DOE/EA-1446

Final Environmental Assessment

for the

Test Capabilities Revitalization at Sandia National Laboratories/New Mexico

National Nuclear Security Administration

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Department of Energy, Office of Kirtland Site Operations
Kirtland Air Force Base, Albuquerque New Mexico

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ACRONYMS AND ABBREVIATIONS

ALARA	as low as reasonably achievable
CDR	Conceptual Design Report
CFR	Code of Federal Regulations
CO	carbon monoxide
CTF	Cask Testing Facility
CUB	Central Utility Building
DoD	Department of Defense
DOE	U.S. Department of Energy
DU	depleted uranium
EA	Environmental Assessment
EDE	effective dose equivalent
ESC	Experimental Sciences Complex
ES&H	Environment, Safety, and Health
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ESP	electrostatic precipitator
FLAME	Fire Laboratory for Accreditation of Modeling by Experiment
ft	foot
ft^2	square feet
ft/sec	feet per second
gal	gallon
HAP	hazardous air pollutant
hr	hour
KAFB	Kirtland Air Force Base
kg	kilogram
ℓ	liter
LLW	low-level radioactive waste
LLMW	low-level mixed waste
lb	pound
m	meter
m^3	cubic meter
MEI	maximally exposed individual
MGY	million gallons per year
mrem	millirem
MTRU	mixed transuranic waste
NA	not applicable
NESHAP	National Emission Standards for Hazardous Air Pollutants
NAAQS	National Ambient Air Quality Standards
NFA	No Further Action
NHPA	National Historic Preservation Act
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NNSA	National Nuclear Security Administration

NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
OEL	Occupational Exposure Limit
OSHA	Occupational Health and Safety Administration
PEL	permissible exposure limits
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act
RV	Reentry Vehicle
SHPO	State Historic Preservation Office
SNL	Sandia National Laboratories
SNL/NM	Sandia National Laboratories/New Mexico
STS	Stockpile-to-Target Sequence
SWEIS	Site-Wide Environmental Impact Statement
TA	Technical Area
TCP	Traditional Cultural Property
TCR	Test Capabilities Revitalization
TEV	threshold emission value
TTC	Thermal Test Complex
TTF	Thermal Test Facility
TPY	tons per year
TRU	transuranic waste
TSCA	Toxic Substances Control Act
USAF	U.S. Air Force
USC	United States Code
USFS	U.S. Forest Service
VOC	volatile organic compound
XTF	Crossflow Test Fire Facility
yd	yard
yd^3	cubic yard
yr	year

1.0 PURPOSE AND NEED FOR AGENCY ACTION

The purpose for action by the Department of Energy (DOE), National Nuclear Security Administration (NNSA), is to support a primary DOE mission of maintaining and demonstrating the safety, reliability, and performance of the nation's nuclear weapons systems. NNSA performs this mission through its Stockpile Stewardship and Management Program. At Sandia National Laboratories (SNL) this mission includes thermal and mechanical testing. These tests are necessary to simulate the normal and abnormal conditions that the test articles would experience. Existing test equipment lags significantly behind state-of-the-art capabilities and is inadequate to provide realistic testing environments for validating modeling and simulation requirements. Facilities have reached the end of their useful lives and do not meet modern health, safety, environmental, and energy conservation standards. There is a need to upgrade and replace existing test capabilities to support current and future mission requirements and the broad range of full scale testing capabilities that must be in place. Without revitalization of SNL's current test facilities, individual test capabilities will be lost during the next five years.

Inherent in DOE's purpose for action is a need to support non-DOE testing requests that are compatible with DOE's capabilities. The U.S. Nuclear Regulatory Commission (NRC) has requested that DOE construct and operate facilities necessary to perform drop, thermal, and inspection characterization tests on rail shipping casks designed to hold high-level radioactive waste as part of NRC's certification process. This is consistent with DOE's thermal and mechanical testing capabilities; however, it is independent of DOE's need to upgrade and replace existing nuclear weapons test capabilities at SNL/New Mexico (SNL/NM).

2.0 NO ACTION AND PROPOSED ACTION ALTERNATIVES

This chapter describes the No Action Alternative, the Proposed Action, and alternatives considered but eliminated from detailed consideration. The No Action Alternative (Section 2.1) would involve continued operations as described for the Expanded Operations Alternative in the Site-Wide Environmental Impact Statement for Sandia National Laboratories/New Mexico (SWEIS; DOE 1999). The Proposed Action (Sections 2.2 and 2.3), designated Test Capabilities Revitalization (TCR), would consist of the upgrade of existing facilities and construction of new facilities that would satisfy the stated Purpose and Need. The Proposed Action was also described as an alternative configuration in the Expanded Operations Alternative in the SWEIS.

Alternatives considered but not evaluated in detail include the following:

Conducting TCR-related activities at another DOE facility – No DOE facilities currently exist that could provide the capabilities to conduct the required test activities. Therefore, this alternative would not meet the purpose and need for agency action and was not evaluated in detail.

Outsourcing activities – No facilities owned by private-sector firms or other government agencies with the necessary capabilities currently exist. Therefore, this alternative would not meet the purpose and need for agency action and was not evaluated in detail.

Discontinue activities – Discontinuation of the site would eliminate the ability of DOE to conduct critical testing. Therefore, this alternative would not meet the purpose and need for agency action and was not evaluated in detail.

2.1 Existing Facilities

The TCR Project would involve the renovation and upgrade of several existing facilities located in Technical Areas (TAs): TA-I, TA-III, and Coyote Test Field, as shown in Figure 2.1. These facilities are briefly described below.

Current activities at the TCR-related facilities involve the occasional non-destructive testing of articles containing a variety of radioactive materials including, but not limited to, special nuclear materials. Non-destructive testing limits are determined by initial testing of articles from which the material has been removed and/or replaced by suitable substitute materials. Test articles are not subjected to a testing environment or conditions above potential failure limits determined by initial testing. Neither the No Action Alternative nor the Proposed Action would involve any testing of articles containing special nuclear materials in any of the thermal test facilities, including the Thermal Test Complex (TTC) and the Cask Testing Facility (CTF).

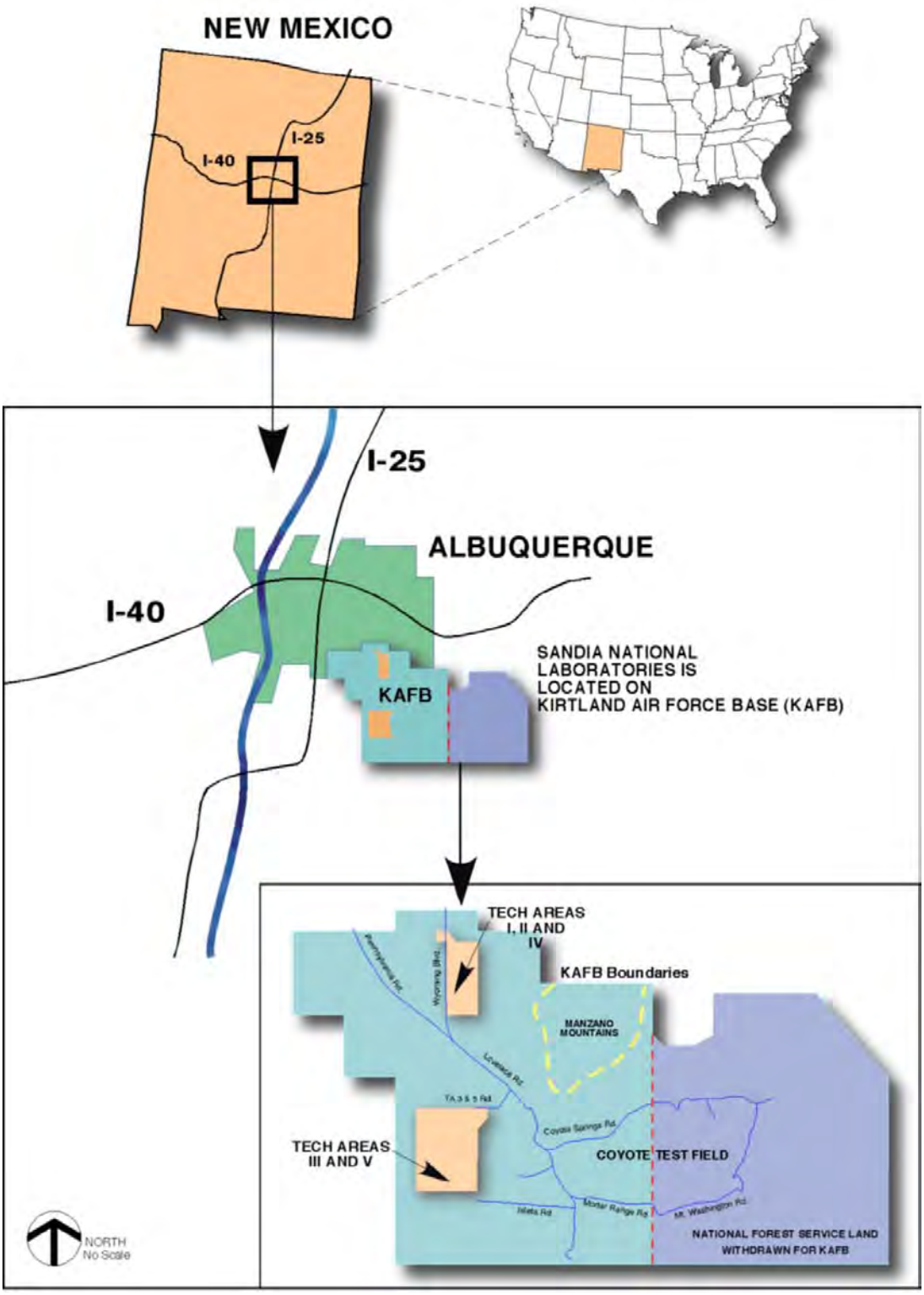

Figure 2.1
Location Map of the SNL/NM Technical Areas

Sled Track Complex

The 10,000-ft sled track, located in TA III, supports weapons system qualification testing and weapons development efforts that must simulate penetration, flight, high-acceleration, and high-shock environments. The simulated environment may be provided through impact, reverse ballistic, or ejection testing. This testing includes shock/laydown tests for bombs, sled ejection tests to verify parachute and laydown performance, impact tests on transportation and container systems, impact fuze tests for reentry vehicles, and a variety of other DOE and Department of Defense (DoD) system tests that require high-speed impacts (SNL 2002).

Operations at the sled track also include the following (DOE 1999):

- Receiving, storing, and handling explosives; pyrotechnics; propellants; and nuclear, radioactive, and chemical materials;
- Fabricating and assembling rocket sleds including payloads and rockets;
- Setting up explosive tests, electronic instrumentation, and data recording and special equipment including lasers, tracking equipment, and X-ray;
- Reducing hazards through area, systems, and personnel control;
- Disposing of explosives; and
- Recovering radioactive and chemical materials.

Small amounts of chemicals are maintained for use in assembling rocket sleds and test payloads in Buildings 6741, 6743, and 6736. For example, various adhesives and epoxies are used to fasten transducers and similar items. Cleaners, lubricants, solvents, paints, and other such agents may also be used in small quantities. Compressed gases are used in the assembly areas, including acetylene and oxygen (for welding), argon, and helium; dry nitrogen and carbon dioxide are used for pneumatic actuators (DOE 1999).

Aerial Cable Test Facility

The Aerial Cable Test Facility, located in the Coyote Test Field, performs gravity drop and accelerated pull-down tests in support of bomb qualification tests and weapons development activities. This test capability provides controlled simulations of the worst-case impact environments experienced by weapons systems and shipping containers. Gravity drop tests are performed from a cable suspended between two peaks, giving up to a 600-foot (ft) vertical distance for acceleration. A rocket-assisted (320-ft sled track) pull-down technique is used to provide higher impact velocities when gravity tests are not adequate (SNL 2002).

Operations require the use of a variety of chemicals (corrosives, solvents, organics, and inorganics) in gaseous, liquid, and solid forms, in relatively small quantities. No radioactive emissions are routinely produced at this facility. Compressed gases used in the assembly areas include acetylene and oxygen (for welding), argon, and helium. There are some chemical emissions, including alcohols, ketones, and other solvents. Small amounts of airborne emissions, including carbon monoxide and lead, are released during explosives tests. Operations associated with preparation of test payloads, fixtures, and rocket sleds involve machining that generates residues, bonding of parts with epoxies, cleaning of parts, and wiping of excess materials (DOE 1999).

Centrifuge Complex

The centrifuges in TA-III generate high-acceleration environments to certify weapons components and systems, satellite systems, guidance systems, and transportation containers. The 35-ft (indoor) and 29-ft (outdoor) centrifuges simulate Reentry Vehicle (RV) launch and reentry environments, aircraft maneuvering accelerations, crash and impact decelerations, and other acceleration environments within the Stockpile-to-Target Sequence (STS) envelope, and support environmental sensing device testing on bomb and missile systems (SNL 2002).

The Centrifuge Complex contains a small chemical inventory but no radioactive materials. Cleaners, lubricants, solvents, paints, and agents are used in small quantities. Compressed gases used in the assembly areas include acetylene and oxygen (for welding), argon, and helium. Chemical emissions, including alcohols, ketones, and other solvents, are associated with various aspects of surface preparation, cleaning, and material processing, including quality control. Small amounts of airborne emissions, including carbon monoxide and lead, are released during explosives tests. Radioactive air emissions are not produced at this facility. Noise from centrifuge operation, collision impacts, and explosive testing does occur. Fragments resulting from centrifuge-launched explosives are recovered shortly after test events (DOE 1999).

Mechanical Shock Facility

The Mechanical Shock Facility in TA-III provides controlled impact and shock environments to support subsystem- and component-level development and qualification testing and to model development and validation activities. This facility houses two horizontal pneumatic actuators (18-inch and 12-inch) and their associated sled tracks (95 ft and 75 ft, respectively) and two bungee-assisted vertical shock machines. Each actuator can support sled and reverse ballistic speeds up to 250 Feet per second (ft/sec) (SNL 2002).

Vibration-Acoustics and Mass Properties Facilities

The large-scale vibration-acoustics facilities in TA-III, which also house Mass Properties operations, provide system-level vibration and shock environment testing capabilities to certify weapons systems (bombs, missile warheads, and reentry systems) to the normal STS environment specifications and to support model development and validation activities. These environmental requirements include transportation, launch, flight, and reentry shock and vibration simulations on full-scale weapons systems. The test capabilities include normal shock and vibration, combined vibration and acoustics, and combined thermal and vibration environments (SNL 2002).

Thermal Radiant Heat Facility

The Thermal Radiant Heat Facility in TA-III provides controlled temperature and heat flux environments using quartz lamps (up to 5,432 °F [3,000° C]) to develop and validate thermal response models and to certify the performance of transportation containers and weapons components, assemblies, and systems for both normal and abnormal thermal environments (SNL 2002).

2.2 No Action Alternative

Under the No Action Alternative, current operations would the facility. No new facilities would be constructed, and existing facilities would not be upgraded. Operations would continue as analyzed in the Expanded Operations Alternative of the SNL/NM SWEIS (DOE 1999).

Following is a description of environmental and human health and safety resources that would be routinely potentially affected under the No Action Alternative.

2.2.1 Air Emissions

Under the No Action Alternative, chemical air emissions would continue as described in the Expanded Operations Alternative in the SWEIS. The emissions include hazardous air pollutants (HAPs), volatile organic compounds (VOCs), and criteria pollutants that are regulated by Federal and local laws. SNL/NM is not a major source for HAPs as described in Title 20 New Mexico Administrative Code (NMAC) Chapter 11 Part 42 section 7.18, *Major Source*. Air emissions for existing facilities associated with the TCR were included in the SNL/NM SWEIS (DOE 1999) air quality analyses.

2.2.2 Water Use and Liquid Effluents

Potable and process water use under the No Action Alternative would be approximately as follows:

- Potable water use – 529,000 gallon per year (gal/yr) (2,002,483 liters per year (ℓ/yr)
- Process water use – 810,000 gal/yr (3,066,184 ℓ/yr)
- Total water use – 1,339,000 gal/yr (5,068,666 ℓ/yr)

Potable and process water would continue to be provided for the entire project under the No Action Alternative, and the baseline rate of water use and wastewater discharge would be the same as that evaluated in the Expanded Operations Alternative of the SWEIS (DOE 1999).

Wastewater generation under the No Action Alternative would be approximately as follows:

- Potable wastewater – 529,000 gal/yr (2,002,483 ℓ/yr)
- Process wastewater – 10,300 gal/yr (38,990 ℓ/yr)
- Total wastewater - 539,300 gal/yr (2,041,473 ℓ/yr)

Sanitary wastewater would continue to be discharged either to the City of Albuquerque sewer system or to septic systems (for remote facilities) or removed from portable toilets and disposed of appropriately. Process wastewater discharged by the facilities would continue to be examined to ensure compliance with City of Albuquerque discharge standards for discharges to the sanitary sewer system or New Mexico Environment Department (NMED) water quality standards for discharges onto the ground.

2.2.3 Waste Management

Current operations generate non-hazardous and hazardous wastes. Non-hazardous waste consists of materials such as office paper, cardboard, plastic, glass, scrap metal, packaging materials, and wood. Under the No-Action Alternative, TCR-related operations would continue to generate solid waste at a rate of approximately 851,504 pounds (lb) (387,047 kilograms (kg) annually. The majority of these waste materials are recycled through SNL/NM's recycling program. Remaining non-hazardous waste is removed and taken to the SNL/NM Solid Waste Transfer Facility where it is sorted, baled, and transported for disposal in local commercial and municipal landfills.

Under the No Action Alternative, operations would continue to generate a total of approximately 4,715 lb/yr (2,143 kg/yr) of hazardous waste. Hazardous waste is stored at or near the point of generation, as designated by the Resource Conservation and Recovery Act (RCRA), 40 Code of Federal Regulations (CFR) 262.34, prior to being transported to the hazardous waste management facility. These quantities are included in the analysis of the Expanded Operations Alternative in the SWEIS (DOE 1999). No radioactive or mixed wastes are currently generated by TCR-related activities.

2.2.4 Human Health and Safety

Worker health and safety precautions and controls for current operations are implemented according to the SNL Environment, Safety, and Health (ES&H) Manual (SNL 2000) and supplemental job-specific procedures. Each major piece of process equipment has an operating procedure.

Operations that employ laser and x-ray hazards are performed using appropriate administrative controls and engineered barriers. These controls include, but are not limited to, operator training and shielding of personnel according to current requirements, including equipment housing that shields operators from laser beam or x-ray exposure. Workers involved in operations connected with potential radiological hazards are protected by engineered controls such as radiation barriers, lead shielding, and alarm systems. Administrative controls, including use of dosimeters and training, are also employed as part of an as-low-as-reasonably-achievable (ALARA) program. The dose rate to employees would be less than 10millirem (mrem) an hour and less than 100 mrem total effective dose equivalent (EDE) a year.

2.3 Proposed Action Construction, Renovation, and Demolition Activities

Construction activities under the Proposed Action would include construction and renovation of the facilities described in the following sections, as well as construction of infrastructure elements in support of these facilities (roads, sidewalks, utility hook-ups, etc.). The Proposed Action construction, renovation, and demolition activities are presented as described in the Conceptual Design Report (CDR) for TCR (SNL 2002) as well as initial planning documents for the CTF.

2.3.1 Sled Track Complex

Under the Proposed Action, the following construction/renovation activities would be conducted at the Sled Track Complex:

- Replace the track-side cabling and provide the target handling area.
- Renovate multiple buildings to extend their useful life 25 years and remove substandard buildings.
- Upgrade of test and site infrastructure, including instrumentation, data acquisition capabilities, and power and communications.
- Complete site improvements, including drainage, grading, and paving along south 5,000 ft of track) and track repairs (concrete, clamps, rails, and alignment.

2.3.2 Aerial Cable Test Facility

Construction and renovation activities would be performed at the Aerial Cable Test Facility under the Proposed Action:

- Site improvements, including drainage, grading, road upgrades, security enhancements, water and sewer, installation of a permanent power, communications, and a data connectivity infrastructure.
- Test infrastructure upgrades, including repairs and replacements to pulleys, cables, winch facilities, anchors, and the sled catch box.
- Construct an approximately 5,000- square feet (ft^2) support facility (the Aerial Cable Test Site Central Support Facility) to provide physically secure storage, data acquisition and control, and work space for personnel assigned to the test site. Construction of this facility would include installation of a small-casing (6-inch) water well to provide water to two toilets and sinks which would replace the portable toilets currently used at the Aerial Cable Test Site and Burn Site during testing. The facility would not include a water fire-suppression facility. The maximum water use for this facility would be approximately 28,800 gal/yr, which is included in the total presented in Section 2.4.2.
- Renovations to multiple buildings to extend their useful life 25 years and removal of substandard buildings.

2.3.3 Centrifuge Complex

The following construction and renovation activities would be conducted at the Centrifuge Complex under the Proposed Action:

- Improvements to data acquisition capabilities.
- General site and infrastructure improvements to address water and sewer needs, paving, soil contamination (hydraulic fluid), and demolition of substandard buildings.
- Major renovations to Building 6526, which houses a 29-ft centrifuge, to include security and code compliance upgrades.
- Construct a 2,500 ft^2 addition to Building 6526 to consolidate work/storage spaces now located in substandard buildings that will be demolished.

2.3.4 Mechanical Shock Complex

Under the Proposed Action, the following construction and renovation would be performed at the Mechanical Shock Complex:

- Upgrade and extend the 18-inch actuator track to support higher-speed (400 ft/sec) testing.
- Renovate Building 6570 to extend its useful life 25 years.
- Replace the compressor equipment (Building 6571).
- Restore the pneumatic power system.
- Provide test equipment enhancements (a velocity measurement system and data acquisition system).
- General site and infrastructure improvements to control erosion, paving, and perimeter fencing.

2.3.5 Vibration-Acoustics and Mass Properties Complex

The following construction and renovation activities would be conducted at the Vibration-Acoustics and Mass Properties Complex under the Proposed Action:

- Renovate Buildings 6560 and 6610 to extend their useful life 25 years.
- Provide site improvements, including grading, drainage, and paving.
- Construct a 2,600 ft^2 addition to Building 6560 to house the facility mechanical systems and to provide a test article handling and staging area.
- Restore the pneumatic power system.
- Replace aging test equipment, controls, and data acquisition systems.

2.3.6 Thermal Test Complex (With new Fire Laboratory for Accreditation of Modeling by Experiment (FLAME)-II test cell and Crossflow Test Fire Facility [XTF])

The following construction and demolition activities would be conducted at the new Thermal Test Complex under the Proposed Action:

- Demolish existing Radiant Heat Facility.
- Construct a new, approximately 22,700 ft^2 facility (the Thermal Test Facility [TTF]) that would house the following operations:
  - A new FLAME-II test cell, approximately 3,400 ft^2, used to investigate the properties of fire environments in an enclosed, flow-controlled, and temperature-controlled structure. Only fuels would be burned in this cell.
  - A radiant heat test cell (new Radiant Heat Facility), approx. 1,600 ft^2.
  - Approximately 2,200 ft^2 to be used for table-top scale abnormal thermal environments laboratory for physics model development and validation and the development of fire sciences diagnostics technologies.

  - A new XTF structure, approximately 4,700 ft^2, including air intake plenum, designed to perform indoor burn tests of test articles that contain explosives and other materials.
  - Approximately 8,500 ft^2 of additional indoor space for a control room, secure storage, light laboratories, environmental chambers, office space (6-8 offices), and support areas.
  - A new Central Utility Building (CUB), approximately, 2,300 ft^2, to provide much of the electrical, mechanical, and controls related to the TTC as well as the test cells in a central location. The CUB also includes the intake plenum for the FLAME-II test cell.
- Construct 2,000 ft^2 of external covered storage next to the TTC.

2.3.7 TA-III Central Services Building

Under the Proposed Action, the following construction and renovation would be performed at the TA-III Central Services Building:

- Renovate and remodel existing Building 6710 to provide a conference area, office space, light laboratory, restroom upgrades, a machine shop, and storage.
- Renovate existing Buildings 6711 (primarily replacement of aged building components) and 6712 (primarily repainting and floor repair).
- Provide site upgrades, including drainage, paving, and parking improvements.
- Demolish storage structure OSB22 (180 ft^2) and remove 21 storage transportainers.
- Relocate and consolidate the machine shop capabilities and long-term storage currently dispersed in TA-III into Building 6710.

2.3.8 Experimental Sciences Center (ESC)

The ESC would be constructed in TA-I, and would provide for the consolidation of operations currently conducted in Buildings 860 and 865. Such operations include machine shops, electronics laboratories, and physical measurements laboratories. Wind tunnels would also be relocated into the ESC. Construction of the ESC under the Proposed Action would include the following:

- A 67,000 ft^2 facility, to be sited in TA-I, which will house 15 labs (including 5 new labs), wind tunnels, and approximately 72 people. The five new laboratories would be similar in nature to those currently in use. The ESC staff will include seven new employees, visiting researchers and students, and existing SNL personnel to be relocated from Buildings 860, 865, and 880.
- Demolish Building 865.

2.3.9 Cask Testing Facility (CTF)

Construction of the new test facility would include the following:

- A 320 ft drop tower to support dropping railroad casks weighing up to 140 tons from a height of 270 ft onto a 3,000,000 lb target.
- A pre- and post-test inspection facility.
- An open burn pool for tests of casks and rail cars.
- An onsite rail system for transportation of casks between the buildings comprising the CTF.

2.3.10 Construction/Demolition Air Conformity

Bernalillo County has been designated as a maintenance area for carbon monoxide (CO) and is in attainment for other Federally regulated pollutants. Trucks and construction equipment would generate CO emissions.

The 20 NMAC 11.04, *General Conformity*, implements Section 176(c) of the Clean Air Act, as amended (42 U.S.C 7401 et seq.), and regulations under 40 CFR 51, Subpart W, with respect to conformity of general Federal action in Bernalillo County. Regulation 20 NMAC Part 11.04.11.1.2, paragraph B, establishes the emission threshold of 100 tons per year (TPY) of CO at SNL/NM that would trigger the requirement to conduct a conformity analysis. Based on anticipated hours of operation of construction equipment, it is estimated that CO emissions throughout the life of the project would be less than 2 tons; therefore CO releases in any given year are anticipated to be substantially below the 100 TPY threshold; therefore a conformity analysis is not required.

2.3.11 Construction/Demolition Water Use and Liquid Effluents

Water use would increase slightly during Proposed Action construction activities due to additional construction personnel onsite and water requirements related to installation and adjustments in the mechanical and plumbing systems of the buildings proposed for modification. Some water would also be required for dust control during the construction effort. Between 20,000 and 50,000 gal/day could be used in the heat of the summer.

2.3.12 Construction/Demolition Waste Management

It is anticipated that construction activities would result in the generation of non-hazardous wastes (primarily construction debris and sanitary wastewater). Construction debris would consist of packaging material including wood crates, cardboard, and plastic; scrap material such as electrical wire, insulation, gypsum drywall, floor tile, carpet, scrap metal, and empty adhesive and paint containers; and concrete debris resulting from the wash-down process following pours. Approximately 1608 tons (1.46 million kg) of construction waste would be generated by construction activities related to the Proposed Action.

Demolition and renovation activities are anticipated to generate approximately 6,500 tons (5.9 million kg) of standard construction waste, primarily concrete, steel, and plastics, bringing the total non-hazardous solid waste generated by the proposed construction, demolition, and renovation to approximately 8,108 tons (7.4 million kg). Current plans are to dispose of this waste in the Kirtland Air Force Base construction waste landfill; alternatively, the waste could be

transported to the City of Albuquerque Cerro Colorado or Rio Rancho construction waste landfills. Materials would be recycled as appropriate.

The TCR-related demolition activities would also generate approximately 117 cubic yards (yd^3) or 47,385 lb (89 cubic meters (m^3) or 21,539 kg) of asbestos waste, which would be removed and managed according to existing SNL/NM asbestos management processes. Asbestos waste would be transported to the Kerrs Mountainair Monofill facility for disposal.

2.3.13 Construction Worker Health and Safety

Construction activities would incorporate all applicable health and safety standards common to each of the construction disciplines employed in the project and would follow all Occupational Health and Safety Administration (OSHA) standards for health and safety practices. The potential for worker exposure to hazardous materials is anticipated to be minimal.

2.4 Proposed Action Operations

Under the Proposed Action, the operations currently conducted at the TCR-associated facilities (described in Section 2.1) would continue with upgraded and updated equipment and facilities. Approximately 171 employees would be involved in TCR-related operations, an increase of 10 employees when compared to the No Action Alternative.

Some existing operations would be relocated (primarily from Buildings 860 and 865) to the ESC in TA-I. Activities at the ESC would include research in thermal/fluid science, material characterization, and optical diagnostics; mechanical testing; and wind tunnel research.

- New operations at the TTC in TA-III would include thermal testing performed at the XTF and fire analyses conducted at the FLAME-II facility, both of which are indoor facilities. The XTF would be an indoor burn facility for fire tests of articles that may contain explosives and other materials. Research in the FLAME would involve tests using a variety of fuels to investigate the properties of fire environments in an enclosed, flow-controlled, and temperature-controlled structure. Preliminary design recommendations include an electrostatic precipitation system for controlling air emissions from these facilities.

It is estimated that the following types and quantities of fuels would be used at the TTC:

- Methanol – 26,800 gal/yr (101,438 ℓ/yr) up to 40 tests per year.
- Acetone – 4,000 gal/yr (15,142 ℓ/yr) up to 80 tests per year.
- Hydrogen – 6.4 million ft^3 (181,228 m^3) up to 40 tests per year.
- Methane – 2 million ft^3/yr (56,634 m^3/yr) up to 40 tests per year.
- JP-8 – 25,000 gal/yr (94,635 ℓ/yr) up to 120 tests per year.

The new, outdoor CTF would support non-destructive certification testing of railroad shipping casks for radioactive materials, including drop and pool-fire testing. Casks would be transported to the facility by truck and would be moved between the testing and analysis locations using an onsite rail system. Tests at the CTF would be for cask characterization only and not certification for failure; therefore, radiation exposure would not be a hazard. Tests would be performed on

new, empty casks only; no hazardous or radioactive materials would be contained within the casks. No items other than casks would be tested at the CTF. Simulations and tests would have been done on these casks before they arrive at SNL to check for any signs of seal leakage. The proposed tests would be well within the established limits of the casks to maintain structural integrity. The casks would not be opened while at SNL.

The cask testing facility will occasionally test waste transportation containers that have internal depleted uranium (DU) shielding. However, the DU will not be released in any form as a result of the performance characterization testing that will be conducted. A pathway for the potential release of the solid DU shielding could not be created unless the transportation container experienced multiple system failures. The planned testing would only involve performance characterization, not limits testing. The planned testing would not include testing to failure. Pool fire testing capabilities would be maintained at the Lurance Canyon Burn Site, which would be maintained as a backup facility for the new Cask Testing Program, which would involve one to two series of tests per year.

2.4.1 Air Emissions

Criteria Pollutants and Hazardous Air Pollutants. An initial estimate of air emissions data related to the Proposed Action was evaluated in the SNL/NM SWEIS (DOE 1999). The CDR for TCR (SNL 2002) and process-specific information were used by SNL/NM to make more refined estimates of the chemical inventories and potential emissions.

For the purpose of this assessment, air emissions at the CTF and the TTC were evaluated according to the same methodology used for the SNL/NM SWEIS (Section 2.3.1). The air quality assessment determined that all criteria air pollutants (i.e., NOx, SOx, CO, and particulate matter smaller than 10 microns in diameter [PM-10]) would comply the Ambient Air Quality Standards. For HAP emissions, chemicals were screened assuming 100% of the inventory was emitted to the air, and 19 chemicals were determined to require modeling. The modeling results were compared to the Occupational Exposure Limit (OEL) divided by 100. The evaluation identified 16 chemicals at the CTF and 3 chemicals at the TTC that did not pass the initial screen. Refined analysis was performed using emission factors developed from knowledge of the testing activities and the physical form of the materials. The results of the refined modeling demonstrated that all 19 constituents passed the screening, i.e., emission were below the OEL divided by 100. This refined modeling did not take credit for control equipment. The results are provided in Table 2.1 and Table 2.2.

Control Equipment. Control equipment in the form of an electrostatic precipitator (ESP) will be installed for the TTC. The ESP collection efficiency will be a minimum 80%.

Radiological. Under the Proposed Action, annual air emissions of depleted uranium, resulting from the operations at the TTC, were below the OEL divided by 100 for hazardous air pollutants. In addition to a HAP concern, DU also has a radiological component. The National Emission Standards for Hazardous Air Pollutants (NESHAP), National Emission Standards for Emission of Radionuclides Other Than Radon From Department of Energy Facilities, requires that emissions from DOE facilities not exceed 10 mrem/yr to the maximally exposed individual (MEI). The potential radiological dose to members of the public was evaluated using the U. S. Environmental Protection Agency (EPA) approved CAP-88PC computer model. The ESP collection efficiency was utilized in the assessment. The resulting dose to the MEI was

Table 2.1 – Dispersion Modeling Results (Hazardous Air Pollutants) at the Cask Testing Facility

Compound	OEL/100 (ug/m^3)	Maximum Impact (ug/m^3)
Benzene	31.9	2.47
Benzyl Chloride	50.0	0.0333
1,3-Butadiene	22.1	0.296
p-Dichlorobenzene	4500	0.506
Napthalene	500	1.48
Styrene	4260	0.358
1,1,2-Trichloroethane	450	0.0728
1,2,4-Trichlorobenzene	400	2.47
Vinyl Chloride	25.6	0.0272
Arsenic	5.00	0.136
Cadmium	0.05	0.0121
Chromium	5.0	0.132
Lead	0.5	0.127
Nickel	15.0	0.0120
Selenium	2.00	0.0132

Table 2.2 – Dispersion Modeling Results (Hazardous Pollutants) at the Thermal Test Complex

Compound	OEL/100 (ug/m^3)	Maximum Impact (ug/m^3)
Beryllium	0.0200	0.000252
Depleted Uranium	2.50	0.000327
Lithium	0.250	0.00395

estimated to be a maximum of 0.00018 mrem/yr, well below the standard. The historic average annual dose to the MEI, resulting from all radiological air emission at SNL/NM is approximately 0.003 mrem/yr.

2.4.2 Water Use and Liquid Effluents

Potable and process water use under the Proposed Action would be approximately as follows:

- Potable water use – 620,000 gal/yr (2,347,712 ℓ/yr)

- Process water use – 1,510,000 gal/yr (5,715,972 ℓ/yr)
- Total water use – 2,130,000 gal/yr (8,063,684 ℓ/yr)

This represents an increase of approximately 791,200 gal/yr (2,649,788 ℓ/yr) as compared to the No Action Alternative. Water use at existing facilities would not increase substantially as a result of operations under the Proposed Action. Much of the increase would be the result of new process water use at the TTC and the CTF.

Wastewater generation under the Proposed Action would be approximately as follows:

- Potable wastewater – 620,200 gal/yr (2,347,712 ℓ/yr)
- Process wastewater – 250,300 gal/yr (947,489 ℓ/yr)
- Total wastewater - 870,500 gal/yr (3,295,201 ℓ/yr)

Sanitary wastewater would be discharged either to the City of Albuquerque sewer system or to septic systems (for remote facilities), or removed from portable toilets and disposed of appropriately. Process wastewater discharged by the facilities would be examined to ensure compliance with City of Albuquerque discharge standards for discharges to the sanitary sewer system or NMED water quality standards for discharges onto the ground.

2.4.3 Waste Management

Operations under the Proposed Action would generate non-hazardous and hazardous wastes as well as very minor quantities of low-level radioactive wastes (LLW). Non-hazardous waste consists of materials such as office paper, cardboard, clean room attire, plastic, glass, scrap metal, packaging materials, and wood. Under the Proposed Action, personnel would generate approximately 857,684 lb/yr (389,856 kg/yr). This represents an increase of approximately 6,180 lb/yr (2,809 kg/yr), or approximately 0.73 % compared to the No Action Alternative. Materials would be recycled as appropriate.

Under the Proposed Action, operations at TCR-related facilities would generate approximately 6,717 lb/yr (3,053 kg/yr) of hazardous waste, an increase of approximately 42% over the amount that would be produced under the No Action Alternative. Much of this increase would result from new operations at the TTC and the CTF.

Under the Proposed Action, up to 2,100 lb/yr (955 kg/yr) of mixed waste could be generated in the form of decontamination waste, personnel protective equipment, and melted components of test articles. Up to 1,000 lb/yr (455 kg) of radioactive waste could be generated from decontamination activities at the TTC. These wastes would be appropriately characterized, packaged, and disposed of in accordance with the existing SNL/NM waste management process.

2.4.4 Human Health and Safety

Worker health and safety protection would include modernized engineered controls in addition to the worker health and safety measures discussed in section 2.2.4.

3.0 AFFECTED ENVIRONMENT

The following sections include discussions of the local environment currently and potentially affected by the construction and operation of the TCR Project. The resource areas described are specific to SNL/NM site-wide conditions, and where applicable, specific to the proposed project area located in TA-I, TA-III, and the Coyote Test Field.

Other resources, summarized below, were considered but are not discussed in detail because they would not be substantially impacted by either the Proposed Action or the No Action Alternative. The buildings and facilities that would be constructed and/or modified under the Proposed Action are located in industrially developed areas of TA-I, TA-III, and the Coyote Test Field at SNL/NM. Surrounding areas have been disturbed as a result of development of each area.

- *Geology and Soils* – Previous surveys discussed in the Environmental Information Document and the SNL/NM SWEIS identified no impacts to the geology and soils in the areas of TA-I, TA-III, and the Coyote Test Field area where the facilities are located or on previously disturbed land in the case of the proposed new ESC. No prime farmlands exist at SNL/NM.
- *Surface Water* – Natural water flow has already been interrupted by the previous site disturbances. Stormwater would be handled in accordance with best management practices.
- *Groundwater* – The project would involve potential installation of a small-casing (6-inch) well at the Aerial Cable Facility Central Services Building to support two toilets and three sinks for use by employees when present at the facility. The facility will be used only during testing at the Aerial Cable Test Facility; therefore, extraction of groundwater at the site would be sporadic and minimal. No other new withdrawals from or discharges to groundwater resources are anticipated, and no sources of potential groundwater contamination would be created or altered. No substantial sources of potential groundwater contamination would be created or altered.
- *Biological Resources* - Under the Proposed Action, impacts to terrestrial resources are anticipated to be minimal. Under the Proposed Action, no impacts to any Federal or State of New Mexico threatened, endangered, or candidate species are anticipated based on a preliminary project screening survey that was conducted (Salinas 2002). However, prior to construction, a clearance survey by a qualified biologist will be conducted to ensure that no impacts occur to species protected by the *Endangered Species Act* and *Migratory Bird Treaty Act*. Additionally, the clearance survey will ensure that soil erosion and sedimentation control measures for construction activities are adequate to protect wetlands.
- *Socioeconomics* – Construction of the facility would require the services of architectural, engineering, and construction firms; however, such support would be temporary. New and upgraded facilities would be staffed primarily with existing personnel. No substantial long-term increases in employment or substantial increases in funding would result from the Proposed Action or the No Action Alternative.

3.1 General Site Description

The TCR Project would be located at SNL/NM's TA-I, TA-III, and the Coyote Test Field near Albuquerque, New Mexico.

3.1.1 Albuquerque

Albuquerque is located in Bernalillo County, in north-central New Mexico, and is in the state's largest city with a population of approximately 420,000. The Sandia Mountains rise steeply immediately north and east of the city, with the Manzanita Mountains extending to the southeast. The Rio Grande runs southward through Albuquerque and is the primary river traversing central New Mexico. Nearby communities include Rio Rancho and Corrales to the northwest, the Pueblo of Sandia and town of Bernalillo to the north, and the Pueblo of Isleta and towns of Los Lunas and Belen to the south (DOE 1999).

3.1.2 SNL/NM

SNL/NM is located within KAFB, approximately 7 miles southeast of downtown Albuquerque. KAFB, including SNL/NM, is situated on a high, arid alluvial fan in the foothills of the Manzano Mountains. The alluvial fan slopes gently to the west to the Rio Grande.

There are 5 SNL/NM TAs that cover approximately 2,560 acres of DOE-owned land. TAs-I, -II, and -IV encompass approximately 645 acres. TA-III encompasses approximately 1,890 acres, and TA-V encompasses approximately 25 acres.

3.1.3 TA-I

TA-I is a relatively small research area consisting of about 370 closely grouped structures consisting primarily of indoor laboratories, office space, and maintenance facilities. TA-I is located adjacent to the various Kirtland AFB structures east of Wyoming Boulevard, west of Eubank Avenue, and north of Tijeras Arroyo (DOE 1999). The preferred site for the ESC is the parking lot north of Building 861 (DOE 2002a).

In addition to the ESC, key facilities located in TA-I include the following (DOE 1999):

- Neutron Generator Facility
- Microelectronics Development Laboratory
- Advanced Manufacturing Processes Laboratory
- Integrated Materials Research Laboratory
- Explosive Components Facility

TA-I also includes support buildings for these facilities, storage, light laboratories, and administrative/office space.

3.1.4 TA-III

TA-III is located approximately 5 miles south of TA-I. The facilities located in this technical area are devoted to violent physical testing and simulating a variety of natural and induced environments. Most of the structures in TA-III are grouped together in small units (organized by testing facility) and separated by extensive open spaces. An administrative building and mobile office trailers provide space for administrative, office, and light laboratory functions. Other key

facilities exist in TA-III in addition to the Rocket Sled Track, the Centrifuge Complex, the Mechanical (Dynamic) Shock, the Thermal Radiant Heat Facility, and the Central Services Building. These include the following (DOE 1999):

- Hot Gas Facility
- Terminal Ballistics Facility
- Static (Force and Pressure) Facility
- Drop Tower
- Water Impact Facility

3.1.5 Coyote Test Field

The Coyote Test Field is a large area within KAFB that contains a variety of remote testing sites and facilities. The area is comprised of mostly open, flat to undulating, grassland terrain in the west, to more mountainous topography in the east. The Aerial Cable Test Facility, Burn Site, and FLAME are located in the Coyote Test Field on land permitted to the DOE by the USAF. Other SNL/NM facilities include the Explosives Applications Laboratory, Containment Technology Test Facility-West, and Thunder Range Complex (DOE 1999).

3.2 Air Quality

3.2.1 Meteorological Conditions

SNL/NM is located along the eastern margin of the regional area known as the Albuquerque Basin. The geography of this area, which consists of mountains, canyons, and the Rio Grande Valley, greatly influences the meteorological conditions. Temperature inversions occur during the winter months, restricting dispersion and dilution of air pollutants in the basin area by trapping the pollution near the surface. The most important implication of meteorological variation across SNL/NM is the effect of wind variability on transport and dispersion of pollutants. Wind characteristics vary across SNL/NM based on proximity to topographical and urban features. The mountains and canyons to the east create the predominant wind directions at SNL/NM. Dispersion occurs as a result of wind patterns developing from the complex interactions of the numerous geographic features. When constituents are emitted to the atmosphere, they are carried away from the source by wind transport and diluted by mixing with the ambient air.

3.2.2 Meteorological Monitoring

Meteorological monitoring commenced at SNL/NM in January 1994. The eight-tower meteorological monitoring network consists of six 10-m towers, one 50-m tower, and one 60-m tower. All towers are instrumented at the 3- and 10-m levels. Instrumentation is also installed at the top of the tall towers. Meteorological variables measured at all tower levels include wind speed, wind direction, and temperature. Relative humidity, precipitation, and atmospheric pressure are also measured.

3.2.3 Air Quality Standards

SNL/NM is located in the Albuquerque Middle Rio Grande Intrastate Air Quality Control Region. Under the National Ambient Air Quality Standards (NAAQS), Bernalillo County is currently in maintenance status for the CO NAAQS. Depending on emission levels, modification to existing sources or construction of new sources emitting CO may require a general or transportation conformity analysis as well as additional levels of controls to comply with the NAAQS. In addition, modification to existing sources or construction of new sources emitting the other criteria pollutants (sulfur dioxide, nitrogen dioxide, ozone, PM-10, and lead) for which a pre-construction permit must be obtained are required to comply with the NAAQS.

NESHAP compliance support is provided to all SNL/NM source owners subject to radionuclide air emissions regulations. The EPA regulates radionuclide air emissions in accordance with 40 CFR 61, Subpart H. Dose is calculated using the CAP-88 computer code. NESHAP regulations stipulate that direct stack or diffuse monitoring is only required if a facility has the potential to produce an effective dose equivalent to the maximally exposed individual of greater than 0.1 mrem/yr. Currently there are no facilities with this potential, and therefore, no stack monitoring is required at SNL/NM. However, while not required by regulation, stack monitoring and calculations based on measured parameters are performed as a best management practice at several facilities. All emissions based on measurements (i.e., continuous monitoring, periodic monitoring, and calculations based on measured parameters) are used to calculate the doses.

There are currently 20 NESHAP sources at SNL/NM that reported radionuclide releases in 1999 (SNL/NM 2001). Facilities located in TA-V that are among the 20 sources include the Annular Core Research Reactor, the Hot Cell Facility, and the Sandia Pulsed Reactor Facility. The NESHAP sources estimate their potential radionuclide air emissions. The EPA has set a maximum individual public dose limit of 10 mrem/yr resulting from the combined radiological emissions produced from any DOE facility. Historically, radioactive releases from SNL/NM have been, and continue to be, several orders of magnitude below this maximum allowable standard.

3.3 Land Use

3.3.1 Land Ownership

Land ownership on KAFB is divided primarily among the U.S. Air Force (USAF), the DOE, the Bureau of Land Management, and the U.S. Forest Service (USFS). The USAF and the DOE are the principal land users within KAFB. Land use is established through coordination and planning agreements between these agencies. DOE owns only a small portion of the land it needs, including SNL/NM, that uses approximately 17 % of Federal land on KAFB (DOE 1999). The TCR Project sites in TA-I and TA-III would be located entirely on DOE-owned land, while the Aerial Cable Test Facility, Burn Site, and existing FLAME facilities are located on USFS withdrawn land.

The location of the new or renovated facilities included in the Proposed Action is provided in Table 3.1. These structures are designed to upgrade the condition of existing structures where similar research is currently conducted in TA-I, TA-III, or the Coyote Test Field.

Table 3.1. Test Capabilities Sites and Locations

Site #	FACILITY	LOCATION
Mechanical		
1	10,000-ft Rocket Sled Track	TA-III
2	Aerial Cable	Coyote Test Field
3	Centrifuge Complex	TA-III
4	Mechanical (Dynamic) Shock	TA-III
5	Vibration and Acoustics	TA-III
Thermal		
6	Burn Site	Coyote Test Field
6a	FLAME Facility	Coyote Test Field
7	Thermal Test Complex	TA-III
7a	Crossflow Test Fire Facility	TA-III
7b	FLAME II	TA-III
7c	Radiant Heat Facility	TA-III
Other		
8	**Central Services Building**	TA-III
9	Experimental Sciences Complex	TA-I
10	Cask Test Facility	TA-III

3.3.2 Environmental Restoration Site

With the exception of the Sled Track in TA-III, environmental restoration (ER) sites associated with the TCR Project have either been approved or are pending review and approval for No Further Action (NFA) status with the NMED. In such areas where project-related activities would occur, close coordination with the ER Project personnel is planned to address any issues. The south area of the Sled Track is currently listed as an active ER site. Project related activities at the Sled Track would require close coordination with the ER Project personnel prior to any construction activities. In addition, although an ER site associated with the Centrifuge Facility has been approved by NMED as an NFA, samples will be taken by SNL's ER Project personnel and analyzed for potential contaminants (due to a rupture of an underground piping system) prior to disposal of material (DOE 1996).

3.4 Waste Management

SNL/NM waste management activities consist of managing, storing, and preparing for offsite disposal of all wastes in accordance with applicable Federal and state regulations, permits obtained under these regulations, and DOE Orders.

Typical waste categories generated onsite include:

- Radioactive waste includes LLW, low-level mixed waste (LLMW), transuranic (TRU) waste, and mixed transuranic (MTRU) waste.
- Hazardous waste includes RCRA listed waste (chemical), Toxic Substances Control Act (TSCA)-listed waste, and biohazardous waste (medical).

- Non-hazardous waste includes solid waste deposited in local landfills (trash and debris) and sewage waste.
- Recyclable material includes lead, ignitable liquids, solvents, oils, scrap metal, paper and plastics.
- Spent nuclear fuel.

All current waste management operations are being implemented following SNL/NM policies established to ensure worker and public safety and compliant management of regulated waste. These policies clearly define waste acceptance criteria, limit the number of workers who handle wastes, provide appropriate waste-specific training, and centralize waste handling areas.

3.5 Cultural Resources

Cultural resources are prehistoric or historic archaeological sites, buildings, structures, districts or other places or objects considered to be important to a culture, subculture, or community for scientific, historical, traditional, religious, or other reasons. The SNL/NM SWEIS (DOE 1999) and the SNL/NM Environmental Information Document (SNL/NM 1999) provide an overview of the types and distribution of cultural resources and a discussion of previous investigations at SNL/NM.

DOE's cultural resource responsibilities are defined in a variety of Federal laws, regulations, and executive orders. The principal Federal law addressing cultural resources is the National Historic Preservation Act (NHPA) of 1966, as amended (16 United States Code [USC] Section 470), and implementing regulations (36 CFR 800), that describe the process for identification and evaluation of historic properties; assessment of the effects of Federal actions on historic properties; and consultation to avoid, reduce, or minimize adverse effects. The term "historic properties" refers to cultural resources that meet specific criteria for eligibility for listing on the National Register of Historic Places (NRHP). This process does not require preservation of historic properties but does ensure that the decisions of Federal agencies concerning the treatment of these places result from meaningful consideration of cultural and historic values and of the options available to protect the properties.

3.5.1 TA-I

TA-I is the highly developed main facility area at SNL/NM. A cultural resource inventory has been conducted of all of TA-I (Hoagland 1990a) and portions have been examined in project-specific surveys conducted more recently. No archaeological resources have been located; and no building, structures, or objects have been recommended or determined eligible for NRHP listing. No specific locations of Traditional Cultural Properties (TCPs) in TA-I were identified during consultations with Native American groups conducted for the SWEIS (DOE 1999). The portion of TA-I inside the security fence was first developed during World War II, although no structures remain in the area from the time period. During 1998 and 1999, SNL/NM conducted an inventory of buildings in TA-I, assessing them in the Cold War context. None were found to be of historic interest at this time.

3.5.2 TA-III

Environmental testing facilities were developed in TA-III beginning in 1953. A cultural resource inventory conducted of TA-III identified no NRHP-eligible archeological sites and recommended further assessment of buildings and structures (Hoagland 1990b). No TCP locations have been identified in TA-III (DOE 1999). In support of the TCR effort, a historical assessment has been conducted of buildings and structures at existing test facilities that would be potentially affected by TCR activities (Ullrich 2002).

10,000-ft Rocket Sled Facility. A potential historic district at the 10,000-ft Rocket Sled Facility has been identified. Buildings 6740 (the track) and 6741 (the control building) are the key elements of the facility and are recommended by SNL/NM as NRHP-eligible as individual properties. The district should also include as contributing elements support Buildings 6742, 6743, 6744, 6745, and 6746. While not of historic interest in their own right, they are important in understanding the sled track's test operations and capabilities.

Centrifuge Complex. The Centrifuge Complex consists of the 35-ft and 29-ft centrifuges and their supporting structures. Four of the buildings have been recommended by SNL/NM as NRHP-eligible as an historic district. Buildings 6520 and 6526, the 35-ft and 29-ft centrifuge facilities respectively, are of historic interest as individual properties while Buildings 6523 and 6523B are essential support structures and contributing elements to the potential district. The other structures at this facility play less important supporting roles, most of which are not essential to the operation of the centrifuges and are therefore of not of historic interest.

Mechanical (Dynamic) Shock Facility. The shock facility is one of the oldest of SNL/NM's environmental test facilities and consists of Building 6570 and the 18-inch actuator track it houses. The actuator is the largest of SNL/NM's shock facilities and provides a variety of test design options. Building 6570 is of historic interest within the Cold War context for the period 1956-1990 and is recommended by SNL/NM as NRHP-eligible as an individual property.

Vibration and Acoustics Facility. Vibration and acoustical environmental testing has been conducted in Buildings 6560 and 6610 since 1955 and 1959, respectively. Each are of historic interest and are recommended as NRHP-eligible as individual properties, because they do not appear to be sufficiently associated with one another to form a potential historic district.

Radiant Heat Facility. None of the structures at the Radiant Heat Facility are of historic interest. DOE consulted with the New Mexico State Historic Preservation Office (SHPO) regarding the two main buildings (Buildings 6536 and 6536B) in the facility. The SHPO concurred with DOE that these structures have lost historic integrity due to the extensive facility and equipment modification.

Air Gun Test Facility. Buildings 6710 and 6711 together housed and operated the air gun test facility. They are not recommended as NRHP-eligible as a historic district within the Cold War context established for SNL/NM. Neither is considered NRHP-eligible as an individual property (Ullrich 2002).

3.5.3 Coyote Test Field

Outdoor environmental testing is conducted by SNL/NM at remote facilities on the western portion of the Kirtland Federal Complex. Cultural resource inventories have not been conducted for the entire test field; however, inventories have been conducted for the individual test

facilities. No significant archaeological resources have been identified in the areas of potential effect for TCR activities (Hoagland 1992, Hoagland and Dello-Russo,1995a, 1995b). No specific TCPs have been identified in the vicinity of the proposed facilities (DOE 1999). The results of the historical assessment of existing test facilities that would be potentially affected by TCR activities follow.

Aerial Cable Test Facility. Although it was built in 1971, the Aerial Cable Test Facility appears to be meet the requirement of "exceptional significance" required for finding properties that are less than 50 years old eligible for NRHP listing. A historic district has been recommended by SNL/NM consisting of the aerial cables themselves and Buildings 9831, 9832, and 9834. The cables and Building 9831 are essential for the facility and are recommended as NRHP-eligible as individual properties, while Buildings 9832 and 9834 are contributing elements to the potential proposed district.

Lurance Canyon Burn Site. Burn testing began in Lurance Canyon in 1968 using open pits. The early test facilities were abandoned, and new facilities were constructed in the 1970s and 1980s including the FLAME facility. There are no historic properties present (Ullrich 2002).

3.6 Site Services

3.6.1 Security

Security is provided by the SNL/NM Protective Services Department, which consists of dispatchers, an offensive force, and a defensive force. In addition, the SNL/NM Emergency Management Team provides planning for emergency preparedness and response, including the analysis of potential impacts of unmitigated and mitigated releases of chemicals and radioactive materials from accidents that could affect SNL/NM personnel and operations, natural phenomenon events, and security-related events. Fire protection is provided by the USAF, which operates five fire stations located throughout KAFB.

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter describes and compares the environmental consequences of the No Action Alternative and the Proposed Action for the TCR Project. Descriptions of the No Action and Proposed Action alternatives are provided in Chapter 2 of this EA, and affected aspects of the environment are discussed in Chapter 3. The following sections compare potential environmental consequences of the two alternatives. Other aspects of the environment were considered in the scoping of the analysis; however, only those potentially affected by the proposed project are discussed in this chapter.

The Proposed Action and No Action Alternative would both result in air emissions, waste generation, process and facility water use, and discharge of liquid effluents into the Albuquerque sanitary sewer system. Table 4.1 summarizes and compares air emissions and other waste volumes related to operations under the No Action Alternative and the Proposed Action. The issues summarized in the table are addressed in the following sections.

Table 4.1 – Comparison of Estimated Annual Emissions, Water Use, and Wastes for the No Action Alternative and the Proposed Action

Emissions and Wastes	No Action Alternative	Proposed Action
Construction and Demolition		
Air Emissions/Conformity	Not applicable (NA)	Less than 2 tons
Asbestos	NA	117 yd^3 or 47,385 lb (89 m^3 or 21,539 kg)
Non-hazardous Waste	NA	8,108 tons (7.4 million kg)
Operations		
Air Emissions	Passes screen (see Section 4.1.1)	Passes screen (see Section 4.4.1)
Hazardous Waste	4,715 lb/yr (2,143 kg/yr)	9,914 lb/yr (4,506 kg/yr)
Radioactive Waste	NA	1,000 lb/yr (455 kg)
Mixed Waste	NA	2,100 lb/yr (955 kg/yr)
Water Use	1,339,000 gal/yr (5,068,666 ℓ/yr)	2,130,000 gal/yr (8,063,684 ℓ/yr)
Wastewater Discharge	539,300 gal/yr (2,041,473 ℓ/yr)	870,500 gal/yr (3,295,201 ℓ/yr)
Non-hazardous Waste[1]	851,504 lb/yr (387,047 kg/yr)	857,684 lb/yr (389,856 kg/yr)

[1] Includes recycled materials discussed in Section 2.3.3.

4.1 No Action Alternative

Description of the projected environmental effects of the No Action Alternative is based on information available from the SNL/NM SWEIS (DOE 1999), the SWEIS Annual Report (SNL 2001), and the CDR for TCR (SNL 2002). The environmental effects of the Proposed Action would be the same as those discussed for the Expanded Operations Alternative in the SWEIS.

Because some of the TCR-related facilities were not discussed in detail in the SWEIS, additional information was gathered and calculations performed to more closely examine the facilities specific to this EA. The following sections are organized according to environmental issues. Discussion of each issue is inclusive of effects or potential effects of all associated operations and emissions and is not facility- or process-specific.

4.1.1 Air Emissions

The SWEIS examined approximately 465 chemicals used at SNL/NM as potential components of routine emissions (Section 5.3.8 of the SWEIS). Occupational Exposure Limits (OELs; a time-weighted average concentration for a conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect) were identified for each of these chemicals, and a "screening" value of the OEL divided by 100 (for conservatism) was established for determining whether emissions factors for each chemical should be developed. This "screening" value is called the Threshold Emission Value (TEV). The initial screening was based on total inventory; in essence, this screening assumed that the entire quantity of a given chemical would be emitted. A chemical passed the screen if a theoretical release of the entire inventory did not cause the TEV to be exceeded. Facility-specific emissions factors were developed for those chemicals that did not pass the initial screening. After applying facility-specific emissions factors, chemicals were screened again to determine whether the TEV was exceeded. Chemicals also passed this screen if the TEV was not exceeded. The SWEIS concluded that normal operations at SNL/NM, including the No Action Alternative for this Environmental Assessment (EA), would not likely result in degradation of air quality.

In the SWEIS, the radiological dose to the MEI due to the radiological air emission from routine SNL/NM facility operations were evaluated. The radiological dose from normal operations of the Expanded Operations Alternative was determined to be 0.51mrem/yr to the MEI.

4.1.2 Water Use and Liquid Effluents

Water use and wastewater generation would continue at 894,000 gal/yr (3.34 million ℓ/yr) and 651,600 gal (2.47 million ℓ), respectively, under the No Action Alternative. Sanitary wastewater would continue to be discharged either to the City of Albuquerque sewer system or to septic systems (for remote facilities) or removed from portable toilets and disposed of appropriately. Process wastewater discharged by the facilities would continue to be analyzed to ensure compliance with City of Albuquerque discharge standards for discharges to the sanitary sewer system or NMED water quality standards for discharges onto the ground.

The No Action Alternative would not result in a change in water use or wastewater generation above that analyzed in the SWEIS.

4.1.3 Waste Management

The No Action Alternative would continue to generate 851,504 lb/yr (387,047 kg/yr) of non-hazardous solid waste and 4,715 lb/yr (2,143 kg/yr) of hazardous wastes. No change in waste generation would result from the No Action Alternative. All wastes would continue to be managed by SNL/NM's waste management program as described in the SWEIS.

4.1.4 Human Health and Safety

Current operations utilize hazardous chemicals and other substances that may affect human health and safety.

Air is the primary pathway for possible worker or public exposure; however, no adverse human health effects would be expected to occur from HAP exposure resulting from the No Action Alternative. The chemicals and solvents used in the current processes are common industrial materials. The SWEIS estimated the overall cancer risk to the MEI from radiation would be less than 1 chance in 4 million.

Engineering and administrative controls are enforced at the facilities associated with the TCR Project to ensure that workers are not exposed to chemicals beyond the permissible exposure limits (PELs) established by the OSHA. Hazards from chemicals in the facility are controlled through engineered barriers, such as fume hoods, local exhaust ventilation, closed containers, closed loop systems, and volume limits. Potential scenarios for accidental exposure to chemicals would continue to be handled in accordance with provisions outlined in the SNL/NM ES&H Manual, Chapter 6, Industrial Hygiene (SNL 2000).

According to the SNL/NM SWEIS (DOE 1999), impacts for the entire SNL/NM workforce are projected to be zero fatalities per year and 1 or 2 confirmed chemical exposures annually. No measurable effects on worker health and safety are anticipated to result from chemical exposure under the No Action Alternative.

4.2 Proposed Action

Under the Proposed Action, renovation and upgrades would be performed at the existing facilities listed in Chapter 2, and the new TTC (including the Radiant Heat Test Cell, FLAME II, and XTF), ESC, and CTF would be constructed. Several existing facilities would also be demolished. The following sections summarize potential environmental consequences associated with the Proposed Action.

4.3 Proposed Action Construction and Demolition Activities

Modifications, renovation, and construction of facilities necessary for implementation of the Proposed Action would result in short-term environmental effects, including noise generated by construction, fugitive dust, and safety and security issues associated with construction personnel on the site. However, these effects would be minimal and confined to relatively small areas for short periods of time.

4.3.1 Construction/Demolition Air Conformity

No discernible changes in air quality are anticipated as a result of Proposed Action construction activities. CO emissions from equipment used for construction would affect air emissions under the Proposed Action. However, the total construction-related CO emissions are projected to be less than 2 tons, which would result in emissions less than the 100 TPY threshold requiring a conformity analysis; therefore, a conformity analysis is not required. Water would be used for dust suppression as appropriate.

4.3.2 Water Use and Liquid Effluents

Water use during construction for installation of equipment and dust suppression would occur during the construction process. The short-term increase in water use due to construction activities is anticipated to be negligible in comparison to SNL/NM's site-wide water use.

4.3.3 Waste Management

Generation and proper management of construction wastes related to the Proposed Action would not exceed the capacity of existing waste management systems. Typical construction debris, as identified in Section 2.4.5, would be generated from demolition and building renovations and modifications under the Proposed Action. Construction, renovation, and demolition activities would result in the generation of approximately 1608 tons (1.47 million kg) of solid waste.

Construction projects are common at SNL/NM; wastes associated with construction are considered routine and are managed according to prescribed procedure. Waste generated during construction of the Proposed Action would be stored in dumpsters prior to disposition. Current plans call for disposal of standard construction waste in the KAFB construction waste landfill.

As much as 117 yd^3 or 47,385 lb (89 m^3 or 21,539 kg) of asbestos-containing materials may be present in the facilities associated with the Proposed Action. Any asbestos encountered during the demolition activities would be removed according to SNL/NM asbestos management procedures. Current procedures involve disposal of asbestos at the Kerrs Environmental Mountainair Monofill Facility.

4.3.4 Health and Safety

Little effect on worker health and safety is anticipated as a result of construction and demolition activities associated with the Proposed Action. Workers would likely have limited if any exposure to chemical hazards during renovation and new facility construction. Hazards would be limited to those commonly associated with construction activities and would be analyzed prior to performing the work. Worker protection measures, including hazard training, work procedures, and the use of personal protective equipment (PPE) would be enforced.

4.3.5 Cultural Resources

Potential impacts to historic properties are assessed by applying the Criteria of Adverse Effect as defined in 36 CFR 800.5a. An adverse effect is found when an action may alter the characteristics of a historic property that qualify it for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by the action that may occur later in time, be farther removed in distance, or be cumulative.

Of the facility locations proposed for TCR activities, the 10,000-ft Rocket Sled Track, Centrifuge Complex, Mechanical (Dynamic) Shock Facility, Vibration and Acoustics Facility, and the Aerial Cable Test Facility each include buildings or structures that SNL/NM has recommended as NRHP-eligible as historic districts or individual historic properties. A historic building inventory was completed of TA-I in 1998 and 1999; no historic properties were identified in the area. Consultation between DOE and the New Mexico SHPO on properties in the area affected by the proposed ESC and TCR activities has concluded that no historic properties will be affected. Similarly, no historic properties are present that would be affected by proposed TCR activities at the TTC or the new CTF.

Proposed TCR activities include a variety of site infrastructure and utility improvements, equipment upgrades, building and structural renovations, construction of new facilities, and removal of buildings and structures. As such, the proposed action is an undertaking, which has the potential to cause effects on historic properties. These proposed changes may alter the characteristics of the properties that qualify them for NRHP listing.

The historic properties present are associated with the contributions that environmental testing conducted at SNL/NM made to weapons design during the Cold War. In addition to this association, some properties are of unique design or size or house unique test equipment because of the nature of the weapons work. The proposed improvements to the test capabilities of these facilities would allow the continued use of these buildings in a mission compatible with their historic role. If other aspects of integrity can be maintained, continued use would have a positive impact on the integrity of the historic properties present. Prior to approving the undertaking, the DOE would complete consultations with the SHPO and other parties regarding the application of the criteria of adverse effect and the development of appropriate mitigation measures to avoid or reduce any impacts in accordance with 36 CFR 800.

The treatment plan(s) to resolve any adverse effects would be negotiated between the SHPO and NNSA. The treatment plan(s) for the affected buildings could include a combination of the following elements: archival medium-format photographs; existing architectural blueprints; preparation of detailed reports on buildings' histories; and interviews with past and present workers. Not all elements would necessarily be applied to all of the eligible buildings.

A Memorandum of Agreement between NNSA and the New Mexico SHPO for resolution of adverse effects would be prepared following SHPO concurrence on the NRHP eligibility assessment and treatment plan. SNL/NM would implement the treatment plan. The Advisory Council on Historic Preservation would be notified of the Memorandum of Agreement and would have an opportunity to comment.

Ground-disturbing activities associated with site improvements, new utility infrastructure, and facility construction could impact undiscovered buried archaeological resources. Although no archaeological resources are known or significant resources anticipated, procedures for addressing the discovery of cultural resources, including human remains and Native American cultural items would be made part of construction plans and specifications. At a minimum, work would stop at the location of the discovery and a qualified archaeologist contacted to assess the find and determine further appropriate actions in coordination with the SHPO.

4.4 Proposed Action Operations

Implementation of the Proposed Action would involve the continuation of current operations at the facilities identified in Section 2.1 and new operations at the TTC, ESC, and CTF. With the exception of the CTF and the TTC, environmental effects of operations would remain the same as those evaluated in the SWEIS because operations at existing facilities would not be expanded and those at the ESC would consist of existing operations relocated to a new facility located essentially adjacent to those currently in use. The following sections describe the environmental consequences of increased production that could result from implementation of the Proposed Action.

4.4.1 Air Emissions

Chemical emissions identified under the No Action Alternative would also be generated under the Proposed Action. This would include all HAP chemicals used by the Proposed Action.

Anticipated air emissions and the resulting consequences were analyzed using the same methodology used for the analyses supporting the SNL/NM SWEIS (DOE 1999). With the completion of the CDR for TCR (SNL 2002), more precise projections of chemical inventories and the resulting air emissions are possible. A list of chemicals projected to be present at the TTC and the CTF was evaluated to determine whether release of the entire inventory of each chemical would exceed the TEV. The initial screening identified 16 chemicals at the CTF and 3 chemicals at the TTC for which process knowledge would be needed to determine whether additional air emissions modeling would be required. For each of these chemicals, an emission rate was calculated based on process knowledge, equipment specifications, and other specific information. In all cases, these refined emission estimates were below the threshold emission values; therefore, additional dispersion modeling was not required, and no degradation of air quality is anticipated. The emissions from facilities at which chemicals are used in large quantities as well as the TEV for each chemical are provided in Table 4.2 and Table 4.3.

Table 4.2 – Dispersion Modeling Results (Hazardous Pollutants) at the Cask Testing Facility

Compound	OEL/100 (ug/m^3)	Maximum Impact (ug/m^3)
Benzene	31.9	2.47
Benzyl Chloride	50.0	0.0333
1,3-Butadiene	22.1	0.296
p-Dichlorobenzene	4500	0.506
Napthalene	500	1.48
Styrene	4260	0.358
1,1,2-Trichloroethane	450	0.0728
1,2,4-Trichlorobenzene	400	2.47
Vinyl Chloride	25.6	0.0272
Arsenic	5.00	0.136
Cadmium	0.05	0.0121
Chromium	5.0	0.132
Lead	0.5	0.127
Nickel	15.0	0.0120
Selenium	2.00	0.0132

Table 4.3 – Dispersion Modeling Results (Hazardous Pollutants) at the Thermal Test Complex

Compound	OEL/100 (ug/m^3)	Maximum Impact (ug/m^3)
Beryllium	0.0200	0.000252
Depleted Uranium	2.50	0.000327
Lithium	0.250	0.00395

The radiological dose to the MEI resulting from the proposed action alternative was modeled and determined to be a maximum of 0.00018 mrem/yr. This is below the SWEIS Expanded Operation Alternative radiological dose of 0.51 mrem/yr and well below the 10 mrem/yr regulatory limit.

4.4.2 Water Use and Liquid Effluents

Potable and process water use under the Proposed Action would be approximately as follows:

- Potable water use – 620,000 gal/yr (2,347,712 ℓ/yr)
- Process water use – 1,510,000 gal/yr (5,715,972 ℓ/yr)
- Total water use – 2,130,000 gal/yr (8,063,684 ℓ/yr)

This represents an increase of approximately 791,200 gal/yr (2,649,788 ℓ/yr) as compared to the No Action Alternative. Water use at existing facilities would not increase substantially as a result of operations under the Proposed Action. Much of the increase would be the result of new process water use at the TTC and the CTF. Water use under the Proposed Action would represent an increase in SNL/NM's total water use in FY 2000 (SNL 2001) from approximately 416 MGY (1.57 billion ℓ/yr) under the SWEIS Expanded Operations Alternative, by approximately 0.002%.

The Proposed Action includes operation of a well for potable water supply at the Aerial Cable Site Central Services Building. Because this well would be pumped intermittently, with a maximum projected annual withdrawal of approximately 28,8000 gal, it appears unlikely that use of this well would affect groundwater movement in the area.

Wastewater generation under the Proposed Action would be approximately as follows:

- Potable wastewater – 620,200 gal/yr (2,347,712 ℓ/yr)
- Process wastewater – 250,300 gal/yr (947,489 ℓ/yr)
- Total wastewater – 870,500 gal/yr (3,295,201 ℓ/yr)

Sanitary wastewater would be discharged either to the City of Albuquerque sewer system or to septic systems (for remote facilities) or removed from portable toilets and disposed of appropriately. Process wastewater discharged by the facilities would be examined to ensure compliance with City of Albuquerque discharge standards for discharges to the sanitary sewer system or NMED water quality standards for discharges onto the ground.

Liquid effluent generated by the Proposed Action would be approximately 870,500 gal/yr (3,295,201 ℓ/yr), an increase of approximately 331,200 gal/yr (1.3 million ℓ/yr). Sanitary wastewater would be discharged either to the City of Albuquerque sewer system or to septic systems (for remote facilities) or removed from portable toilets and disposed of appropriately. Process wastewater discharged by the facilities would be examined to ensure compliance with City of Albuquerque discharge standards for discharges to the sanitary sewer system or NMED water quality standards for discharges onto the ground.

The increase in water use would not substantially affect current or projected water supply to SNL/NM, and increase in liquid effluent generation would not affect SNL/NM's ability to discharge wastewater. No modifications to either system, other than routine connections

between the systems and the facilities, would be required. The increase in both water use and wastewater generation would be minor.

4.4.3 Waste Management

Non-hazardous solid waste volumes would increase to 857,684 lb/yr (389,856 kg/yr). This represents an increase of approximately 6,180 lb/yr (2,809 kg/yr), or approximately a 0.73 % increase in waste volume compared to waste generation under the No Action Alternative. Collection and disposal of these wastes would remain within the capacity of existing facilities and operations.

Hazardous waste volumes would be approximately 9,914 lb/yr (4,506 kg/yr) of hazardous waste, an increase of approximately 6,482 lb/yr (2,946 kg/yr) over the amount that would be produced under the No Action Alternative. However, this represents only a 0.01 % increase in the total quantity of hazardous waste estimated for the SWEIS Expanded Operations Alternative. Management of this quantity of waste remains within the capacity of existing hazardous waste management systems at SNL/NM.

Low-level radioactive waste at TCR-associated facilities could increase from none to 1,000 lb/yr (455 kg) as a result of Proposed Action operations, specifically those associated with decontamination of the XTF between tests. Using the 500 kg/m^3 conversion for low-level radioactive waste used in the SWEIS (DOE 1999), this amounts to approximately 0.91 m^3 of radioactive waste. The SWEIS reports that approximately 9,897 ft^3 of low-level radioactive waste is generated annually by SNL/NM under the Expanded Operations Alternative, which equates to approximately 280 m^3; therefore, the Proposed Action would result in an increase in SNL/NM's total low-level radioactive waste of approximately 0.33 % as opposed to the No Action Alternative. Mixed radioactive waste could increase from none to 2,100 lb/yr (955 kg/yr). The additional mixed waste represents an increase of approximately 19 % above the current 10,899 lb (4,954 kg) currently produced at SNL/NM (DOE 1999, Appendix H), and would be readily accommodated by SNL's waste management system.

4.4.4 Human Health and Safety

The Proposed Action would not result in substantially increased risks to workers and the public. Analysis of human health impacts in the SNL/NM SWEIS supports the conclusion that any increase in human health risk would be a result of a larger employee population, rather than introduction of new or unique hazards. Impacts expected would be zero fatalities per year, approximately 326 nonfatal injuries/illnesses per year, and 1 or 2 confirmed chemical exposures per year (DOE 1999). The overall cancer risk to the maximally exposed individual from radiation due to the proposed action would not change the SWEIS determination of less than 1 chance in 4 million.

However, the increase in employee population (an additional 10 employees) resulting from the Proposed Action would be relatively minor. Modernization would include engineered controls to enhance worker safety; therefore, hazards to workers and the resulting impacts including injuries and exposure-related illness would likely decrease slightly under the Proposed Action.

4.5 Cumulative Effects

Cumulative effects of SNL/NM operations, including most of those associated with Proposed Action, were evaluated as part of the cumulative impact analysis in the SNL/NM SWEIS, Chapter 6 (DOE 1999). This analysis, which evaluated SNL/NM operations in the context of other DOE, DoD, Federal, state, and local activities, is incorporated by reference in this EA. Many of the operations in TA-III were also evaluated in the Environmental Assessment of the Sandia National Laboratories Design, Evaluation, and Test Technology Center at Technical Area III, Kirtland Air Force Base, New Mexico (DOE 1997). The Environmental Assessment of the Microelectronics Engineering Sciences and Applications Complex at Sandia National Laboratories (DOE 2000) evaluated the construction and operation of that facility in SNL/NM's TA-I. The area affected by the Proposed Action would be the same as that discussed in these three National Environmental Policy Act documents. The Proposed Action involves the renovation of several facilities; however, in most cases, little change would result in the nature and extent of the operations. The new ESC would be used to consolidate existing operations currently located in close proximity to the proposed location of the new facility, and the effects of operations at the ESC would be essentially the same as those currently being conducted. Two new facilities, the TTC and the CTF, would result in new impacts; however, the analyses conducted in support of this assessment revealed no evidence that the consequences of the Proposed Action would add substantially to the cumulative impacts evaluated in the SWEIS. Therefore, the effects of the Proposed Action, when combined with the effects resulting from common issues of actions taken by DOE, DoD, Federal, state, and local entities, would not result in cumulatively significant effects.

4.6 Abnormal Occurrences

An accident consequence analysis was performed to determine the worst-case impact of an unplanned explosive event as part of a safety analysis to support a weapon surveillance test at the Aerial Cable Test Facility involving test articles that contain potentially hazardous materials. This accident analysis found that for a low-probability hypothetical blast that includes both air releases and the subsequent deposition of the release onto soils would pose no human health risk.

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APPENDIX A: ABNORMAL EVENT ANALYSIS

Crossflow Test Fire Facility Consequence Analysis

An accident consequence analysis was performed to determine the worst-case impact of an unplanned explosive event as part of a safety analysis to support a weapon surveillance test at the Aerial Cable Test Facility involving test articles that contain potentially hazardous materials.[1,2] The analyzed test article bounds the amount of hazardous materials that will be contained within test units that will be evaluated in the planned Test Capabilities Revitalization (TCR) test facilities, including the Crossflow Test Facility (XTF). The numerical model used to generate a conservative estimate of small fragment production for the materials and system of interest relies on the Grady-Kipp dynamic fragmentation model implemented in the CTH hydrocode. This model has been validated through extensive controlled and full-scale testing.[3]

As noted in a written statement by LLNL, the test environments evaluated in this analysis are "extremely unlikely" to initiate an event that could scatter the materials of concern. Further, the SWEIS estimates the probability of detonation (caused by impacts) to be in the range from 10E-5 to 10E-7, depending on the impact velocity.[4] Nevertheless, the CTH analysis considered the worst-case sequence of events that could theoretically generate the maximum amount of hazardous materials for dispersal. A safety factor was then added to the numerical results to generate a dispersal source term with 40 g each of beryllium, lithium, and depleted uranium. The ERAD/ACRID code developed for the Nuclear Emergency Search Team (NEST) was applied to these source terms for dispersal modeling to determine the maximum potential exposure of on-site workers and the nearest possible offsite residents through (1) the inhalation pathway immediately following release, and (2) soil pathways including incidental ingestion of soil, inhalation of resuspended soil dust for years after the release, and dermal contact.

The criteria used to evaluate the human health risks for each receptor (on site workers and off site residents) were as follows:

Air inhalation: modeled air concentrations were compared to the DOE beryllium action level of 0.2 µg/m3 (10 CFR 850), which corresponds to 0.096 mg-min/m^3 for onsite workers. The screening benchmark used for chronic residential air exposure to beryllium was 0.008 µg/m3, which corresponds to 0.004 mg-min/m^3. Similarly, the screening level for lithium is 0.25 µg/m^3, which corresponds to 0.120 mg-min/m^3.

Soil Ingestion/Inhalation: The NMED screening level for beryllium in soil is 440 mg/kg for industrial receptors and 150 mg/kg for residential receptors.

The modeling considered dispersal under both stable and unstable meteorological conditions. The stable environment creates the most adverse scenario from a health risk standpoint. Figure 1 illustrates the maximum ground level concentrations of beryllium that would be achieved within an 8-hour period under stable and unstable meteorological conditions following a hypothetical worst-case uncontained explosive event. As shown in the figure, the occupational exposure limit threshold concentration levels for beryllium would not be generated at any location during the 8-hour period following an explosion, regardless of the meteorological conditions. This also applies to the lithium, which would disperse in the same manner as the beryllium. Since the beryllium concentration action levels are lower than the lithium action levels, the Figure 1 beryllium dispersal results bound lithium dispersal concentrations.

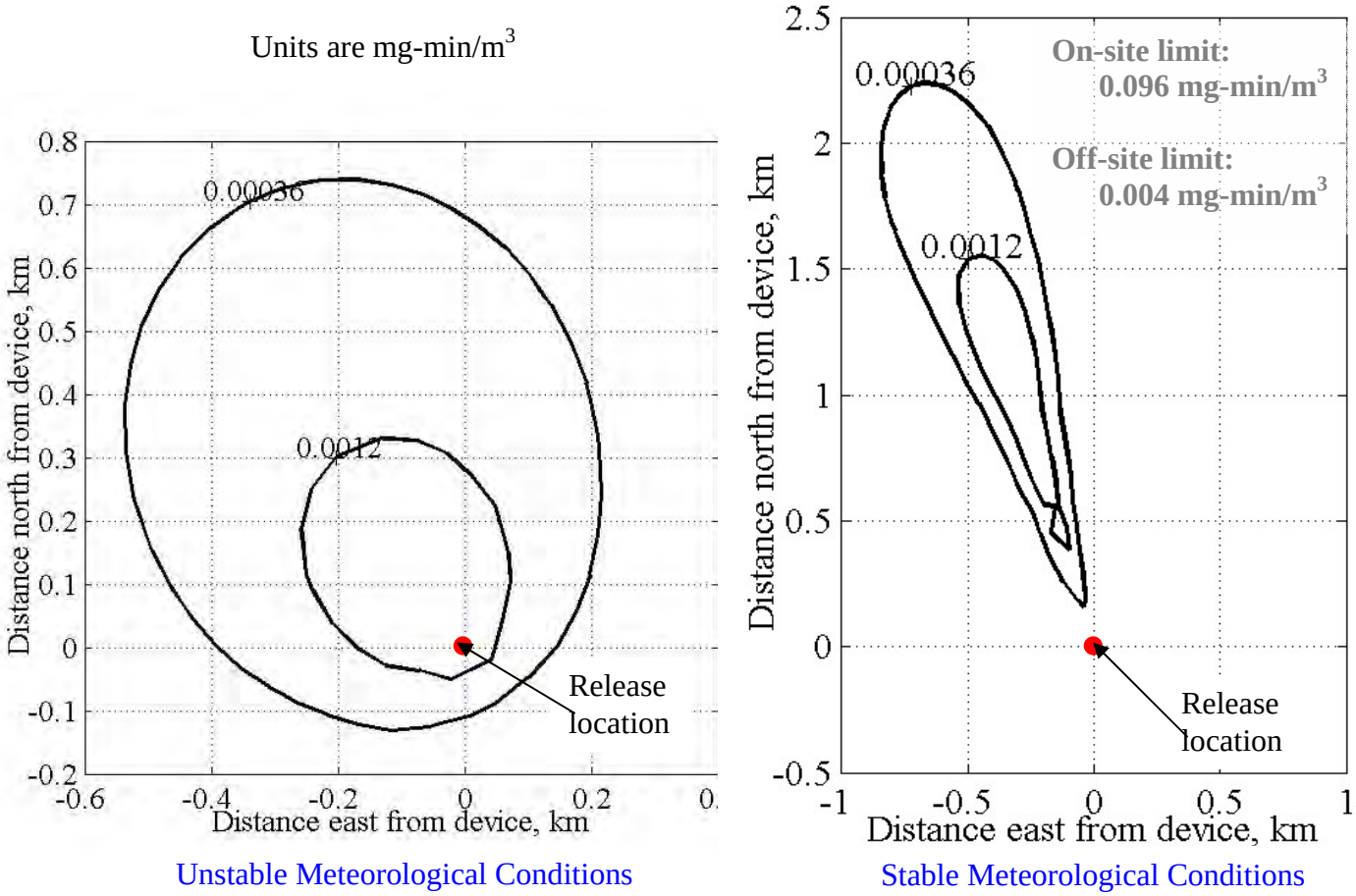

Figure 1. ***Maximum beryllium concentration levels established in 8-hr period for dispersal in unstable (left) and stable (right) meteorology. Be results envelope Li concentrations.***

Figure 2 presents the computed soil deposition levels. As shown in the figure, the deposited quantities are orders of magnitude below the regulatory thresholds. Further, since the maximum number of test articles containing beryllium, lithium, and depleted uranium to be performed during the life of the facilities is on the order of tens, cumulative depositions from these low probability potential explosive events could not approach the regulatory thresholds.

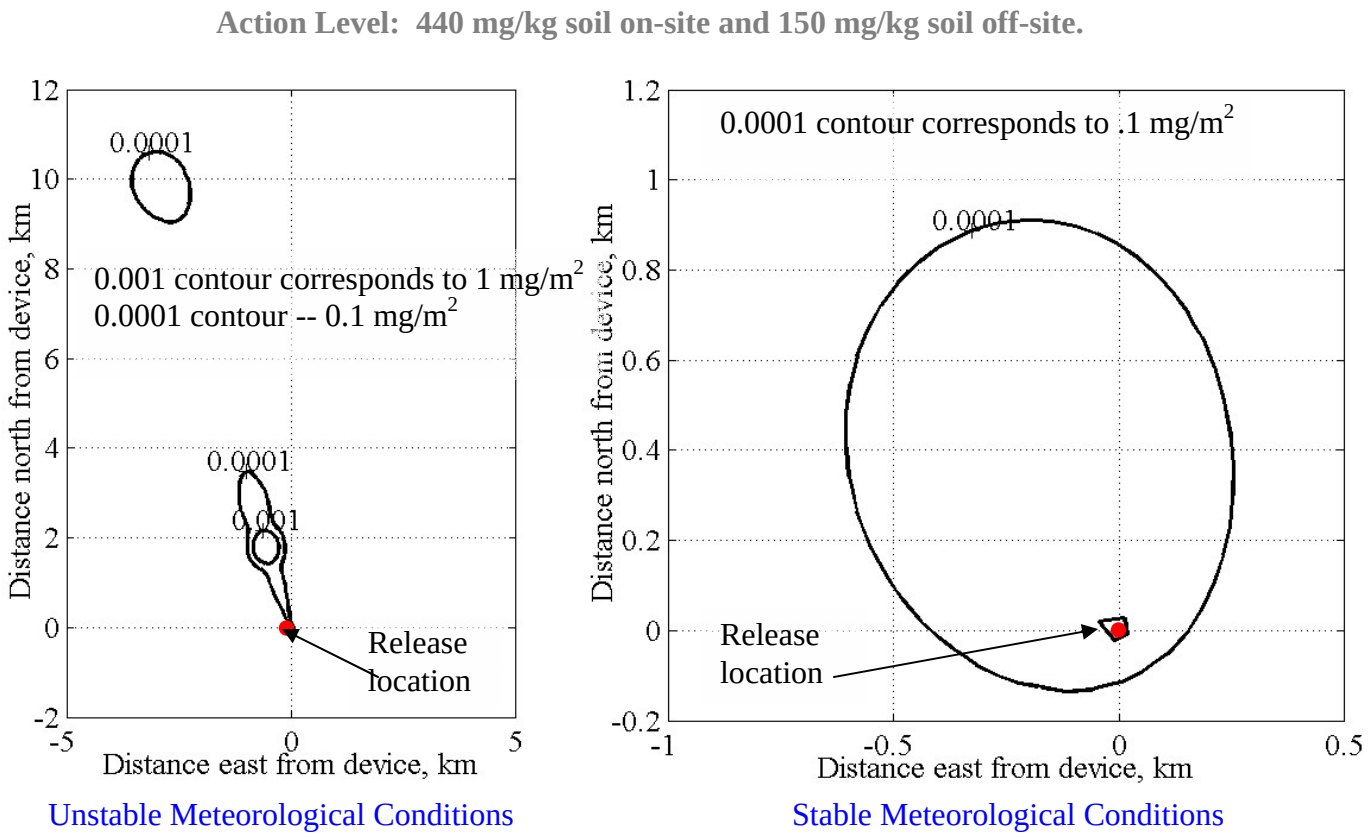

Figure 2. ***Maximum beryllium soil deposition levels. Beryllium results envelope Li deposition quantities.***

Figures 3 and 4 display the worst-case uranium chronic dose and soil deposition quantities that would be generated under both stable and unstable meteorological conditions. As illustrated by the maximum value contours, neither the dose nor deposition magnitudes are large enough to be of concern.

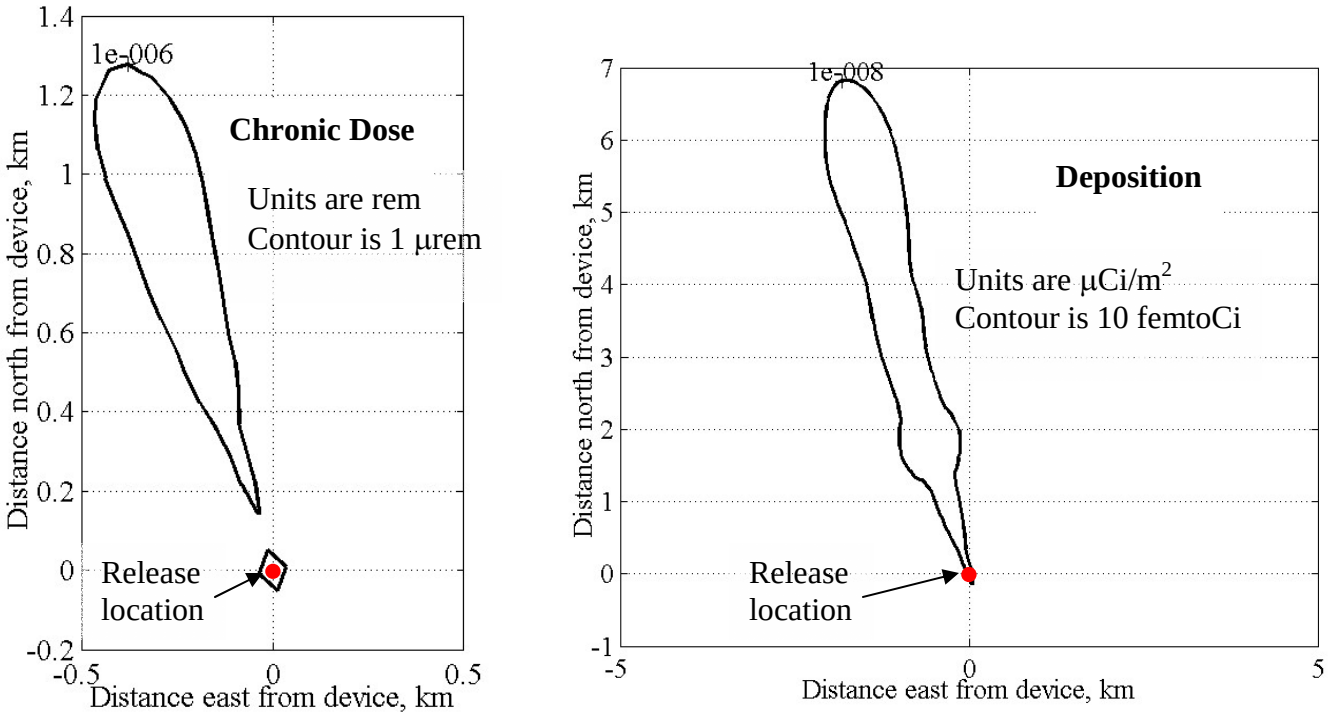

Figure 3. ***Maximum uranium dosage and deposition for stable meteorological conditions.***

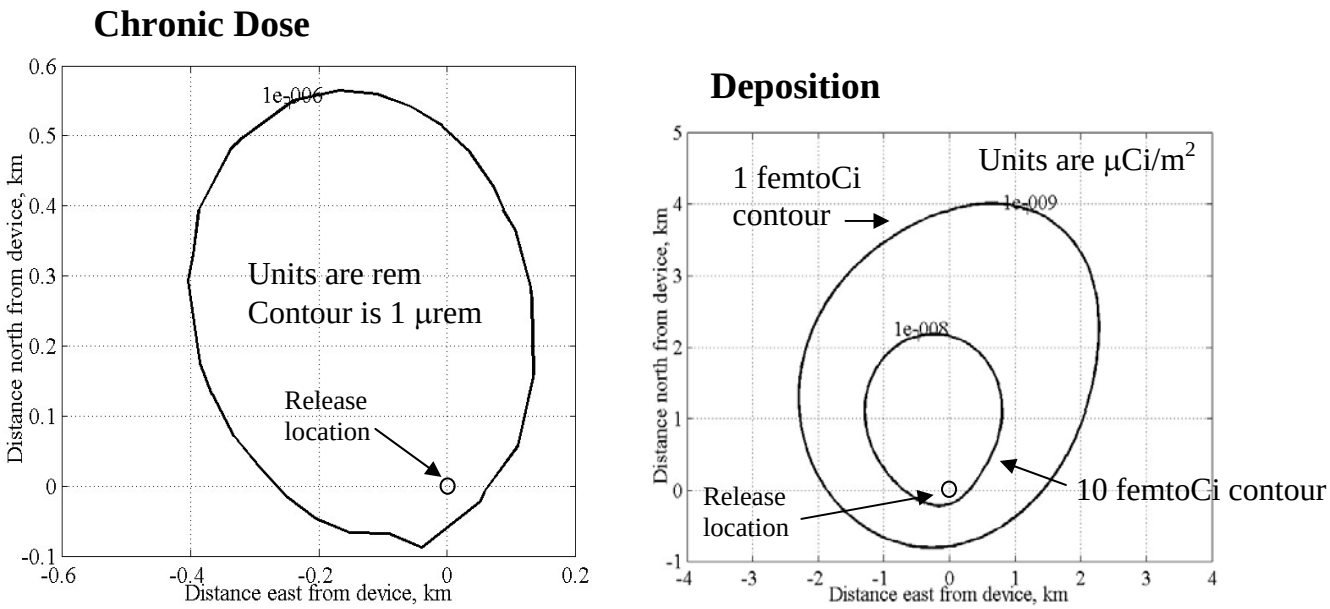

Figure 4. ***Maximum uranium dosage and deposition for unstable meteorological conditions.***

In summary, this consequence analysis demonstrates that a low probability hypothetical blast that includes both air releases and the subsequent deposition of the release onto soils would pose no human health risk. Specifically, the release and dispersal of beryllium, lithium, and depleted uranium would be significantly below the regulatory action levels. Though this analysis was initially conducted for another purpose and site, the results are directly applicable to the XTF and all other TCR test facilities. The source terms for dispersal duplicate the worst-case scenario for the XTF if the building itself is ignored (i.e., the actual amount that would escape the facility would be less than the uncontained open air scenario).

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