

This appendix provides an assessment of the potential for disproportionately high and adverse human health or environmental effects on minority and low-income populations resulting from the implementation of the alternatives described in Chapter 2 of this EIS.

D.2 DEFINITIONS

Minority Individuals and Populations

The following definitions of minority individuals and populations were used in this analysis of environmental justice:

- **Minority individuals—**Individuals who are members 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. This definition is similar to that given in the CEQ environmental justice guidance (CEQ 1997), except that it has been modified to reflect *Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity* (62 FR 58782) and recent guidance (OMB 2000) published by the Office of Management and Budget. These revisions were adopted and used by the Census Bureau in collecting data for Census 2000. When data from the 1990 census are used, a minority individual will be defined as someone self-identified as: Hispanic; American Indian, Eskimo, or Aleut; Asian or Pacific Islander; or Black. As discussed below, racial and ethnic data from the 1990 census cannot be directly compared with that from Census 2000.

  The Office of Management and Budget has also recommended that persons self-identified as multiracial should be counted as a minority individual if at least one of the races is a minority race (OMB 2000). During Census 2000, approximately two percent of the population identified themselves as members of more than one race (DOC 2001a). Approximately two-thirds of those designated themselves as members of at least one minority race.

- **Minority population—**Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent, or (b) 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. In identifying minority communities, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a geographically dispersed and transient set of individuals (such as migrant workers or American Indians/Alaska Natives), where either type of group experiences common conditions of environmental exposure or effect. The selection of the appropriate unit of geographic analysis may be a governing body's jurisdiction, a neighborhood, census tract, or other similar unit that is to be chosen so as to not artificially dilute or inflate the affected minority population. A minority population also exists if there is more than one minority group present and the minority percentage, as calculated by aggregating all minority persons, meets one of the above-stated thresholds.

In the discussions of environmental justice in this EIS, persons self-designated as Hispanic or Latino are included in the Hispanic or Latino population, regardless of race. For example, the Asian population is composed of persons self-designated as Asian and not of Hispanic or Latino origin. Asians who designated themselves as having Hispanic or Latino origins are included in the Hispanic or Latino population. Data for the analysis of minority populations in 2000 were extracted from the U.S. Census Bureau's Summary File 1 (DOC 2001b).

Low-Income Populations and Individuals

Executive Order 12898 specifically addresses "disproportionately high and adverse effects" on "low-income" populations. The CEQ recommends that poverty thresholds be used to identify "low-income" individuals (CEQ 1997).

The following definition of low-income population was used in this analysis:

- **Low-income population—**Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the U.S. 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 American Indians/Alaska Natives), where either type of group experiences common conditions of environmental exposure or effect (CEQ 1997).

Data for the analysis of low-income populations were extracted from the U.S. Census Bureau's Summary File 3 (DOC 2002a).

Disproportionately High and Adverse Human Health Effects

Adverse health effects are measured in risks and rates that could result in latent cancer fatalities, as well as other fatal or nonfatal adverse impacts to human health. Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority population or low-income population is significant and exceeds the risk of exposure rate for the general population or for another appropriate comparison group (CEQ 1997).

Disproportionately High and Adverse Environmental Effects

A disproportionately high environmental impact refers to an impact or risk of an impact in a low-income or minority community that is significant and exceeds the environmental impact on the larger community. An adverse environmental impact is an impact that is determined to be both harmful and significant. In assessing cultural and aesthetic environmental impacts, impacts that uniquely affect geographically dislocated or dispersed or minority low-income populations are considered (CEQ 1997).

Potentially affected areas examined in this EIS include areas defined by a 50-mile (80-kilometer) radius centered on candidate facilities for chemical and metallurgy research (CMR) activities. Potentially affected areas used in the analysis of environmental justice are the same as those used in the analysis of radiological health effects described in Chapter 4.

D.3 Spatial Resolution

For the purposes of enumeration and analysis, the Census Bureau has defined a variety of areal units (DOC 2002b, Appendix F). Areal units of concern in this document include (in order of increasing spatial resolution) states, counties, census tracts, block groups, and blocks. The "block" is the smallest of these entities and offers the finest spatial resolution. This term refers to a relatively small geographical area bounded on all sides by visible features such as streets and streams or by invisible boundaries such as city limits and property lines. During the 2000 census, the Census Bureau subdivided the United States and its territories into 8,269,131 blocks (DOC 2002b, Appendix F). For comparison, the number of counties, census tracts, and block groups used in the 2000 census were 3,232; 66,304; and 211,267, respectively. While blocks offer the finest spatial resolution, economic data required for the identification of low-income populations are not available at the block level of spatial resolution. In the analysis below, block-level resolution is used to identify minority populations and block-group-level resolution is used to identify low-income populations.

Boundaries of the areal units are selected to coincide with features such as streams and roads or political boundaries such as county and city borders. Boundaries used for aggregation of the census data usually do not coincide with boundaries used in the calculation of health effects. As discussed in Chapter 4, radiological health effects due to an accident at each of the sites considered for the proposed actions are evaluated for persons residing within a distance of 50 miles (80 kilometers) of an accident site. In general, the boundary of the circle with a 50-mile (80-kilometer) radius centered at the accident site would not coincide with boundaries used by the Census Bureau for enumeration of the population in the potentially affected area. Some blocks or block groups lie completely inside or outside of the radius used for health effects calculation, while others are only partially included. As a result of these partial inclusions, uncertainties are introduced into the estimate of the population at risk from the accident.

In order to estimate the populations at risk in partially included block groups, it was assumed that populations are uniformly distributed throughout the area of each block group. For example, if 30 percent of the area of a block or block group lies within 50 miles (80 kilometers) of the accident site, it was assumed that 30 percent of the population residing in that block or block group would be at risk.

D.4 ENVIRONMENTAL JUSTICE ANALYSIS

This analysis of environmental justice concerns is based on the assessment of the environmental impacts reported in Chapter 4. This analysis was performed to identify any disproportionately high and adverse human health or environmental impacts on minority or low-income populations surrounding the candidate sites. Demographic information obtained from the Census Bureau was used to identify the minority populations and low-income communities in the zone of potential impact surrounding the sites (DOC 2001b, DOC 2002a). Data from Census 2000 were used to identify populations at risk in potentially affected counties.

As discussed in Chapter 2, three technical areas at LANL are associated with the relocation of CMR operations (see **Figure D–1**): (1) TA-3, the location of the existing CMR Building; (2) TA-55, the proposed location for the new CMRR Facility; and (3) TA-6, an alternative "Greenfield" location for the new CMRR Facility. All of the candidate locations are within approximately one mile (1.6 kilometers) of each other.

D.4.1 Results for the No Action Alternative

Under the No Action Alternative, CMR operations would continue at the existing CMR Building in TA-3 and no new facilities would be constructed. This section describes the low-income and minority populations living within the potentially affected area surrounding TA-3. It also describes the potential environmental impacts on those populations that could result from implementation of the No Action Alternative.

D.4.1.1 Minority Populations Surrounding TA-3

Figure D–2 shows the potentially affected area centered on Wing 9 of the existing CMR Building. It shows the counties at radiological risk and the composition of the population at risk in each county. The "population at risk" refers to all persons who reside within 50 miles (80 kilometers) of the existing CMR Building or the proposed locations for the new CMRR Facility at TA-55 and TA-6. The 50-mile (80-kilometer) distance was selected to correspond to the radius-of-effects for potential radiological health impacts. The counties at radiological risk are: Bernalillo, Los Alamos, Mora, Rio Arriba, Sandoval, San Miguel, Santa Fe, and Taos.

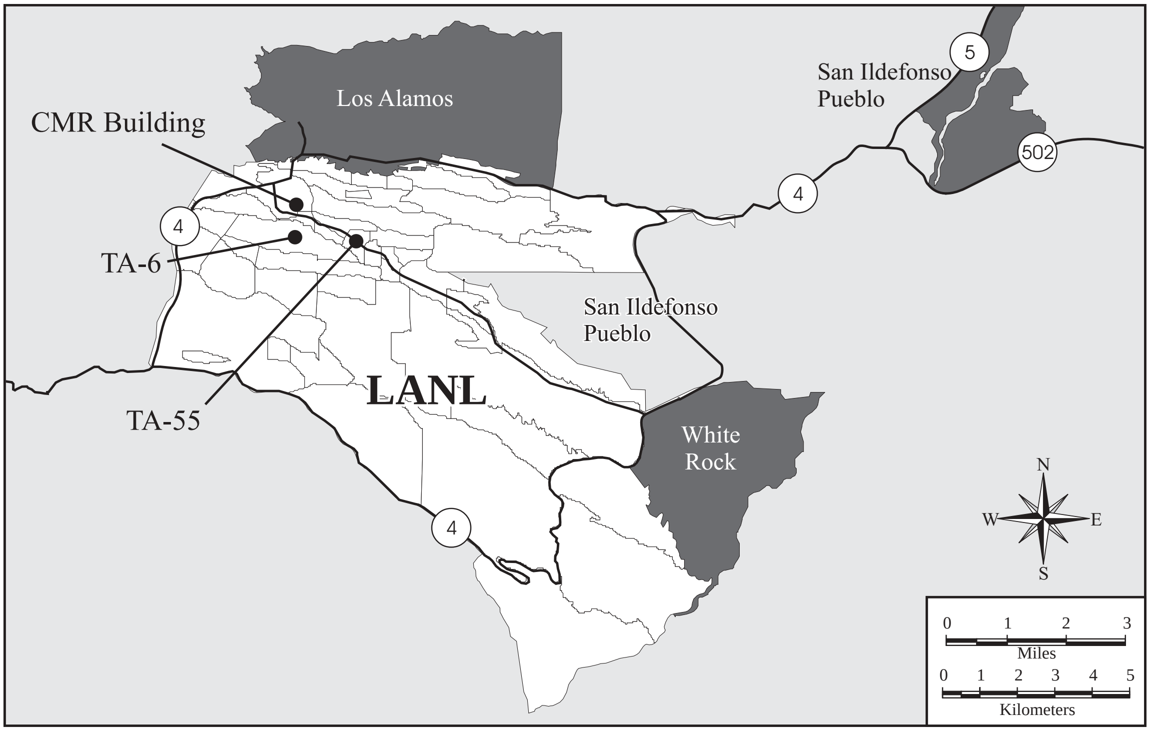

Figure D–1 CMR Building and Sites for the new CMRR Facility

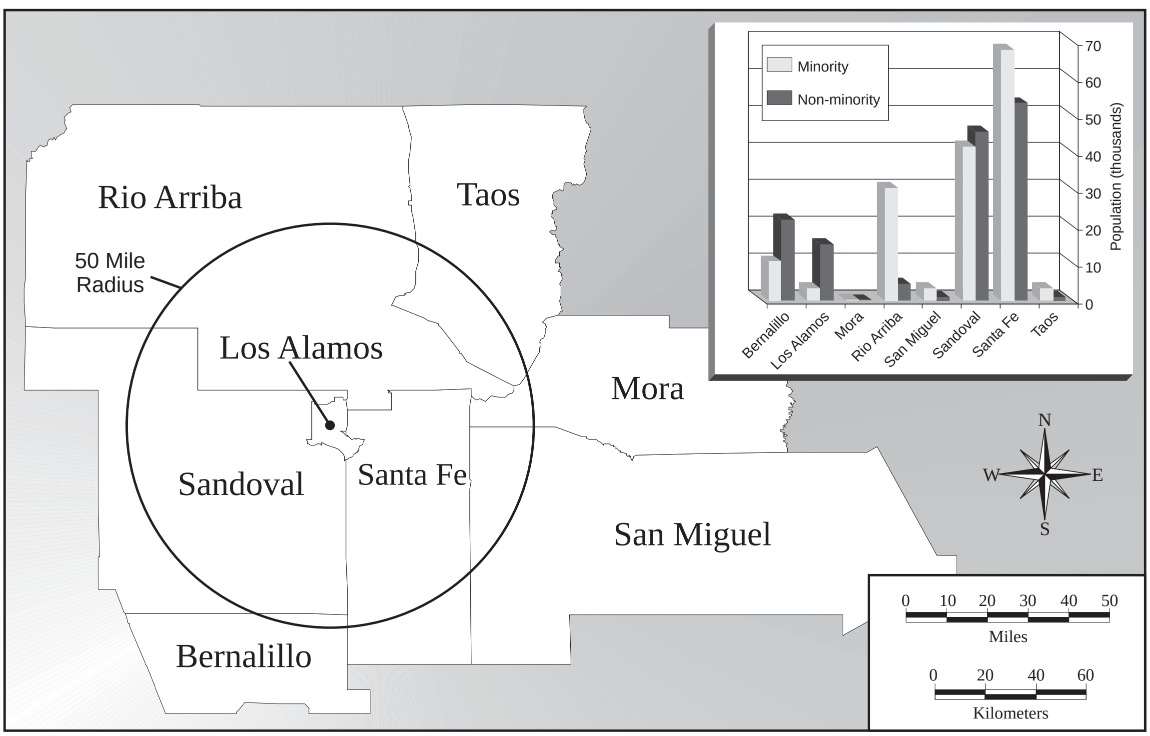

Figure D–2 Minority and Non-Minority Populations Living in Potentially Affected Counties Surrounding TA-3

Minority and non-minority populations living within the 50-mile (80-kilometer) distance from the existing CMR Building are shown as a bar graph for each potentially affected county.

Figure D–3 shows the composition of the minority population as a function of distance from the existing CMR Building. For the potentially affected area surrounding the existing CMR Building, the combined Hispanic or Latino and American Indian populations comprised 94 percent of the total potentially affected minority population in 2000. Moving outward from the location of the existing CMR Building, minority populations increase most noticeably near the outskirts of Española, Santa Fe, and Albuquerque. More than one-half of the potentially affected Hispanic or Latino population lived in the Española-Santa Fe area in the year 2000.

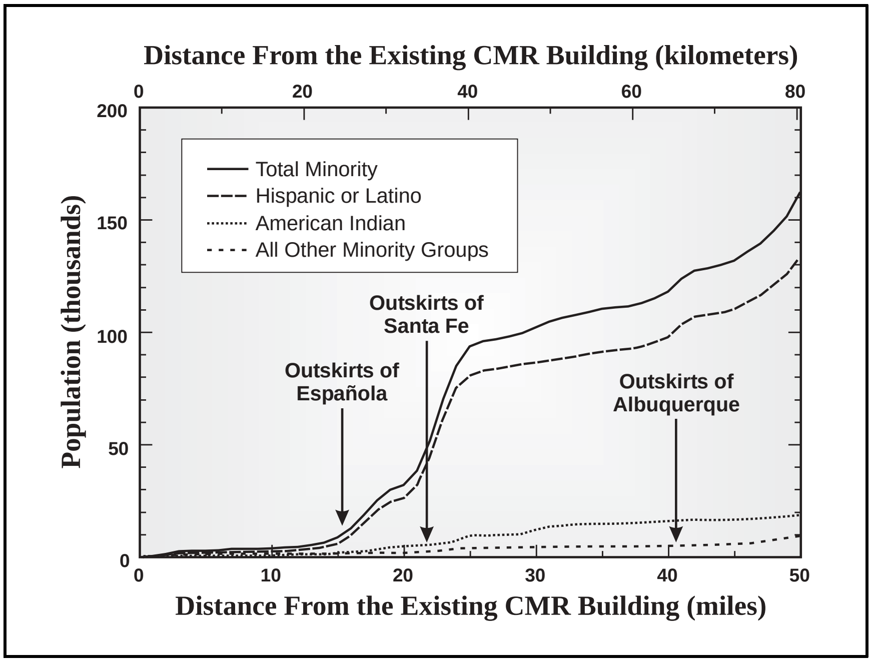

Figure D–3 Minority Populations as a Function of Distance from the Existing CMR Building

As shown in **Table D–1**, approximately 160,000 minority individuals lived within 50 miles (80 kilometers) of the existing CMR Building in the year 2000. Eighty-seven percent of the potentially affected minority population was resident in three of the eight potentially affected counties: Rio Arriba, Sandoval, and Santa Fe Counties.

Table D–1 Minority Populations Living in Potentially Affected Counties Surrounding the Existing CMR Building in the Year 2000

County	*Total Minority Population*	*Potentially Affected Minority Population*	*Percentage of the Totally Affected Minority Population*
Bernalillo	285,081	10,522	6.6
Los Alamos	3,235	3,235	2.0
Mora	4,293	118	< 0.1
Rio Arriba	35,404	30,309	18.9
San Miguel	24,332	3,256	2.0
Sandoval	44,165	41,635	26.0
Santa Fe	69,713	67,686	42.3
Taos	19,597	3,186	2.0
Total	485,820	159,947	100.0*

* Sum of individual percentages may not equal 100 percent due to roundoff.

D.4.1.2 Low-Income Populations Surrounding TA-3

Figure D–4 shows the counties at radiological risk from CMR activities in the existing CMR Building. Low-income and non-low-income populations living within the 50-mile (80-kilometer) distance from the existing CMR Building are shown as a bar graph for each potentially affected county. Eighty-seven percent of the potentially affected low-income population lives in three of the eight potentially affected counties: Rio Arriba, Sandoval, and Santa Fe (See **Table D–2**). Among the 33 counties in New Mexico, 4 of the potentially affected counties have the lowest percentages of their population with incomes below the poverty threshold: Bernalillo, Los Alamos, Sandoval, and Santa Fe.

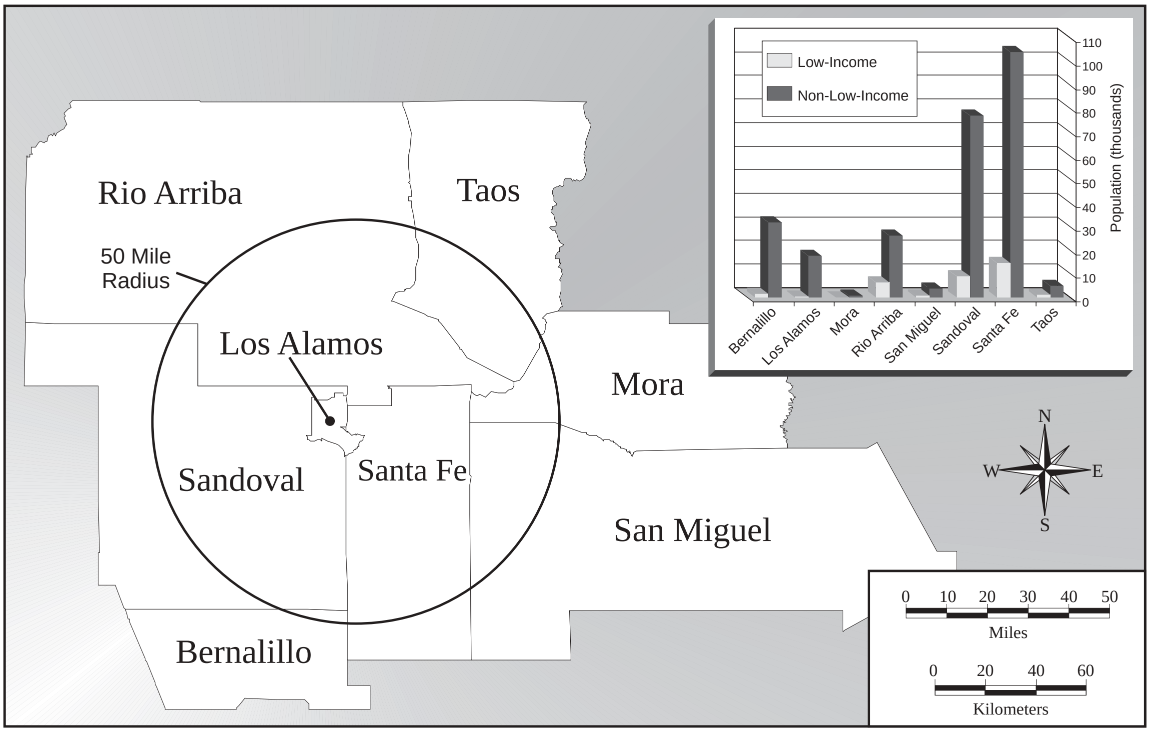

Figure D–4 Low-Income and Non-Low-Income Populations Living in Potentially Affected Counties Surrounding TA-3

Table D–2 Low-Income Populations Surrounding the Existing CMR Building by County

County	*Rank Among All New Mexico Counties (lowest percent poverty among the total county population)*	*Number of Low-Income Persons in County in 2000*	*Low-Income Population at Risk in 2000*	*Percent of the Total Low-Income Population at Risk*
Bernalillo	4	74,987	1,623	4.7
Los Alamos	1	543	534	1.5
Mora	28	1,305	265	0.8
Rio Arriba	18	8,303	6,509	18.6
San Miguel	25	7,110	846	2.4
Sandoval	3	10,847	9,266	26.4
Santa Fe	2	15,241	14,742	42.0
Taos	19	6,232	1,284	3.7

Figure D–5 shows the low-income population surrounding TA-3 as a function of distance from the existing CMR Building. Moving outward from the location of the existing CMR Building, low-income populations increase most noticeably near the outskirts of Española, Santa Fe, and Albuquerque. Approximately one-half of the low-income population lives within 25 miles (40 kilometers) of the existing CMR Building.

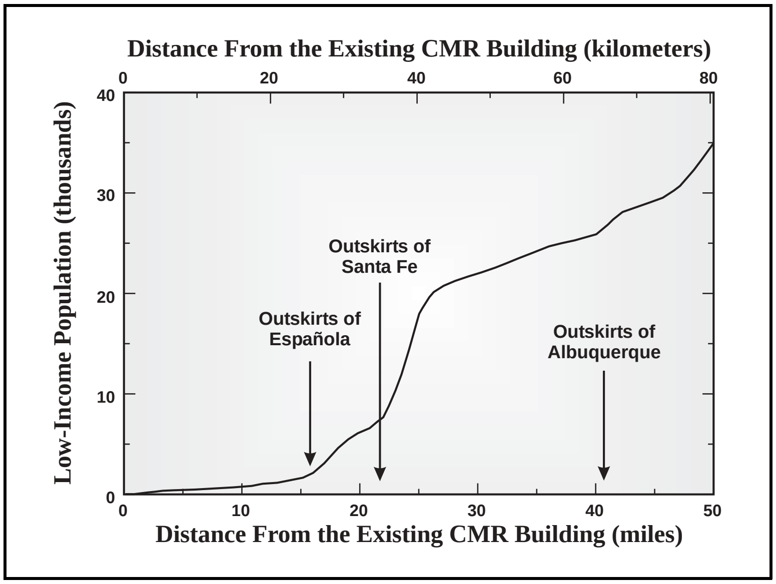

Figure D–5 Low-Income Population as a Function of Distance from the Existing CMR Building

D.4.1.3 Impacts of the No Action Alternative on Low-Income and Minority Populations

Normal Operations

As discussed in Section 4.2.9.1 (see Table 4–3), the likelihood of a fatal cancer to the maximally exposed offsite individual under the No Action Alternative from normal operations would be less than approximately 1 chance in 13 million for each year of exposure. The risk of a latent cancer fatality occurring among the population surrounding the CMR Building would be approximately 1 chance in 2,000 for each year of exposure. Under normal operating conditions, the dose from radiological emissions from the CMR Building would be approximately a factor of 1,400 less than the dose from background radiation present in the potentially affected area surrounding the CMR Building. Also during normal operations under the No Action Alternative, chemical releases to the atmosphere would be less than EPA screening thresholds (40 CFR 68) that designate a hazard to human health.

Thus, normal operations under the No Action Alternative would pose no adverse radiological risk to persons residing in the potentially affected area surrounding the CMR Building, including minority and low-income persons. In addition, the special pathways analysis described in Section D.4.4 shows that CMR operations under the No Action Alternative would not pose an adverse risk to American Indians or others who depend upon subsistence hunting, fishing, and gathering.

Radiological and Chemical Accidents

The risks to the public from potential accidents under the No Action Alternative are discussed in Section 4.3.9.2 (Table 4–5). A severe earthquake would result in the largest radiological risk for the public and the maximally exposed offsite individual. These risks are approximately 1 chance in 500 per year of causing a latent cancer fatality (0.002 latent cancer fatalities) in the total population. Thus, for the accidents evaluated in this EIS under the No Action Alternative, no latent cancer fatalities among the public would be expected to result from any of these accidents, including minority or low-income persons.

Quantities of toxic and carcinogenic chemicals that would be stored in the CMR Building under the No Action Alternative are less than EPA screening thresholds (40 CFR 68) that designate a hazard to human health. Accidents that could occur at the CMR Building under the No Action Alternative would not pose a chemical release hazard to the public, including minority and low-income persons.

Waste Generation and Management

Waste generated under the No Action Alternative would be the same as those currently experienced at LANL. This is because waste generation during CMR operations would not change due to operational restrictions, and therefore, the same types and volumes of waste would be generated (see Section 4.2.11). Section 3.12.1 presents a discussion on the waste types and quantities generated by current CMR activities and compares the waste generated with LANL's available waste management capacities. All waste currently generated are within LANL's capacity for handling waste. Continuation of CMR activities at the existing CMR Building would not be expected to adversely affect air or water quality, or to result in contamination of Tribal lands adjacent to the LANL boundary.

In summary, implementation of the No Action Alternative would not pose disproportionately high or adverse environmental risks to low-income or minority populations living in the potentially affected area surrounding the existing CMR Building.

D.4.2 Results for Action Alternatives 1 and 3

Under Alternatives 1 and 3, new laboratory building(s) would be constructed at TA-55 to house analytical chemistry and materials characterization activities that are currently conducted at the existing CMR Building. Under Alternative 1, a new administrative offices and support functions building would also be constructed at TA-55 and the existing CMR Building would be partly or totally dispositioned. Under Alternative 3, the existing CMR Building would continue to house administrative offices and support functions for CMR operations. This section describes the low-income and minority populations living within the potentially affected area surrounding TA-55. It also describes the potential environmental impacts on those populations that could result from implementation of Alternatives 1 and 3.

D.4.2.1 Minority Populations Surrounding TA-55

Figure D–6 shows the potentially affected area centered on the proposed location for a new CMRR Facility at TA-55. It shows the counties at radiological risk and the composition of the population at risk in each county. The "population at risk" refers to all persons who reside within 50 miles (80 kilometers) of the new CMRR Facility. The 50-mile (80-kilometer) distance was selected to correspond to the radius-of-effects for potential radiological health impacts. The counties at radiological risk are the same as those discussed under the No Action Alternative: Bernalillo, Los Alamos, Mora, Rio Arriba, Sandoval, San Miguel, Santa Fe, and Taos.

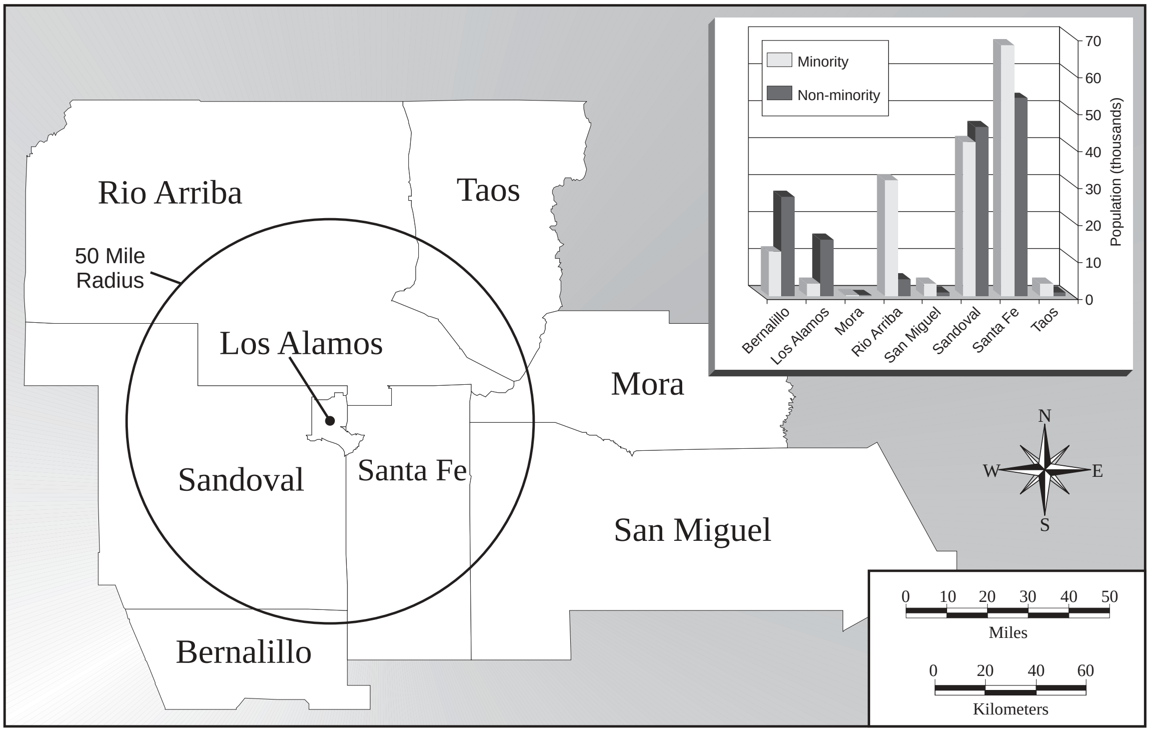

Figure D–6 Minority and Non-Minority Populations Living in Potentially Affected Counties Surrounding TA-55

Minority and non-minority populations living within the 50-mile (80-kilometer) distance from TA-55 are shown as a bar graph for each potentially affected county.

Figure D–7 shows the composition of the minority population as a function of distance from TA-55. The combined Hispanic or Latino and American Indian populations comprised 94 percent of the total potentially affected minority population. Moving outward from TA-55, minority populations increase most noticeably near the outskirts of Española, Santa Fe, and Albuquerque. More than one-half of the potentially affected Hispanic or Latino population lived in the Española-Santa Fe area in the year 2000.

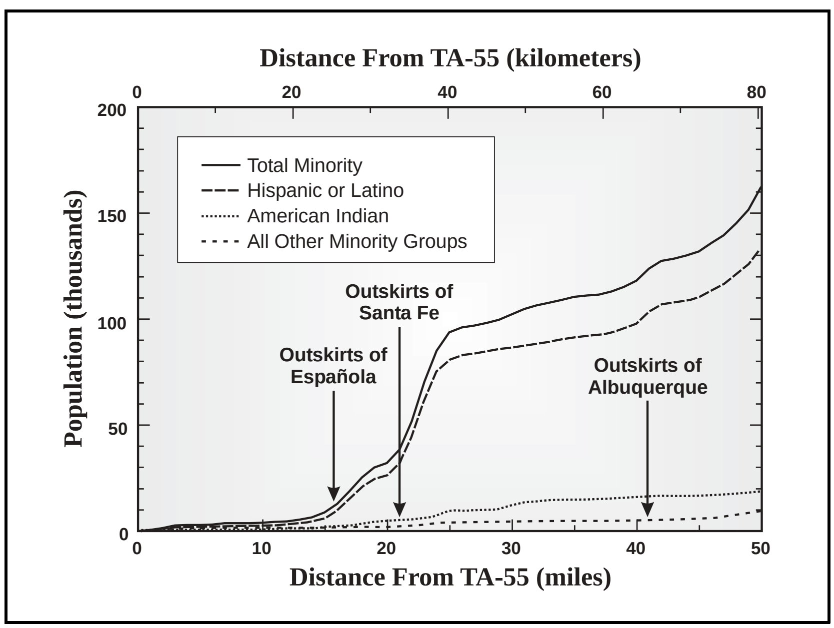

Figure D–7 Minority Populations as a Function of Distance from TA-55

As shown in **Table D–3**, approximately 162,000 minority individuals lived within 50 miles (80 kilometers) of TA-55 in the year 2000. Eighty-six percent of the potentially affected minority population was resident in three of the eight potentially affected counties: Rio Arriba, Sandoval, and Santa Fe Counties.

Table D–3 Minority Populations Living in Potentially Affected Counties Surrounding TA-55 in the Year 2000

County	*Total Minority Population*	*Potentially Affected Minority Population*	*Percentage of the Totally Affected Minority Population*
Bernalillo	285,081	12,432	7.7
Los Alamos	3,235	3,235	2.0
Mora	4,293	172	0.1
Rio Arriba	35,404	30,297	18.7
San Miguel	24,332	3,395	2.1
Sandoval	44,165	41,375	25.6
Santa Fe	69,713	67,746	41.8
Taos	19,597	3,244	2.0
Total	485,820	161,896	100.0

D.4.2.2 Low-Income Populations Surrounding TA-55

Figure D–8 shows the counties at radiological risk from CMR operations that would be conducted at TA-55. Low-income and non-low-income populations living within 50-miles (80-kilometers) are shown as a bar graph for each potentially affected county. Eighty-six percent of the potentially affected low-income population lives in three of the eight potentially affected counties: Rio Arriba, Sandoval, and Santa Fe (see **Table D–4**). Among the 33 counties in New Mexico, 4 of the potentially affected counties have the lowest percentages of their population with incomes below the poverty threshold: Bernalillo, Los Alamos, Sandoval, and Santa Fe.

Table D–4 Low-Income Populations Surrounding TA-55 by County

County	*Rank Among All New Mexico Counties (lowest percent poverty among the total county population)*	*Number of Low-Income Persons in County in 2000*	*Low-Income Population at Risk in 2000*	*Percent of the Total Low-Income Population at Risk*
Bernalillo	4	74,987	1,975	5.6
Los Alamos	1	543	534	1.5
Mora	28	1,305	293	0.8
Rio Arriba	18	8,303	6,495	18.3
San Miguel	25	7,110	920	2.6
Sandoval	3	10,847	9,168	25.8
Santa Fe	2	15,241	14,757	41.6
Taos	19	6,232	1,356	3.8

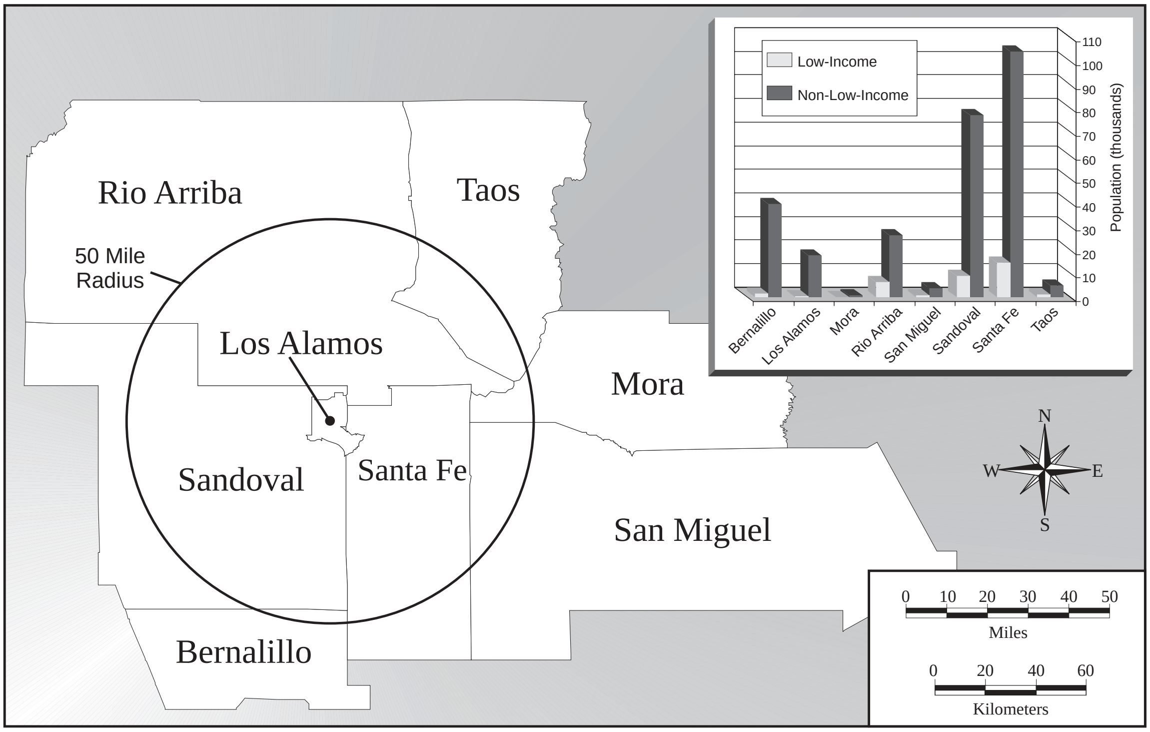

Figure D–8 Low-Income and Non-Low-Income Populations Living in Potentially Affected Counties Surrounding TA-55

Figure D–9 shows the low-income population surrounding TA-55 as a function of distance from TA-55. Moving outward from this location, low-income populations increase most noticeably near the outskirts of Española, Santa Fe, and Albuquerque. Approximately one-half of the low-income population lives within 24 miles (39 kilometers) of TA-55.

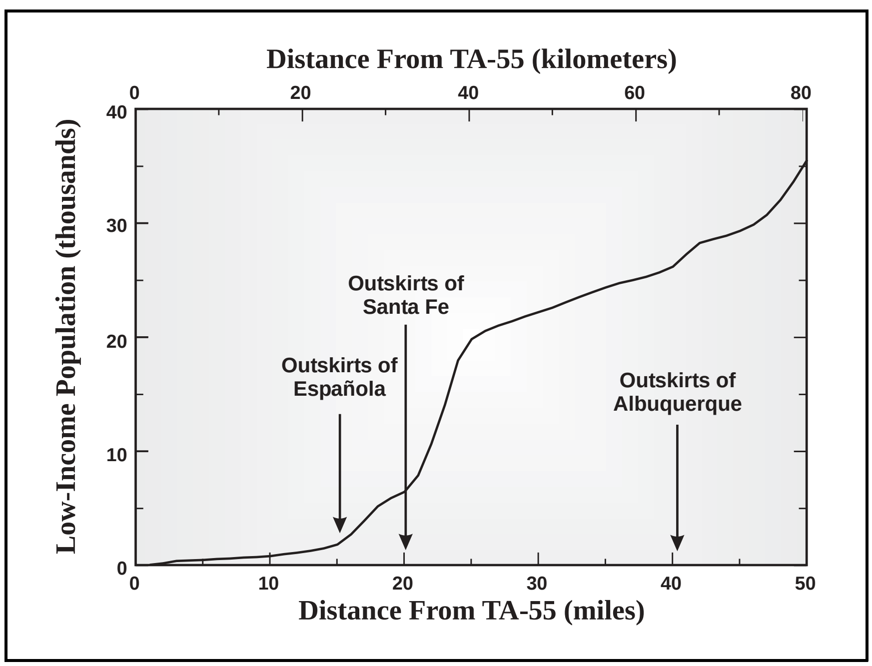

Figure D–9 Low-Income Population as a Function of Distance from TA-55

D.4.2.3 Impacts of Alternatives 1 and 3 on Low-Income and Minority Populations Surrounding TA-55

Construction

Under Alternative 1 (Preferred Alternative), a new administrative offices and support functions building and laboratory building(s) would be constructed at TA-55. Alternative 3 is similar except that the existing CMR Building would continue to house administrative offices and support functions activities with only new laboratory building(s) being constructed at TA-55. As discussed throughout Sections 4.3 and 4.5, environmental impacts due to construction would be temporary and would not extend beyond the boundary of LANL. Under Alternatives 1 and 3, construction at TA-55 would not result in adverse environmental impacts to members of the public living within the potentially affected area surrounding TA-55, including low-income and minority populations.

Normal Operations

As discussed in Sections 4.3.9.1 and 4.5.9.1, under Alternatives 1 and 3, the likelihood of a cancer fatality to the maximally exposed offsite individual from normal operations at the new CMRR Facility would be less than approximately 1 chance in 6 million for each year of exposure. The risk of a latent cancer fatality occurring among the population surrounding the CMRR Facility at TA-55 would be approximately 1 chance in 1,000 for each year of exposure. Under normal operating conditions, the dose from radiological emissions from the CMRR Facility at TA-55 would be a factor of 700 less than the dose from background radiation present in the potentially affected area surrounding TA-55. Also, during normal operations under Alternatives 1 and 3, chemical releases to the atmosphere would be less than EPA screening thresholds (40 CFR 68) used to designate a hazard to human health.

Thus, normal operations under Alternatives 1 and 3 would pose no adverse risk to minority and low-income populations residing in the potentially affected area surrounding the CMRR Facility at TA-55. In addition, the special pathways analysis described in Section D.4.4 shows that CMR operations would not pose an adverse risk to American Indians or others who depend upon subsistence hunting, fishing, and gathering.

Radiological and Chemical Accidents

The risks to the public from potential accidents under Alternatives 1 and 3 are discussed in Section 4.3.9.2 and presented in Table 4–15. A facility-wide spill would result in the largest radiological consequences for the public and the maximally exposed offsite individual. These risks are approximately 1 chance in 238 of causing a latent cancer fatality (0.0042 latent cancer fatalities) in the total population. Thus, for the accidents evaluated in this EIS under Alternatives 1 and 3, no latent cancer fatalities among the public would be expected to result from any of these accidents, including minority or low-income persons.

Quantities of toxic and carcinogenic chemicals that would be used and stored in the CMRR Facility at TA-55 under Alternatives 1 and 3 are less than EPA screening thresholds (40 CFR 68) that would pose a hazard to human health. Accidents that could occur at the CMRR Facility under Alternatives 1 and 3 would not pose a chemical release hazard to the public, including minority and low-income persons.

Waste Generation and Management

As discussed in Sections 4.3.11 and 4.5.11, waste generated under Alternatives 1 and 3 would be managed under the existing waste management system at LANL. All waste generated would be within LANL's capacity for handling waste.

In summary, CMR operations under Alternatives 1 and 3 would not be expected to adversely affect air or water quality, or to result in contamination of Tribal lands adjacent to the LANL boundary. Implementation of Alternatives 1 and 3 would not pose disproportionately high or adverse environmental risks to low-income or minority populations living in the potentially affected area surrounding the CMRR Facility at TA-55.

D.4.3 Results for Action Alternatives 2 and 4

Under Alternatives 2 and 4, new laboratory building(s) would be constructed at TA-6 to house analytical chemistry and materials characterization activities that are currently conducted at the existing CMR Building. Under Alternative 2, a new administrative offices and support functions building would also be constructed at TA-6 and the existing CMR Building would be partly or totally dispositioned. Under Alternative 4, the existing CMR Building would continue to house administrative offices and support functions for CMR operations. This section describes the low-income and minority populations living within the potentially affected area surrounding TA-6. It also describes the potential environmental impacts on those populations that could result from implementation of Alternatives 2 and 4.

D.4.3.1 Minority Populations Surrounding TA-6

Figure D–10 shows the potentially affected area centered on the proposed location for a new CMRR Facility at TA-6. It shows the counties at radiological risk and the composition of the population at risk in each county. The "population at risk" refers to all persons who reside within 50 miles (80 kilometers) of the new CMRR Facility. The 50-mile (80-kilometer) distance was selected to correspond to the radius-of-effects for potential radiological health impacts. The counties at radiological risk are the same as those discussed under the No Action Alternative and Action Alternatives 1 and 3: Bernalillo, Los Alamos, Mora, Rio Arriba, Sandoval, San Miguel, Santa Fe, and Taos.

Minority and non-minority populations living within the 50-mile (80-kilometer) distance from TA-6 are shown as a bar graph for each potentially affected county.

Figure D–11 shows the composition of the minority population as a function of distance from TA-6. The combined Hispanic or Latino and American Indian populations comprised 94 percent of the total potentially affected minority population. Moving outward from TA-6, minority populations increase most noticeably near the outskirts of Española, Santa Fe, and Albuquerque.

More than one-half of the potentially affected Hispanic or Latino population lived in the Española-Santa Fe area in the year 2000.

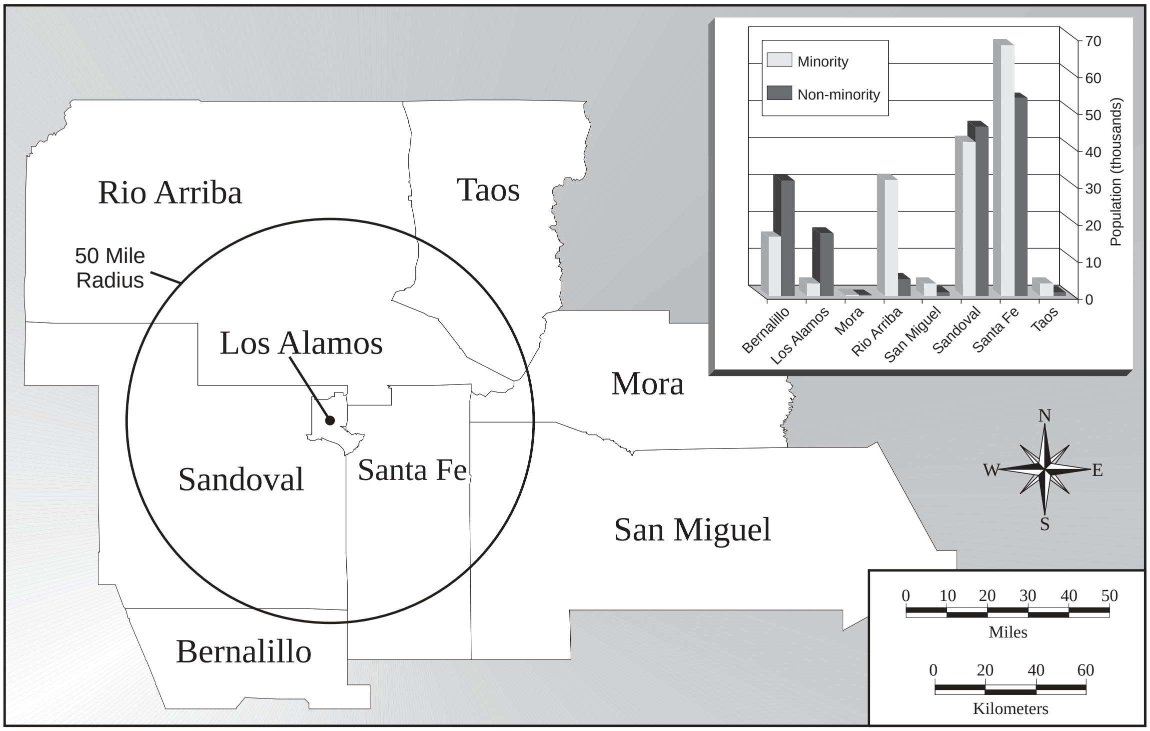

Figure D–10 Minority and Non-Minority Populations Living in Potentially Affected Counties Surrounding TA-6

As shown in **Table D–5**, approximately 165,000 minority individuals lived within 50 miles (80 kilometers) of TA-6 in the year 2000. Eighty-five percent of the potentially affected minority population was resident in three of the eight potentially affected counties: Rio Arriba, Sandoval, and Santa Fe Counties.

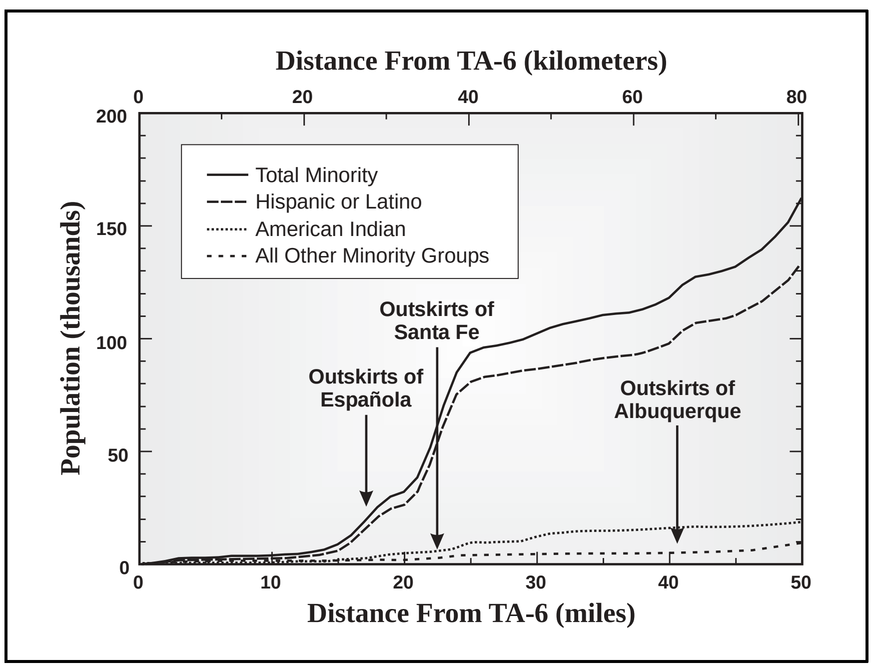

Figure D–11 Minority Populations as a Function of Distance from TA-6

Table D–5 Minority Populations Living in Potentially Affected Counties Surrounding TA-6 in the Year 2000

County	*Total Minority Population*	*Potentially Affected Minority Population*	*Percentage of the Totally Affected Minority Population (percent)*
Bernalillo	285,081	14,999	9.1
Los Alamos	3,235	3,235	2.0
Mora	4,293	111	0.1
Rio Arriba	35,404	30,302	18.4
San Miguel	24,332	3,259	2.0
Sandoval	44,165	41,688	25.3
Santa Fe	69,713	67,712	41.2
Taos	19,597	3,161	1.9
Total	485,820	164,467	100.0

D.4.3.2 Low-Income Populations Surrounding TA-6

Figure D–12 shows the counties at radiological risk from CMR operations that would be conducted at TA-6. Low-income and non-low-income populations living within 50-miles (80-kilometers) are shown as a bar graph for each potentially affected county. Eighty-five percent of the potentially affected low-income population lives in three of the eight potentially affected counties: Rio Arriba, Sandoval, and Santa Fe (see **Table D–6**). Among the 33 counties in New Mexico, 4 of the potentially affected counties have the lowest percentages of their population with incomes below the poverty threshold: Bernalillo, Los Alamos, Sandoval, and Santa Fe.

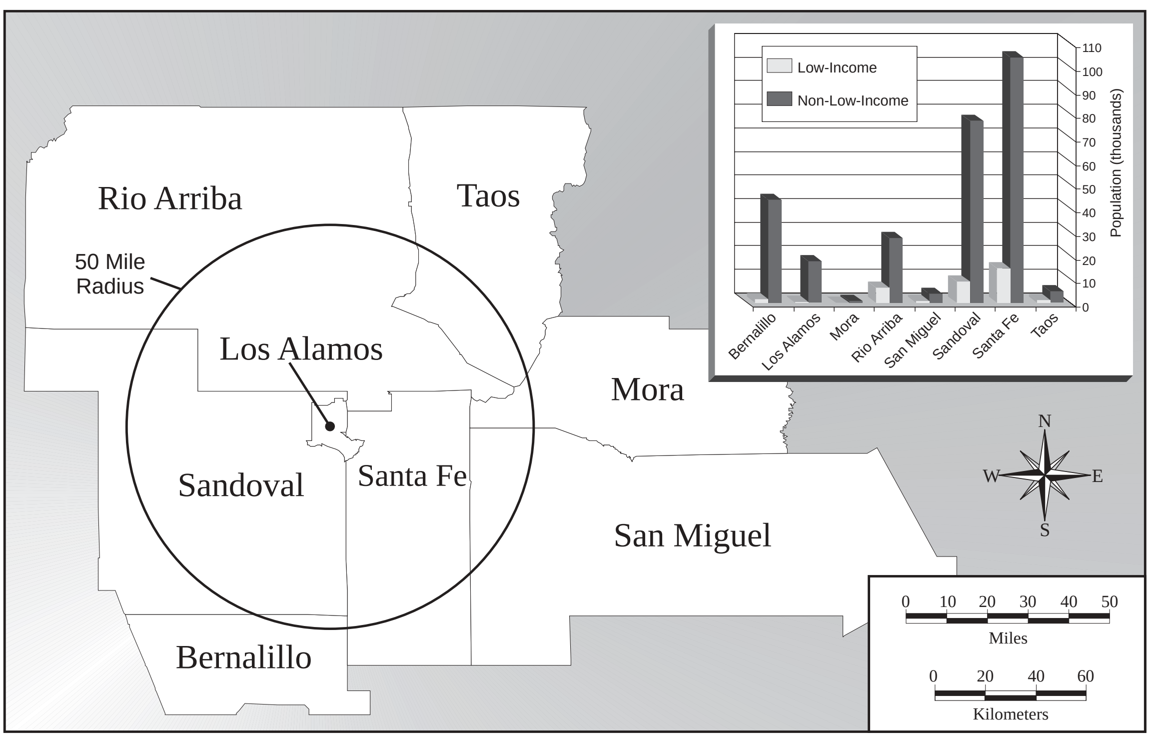

Figure D–12 Low-Income and Non-Low-Income Populations Living in Potentially Affected Counties Surrounding TA-6

Table D–6 Low-Income Populations Surrounding TA-6 by County

County	*Rank Among All New Mexico Counties (lowest percent poverty among the total county population)*	*Number of Low-Income Persons in County in 2000*	*Low-Income Population at Risk in 2000*	*Percent of the Total Low-Income Population at Risk*
Bernalillo	4	74,987	2,319	6.5
Los Alamos	1	543	534	1.5
Mora	28	1,305	261	0.7
Rio Arriba	18	8,303	6,503	18.1
San Miguel	25	7,110	847	2.4
Sandoval	3	10,847	9,292	26.0
Santa Fe	2	15,241	14,747	41.3
Taos	19	6,232	1,236	3.5

Figure D–13 shows the low-income population surrounding TA-6 as a function of distance from TA-6. Moving outward from this location, low-income populations increase most noticeably near the outskirts of Española, Santa Fe, and Albuquerque. Approximately one-half of the low-income population lives within 25 miles (40 kilometers) of TA-6.

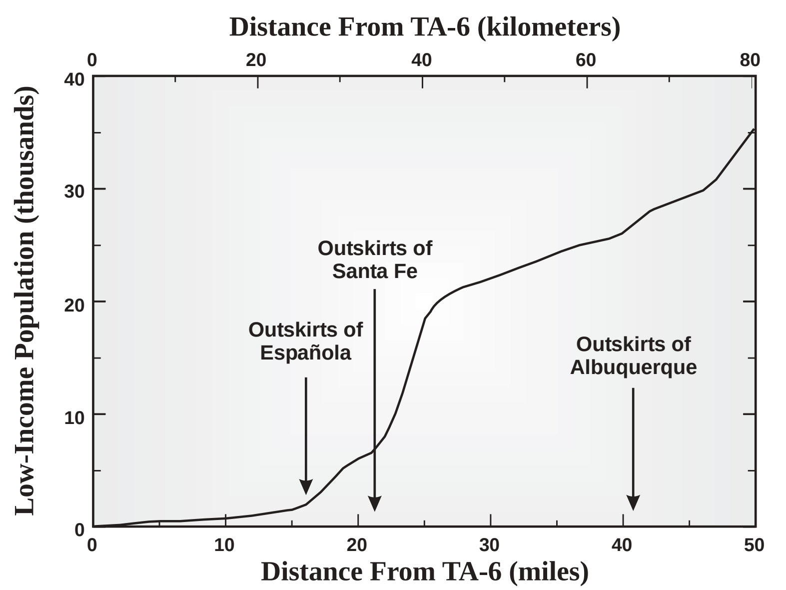

Figure D–13 Low-Income Population as a Function of Distance from TA-6

D.4.3.3 Impacts of Alternatives 2 and 4 on Low-Income and Minority Populations Surrounding TA-6

Construction

Under Alternative 2, a new administrative offices and support functions building and laboratory building(s) would be constructed at TA-6. Alternative 4 is similar except that the existing CMR Building would continue to house administrative offices and support functions activities with only new laboratory building(s) being constructed at TA-6. As discussed throughout Sections 4.4 and 4.6, environmental impacts due to construction would be temporary and would not extend beyond the boundary of LANL. Under Alternatives 2 and 4, construction at TA-6 would not result in adverse environmental impacts to members of the public living within the potentially affected area surrounding TA-6, including low-income and minority populations.

Normal Operations

As discussed in Sections 4.4.9.1 and 4.6.9.1, under Alternatives 2 and 4, the likelihood of a cancer fatality to the maximally exposed offsite individual from normal operations at the new CMRR Facility would be less than approximately 1 chance in 5.6 million for each year of exposure. The risk of a latent cancer fatality occurring among the population surrounding the CMRR Facility at TA-6 would be approximately 1 chance in 1,000 for each year of exposure. Under normal operating conditions, the dose from radiological emissions from the CMRR Facility would be a factor of 700 less than the dose from background radiation present in the potentially affected area. Also, during normal operations under Alternatives 2 and 4, chemical releases to the atmosphere would be less than EPA screening thresholds (40 CFR 68) that designate a hazard to human health.

Thus, normal operations under Alternatives 2 and 4 would pose no adverse risk to minority and low-income populations residing in the potentially affected area surrounding the CMRR Facility at TA-6. In addition, the special pathways analysis described in Section D.4.4 shows that CMR operations would not pose an adverse risk to American Indians or others who depend upon subsistence hunting, fishing, and gathering.

Radiological and Chemical Accidents

The risks to the public from potential accidents under Alternatives 2 and 4 are discussed in Section 4.3.9.2 and presented in Table 4–25. A severe facility-wide spill would result in the largest radiological consequences for the public and the maximally exposed offsite individual. These risks are approximately 1 chance in 250 of causing a latent cancer fatality (0.004 latent cancer fatalities) in the total population. Thus, for beyond design basis accidents evaluated in this EIS under Alternatives 2 and 4, no latent cancer fatalities among the public would be expected to result from any of these accidents, including minority or low-income persons.

Quantities of toxic and carcinogenic chemicals that would be used and stored at the CMRR Facility at TA-6 under Alternatives 2 and 4 are less than EPA (40 CFR 68) screening thresholds used to designate hazards to human health. Accidents that could occur at the CMRR Facility under Alternatives 2 and 4 would not pose a chemical release hazard to the public, including minority and low-income persons.

Waste Generation and Management

As discussed in Sections 4.4.11 and 4.6.11, waste generated under Alternatives 2 and 4 would be managed under the existing waste management system at LANL. All waste generated would be within LANL's capacity for handling waste.

In summary, CMR operations under Alternatives 2 and 4 would not be expected to adversely affect air or water quality, or to result in contamination of Tribal lands adjacent to the LANL boundary. Implementation of Alternatives 2 or 4 would not pose disproportionately high or adverse environmental risks to low-income or minority populations living in the potentially affected area surrounding the CMRR Facility at TA-6.

D.4.4 Special Pathways Analysis

As shown in Figures D–3, D–7, and D–11, minority populations surrounding the existing CMR Building and the proposed locations for the CMRR Facility at TA-55 and TA-6 are comprised largely of Hispanics and American Indians. Radiological health impacts discussed in Chapter 4 and Appendix B of this EIS consider the exposure of the general public to external radiation, inhalation of airborne radioactive materials and hazardous chemicals, ingestion of contaminated water and food, and the inadvertent ingestion of contaminated soils. Special exposure pathways such as the ingestion of radiologically contaminated herbal teas, game, and fish could have additional impacts on American Indians or others who depend on subsistence hunting, fishing, and gathering. An evaluation of health impacts that could arise from the ingestion of contaminated food through special pathways was performed during preparation of the *LANL SWEIS* (DOE 1999; Appendix D, Section D.2). It found that ingestion risks from special pathways were the same for all alternatives evaluated in the *LANL SWEIS* (including the Expanded Operations Alternative) because most of the ingestion risk is attributable to existing levels of radiological contamination in water and soils local to the Los Alamos area (DOE 1999, Section 5.3.6.1). **Table D–7** summarizes the results of the special pathways analysis. The annual dose to exposed individuals resulting from the ingestion of local fish, elk, piñon nuts, and herbal tea brewed from locally grown plants was estimated to be approximately 3.2 millirem. The associated radiological risk would be approximately 1 chance in 620,000 of an exposed individual contracting a fatal cancer for each year of exposure. Since the operational characteristics of the CMRR Facility are based on the level of CMR operations required to support the *LANL SWEIS* Expanded Operations Alternative and the ingestion risk is the same for all of the alternatives evaluated in the *LANL SWEIS*, CMR operations would not be expected to pose an adverse risk to American Indians or others who depend on subsistence hunting, fishing, and gathering.

Table D–7 Worst-Case Public Radiological Dose and Potential Consequences by Ingestion Pathways for Special Pathways Receptors, All Alternatives [a]

Exposure Pathway	*Special Pathways Receptors [b]*	
	Dose (millirem per year)	*Chance of an Excess Latent Cancer Fatality Per Year*
Fish	0.46	1 in 4,300,000
Elk Heart and Liver	0.034	1 in 59,000,000
Piñon Nuts	0.13	1 in 15,000,000
Indian Tea (Cota)	2.60	1 in 770,000
Total	3.22	1 in 620,000

[a] Because almost all public ingestion is from naturally occurring radionuclides, weapons testing fallout, and contamination from past operations, the ingestion dose is not affected by the alternatives (DOE 1999, Section 5.1.6).
[b] Special pathways receptors are those with traditional Native American or Hispanic lifestyles.

D.5 REFERENCES

CEQ (Council on Environmental Quality), 1997, *Environmental Justice Guidance Under the National Environmental Policy Act*, Executive Office of the President, Washington, DC, (*available at http://tis.eh.doe.gov/nepa/tools/guidance/volumei.htm*), December 10.

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DOC (U.S. Department of Commerce), 2002a, *TECHNICAL DOCUMENTATION: Census 2000 Summary File 3 Technical Documentation*, U.S. Census Bureau, SF3/02(RV), Washington, DC, (*available at http://www2.census.gov/census_2000/datasets/Summary_File_3/*), August.

DOC (U.S. Department of Commerce), 2002b, *Census 2000 TIGER/Line Files Technical Documentation*, UA 2000, Bureau of the Census, Washington, DC, (*available at http://www.census.gov/geo/www/tiger/tigerua/ua_tgr2k.html*), April.

DOE (U.S. Department of Energy), 1999, *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory*, DOE/EIS-0238, Albuquerque Operations Office, Albuquerque, New Mexico, January.

OMB (Office of Management and Budget), 2000, *Guidance on Aggregation and Allocation of Data on Race for Use in Civil Rights Monitoring and Enforcement*, OMB Bulletin No. 00-02, Washington, DC, (*available at http://www.whitehouse.gov/omb/bulletins/b00-02.html*), March 9.

DEPARTMENT OF ENERGY

National Nuclear Security Administration; Notice of Intent To Prepare an Environmental Impact Statement for the Proposed Chemistry and Metallurgy Research Building Replacement Project at Los Alamos National Laboratory, Los Alamos, NM

AGENCY: Department of Energy, National Nuclear Security Administration.

ACTION: Notice of intent.

SUMMARY: Pursuant to the National Environmental Policy Act ((NEPA) of 1969, as amended (42 U.S.C. 4321 *et seq.*), and the DOE Regulations Implementing NEPA (10 CFR part 1021), the National Nuclear Security Administration (NNSA), an agency within the U.S. Department of Energy (DOE), announces its intent to prepare an environmental impact statement (EIS) to assess the consolidation and relocation of mission critical chemistry and metallurgy research (CMR) capabilities at Los Alamos National Laboratory (LANL) from degraded facilities such that these capabilities would be available on a long-term basis to successfully accomplish LANL mission support activities or programs. DOE invites individuals, organizations, and agencies to present oral or written comments concerning the scope of the EIS, including the environmental issues and alternatives that the EIS should address.

DATES: The public scoping period starts with the publication of this Notice in the **Federal Register** and will continue until August 31, 2002. DOE will consider all comments received or postmarked by that date in defining the scope of this EIS. Comments received or postmarked after that date will be considered to the extent practicable. Public scoping meetings will provide the public with an opportunity to present comments, ask questions, and discuss concerns regarding the EIS with NNSA officials. The locations, dates and times for the public scoping meetings are as follows:

August 13, 2002, from 4–8 p.m., Cities of Gold Hotel, Pojoaque, New Mexico
August 15, 2002, from 4–8 p.m., Fuller Lodge, Los Alamos, New Mexico

The DOE will publish additional notices on the dates, times, and locations of 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 units of local government that desire to be designated a cooperating agency should contact Ms. Elizabeth Withers at the address listed below by August 16, 2002.

ADDRESSES: Written comments or suggestions concerning the scope of the CMRR EIS or requests for more information on the EIS and public scoping process should be directed to: Ms. Elizabeth Withers, EIS Document Manager, U.S. Department of Energy, National Nuclear Security Administration, Office of Los Alamos Site Operations, 528 35th Street, Los Alamos, New Mexico, 87544; facsimile at (505) 667–9998; or E-mail at *ewithers@doeal.gov.* Ms. Withers may also be reached by telephone at (505) 667–8690.

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 EIS Hotline at (toll free) 1–877–491–4957. The Hotline will have instructions on how to record comments and requests.

FOR FURTHER INFORMATION CONTACT: For general information on NNSA NEPA process, please contact: Mr. James Mangeno (NA–3.6), NNSA NEPA Compliance Officer, U.S. Department of Energy, 1000 Independence Ave, SW., Washington, DC 20585, or telephone 202–586–8395. For general information about the DOE NEPA process, please contact: Ms. Carol 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 1–800–472–2756.

SUPPLEMENTARY INFORMATION: Los Alamos National Laboratory (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 27,800 acres or approximately 43 square miles and is operated for DOE NNSA by a contractor, the University of California. It is a multidisciplinary, multipurpose institution engaged in theoretical and experimental research and development. LANL has been assigned science, research and development, and production NNSA mission support activities that are critical to the accomplishment of the NNSA national security objectives (as reflected in the Stockpile Stewardship and Management Programmatic EIS (DOE/EIS–0236). Specific LANL assignments for the foreseeable future include production of War-Reserve (WR) products, assessment and certification of the stockpile, surveillance of the WR components and weapon systems, ensuring safe and secure storage of strategic materials, and management of excess plutonium inventories. In addition, LANL also supports actinide (actinides are any of a series of elements with atomic numbers ranging from actinium-89 through lawrencium-103) science missions ranging from Plutonium-238 heat-source program for the National Aeronautics and Space Administration (NASA) to arms control and technology development. 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.

The capabilities needed to execute the 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 at Technical Areas (TAs) 3 and 55, respectively), which are used for processing, characterizing and storage of special nuclear material. Most of the LANL mission support functions previously listed require analytical chemistry, material characterization, and actinide research and development support capabilities and capacities that currently exist at facilities within the CMR Building and are not available elsewhere. Other unique capabilities are located at the 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.

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 over 50 years old and many of its systems and structural components are in need of being upgraded, refurbished, or replaced. Recent studies conducted in the late 1990s have identified a seismic fault trace located beneath the CMR Building, which greatly enhances the level of structural upgrades needed at the CMR

Building to meet current structural seismic code requirements for a Hazard Category 2 nuclear facility. Performing the needed repairs, upgrades and systems retrofitting for long-term use of the aging CMR Building to allow it to adequately house the mission critical CMR capabilities would be extremely difficult and cost prohibitive. Over the long-term, 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 would preclude the full implementation of the level of operation DOE decided upon through its Record of Decision for the 1999 LANL Site-wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory (DOE/EIS–0238). CMR capabilities are necessary to support the current and directed stockpile work and campaign activities at LANL. The currently estimated end-of-life for the existing CMR Building is about 2010. The CMR Building is near the end of its useful life and action is required by NNSA to assess alternatives for continuing these activities for the next 50 years.

Currently, NNSA expects that the CMR Building Replacement Project EIS (CMRR EIS) will evaluate the environmental impacts associated with relocating the CMR capabilities at LANL to the new buildings sited at the following alternative locations: (1) Next to the Plutonium Facility at Technical Area 55 (TA–55) at LANL (the Proposed Action), or (2) a ''greenfield'' site(s) at or near TA–55. NNSA will evaluate performing minimal necessary structural and systems upgrades and repairs to portions of the existing CMR Building and continuing the use of these upgraded portions of the structure for office and light laboratory purposes, as well as evaluating the potential decontamination and demolition of the entire existing CMR Building as disposition options coupled with the alternatives for construction and operation of new nuclear laboratory facilities at the two previously identified locations. The EIS would also consider the performance of minimal necessary structural and systems upgrades and repairs to the existing CMR Building as a no-action alternative with continued maintenance of limited mission critical CMR capabilities at the CMR Building. It is possible that this list of reasonable alternatives may change during the scoping process.

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 to 1949 Uniform Building Codes in the late 1940s and early 1950s. DOE has maintained and upgraded the building over time to provide for continued safe operations. In 1992, DOE initiated planning and implementation of CMR Building upgrades intended to address specific safety, reliability, consolidation and safeguards issues (these were the subject of DOE/EA–1101). These upgrades were intended to extend the useful life of the CMR Building an additional 20 to 30 years. However, in 1997 and 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, the DOE determined that the originally planned extensive upgrades to the building would be much more expensive and time-consumptive than had been identified. Furthermore, the planned upgrades would be marginally effective in providing the required operational risk reduction and program capabilities to support NNSA mission assignments at LANL. As a result, in January 1998, the DOE directed the down-scope of the CMR Building upgrade projects to only those upgrades needed to ensure safe and reliable operations through about the year 2010. CMR Building operations and capabilities are currently being restricted in scope due to safety and security constraints; it is not being operated to the full extent needed to meet the DOE NNSA operational requirements established in 1999 for the foreseeable future over the next 10 years. In addition, continued support of LANL's existing and evolving missions roles are anticipated to require additional capabilities such as the ability to handle large containment vessels in support of Dynamic Experiments.

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 support CMR activities conducted at the CMR Building. This management strategy also committed NNSA to developing long-term facility and site plans to relocate the CMR capabilities elsewhere at LANL by 2010, as necessary to maintain continuing LANL support of national security and other NNSA missions.

Purpose and Need: NNSA needs to provide the physical means for accommodating the continuation of the CMR Building's functional, mission-critical CMR capabilities beyond 2010 in a safe, secure, and environmentally sound manner at LANL. At the same time, NNSA should also take advantage of the opportunity to consolidate like activities for the purpose of operational efficiency, and it is prudent to provide extra space for future anticipated capabilities or activities requirements.

Proposed Action and Alternatives: The Proposed Action (Preferred Alternative) is to construct a new facility at TA–55 composed of two or three buildings to house the existing CMR Building capabilities. One of the new buildings would provide space for administrative offices and support activities; the other building(s) would provide secure laboratory spaces for research and analytical support activities. Construction of the laboratory building(s) at above ground level would be considered. Tunnels may be constructed to connect the buildings. At a minimum, the buildings would operate for the next 50 years. A parking lot or structure would also be constructed as part of the Proposed Action.

Reasonable alternatives to the proposed action have not been definitively identified, but could include construction of a new CMR facility at a nearby location to TA–55 within an undeveloped ''greenfield'' area. Another alternative could consider continuing use of portions of the existing CMR Building with the implementation of minimal necessary structural and systems upgrades and repairs for office and light laboratory purposes, together with the construction of new nuclear laboratory facilities at the two previously identified locations. If either of the two alternatives were chosen that would completely remove CMR activities from the existing CMR Building, options for the disposition of the existing CMR Building could include an option for continuing use of the existing CMR Building with the implementation of minimal necessary structural and systems upgrades and repairs for offices or other purposes appropriate to the condition of the structure, and an option for complete decontamination and demolition of the entire CMR Building with subsequent waste disposal. As required by the Council on Environmental Quality NEPA regulations, a No Action alternative will also be evaluated. The No Action alternative would be to continue the current use of the CMR Building for CMR operations with minimal structural and equipment component replacements and repairs so that it could continue to function, although the CMR capabilities would likely be restricted to minimal levels.

Potential Issues for Analysis: NNSA has tentatively identified the following issues for analysis in this EIS. Additional issues may be identified as a result of the scoping process.

1. Potential human health impacts (both to members of the public and to workers) related to the proposed new facility and anticipated LANL nearby activities during normal operations and reasonably foreseeable accident conditions.

2. Potential impacts to air, water, soil, visual resources and viewsheds associated with constructing new buildings, relocating and continuing CMR operations.

3. Potential impacts to plants and animals, and to their habitats, including Federally-listed threatened or endangered species and their critical habitats, wetlands and floodplains, associated with constructing new buildings, relocating and continuing CMR operations.

4. Potential impacts from geologic site conditions and land uses associated with constructing new buildings, relocating and continuing CMR operations.

5. Potential impacts from irretrievable and irreversible consumption of natural resources and energy associated with constructing new buildings, relocating and continuing CMR operations.

6. Potential impacts to cultural resources, including historical and prehistorical resources and traditional cultural properties, from constructing new buildings, relocating and continuing CMR operations.

7. Potential impacts to infrastructure, transportation issues, waste management, and utilities associated with constructing new buildings, relocating and continuing CMR operations.

8. Potential impacts to socioeconomic conditions from constructing new buildings, relocating and continuing CMR operations.

9. Potential environmental justice impacts to minority and low-income populations as a result of constructing new buildings, relocating and continuing CMR operations.

10. Potential cumulative impacts from the Proposed Action and other past, present, and reasonably foreseeable actions at LANL.

NNSA anticipates that certain classified information will be consulted in the preparation of this CMRR EIS and used by decision-makers to decide where and how to relocate the CMR capabilities from the existing CMR Building. This EIS may contain a classified appendix. To the extent allowable, the EIS will summarize and present this information in an unclassified manner.

Related NEPA Reviews: Following is a summary of recent NEPA documents that may be considered in the preparation of this EIS and from which this EIS may be tiered, and of future EISs that may be in preparation simultaneously with the CMRR EIS. The CMRR EIS will include relevant information from each of these documents.

- The Final Stockpile Stewardship and Management Programmatic Environmental Impact Statement (SSM PEIS) (DOE/EIS–0236). The SSM PEIS addressed the facilities and missions to support the stewardship and management of the U.S. nuclear stockpile. The Record of Decision (ROD) was issued in 1996 and identified stewardship and management mission support activities assigned to LANL, in particular, the reestablishment of DOE's plutonium pit production capability.
- The Final Los Alamos National Laboratory Site-Wide Environmental Impact Statement (SWEIS) (DOE/EIS–0238). The SWEIS analyzed four levels of operations alternatives for LANL to meet its existing and potential future program assignments: The No Action Alternative, the Expanded Operations Alternative, the Reduced Operations Alternative, and the Greener Alternative. The SWEIS also provided project specific analysis for two proposed projects: The Expansion of TA–54/Area G Low Level Waste Disposal Area; and Enhancement of Plutonium Pit Manufacturing. The SWEIS Record of Decision identified the Expanded Alternative with reduced pit manufacturing capabilities as the level of operations DOE would undertake at LANL over the next ten years.
- The Draft Environmental Impact Statement for the Proposed Relocation of Technical Area 18 Capabilities and Materials at Los Alamos National Laboratory (TA–18 EIS) (DOE/EIS–0319). The TA–18 EIS considers relocating the TA–18 criticality mission activities to another location at LANL; to the Nevada Test Site near Las Vegas, Nevada; to Sandia National Laboratory at Albuquerque, New Mexico; or to the Argonne National Laboratory—West near Idaho Falls, Idaho. If retained at LANL, the TA–18 activities could be housed in new buildings constructed next to the Plutonium Facility at TA–55; could remain in the current facilities without any upgrades; or could remain in upgraded facilities at TA–18.
- The NNSA is considering initiation of the preparation of an EIS on the proposed Modern Pit Facility. As the analysis for this new facility progresses it will be incorporated, if applicable, into the CMRR EIS to the extent practicable.

Public Scoping Process: The scoping process is an opportunity for the public to assist the NNSA in determining the alternatives and issues for analysis. 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 could be considered. The above list of issues to be considered in the EIS analysis is tentative and is intended to facilitate public comment on the scope of this EIS. It is not intended to be all-inclusive, nor does it imply any predetermination of potential impacts. The CMRR EIS 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 at the following locations: Los Alamos Outreach Center, 1350 Central Avenue, Suite 101, Los Alamos, New Mexico, 87544; and the Zimmerman Library, University of New Mexico, Albuquerque, New Mexico 87131.

Issued in Washington, DC, this 15th day of July, 2002.

Linton Brooks,

Acting Administrator, National Nuclear Security Administration.

[FR Doc. 02–18552 Filed 7–22–02; 8:45 am]

BILLING CODE 6450–01–P

NEPA DISCLOSURE STATEMENT FOR PREPARATION OF AN EIS FOR THE CHEMISTRY AND METALLURGY RESEARCH BUILDING REPLACEMENT PROJECT AT LOS ALAMOS NATIONAL LABORATORY

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) to assure consideration of your proposal)

(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:

____
Signature

Richard T. Profant
Name

Corporate Vice President
Energy Solutions Group

February 2003
Date

Science Applications International Corporation