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CHAPTER 3

Alternatives for Continuing Operations at SNL/NM

This chapter describes the three alternatives the U.S. Department of Energy (DOE) has analyzed in detail regarding continuing operations at Sandia National Laboratories/New Mexico (SNL/NM). It describes the activities and the level of activities, which will vary depending on the alternative analyzed, at SNL/NM's selected facilities. In addition, the chapter identifies the alternatives the DOE has considered, but not analyzed in detail because they were not reasonable. It concludes by summarizing the comparison of the environmental consequences of the three alternatives.

3.1 INTRODUCTION

Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508) require that the DOE and other Federal agencies use the review process established by the *National Environmental Policy Act* (NEPA) of 1969, as amended (42 United States Code [U.S.C.] 4321 *et seq.*) and the DOE regulations implementing NEPA (10 CFR Part 1021) to evaluate not only the proposed action, but also to identify and review reasonable alternatives to the proposed action, as well as a "no action" alternative. This comprehensive review ensures that environmental information is available to public officials and citizens before decisions are made and before actions are taken. The alternatives are central to an environmental impact statement (EIS).

The proposed action for the Site-Wide Environmental Impact Statement (SWEIS) is to continue to operate SNL/NM as a DOE national laboratory. The DOE, with public input, developed three alternatives to accomplish this proposed action and assess environmental impacts of activities at SNL/NM. This chapter examines and compares the three alternatives. For clarity and brevity, the descriptions of the alternatives in the text (Sections 3.2, 3.3, and 3.4) and in the tables (Section 3.6) focus on significant distinguishing features that characterize the variation of activities across alternatives. More complete descriptions of the activities at SNL/NM are provided by facility in Chapter 2. All of the activities discussed in Chapter 2 were used in evaluating the impacts of each alternative. The alternatives are defined below.

- *No Action Alternative (Section 3.2)*
- *Expanded Operations Alternative (Section 3.3), the DOE's Preferred Alternative*
- *Reduced Operations Alternative (Section 3.4)*

These three alternatives represent the range of levels of operation necessary to carry out DOE mission lines, from the minimum levels of activity that maintain core capabilities (Reduced Operations Alternative) to the highest reasonable activity levels that could be supported by current facilities, and the potential expansion and construction of new facilities for specifically identified future actions (Expanded Operations Alternative, the DOE's Preferred Alternative).

Under the No Action Alternative, ongoing DOE and interagency programs and activities at SNL/NM would continue the status quo, that is, operating at planned levels as reflected in current DOE management plans. In some cases, these planned levels include increases over today's operating levels. This would also include any recent activities that have already been approved by the DOE and have existing NEPA documentation.

Under the Expanded Operations Alternative, DOE and interagency programs and activities at SNL/NM would increase to the highest reasonable activity levels, as set forth in this SWEIS, that could be supported by current facilities and their potential expansion and construction of new facilities for future actions specifically identified in the SWEIS. In this Final SWEIS the Expanded Operations Alternative has two potential configurations for the Microelectronics Development Laboratory (MDL) facility. In the first configuration, the SWEIS analyzed the expansion of operations in the existing MDL (analyzed in the Draft SWEIS). In the second configuration, the SWEIS presents the available information on the developing proposal for the Microsystems and Engineering Sciences Applications (MESA) Complex, including impacts from the construction and operation of the facility (see Sections 3.3 and 5.4) adjacent to the existing MDL. The DOE has included in the second configuration of the Expanded Operations Alternative all available programmatic and environmental information on the

MESA Complex based on its approved Microsystems and Engineering Sciences Applications Complex Conceptual Design Plan (SNL/NM 1999).

The conceptual design for the MESA Complex will be finalized in the December 1999 timeframe with the issuance of the Conceptual Design Report currently under preparation. Thus, because the information on the MESA Complex in this SWEIS is preliminary and incomplete (based on the Conceptual Design Plan), and was added after issuance of the Draft SWEIS for public review and comment, the DOE has determined that an additional NEPA review will be conducted for the construction and operation of the proposed MESA Complex after the conceptual design is finalized. Based on the current configuration for the proposed MESA Complex, the DOE will prepare an environmental assessment (EA) to determine whether an environmental impact statement is required and will include the opportunity for public participation. The decision whether or not to construct and operate the MESA Complex will be made following the additional NEPA review. The DOE did not include the MESA Complex in "Projects Under Consideration" in the Draft SWEIS because the DOE had not then decided to proceed with conceptual design for the project. Once the DOE decided to go forward with conceptual design, however, it elected to present the information it had gathered thus far from the ongoing conceptual design. Nothing in the Final SNL/NM SWEIS is intended to influence the findings of any subsequent NEPA review of the MESA Complex. Similarly, the Record of Decision (ROD) based on the Final SWEIS will not affect the DOE's eventual decision with respect to the MESA Complex. Any decision to construct and operate the MESA Complex will be based solely on a NEPA review specific to the MESA Complex.

While the DOE will not make a decision on MESA based on this SWEIS, construction and operation of the MESA Complex is nonetheless presented in the SWEIS. The DOE has elected to share with the public such information as it has assembled in the course of its ongoing conceptual design of the MESA Complex to give the public an idea of the additional consequences that could potentially occur at SNL/NM should the project go forward (see Section 5.4, Expanded Operations Alternative). Because conceptual design is ongoing, environmental impact information is also incomplete and preliminary and may differ from what will be presented in the subsequent EA.

Under the Reduced Operations Alternative, DOE and interagency programs and activities at SNL/NM would be reduced to the minimum level of operations needed to maintain SNL/NM facilities and equipment in an operational readiness mode.

The Notice of Intent (NOI) (62 Federal Register [FR] 29332) proposed that the No Action and Expanded Operations Alternatives be considered in the SWEIS (see Chapter 14); however, a third alternative, the Reduced Operations Alternative, was added to show a broader range of alternatives and respond to comments received from the public during the scoping process (Section 1.7).

The SWEIS analyzes the environmental impacts of activities at SNL/NM associated with these three alternatives, as well as activities common to all alternatives including maintenance support and material management. The alternatives are more fully described in Chapter 3.

The DOE did not present a Preferred Alternative in the Draft SNL/NM SWEIS. The DOE has now selected the Expanded Operations Alternative (exclusive of the MESA Complex) as its Preferred Alternative. Under the Expanded Operations Alternative, the DOE would expand operations at SNL/NM as the need arose (until 2008), subject to the availability of congressional appropriations, to increase the level of existing operations to the highest reasonable foreseeable activity levels that are analyzed in the SWEIS. The Preferred Alternative would only implement expansion at the existing MDL, without addition of the MESA Complex.

DOE work assignments to SNL/NM are based on using existing personnel and facility capabilities, as described in Chapters 1 and 2. The DOE has examined the various activity levels typical of past SNL/NM operations (generally within the past few years), and assumes that future work descriptions will resemble current and recent activities.

The three alternatives represent the range of operating levels that could be reasonably implemented in the 10-year time frame of the SWEIS analysis (1998–2008). Many of SNL/NM's ongoing and planned activities do not vary by alternative. The No Action Alternative reflects currently planned activities or projects, some of which may already have NEPA documentation and analysis.

Table 3.1–1 provides a brief summary of the facilities evaluated in this SWEIS. Table 3.6–1 (see Section 3.6) provides an expanded look at the materials used and wastes generated at each facility.

In order to provide comprehensive baseline data from which operational levels could be projected, the DOE gathered the best-available data representing the facilities' normal levels of operation. In most cases, the base year for data was 1996. For some facilities, several years of data were gathered in order to determine normal trends. Facilities that have base years other than 1996 are noted in the tables in Section 3.6. Also, note that projected activity levels under the Reduced Operations Alternative could be above the base years' because some facilities were operating below the minimum levels of activity necessary to maintain core capabilities or facilities were not yet in full operation (Section 3.4).

The DOE is not revisiting any programmatic decisions previously made in other NEPA documents, such as those addressing weapons complex consolidation and reconfiguration, materials disposition, or waste management. The SWEIS includes these programmatic activities in order to provide the DOE and the public with an overall understanding of the activities at SNL/NM.

Many of the selected facilities are engaged primarily in activities supporting the DOE's national security mission. Other facilities are engaged in energy resources and research and development (R&D) efforts, such as materials research, radiochemistry, and health research. The DOE examined specific activities performed at SNL/NM facilities that relate to issues identified from public input, the DOE mission lines, and the potential for environmental impacts.

The DOE did not identify a Preferred Alternative in the Draft SWEIS. In this Final SWEIS, the Expanded Operations Alternative becomes the Preferred Alternative (exclusive of the MESA Complex).

3.2 NO ACTION ALTERNATIVE

Summary Description

Under the No Action Alternative, ongoing DOE and interagency programs and activities at SNL/NM would continue the status quo, that is, operating at planned levels as reflected in current DOE management plans for 1998 through 2008. In some cases, these planned levels include increases over today's operating levels. This would also include any recent activities that have already been approved by DOE and have existing NEPA documentation. If these planned operations are implemented in the future, they could result in increased activity above present levels. Thus, the No Action Alternative forecasts, over 10 years, the level of activity for facility operations that would implement current management plans for assigned programs.

The CEQ's NEPA implementing regulations (40 CFR Parts 1500-1508) require analyzing the No Action Alternative to provide a benchmark against which the impacts of the activities presented in the other alternatives can be compared. The No Action Alternative analysis includes current operations and ongoing and planned environmental restoration activities. Some of these activities have already had NEPA review. It also includes any approved and interim actions and facility expansion or construction, where detailed design and associated NEPA documentation were completed by the end of March 1998. The analysis also includes facilities, including new construction and upgrades, for which NEPA documents have been prepared, decisions made, and funds allocated in the fiscal year 2000 planning year budget (submitted in 1998).

3.2.1 Basis for Current Planned Operations

DOE management plans include continued support of major DOE programs, such as Defense Programs (DP), Nuclear Energy, Fissile Material Disposition, Environmental Management, and Science. They also include projects to maintain existing facilities and capabilities and projects for which a NEPA determination has been made (for example, the Medical Isotopes Production Project).

Other plans used to prepare the description of the No Action Alternative include the site development plans for SNL/NM, interagency agreements between the DOE and the U.S. Department of Defense (DoD), programmatic environmental impact statements (PEISs), Presidential Decision Directives, and DOE Work for Others (WFO) proposals and guidance. Some documents have future projects included for planning purposes; others have been deleted due to lack of funding or other reasons. The activities reflected in this alternative include planned increases in some SNL/NM operations and activities over previous years' levels (for example, medical isotopes production). There may also be decreases in some SNL/NM activities (for example, a decrease in certain outdoor testing activities).

Table 3.1–1 Summary of Facility Activity Levels Used as the Basis of Alternatives Analysis

FACILITY	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (per year)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE (2008)	REDUCED OPERATIONS ALTERNATIVE (2008)
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
Neutron Generator Facility	Development or production of devices, processes, and systems	Neutron generators	Neutron generators	600	2,000	2,000	2,000	2,000
Microelectronics Development Laboratory	Development or production of devices, processes, and systems	Microelectronic devices and systems	wafers	4,000	5,000	7,000	7,500[e]	2,666
Advanced Manufacturing Processes Laboratory	Development or production of devices, processes, and systems	Materials, ceramics/glass, electronics, processes, and systems	operational hours	248,000	310,000	310,000	347,000	248,000
Integrated Materials Research Laboratory	Other	Research and development of materials	operational hours	395,454	395,454	395,454	395,454	363,817
Explosive Components Facility	Test activities	Neutron generator tests	tests	200 (FY 1998)	500	500	500	500
		Explosive testing	tests	600	750	850	900	300
		Chemical analysis	analyses	900	950	1,000	1,250	500
		Battery tests	tests	50	60	60	100	10

Table 3.1–1 Summary of Facility Activity Levels Used as the Basis of Alternatives Analysis (continued)

FACILITY	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (per year)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE (2008)	REDUCED OPERATIONS ALTERNATIVE (2008)
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
PHYSICAL TESTING AND SIMULATION FACILITIES								
Terminal Ballistics Complex	Test activities	Projectile impact testing	tests	50	80	100	350	10
		Propellant testing	tests	25	40	50	100	4
Drop/Impact Complex	Test activities	Drop test	tests	18	20	20	50	0
		Water impact	tests	1	1	1	20	1
		Submersion	tests	1	1	1	5	0
		Underwater blast	tests	0	2	2	10	0
Sled Track Complex	Test activities	Rocket sled test	tests	10	10	15	80	2
		Explosive testing	tests	12	12	12	239	0
		Rocket launcher	tests	3	4	4	24	0
		Free-flight launch	tests	40	40	40	150	0
Centrifuge Complex	Test activities	Centrifuge	tests	32	46	46	120	2
		Impact	tests	0	10	10	100	0

Table 3.1–1 Summary of Facility Activity Levels Used as the Basis of Alternatives Analysis (continued)

FACILITY	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (per year)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE (2008)	REDUCED OPERATIONS ALTERNATIVE (2008)
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
ACCELERATOR FACILITIES								
SATURN	Test activities	Irradiation of components or materials	shots	65	200	200	500	40
HERMES III	Test activities	Irradiation of components or materials	shots	262	500	500	1,450	40
Sandia Accelerator & Beam Research Experiment	Test activities	Accelerator shots	shots	187	225	225	400	0
Short-Pulse High Intensity Nanosecond X-Radiator	Test activities	Irradiation of components or materials	shots	1,185	2,500	2,500	6,000	200
Repetitive High Energy Pulsed Power Unit I	Test activities	Accelerator tests	tests	500	5,000	5,000	10,000	100
Repetitive High Energy Pulsed Power Unit II	Test activities	Radiation production	tests	80	160	160	800	40
Z-Machine	Test activities	Accelerator shots	shots	150	300	300	350	84
Tera-Electron Volt Semiconducting Linear Accelerator	Test activities	Accelerator shots	shots	40	1,000	1,000	1,300	40

Table 3.1–1 Summary of Facility Activity Levels Used as the Basis of Alternatives Analysis (continued)

FACILITY	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (per year)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE (2008)	REDUCED OPERATIONS ALTERNATIVE (2008)
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
Advanced Pulsed Power Research Module	Test activities	Accelerator shots	shots	500	1,000	1,000	2,000	40
Radiographic Integrated Test Stand	Test activities	Accelerator shots	shots	0	400	600	800	100
REACTOR FACILITIES								
New Gamma Irradiation Facility	Test activities	Tests	hours	0	13,000	13,000	24,000	0
Gamma Irradiation Facility	Test activities	Tests	hours	1,000	0	0	8,000	0
Sandia Pulsed Reactor	Test activities	Irradiation tests	tests	100	100	100	200	30
Annular Core Research Reactor (DP for No Action and Reduced Operations Alternatives, ACPR-II for Expanded Operations Alternative)	Test activities	Irradiation tests	test series	0	1	0	2 to 3	0
		Fissile component tests	tests	0	0	0	2	0
		Materials/ electronics tests	tests	0	0	0	6	0

Table 3.1–1 Summary of Facility Activity Levels Used as the Basis of Alternatives Analysis (continued)

FACILITY	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (per year)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE (2008)	REDUCED OPERATIONS ALTERNATIVE (2008)
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
Annular Core Research Reactor (medical isotopes production configuration)	Test activities	Irradiation of production targets	targets	8	375	375	1,300	40
Hot Cell Facility	Development or production of devices, processes, and systems	Processing of production targets	targets	8	375	375	1,300	40
OUTDOOR TEST FACILITIES								
Aerial Cable Facility	Test activities	Drop/pull-down	tests	21	32	38	100	2
		Aerial target	tests	6	6	6	30	0
		Scoring system tests	series	0	1	1	2	0
Lurance Canyon Burn Site	Test activities	Certification testing	tests	12	12	12	55	1
		Model validation	tests	56	56	56	100	0
		User testing	tests	37	37	37	50	0
Containment Technology Test Facility - West	Test activities	Survivability testing	tests	1	1	0	2	1
Explosives Applications Laboratory	Test activities	Explosive testing	tests	240	240	240	275 to 360	50

Table 3.1–1 Summary of Facility Activity Levels Used as the Basis of Alternatives Analysis (continued)

FACILITY	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (per year)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE (2008)	REDUCED OPERATIONS ALTERNATIVE (2008)
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
Thunder Range Complex	Other	Equipment disassembly and evaluation	days	60	82	82	144	42
	Test activities	Ground truthing tests	test series	1	5	8	10	1
INFRASTRUCTURE FACILITIES								
Steam Plant	Infrastructure	Generate and distribute steam to DOE, TA-I, KAFB East, Coronado Club	lb	544 M	544 M	544 M	544 M	362 M
Hazardous Waste Management Facility	Infrastructure	Collection, packaging, handling, and short-term storage of hazardous and other toxic waste[b]	kg	203,000	192,000	196,000	214,000 (215,200)[e]	175,000
	Waste managed[c]	RCRA hazardous waste	kg	55,852	70,469	74,358	92,314 (93,514)[e]	53,123
Radioactive and Mixed Waste Management Facility	Infrastructure	Receipt, packaging, and shipping of radioactive waste[d]	lb	1.6 M	2.1 M	2.1 M	2.7 M[e]	0.8 M
	Waste managed[c]	Low-level waste	ft^3 (m^3)	11,874 (337)	15,436 (438)	15,436 (438)	19,592[e] (556)	5,937 (168)

Table 3.1–1 Summary of Facility Activity Levels Used as the Basis of Alternatives Analysis (concluded)

FACILITY	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (per year)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE (2008)	REDUCED OPERATIONS ALTERNATIVE (2008)
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
Thermal Treatment Facility	Infrastructure	Treatment of waste	lb	Minimal	336	336	1,200	Minimal

Source: SNL/NM 1998a
ACPR: Annular Core Pulsed Reactor
DOE: U.S. Department of Energy
DP: Defense Programs
FTE: full-time equivalent
FY: fiscal year
HERMES: High Energy Radiation Megavolt Electron Source
HWMF: Hazardous Waste Management Facility
KAFB: Kirtland Air Force Base
lb: pound
MDL: Microelectronics Development Laboratory
MESA: Microsystems and Engineering Sciences Applications
RCRA: *Resource Conservation and Recovery Act*
RMWMF: Radioactive and Mixed Waste Management Facility
TA: technical area
TSCA: *Toxic Substances Control Act*

[a] Base year is the year selected as most representative of normal operations (SNL/NM 1998ee).
[b] Larger number is a total including TSCA waste, other solid waste, recyclable materials, and inventory (non-RCRA).
[c] Numbers do not represent totals (generation), only quantities to be managed by the specific facility.
[d] Includes inventory.
[e] The Expanded Operations Alternative with MESA (if implemented): The MDL maximum production capability with or without MESA would be 7,500 wafers per year. Because MESA would not increase personnel and because MDL operations to support 7,500 wafers per year would require three shifts, an increase would be unlikely. In the case of the HWMF, the quantity of 214,000 kg would change because of an additional 1,200 kg of hazardous waste per year due to MESA. In the case of the RMWMF, the quantities would not show an increase of 0.1 ft^3 of radioactive low-level waste because the amount is not significant compared to the total.

Organization of Chapter 3

Sections 3.2 through **3.4** describe the activities that would occur at selected facilities under each of the three alternatives.

Section 3.5 describes alternatives that were considered but eliminated from detailed analysis.

Section 3.6 compares the environmental consequences of the three alternatives.

The *Facilities and Safety Information Document* (SNL/NM 1997b, SNL/NM 1998ee) and facility source documents (SNL/NM 1998a) provide in-depth information concerning the activities, operations, and hazards of selected facilities. These documents have been used extensively to describe the following facility activities in this chapter. The facilities discussed below are also described in detail in the Facility Descriptions following Chapter 2. For most facilities, the base year considered is 1996. The base year for the Neutron Generator Facility (NGF) is 1998, the first year in which the facility will have achieved its initially planned level of production.

3.2.2 Selected Facilities in Technical Areas-I and -II

Under the No Action Alternative, the following activities would take place at the facilities in Technical Areas (TAs)-I and -II.

3.2.2.1 Neutron Generator Facility

Under all alternatives, the NGF, TA-I, would continue to be used to fabricate neutron generators and neutron tubes. Support activities would include a wide variety of manufacturing, testing, and product development techniques and processes. An addition to an existing building would be constructed to meet production projections. Additionally, Building 870 would undergo extensive renovations. Approximately 2,000 neutron generators and associated neutron and switch tubes would be manufactured per year by 2008.

3.2.2.2 Microelectronics Development Laboratory

The MDL, TA-I, would continue to be used to conduct R&D activities on microelectronic devices for nuclear weapons. A broad range of microtechnology development and engineering activities, including integrated circuit and wafer production, would occur. Approximately 4,000 wafers would be produced in the base year, increasing to 5,000 wafers by 2003 and 7,000 wafers by 2008.

The Compound Semiconductor Research Laboratory (CSRL) (Building 893) would remain in operation in its present location.

3.2.2.3 Advanced Manufacturing Process Laboratory

Advanced manufacturing technologies are developed and applied at the Advanced Manufacturing Process Laboratory (AMPL), TA-I. Under the No Action Alternative, AMPL activities would include hardware manufacturing, emergency and prototype manufacturing, development of manufacturing processes, and design and fabrication of production equipment. The activities conducted in the AMPL would be typical of other laboratories and small-scale manufacturing plants working with ceramics, glass, plastics, electronics, and other materials. There would be a slight increase in WFO. Operational hours (the number of employees multiplied by the number of hours worked) under the No Action Alternative would be 248,000 hours per year in the base year (1996-1997), increasing to 310,000 hours per year in 2003 and 2008. Personnel would increase from 150 in the base year to 184 in 2003 and 2008.

3.2.2.4 Integrated Materials Research Laboratory

Research on materials and advanced components would continue to be conducted at the Integrated Materials Research Laboratory (IMRL), TA-I. A wide variety of materials would be investigated, including metallic alloys, semiconductors, superconductors, ceramics, opticals, and dielectric materials. Basic research activities would continue in chemistry, physics, and energy technologies. The 1998 number for operational hours was derived by multiplying the number of workers in the IMRL by the number of hours worked by one employee during a year. This totals approximately 395,000 hours per year for 1998, 2003, and 2008.

3.2.2.5 Explosive Components Facility

The Explosive Components Facility (ECF), TA-II, would continue to be used to support the work performed at the NGF and the R&D performed on a variety of energetic components. Energetic component research, testing, development, and quality control activities focus in four areas: neutron generators, explosives, chemicals,

and batteries. Expected operating levels at the ECF would include 200 neutron generator tests in the base year, increasing to approximately 500 neutron generator tests per year through 2008. Other tests would involve 600 explosive tests in the base year, growing to 750 tests in 2003 and 850 tests in 2008. Chemical analyses would increase from 900 analyses in the base year to 1,000 in 2008. Battery tests would range from 50 tests in the base year to 60 tests in 2003 and 2008.

3.2.3 Physical Testing and Simulation Facilities

TA-III incorporates four principal testing facilities: the Terminal Ballistics Complex, Drop/Impact Complex, Sled Track Complex, and Centrifuge Complex, described below.

3.2.3.1 Terminal Ballistics Complex

Ballistic studies and solid-fuel rocket motor tests would continue to be conducted at the Terminal Ballistics Complex. Testing capabilities would include research in areas of armor penetration, vulnerability, acceleration, flight dynamics, and accuracy. Projectile impact tests would include all calibers of projectiles, from small arms to the 155-mm gun. For projectile impact testing, 50 tests would occur in the base year, increasing to approximately 80 tests each year by 2003 and 100 tests annually by 2008. Approximately 25 propellant tests would occur in the base year, increasing to 40 tests annually by 2003 and 50 tests annually by 2008.

3.2.3.2 Drop/Impact Complex

Tests designed for the validation of analytical modeling and weapons system certification would continue to be conducted at the Drop/Impact Complex. Test activities would focus on water and underwater tests, design verification, and performance assessments. After the base year activity level of 18 tests, up to 20 tests would be conducted each year through 2008. One water impact test, one submersion test, and as many as two underwater blast tests would be planned annually through 2008.

3.2.3.3 Sled Track Complex

The Sled Track Complex is a test facility that simulates high-speed impacts of weapon shapes, substructures, and components to verify design integrity, performance, and fuzing functions. Sled Track Complex capabilities would continue to include testing parachute systems, transportation equipment, and reactor safety. Tests would include rocket sleds; short-duration, free-flight launches; rocket launches; and explosives using SNL/NM instrumentation capabilities in lasers, photometrics, telemetry, and other data collection techniques. Current plans would number 10 to 15 rocket sled tests per year through 2008. Other tests would number 40 short-duration, free-flight launches, up to 4 rocket launches, and 12 explosive detonations per year through 2008.

3.2.3.4 Centrifuge Complex

The Centrifuge Complex would continue to be used to test objects weighing up to 5 tons or more with over 100 *g* of force. Following 32 tests in 1998, this would increase to an estimated 46 tests annually in 2003 and 2008 on a variety of test objects. Although no impact tests have occurred, 10 tests per year are planned for 2003 through 2008.

3.2.4 Accelerator Facilities

3.2.4.1 SATURN

Under the No Action Alternative, the SATURN accelerator would continue to be used to produce X-rays to simulate the radiation effects of nuclear bursts on electronic and material components. SATURN capabilities would be used to test satellite systems, weapons materials and components, and reentry vehicle and missile subsystems. Accelerator activities would include an estimated activity of 65 shots in 1998, increasing to 200 shots per year by 2003. Accelerator activity would remain at this level (200 shots) through 2008.

3.2.4.2 High-Energy Radiation Megavolt Electron Source III

High-Energy Radiation Megavolt Electron Source III (HERMES III) would continue to be used to provide gamma ray effects testing capabilities. HERMES III would test electronic components and weapon systems and would include high-fidelity simulation over large areas in near nuclear-explosion radiation environments. Activity levels would be approximately 262 shots per year in 1998, increasing to approximately 500 shots per year through 2003 and 2008.

3.2.4.3 Sandia Accelerator & Beam Research Experiment

The Sandia Accelerator & Beam Research Experiment (SABRE) would continue to be used to provide X-ray and

gamma ray effects testing capabilities. SABRE capabilities would allow testing of pulsed-power technologies, fusion systems, and weapons systems. Other activities would include computer science, flight dynamics, satellite systems, and robotics testing. Approximately 187 shots would occur in 1998, increasing to approximately 225 shots per year in 2003 and 2008.

3.2.4.4 Short-Pulse High Intensity Nanosecond X-Radiator

The Short-Pulse High Intensity Nanosecond X-Radiator (SPHINX) accelerator would continue to be used to produce high-voltage accelerations to measure X-ray-induced currents in integrated circuits and heat response in materials. The SPHINX would provide testing capabilities in radiation environments for a variety of weapons components. Approximately 1,185 shots would occur in 1998, increasing to approximately 2,500 shots per year in 2003 through 2008.

3.2.4.5 Repetitive High Energy Pulsed Power I

The Repetitive High Energy Pulsed Power (RHEPP) I would continue to be used for the development of pulsed-power technology, including high-power energy tests. Activities would include basic scientific research, development, and testing. The RHEPP I averaged approximately 500 tests per year over 1996 and 1997. This would increase to approximately 5,000 tests per year by 2003 through 2008.

3.2.4.6 Repetitive High Energy Pulsed Power II

The RHEPP II would continue to be used to develop radiation processing applications using powerful electron or X-ray beams. Activities would include testing of high power magnetic switches and specialty transmission lines. Operations in 1996 included 80 tests per year. As many as 4 tests per week for 40 weeks (160 tests per year) would be completed at the RHEPP II by 2003 through 2008.

3.2.4.7 Z-Machine

The Z-Machine would continue to be used to produce extremely short, extremely powerful energy pulses at various targets. The Z-Machine capabilities simulate special atmospheric conditions and fusion reaction conditions. The average activity in 1996 and 1997 was approximately 150 shots per year. A projected 165 accelerator firings would occur per year using tritium, deuterium, plutonium, and depleted uranium (DU). An additional 135 accelerator firings would support performance assessment and development of advanced pulsed-power sources, for a total of 300 shots per year by 2003 through 2008.

3.2.4.8 Tera-Electron Volt Energy Superconducting Linear Accelerator

The Tera-Electron Volt Energy Superconducting Linear Accelerator (TESLA) facility would continue to be used to test plasma opening switches for pulsed-power drivers. Other activities would include basic research science, material development, and material testing. TESLA activities in 1998 increased to 40 shots. Following a base year of 40 test shots, as many as 1,000 test shots per year would be completed for pulsed-power technology development in 2003 through 2008.

3.2.4.9 Advanced Pulsed Power Research Module

The Advanced Pulsed Power Research Module (APPRM) would be used to evaluate the performance and reliability of components including next-generation accelerators. Activities would include research and development in pulsed-power technologies such as power storage, high-voltage switching, and power flow. Following base year operations of 500 shots, the APPRM would fire approximately 1,000 shots per year in 2003 and 2008.

3.2.4.10 Radiographic Integrated Test Stand

The Radiographic Integrated Test Stand (RITS) accelerator is anticipated to start operations in 1999. It would be used to develop and demonstrate capabilities for future accelerator facility design. The DOE categorically excluded the project. The proposed accelerator would replace the existing Proto II accelerator. Capabilities would focus on demonstrating inductive voltage technology. It is estimated that there will be 200 shots in the startup year (1999). Approximately 400 shots would occur per year in 2003, increasing to 600 shots per year in 2008.

3.2.5 Reactor Facilities

3.2.5.1 New Gamma Irradiation Facility

Under the No Action Alternative, the New Gamma Irradiation Facility (NGIF) would be used to perform a wide variety of gamma irradiation experiments under both dry and water-pool conditions. The NGIF would replace the Gamma Irradiation Facility (GIF) prior to

2003. The NGIF would provide capabilities for studies in thermal and radiation effects, weapons component degradation, nuclear reactor material and components, and other nonweapon applications. The NGIF was not operational in 1998. This facility would be constructed after the No Action baseline time frame; hence, there are no activities planned prior to 2003. Operations would begin in 2000 or 2001, depending on operational approval. By 2003, a wide variety of test packages would be conducted each year. Approximately 13,000 test hours per year would be expected from 2003 through 2008.

3.2.5.2 Gamma Irradiation Facility

The GIF would continue to be used to perform gamma irradiation experiments until the NGIF begins operation. The facility would irradiate test packages for approximately 1,000 test hours per year. Operating levels by 2003 would decrease to zero, coinciding with the startup and operation of the NGIF. The decision to reuse, modify, or demolish the GIF will be addressed in future NEPA documentation.

3.2.5.3 Sandia Pulsed Reactor

The Sandia Pulsed Reactor (SPR) would continue to provide multiple fast-burst reactor, near-fission spectrum radiation environments. Testing activities would include a wide variety of technologies that support both defense and nondefense projects. Approximately 100 tests per year would be expected through 2008.

3.2.5.4 Annular Core Research Reactor– Medical Isotopes Production or Defense Programs Testing Configuration

The Annular Core Research Reactor (ACRR) may be operated in either of two ways: to produce medical isotopes or to support DP. Descriptions of these two operating configurations follow. The impacts for each of these configurations are presented separately in Table 3.6–1 and Chapter 5.

ACRR—Medical isotopes production configuration activities would produce medical and research radioactive isotopes. Research activities that are compatible and capable of being conducted concurrently with production would continue. Under the No Action Alternative, the ACRR would operate for 52 weeks to irradiate targets to produce approximately 30 percent of the U.S. demand (on average, not necessarily a “fixed” amount each week) for molybdenum-99 and other medical and research isotopes, such as iodine-131, xenon-133, and iodine-125. The 2003 and 2008 estimates assume that the SNL/NM medical isotopes production program would operate primarily as a backup to Nordion, Inc. At the 30 percent of U.S. demand production level expected for the 2003 and 2008 scenarios, it is assumed that the reactor would be operated for 16 hours per day, 5 days per week (4,160 hours per year) at a maximum power level of 4 MW (approximately 16,640 MWh per year).

The production needs could require varying scenarios that would range from periods of shutdown to periods of operation at 100 percent of the U.S. demand level (approximately 25 targets per week). Under the No Action Alternative, irradiation of eight targets is planned in the base year, increasing to 375 targets in 2003 through 2008.

ACRR — DP testing configuration capabilities would be maintained. The DOE also has identified a recent, short-term need to conduct a single test series related to the certification of some weapons components (Weigand 1999a). The ACRR would be reconfigured to pulse-mode operation for a limited-duration test period (12 to 18 months following the ROD) (Weigand 1999b). This test campaign would be conducted in the existing ACRR facility, which would have to be temporarily reconfigured to restore DP testing capability. The reconfiguration activities required to change the reactor to the DP test configuration would mainly consist of replacing the central cavity, enabling the pulse mode of operation, reconfiguring the core fuel, reinstalling the appropriate fuel-ringed external cavity (if required), executing the necessary battery of tests, preparing documentation, and conducting reviews to certify that the reconfigured reactor is operational. The reconfiguration to ACRR-DP would be done so that conversion back to ACRR-medical isotope production would be more efficient. The DOE is evaluating the potential need for long-term DP test requirements for ACRR, but currently the DOE has no plans for such tests. Any future long-term test campaigns would undergo the appropriate NEPA reviews. The readiness capability to maintain the DP-testing configuration is described in detail in the April 1996, *Medical Isotopes Production Project: Molybdenum-99 and Related Isotopes Environmental Impact Statement* (DOE 1996b).

The DOE considered the possibility of conducting this short-term test series at other DOE sites. Only Transient Reactor Test Facility (TREAT), Idaho National Engineering & Environmental Laboratory (INEEL), was

a possible alternate, but was dismissed because of the limited timeframe needed to complete the test campaign (Minnema 1999). The DOE is also evaluating the possibility of using nondestructive simulations (computer modeling) to accomplish certification.

3.2.5.5 Hot Cell Facility

The Hot Cell Facility (HCF) would primarily support medical isotopes production. Isotopes production operations and associated capabilities include isotope extraction and separation, isotope product purification, product packaging, and quality control. The base year level of activity would include 8 targets per year and would increase to 375 by 2003, continuing at the same rate until 2008.

3.2.6 Outdoor Test Facilities

3.2.6.1 Aerial Cable Facility

The Aerial Cable Facility would be used to conduct a variety of impact tests involving weapon systems and aircraft components. Capabilities include free-fall drop, rocket pull-down, and captive flight tests with state-of-the-art instrumentation, data recording, and simulation technologies. Under this alternative, approximately 21 drop/pull-down tests would be completed in the base year, increasing to 32 tests in 2003 and 38 tests in 2008. Approximately one-half dozen other tests would be completed each year.

3.2.6.2 Lurance Canyon Burn Site

The Lurance Canyon Burn Site is a group of facilities that would be used to test, certify, and validate material and system tolerances. Test objects would be burned for short periods of time under controlled conditions. Approximately 12 certification tests would be conducted each year through the year 2008, with 56 model validation tests and 37 user tests.

3.2.6.3 Containment Technology Test Facility - West

Planning for the two tests at the Containment Technology Test Facility-West began in 1991. Each test would involve a series of successive events leading up to ultimate failure of the two test vessels. The first test was completed in 1997, and the second test is scheduled for completion in 2000. After the second test, there are no further plans for additional testing.

3.2.6.4 Explosives Applications Laboratory

The Explosives Applications Laboratory (EAL) would continue to design, assemble, and test explosive materials, components, and equipment for multiple programs. Work at the facility would involve arming, fuzing, and firing of explosives and testing of components. The EAL would use X-ray analysis, fabrication technology, photographic analysis, and machine shop techniques to complete energetic material research and development. Approximately 240 tests would be completed each year through 2008.

3.2.6.5 Thunder Range Complex

The Thunder Range Complex capabilities would range from disassembly and evaluation to calibration and verification testing of special nuclear and nonnuclear systems. Examination and testing of objects would involve cleaning, physical examination, disassembly, measurement, sampling, photography, and data collection. Equipment disassembly would take place during 60 days per year in the base year, increasing to 82 days per year in 2003 through 2008. Ground-truthing tests consist of one test series in the base year, increasing to five test series in 2003 and eight test series in 2008.

3.2.7 Infrastructure Facilities

3.2.7.1 Steam Plant

The steam plant would continue to produce and distribute steam to SNL/NM and Kirtland Air Force Base (KAFB) facilities. The steam would be primarily used for domestic hot water and building heat. Approximately 544 M lb would be produced each year.

3.2.7.2 Hazardous Waste Management Facility

The Hazardous Waste Management Facility (HWMF) would handle, package, short-term store, and ship hazardous, toxic, and nonhazardous chemical wastes. The HWMF is a *Resource Conservation and Recovery Act* (RCRA), Part B-permitted facility that would support waste generators throughout SNL/NM. The HWMF would prepare wastes for offsite transportation for recycling, treatment, or disposal at licensed facilities. The facility would operate one shift. Quantities of RCRA hazardous waste managed (see Section 3.6, Table 3.6–1) would range from 55,852 kg in the base year to 74,358 kg through 2008. Infrastructure-related activities are rated at approximately 200,000 kg per year (see Section 3.6, Table 3.6–1).

3.2.7.3 Radioactive and Mixed Waste Management Facility

The Radioactive and Mixed Waste Management Facility (RMWMF) would continue to serve as a centralized facility for receipt, characterization, compaction, treatment, repackaging, certification, and storage of low-level waste (LLW), transuranic (TRU) waste, low-level mixed waste (LLMW), and mixed transuranic (MTRU) waste. A new prefabricated storage building would be constructed to replace an existing building to improve flexibility and operational efficiencies. The replacement of the existing facility is covered by Categorical Exclusion B6.10 (10 CFR Part 1021). Like the HWMF, the RMWMF would support waste generators throughout SNL/NM. The RMWMF would prepare waste for offsite treatment and disposal at permitted and licensed facilities. The facility would operate one shift. Total wastes by waste type are presented in Section 3.6, Table 3.6–1. Annual quantities of radioactive waste managed (see Section 3.6, Table 3.6–1) would range from 11,874 ft^3 (337 m^3) for LLW (only 3,322 ft^3 [94 m^3] are generated; the remainder is legacy waste [see Section 3.6, Table 3.6–2]) in the base year to 15,436 ft^3 (438 m^3) for LLW (only 5,993 ft^3 [170 m^3] are generated; the difference is legacy waste [see Section 3.6, Table 3.6–2]) through 2008. Annually, for LLMW, TRU, and MTRU, the quantities to be managed (see Section 3.6, Table 3.6–1) through the RMWMF, including legacy waste and the expected quantities to be generated (see Section 3.6, Table 3.6–2), are as follow: 5,353 ft^3 (152 m^3) to 6,959 ft^3 (197 m^3) LLMW managed; 153 ft^3 (4.33 m^3) to 258 ft^3 (7.31 m^3) LLMW generated; 214 ft^3 (6.1 m^3) to 278 ft^3 (7.9 m^3) TRU managed; zero ft^3 (zero m^3) to 26 ft^3 (0.74 m^3) TRU generated; and 16 ft^3 (0.45 m^3) to 23 ft^3 (0.65 m^3) MTRU managed; 16 ft^3 (0.45 m^3) to 23 ft^3 (0.65 m^3) MTRU generated. Infrastructure-related activities are rated at 2.1 M lb per year (see Section 3.6, Table 3.6–1).

3.2.7.4 Thermal Treatment Facility

The Thermal Treatment Facility (TTF) would thermally treat (burn) small quantities of explosive materials and explosives-contaminated waste. Quantities would range from minimal in the base year to 336 lb of waste through 2008. This assumes that the RCRA permit is reissued.

3.3 EXPANDED OPERATIONS ALTERNATIVE – THE DOE'S PREFERRED ALTERNATIVE

The Expanded Operations Alternative, the DOE's Preferred Alternative (exclusive of the MESA Complex), assumes implementation of assignments that would result in the highest reasonable foreseeable activity levels that could be supported by current facilities and the potential expansion and construction of new facilities. Appropriate NEPA documentation would be prepared prior to any new construction. This alternative addresses the same facilities described in Section 3.2 for the No Action Alternative. Under this alternative, operations could increase to the highest reasonably foreseeable levels over the next 10 years. The following sections describe the activities that would occur at specific facilities as a result of implementing assignments under the Expanded Operations Alternative.

The DOE did not present a Preferred Alternative in the Draft SNL/NM SWEIS. The DOE has now selected the Expanded Operations Alternative (exclusive of the MESA Complex) as its Preferred Alternative. Under the Expanded Operations Alternative, the DOE would expand operations at SNL/NM as the need arose (until 2008), subject to the availability of congressional appropriations, to increase the level of existing operations to the highest reasonable foreseeable activity levels that are analyzed in the SWEIS. The Preferred Alternative would only implement expansion at the existing MDL, without addition of the MESA Complex.

3.3.1 Selected Facilities in Technical Areas-I and -II

3.3.1.1 Neutron Generator Facility

Under all alternatives, the NGF, TA-I, would continue to be used to fabricate neutron generators and neutron tubes. Support activities would include a wide variety of manufacturing, testing, and product development techniques and processes. An addition to an existing building would be constructed to meet production projections. Additionally, Building 870 would undergo extensive renovations. Approximately 2,000 neutron generators and associated neutron and switch tubes would be manufactured per year by 2008.

3.3.1.2 Microelectronic Development Laboratory

The MDL could operate in either of two configurations: 1) to support R&D and production of silicon-based microelectronic devices, or 2) to support R&D and production of silicon-based microelectronic devices along with producing war reserve microsystems-based components with specialty alloys (such as gallium arsenide and indium arsenide). The following paragraphs describe these two operating configurations. Where appropriate, information has been added to Table 3.6–1, which lists the differences in activity levels between these two configurations. The impacts of the two configurations are described in Sections 3.6 and 5.4.

The MDL silicon-based production configuration (including R&D) would produce 7,500 wafers per year, using three shifts. The DOE anticipates that the use of new technologies and manufacturing processes would meet expanded activities. There would be no construction of new facilities to meet this expanded wafer production and the CSRL (Building 893) would remain in operation in its present location.

The MESA configuration (including R&D) would produce a mix of 7,500 silicon/specialty alloy wafers per year. The DOE has identified a need related to the surety improvements in weapon systems incorporating microelectronics, microoptics, and microelectromechanical systems in these silicon/specialty alloy wafers. This configuration would include a state-of-the-art complex (260,000 gross ft^2) of new facilities. The estimated $300 M project would integrate and leverage the scientific and technological capabilities existing separately at the MDL and CSRL in a new laboratory to replace the outdated CSRL and by collocating it adjacent to the current MDL. The project would include retooling existing operations. Related infrastructure needs would include small laboratories, offices, and gas storage. If implemented, MESA would become operational about 2003, after which the DOE would phase out and eventually decontaminate and demolish the existing CSRL. Based on current project information, an EA would be completed before this configuration could be implemented.

3.3.1.3 Advanced Manufacturing Processes Laboratory

Activities at the AMPL would be similar to those under the No Action Alternative. Operations would increase beyond a single shift, adding 54 employees. Operations would increase to 347,000 hours per year.

3.3.1.4 Integrated Materials Research Laboratory

Activities at the IMRL would be the same as under the No Action Alternative (approximately 395,000 hours per year). Currently, the IMRL is operating at maximum capacity. No expansion would be anticipated.

3.3.1.5 Explosive Components Facility

Activities at the ECF would be similar to those under the No Action Alternative. Operations would be maximized to complete 500 neutron generator tests, 900 explosive tests, 1,250 chemical analyses, and 100 battery tests annually.

3.3.2 Physical Testing and Simulation Facilities

3.3.2.1 Terminal Ballistics Complex

Activities would be the same as under the No Action Alternative. No additional capabilities or new activities would be undertaken. The operating level would be increased to 350 projectile impact tests and 100 propellant tests per year.

3.3.2.2 Drop/Impact Complex

The Drop/Impact Complex tests would be expanded for all four capabilities: drop test, water impact, submersion, and underwater blasting. The projected increase would be beyond historic use but within the complex capabilities. Approximately 50 drop tests, 20 water impact tests, 5 submersion tests, and 10 underwater blast tests would occur each year.

3.3.2.3 Sled Track Complex

Activities would be the same as those described under the No Action Alternative. Operating levels would be increased to approximately 80 rocket sled tests, 239 explosive tests, 24 rocket launches, and 150 free-flight launches per year.

3.3.2.4 Centrifuge Complex

The Centrifuge Complex activities would be the same as those described under the No Action Alternative. However, the number of tests per year would increase to 120 centrifuge tests and 100 impact tests.

3.3.3 Accelerator Facilities

3.3.3.1 SATURN

Under the Expanded Operations Alternative, the accelerator output would increase by 3 shots or firings every other day for a maximum of 500 shots annually. Activities would be the same as those described under the No Action Alternative.

3.3.3.2 High-Energy Radiation Megavolt Electron Source III

The HERMES III capabilities would remain the same under the Expanded Operations Alternative. The maximum number of shots per year would be 1,450. This level of activity would be achieved through the addition of multiple shifts.

3.3.3.3 Sandia Accelerator & Beam Research Experiment

Testing at the SABRE would increase to 400 shots per year. Activities would be the same as those described in the No Action Alternative.

3.3.3.4 Short-Pulse High Intensity Nanosecond X-Radiator

The SPHINX would operate at a maximum of 6,000 shots per year. Activities would be the same as those described under the No Action Alternative. This would be an increase from 1,185 shots in the 1997 base year. This increase would be achieved through multiple shifts.

3.3.3.5 Repetitive High Energy Pulsed Power I

The tests projected for the RHEPP I would be in both the single and repetitive pulse modes. The RHEPP I would provide support for approximately 10,000 tests per year. No new capabilities or activities would be expected.

3.3.3.6 Repetitive High Energy Pulsed Power II

The RHEPP II capacity would be maximized at 20 tests per week for 40 weeks per year (800 tests). Activities would be similar to those described under the No Action Alternative.

3.3.3.7 Z-Machine

The Z-Machine capability would be maximized to 350 firings per year. Approximately 78 percent would involve nuclear materials identified under the No Action Alternative. Upgrades would be planned to maximize the Z-Machine's operations.

3.3.3.8 Tera-Electron Volt Energy Superconductor Linear Accelerator

The operating levels at the TESLA would be increased to 1,300 shots per year.

3.3.3.9 Advanced Pulsed Power Research Module

The APPRM activity would increase to 2,000 shots per year.

3.3.3.10 Radiographic Integrated Test Stand

The RITS would operate at a maximum of approximately 800 tests per year. Capabilities would remain the same as those described under the No Action Alternative.

3.3.4 Reactor Facilities

3.3.4.1 New Gamma Irradiation Facility

The NGIF would irradiate test packages for approximately 24,000 test hours per year. Capabilities would remain the same as those described under the No Action Alternative.

3.3.4.2 Gamma Irradiation Facility

GIF operations would continue under the Expanded Operations Alternative. Actual operations would expand to complete tests in two available cells. The GIF would supplement the capabilities of the NGIF. Approximately 8,000 test hours would be expected.

3.3.4.3 Sandia Pulsed Reactor

Several new, yet-to-be-designed reactors would be added to the SPR facility. Modifications would be completed to enhance and expand current capabilities. Operating levels would increase to 200 tests per year.

3.3.4.4 Annular Core Pulse Reactor II

The Annular Core Pulse Reactor (ACPR-II) would be an additional pulse-power reactor similar to the ACRR. The ACPR-II would operate in pulse mode using the same fundamental design as the ACRR prior to its conversion to the medical isotopes production configuration. The Expanded Operations Alternative assumes that there would be an ongoing need for DP testing in a pulsed-

power reactor facility. Approximately two major fissile component tests and approximately six material irradiation, electronics effects tests would be performed each year. These tests would involve setup, calibration, and operation sequences that could require from 1 to 2 days to several weeks, depending on the conditions of the test. To meet this need, an additional ACPR facility would be reconstituted using the same fundamental design as the ACRR facility. If this additional ACPR facility is proposed at some time in the future, the DOE would prepare a separate project-specific NEPA review.

The specially designed uranium oxide-beryllium oxide fuel from the existing ACRR medical isotopes production configuration would be used for the reconstituted ACPR-II to support DP test requirements. New fuel of a more standard design would be purchased for the original ACRR medical isotopes production configuration to support ongoing isotope production activities.

Under the Expanded Operations Alternative for DP testing in the ACPR-II, approximately two or three test campaigns (consisting of several individual tests) would be conducted each year. A test campaign would consist of a test setup period of a few days to 2 weeks and a test duration (time in reactor) of 1 day to 2 weeks. These tests would typically use the ACPR-II in its pulse mode or steady-state operations that would not exceed a few days in duration. Hence, a minimal amount of resources such as uranium fuel and water would be expended for these tests for high-use, steady-state operation.

3.3.4.5 Annular Core Research Reactor–Medical Isotopes Production Configuration

The ACRR medical isotopes production configuration would be operated for 24 hours per day, 7 days per week, at a maximum power level of 4 MW (approximately 35,000 MWh per year) to meet the entire U.S. demand for molybdenum-99 and other isotopes such as iodine-131, xenon-133, and iodine-125. This would require the irradiation of about 25 highly enriched uranium targets per week (1,300 per year).

3.3.4.6 Hot Cell Facility

Under the Expanded Operations Alternative, the HCF would continuously process 100 percent of the U.S. demand for molybdenum-99 and other isotopes such as iodine-131, xenon-133, and iodine-125. This would require the processing of about 25 irradiated, highly enriched uranium targets per week (1,300 per year).

3.3.5 Outdoor Test Facilities

3.3.5.1 Aerial Cable Facility

The Aerial Cable Facility drop, pull-down, aerial target, and system testing capabilities would remain the same as under the No Action Alternative. Drop tests of joint test assemblies that contain DU, enriched uranium, and insensitive high explosives would represent a new test activity at the complex. These test articles would contain less than 45 lb of DU, less than 120 lb of enriched uranium, and less than 104 lb of insensitive high explosives (plastic-bonded explosive [PBX]-9502 or press-moldable explosive [LX]-17). Test articles would be designed using insensitive high explosives because of the low probability of detonation under test conditions. In addition, the nuclear material contained in the test article would be configured in a manner that prevents a criticality event from occurring. The number of tests using this kind of test article (containing DU, enriched uranium, and insensitive high explosives) could range from one to five per year depending upon programmatic requirements. The total number of drop/pull-down tests would increase to an estimated 100 experiments per year. Aerial target tests would increase to 30 tests per year. Two series of scoring system tests would be conducted each year.

3.3.5.2 Lurance Canyon Burn Site

The Lurance Canyon Burn Site activities in certification, model validation, and user testing would remain similar to those described under the No Action Alternative. The number of certification tests would increase to an estimated 55 tests per year under the Expanded Operations Alternative. Model validation tests and user tests would increase to 100 and 50 per year, respectively.

3.3.5.3 Containment Technology Test Facility - West

The Containment Technology Test Facility - West would perform two survivability tests per year under the Expanded Operations Alternative. No new programs would be anticipated.

3.3.5.4 Explosives Applications Laboratory

Activities at the EAL would increase slightly under the Expanded Operations Alternative. The number of explosive tests would range from 275 to a maximum of 360 tests per year.

3.3.5.5 Thunder Range Complex

Activities at the Thunder Range Complex would increase slightly to 10 test series per year in 2008. Equipment disassembly would increase to 144 days per year. A moderate increase in workload would occur and the number of facility personnel would increase slightly.

3.3.6 Infrastructure Facilities

3.3.6.1 Steam Plant

The steam plant would require upgrades of several boilers, steam distributors, and natural gas supply systems. The actual boiler upgrade would potentially include a technology change to cogeneration units. Steam production, however, would remain similar (544 M lb per year) to that under the No Action Alternative.

3.3.6.2 Hazardous Waste Management Facility

The HWMF activities would remain the same as under the No Action Alternative. Operating conditions, however, would increase from one to three shifts. Quantities of RCRA hazardous waste managed (see Section 3.6, Table 3.6–1) would be 92,314 kg each year. Infrastructure-related activities are rated at 214,000 kg per year (see Section 3.6, Table 3.6–1).

Under the MESA Complex configuration, HWMF activities would remain the same; however, infrastructure-related activities would increase from 214,000 kg to 215,200 kg per year (see Section 3.6, Table 3.6–1), and managed RCRA hazardous waste would increase from 92,314 kg to 93,514 kg per year.

3.3.6.3 Radioactive Mixed Waste Management Facility

The RMWMF capabilities would remain the same as under the No Action Alternative. A new prefabricated building would be constructed to replace an existing building to improve flexibility and operational efficiencies. The operations would be increased from one to two shifts. Annual quantities of radioactive waste managed (see Section 3.6, Table 3.6–1) would be 19,592 ft^3 (556 m^3) for LLW (only 9,897 ft^3 [280 m^3] are generated; the remainder is legacy waste [see Section 3.6, Table 3.6–2]). Annually, for LLMW, TRU, and MTRU, the quantities to be managed (see Section 3.6, Table 3.6–1) through the RMWMF, including legacy waste and the expected quantities to be generated (see Section 3.6, Table 3.6–2), are as follow: 8,833 ft^3 (251 m^3) LLMW managed; 258 ft^3 (7.31 m^3) LLMW generated; 353 ft^3 (10 m^3) TRU managed; 26 ft^3 (0.74 m^3) TRU generated; and 37 ft^3 (1.05 m^3) MTRU managed; 37 ft^3 (1.05 m^3) MTRU generated. Infrastructure-related activities are rated at 2.7 M lb per year (see Section 3.6, Table 3.6–1).

Under the MESA configuration, RMWMF activities would remain the same; MESA would increase radioactive waste generation by 0.1 ft^3 per year.

3.3.6.4 Thermal Treatment Facility

Activities at the TTF would remain the same as under the No Action Alternative; quantities of wastes treated, however, would increase. Approximately 1,200 lb of waste per year would be thermally treated. This rate assumes that 60 burns are performed at 20 lb of waste per burn. This rate also assumes that the RCRA permit is reissued.

3.4 REDUCED OPERATIONS ALTERNATIVE

The Reduced Operations Alternative reflects minimum levels of activity required to maintain a facility's assigned capability over the next 10 years (1998-2008). In some specific facilities, the Reduced Operations Alternative includes activity levels that represent an increase over the base period activity levels (typically 1996). The facilities are those that, during the base period, have not been operated at a level sufficient to maintain capability or to satisfy DOE-assigned theoretical or experimental R&D product requirements.

This alternative does not eliminate assigned missions or programs, but could entail not meeting technical program requirements or could increase program or technological risk (for example, not meeting program deliverables, reduced technology demonstration activities, or a decline in technological capability). However, under this alternative, SNL/NM operations would not be reduced beyond those required to maintain safety and security activities, such as maintaining nuclear materials, high explosives, or other hazardous materials in storage or use.

The following sections describe the activities that would occur at specific facilities as a result of implementing the Reduced Operations Alternative.

3.4.1 Selected Facilities in Technical Areas-I and -II

3.4.1.1 Neutron Generator Facility

Under all alternatives, the NGF, TA-I, would continue to be used to fabricate neutron generators and neutron tubes. Support activities would include a wide variety of manufacturing, testing, and product development techniques and processes. An addition to an existing building would be constructed to meet production projections. Additionally, Building 870 would undergo extensive renovations. Approximately 2,000 neutron generators and associated neutron and switch tubes would be manufactured per year by 2008.

3.4.1.2 Microelectronics Development Laboratory

All existing capabilities would remain to produce a reduced number of wafers. Operations would be single-shift only. Approximately 2,700 wafers would be manufactured each year.

3.4.1.3 Advanced Manufacturing Processes Laboratory

The level of effort projected for the Reduced Operations Alternative would be similar to that under the No Action Alternative because the facility would be operating with the minimum number of personnel (minus administrative staff) required to maintain operational capability in each of the various areas of expertise. Approximately 248,000 operational hours would be expected.

3.4.1.4 Integrated Materials Research Laboratory

The level of effort projected under the Reduced Operations Alternative would be slightly lower than that under the No Action Alternative. A reduction in capabilities would not occur; however, there could be a slight reduction in the number of personnel and operational hours (approximately 364,000 per year).

3.4.1.5 Explosive Components Facility

Existing activities would continue at reduced levels. Activities at the ECF would include 500 neutron generator tests, 300 explosive tests, 500 chemical analyses, and 10 battery tests per year.

3.4.2 Physical Testing and Simulation Facilities

3.4.2.1 Terminal Ballistics Complex

All existing capabilities would remain under the Reduced Operations Alternative. Operating levels would be reduced to a minimum to support those capabilities. An estimated 10 projectile impact tests and 4 propellant tests would be conducted each year.

3.4.2.2 Drop/Impact Complex

All existing capabilities would remain under the Reduced Operations Alternative. No drop tests would be conducted, but one water impact test would be conducted annually to maintain operational capability. No submersion or underwater blasts would occur.

3.4.2.3 Sled Track Complex

All existing activities would remain viable under the Reduced Operations Alternative. Approximately two rocket sled tests would occur each year. While other types of tests would not be conducted, the capability would be maintained.

3.4.2.4 Centrifuge Complex

Existing activities would be reduced to a minimum level of testing required to maintain operational capability. Testing would cease for certification of weapon modifications and special items. At least two annual centrifuge tests would be conducted. No impact testing would be done under the Reduced Operations Alternative.

3.4.3 Accelerator Facilities

3.4.3.1 SATURN

The SATURN capabilities would remain at a sufficient level to maintain operational readiness. The number of shots would decrease to 40 each year.

3.4.3.2 High-Energy Radiation Megavolt Electron Source III

Existing capabilities would be maintained at the HERMES III facility. Annual tests would be reduced to an estimated 40 shots per year.

3.4.3.3 Sandia Accelerator & Beam Research Experiment

Under the Reduced Operations Alternative, the SABRE would be placed in standby mode. No test shots would be required to keep the facility operational. With minimal testing and general maintenance, operational capabilities would remain in place.

3.4.3.4 Short-Pulse High Intensity Nanosecond X-Radiator

Under the Reduced Operations Alternative, approximately 200 test shots would be completed each year. All existing capabilities would remain in a state of operational readiness.

3.4.3.5 Repetitive High Energy Pulsed Power I

All existing capabilities would be maintained. The number of tests would be reduced to 100 per year.

3.4.3.6 Repetitive High Energy Pulsed Power II

Activities would continue at the RHEPP II facility; however, the number of tests would decrease to 40 tests per year.

3.4.3.7 Z-Machine

Under the Reduced Operations Alternative, an estimated 84 tests per year would be required to maintain existing capabilities.

3.4.3.8 Tera-Electron Volt Energy Superconductor Linear Accelerator

All existing capabilities would be maintained under the Reduced Operations Alternative. To maintain operational readiness, an estimated 40 shots would be completed each year.

3.4.3.9 Advanced Pulsed Power Research Module

The level of activity necessary to maintain the operational capabilities would be 40 shots per year.

3.4.3.10 Radiographic Integrated Test Stand

Under the Reduced Operations Alternative, the minimum level of shots required to ensure operational capability in both the pulse-power and explosive modes would be an estimated 1 to 3 per week over the 40-week operational year. A total of 100 shots per year would be necessary to maintain operational capacity.

3.4.4 Reactor Facilities

3.4.4.1 New Gamma Irradiation Facility

Under the Reduced Operations Alternative, the NGIF would not conduct any irradiation tests.

3.4.4.2 Gamma Irradiation Facility

Under the Reduced Operations Alternative, the GIF would not conduct irradiation tests.

3.4.4.3 Sandia Pulsed Reactor

Under the Reduced Operations Alternative, the SPR facility would conduct 30 tests to maintain existing capabilities. No new reactors would be added to the facility.

3.4.4.4 Annular Core Research Reactor–Medical Isotopes Production Configuration

Under the Reduced Operations Alternative, the ACRR medical isotopes production configuration would irradiate the minimum number of targets required to maintain the facility, staff, processes, and material inventories needed to restart production activities on short notice. This would consist of the irradiation of approximately 40 targets per year. Although the ACRR would not be used in the DP configuration, the readiness capability to operate would be maintained.

3.4.4.5 Hot Cell Facility

Under the Reduced Operations Alternative, the HCF would process the minimum number of targets required to maintain the facility, staff, processes, and material inventories needed to restart production activities on short notice. This would consist of the processing of approximately 1 target per week over 40 weeks, or 40 targets per year. The HCF-associated facilities would be maintained at the minimum operational level. Occasional activities would be performed to support those programs that require the capabilities of these facilities. Total wastes by waste type are presented in Section 3.6, Table 3.6–1.

3.4.5 Outdoor Test Facilities

3.4.5.1 Aerial Cable Facility

All existing capabilities would remain as described under the No Action Alternative. Some activities would be reduced to zero tests per year. Two drop/pull-down tests would be conducted annually.

3.4.5.2 Lurance Canyon Burn Site

All existing capabilities would be maintained with minimal testing (one certification test per year).

3.4.5.3 Containment Technology Test Facility - West

To maintain the existing capability, at least one test would be required over a period of several years. A typical test cycle would be 6 years.

3.4.5.4 Explosives Applications Laboratory

Maintaining the site capability and qualifications would require approximately 50 tests per year to ensure minimum qualifications for arming, fuzing, and firing of explosives and explosives components.

3.4.5.5 Thunder Range Complex

All existing capabilities would be maintained. One test, ranging in duration from 1 to 30 days, would be completed each year. Equipment disassembly would be reduced to 42 days per year.

3.4.6 Infrastructure Facilities

3.4.6.1 Steam Plant

Steam plant production would decline to 362 M lb per year.

3.4.6.2 Hazardous Waste Management Facility

The HWMF capability would be maintained through the life of the current permit. The facility would be operated with one shift. Quantities of RCRA hazardous waste managed (see Section 3.6, Table 3.6–1) would be 53,123 kg each year. Infrastructure-related activities are rated at 175,000 kg per year.

3.4.6.3 Radioactive Mixed Waste Management Facility

The RMWMF capability would be maintained consistent with the applicable permit requirements. The facility would be operated with one shift. Annual quantities of radioactive waste managed (see Section 3.6, Table 3.6–1) would be 5,937 ft^3 (168 m^3) for LLW (only 3,616 ft^3 [102.4 m^3] are generated; the remainder is legacy waste [see Section 3.6, Table 3.6–2]). Annually, for LLMW, TRU, and MTRU, the quantities to be managed (see Section 3.6, Table 3.6–1) through the RMWMF, including legacy waste and the expected quantities to be generated (see Section 3.6, Table 3.6–2), are as follow: 2,677 ft^3 (76 m^3) LLMW managed; 134 ft^3 (3.79 m^3) LLMW generated; 107 ft^3 (3 m^3) TRU managed; no TRU generated; and 8 ft^3 (0.23 m^3) MTRU managed; 8 ft^3 (0.23 m^3) MTRU generated. Infrastructure-related activities are rated at approximately 0.8 M lb per year.

3.4.6.4 Thermal Treatment Facility

The TTF capability would be maintained at minimal operational levels without treating waste.

3.5 ALTERNATIVES THAT WERE CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

The CEQ regulations implementing NEPA require that all reasonable alternatives be evaluated in an EIS (40 CFR §1502.14[a]). The term *reasonable* has been interpreted by CEQ to include those alternatives that are practical or feasible from a common sense, technical, and economic standpoint. The range of reasonable alternatives is, therefore, limited to continued SNL/NM operations. DOE mission line assignments to SNL/NM define the agency's purpose and need for action, as discussed in Chapter 1.

The DOE carefully considered public input and comments received during the pre-scoping and scoping processes. Some alternatives suggested for SNL/NM's future operations were not considered in detail in the SWEIS because they were deemed unreasonable within the next 10 years. These alternatives are defined and the reasons why they were eliminated from detailed analysis are presented in the following sections.

3.5.1 Shutdown of Sandia National Laboratories/New Mexico

Under this alternative, SNL/NM operations would shut down and all facilities would be subject to decontamination and decommissioning (D&D). All DOE property would be transferred following D&D.

Public Law (PL) 103-160, the *National Defense Authorization Act of 1994*, and Presidential policy statements on the future of the laboratories (The White House 1995) require maintaining a safe and reliable nuclear weapons stockpile as a cornerstone of the nation's nuclear deterrent for the near future. The continued viability of all three DOE weapons laboratories, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and SNL, is essential to ensuring

national security. Unique competencies and facilities at SNL/NM provide for R&D, surveillance, testing, reliability and safety assessment, certification, and manufacturing associated with nuclear weapons.

Because continuing operations at SNL/NM are essential to DOE's implementation of PL 103-160, Presidential Decision Directives, U.S. compliance with treaties, as well as Congressional guidance and national security policy, the shutdown of SNL/NM is not a reasonable alternative and is not analyzed in the SWEIS.

SNL/NM's continued operations fulfill national security requirements for stockpile stewardship and management (based on PL 103-160, the DoD Nuclear Posture Review, Presidential Decision Directives, and the Nuclear Weapon Stockpile Memorandum), and it is not economically feasible to reassign certain SNL/NM activities to other DOE laboratories (see PL 103-160 and the Stockpile Stewardship and Management (SSM) PEIS, Volume I, Sections 2.2 and 2.3 [DOE 1996a]).

3.5.2 Expansion of Nonweapons Environmental and Renewable Energy Research

During the public scoping process, the DOE received a suggestion that it consider changing the focus of SNL/NM's mission statement from ensuring the safety, reliability, and security of the nuclear weapons stockpile to expanding SNL/NM's capabilities in the areas of improving energy and material efficiency; renewable resources, waste management and recycling research; and biodegradable and reusable material development.

The DOE's mission lines and funding come from Congress and the President. In the course of the implementation process, the DOE assigns aspects of its mission lines to its laboratory and plant facilities across the country, based on the unique skills and capabilities of each facility. SNL/NM is one of only three national laboratories whose primary mission from DOE is to contribute its specialized capabilities to the assurance of a safe, secure, and reliable nuclear weapons stockpile. The 1996 SSM PEIS reaffirmed the continuation of SNL/NM's role in DOE's nuclear weapons program. To fulfill its primary mission, SNL/NM has developed and perfected unique capabilities, such as high explosives R&D and testing, radiation effects experimentation through the use of accelerators and research reactors, neutron generator production, engineering and production of nonnuclear components, and microelectronics and photonics research.

Notwithstanding SNL/NM's primary mission, the energy crisis in the 1970s and other events caused the DOE to request that SNL/NM apply its knowledge and expertise to support its other mission lines (Section 2.1). SNL/NM accomplished this task by expanding its research, developed primarily as an offshoot of weapons research, into a number of environmental and energy fields. Areas where SNL/NM has been active include waste management, environmental restoration, energy efficiency, renewable energy, magnetic fusion, and nuclear, fossil, and solar energy.

This alternative was not analyzed in detail because the three alternatives analyzed in detail evaluate and bound levels of *activity* (Section 3.1) for facilities where ongoing environmental and energy research activities are conducted. If, during the next 10 years, the DOE wants to consider increasing or reallocating existing weapons resources to any of the environmental or energy fields, the increased activities are already encompassed in the evaluation of the three alternatives described in Sections 3.2, 3.3, and 3.4.

3.5.3 Returning Withdrawn Forest Service Land to Public Use

During the public scoping and public meeting processes, a commenter suggested that the DOE consider returning all or part of the withdrawn Forest Service lands to public use, including carrying out the necessary decontamination and decommissioning activities.

As discussed in Section 3.5.2, the SSM PEIS established SNL/NM's programmatic roles and responsibilities. To accomplish the primary mission from the DOE, SNL/NM contributes its specialized capabilities to ensure a safe, secure, and reliable nuclear weapons stockpile. In fact, SNL/NM has developed and perfected some unique outdoor testing capabilities in the Withdrawn Area. Specifically, the Aerial Cable Facility and the Lurance Canyon Burn Site provide unique testing capabilities that are an essential complement to the other physical testing capabilities and facilities available in TA-III (Physical Testing and Simulation Facility Group) and Coyote Test Field (Outdoor Test Facility Group). Areas surrounding these two sites are necessary for safety buffer zones and the physiography is optimal to minimize the areal extent of these zones. The current location at SNL/NM provides a configuration that would be cost prohibitive and physically difficult to duplicate at another DOE site. In addition, if another DOE site could be found that was available and compatible for relocation of these testing facilities,

moving the facilities would result in the temporary unavailability of these capabilities to the weapons program.

3.6 COMPARISON OF ENVIRONMENTAL CONSEQUENCES AMONG ALTERNATIVES

The SWEIS combines the results of several studies to address consequences to the environment and risks associated with the DOE's operations at SNL/NM. The affected environment evaluated in the SWEIS includes the following 13 resource areas: land use and visual resources, infrastructure, geology and soils, water resources and hydrology, biological and ecological resources, cultural resources, air quality, human health and worker safety, transportation, waste generation, noise and vibration, socioeconomics, and environmental justice (see Chapter 4).

The following subsections summarize the environmental consequences and risks by resource area under each alternative. Tables 3.6–1 through 3.6–4 present the comparison of environmental consequences in tabular form. Table 3.6–1 summarizes operational data from the selected facilities for each alternative. The facilities are arranged by selected facility/facility group, including the infrastructure facilities. Table 3.6–2 compares important parameters used in performing impact analyses described in Chapter 5. Table 3.6–3 compares impacts determined from these analyses for each alternative. Table 3.6–4 presents a condensed list of high-consequence impacts determined from the accidents analyses for each alternative. A complete list may be found in Appendix F.

3.6.1 Land Use and Visual Resources

No adverse impacts to land resources are expected as a result of the No Action, Expanded Operations, or Reduced Operations Alternatives. The extent of DOE land and U.S. Air Force (USAF)-permitted acreage currently available for use by SNL/NM facilities on KAFB would remain approximately the same. Operations would remain consistent with industrial and research park uses and would have no foreseeable effects on established land use patterns or requirements. Buffer zones would continue to remain at their current size and location. New SNL/NM facilities, expansions, and upgrades would be limited and would not require changes to current land ownership or classification status because these activities would be planned in or near existing facilities, within already disturbed or developed areas, or on land already under DOE control. There would be no adverse impacts to visual resources that change the overall appearance of the existing landscape, obscure views, or alter the visibility of SNL/NM structures. New facilities, expansions, and upgrades would be planned in or near existing facilities in areas with common scenic quality. Efforts initiated by SNL/NM to incorporate a campus-style design would continue.

If implemented, the MESA Complex configuration for the Expanded Operations Alternative would have a negligible effect on land or visual resources. The facility would be built on land owned by the DOE in an area (TA-I) that is already well developed with structures of common scenic quality.

3.6.2 Infrastructure

Annual projected utility demands for all alternatives would be well within system capacities. The consumption of electricity would range from 185,000 MWh per year (Reduced Operations Alternative) to 198,000 MWh per year (Expanded Operations Alternative). Projected water usage would range from 416 M gal to 495 M gal per year. Actual water usage probably would be lower because SNL/NM has implemented a conservation program to reduce usage by 30 percent by 2004. For comparison purposes, a conservation scenario is provided under the No Action Alternative. Other infrastructure-related factors, including maintenance, roads, communications, steam, natural gas, and facility decommissioning, would be similar for each alternative and would not be adversely affected by the projected levels of SNL/NM operations. Although not listed in Table 3.6–2, for the Expanded Operations Alternative, the infrastructure analysis included a 10-percent additional increase to illustrate that the utility systems supporting SNL/NM have adequate capacity.

If implemented, the MESA Complex configuration for the Expanded Operations Alternative would increase the consumption of electricity from 198,000 MWh per year to 204,000 MWh per year. Projected water use would increase from 495 M gal per year to 499 M gal per year. Projected wastewater and natural gas quantities would increase slightly.

Table 3.6–1. Comparison of Activity Levels at 10 Selected Facilities/Facility Groups Under the No Action, Expanded Operations, and Reduced Operations Alternatives

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (PER YEAR)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
Neutron Generator Facility	Development or production of devices, processes, and systems	Neutron generators	Neutron generators	600	2,000	2,000	2,000	2,000
	Expenditures		dollars	2.6 M	5.2 M	5.2 M	5.2 M	5.2 M
	Hazardous waste		kg	2,760	3,680	3,680	3,680	3,680
	Low-level waste		kg	3,000	4,000	4,000	4,000	4,000
	Low-level mixed waste		kg	150	300	300	300	300
	Nuclear consumption	Tritium	Ci	386	652	652	652	652
	Nuclear inventory	Tritium	Ci	682	836	836	836	836
	Radioactive air emissions	Tritium	Ci	94	156	156	156	156
	Personnel		FTEs	160	320	320	320	320
	Process water		gal	4.5 M	5 M	5 M	5 M	5 M
	Wastewater		gal	4.5 M	5 M	5 M	5 M	5 M
Microelectronics Development Laboratory (with MESA)	Development or production of devices, processes, and systems	Microelectronic devices and systems	wafers	4,000	5,000	7,000	7,500 (7,500)	2,666
	Boiler energy consumption	Natural gas	ft^3	34.3 M	34.3 M	34.3 M	34.3 M (40.8 M)	34.3 M
	Hazardous waste		kg	2,520	3,150	4,410	4,738 (5,938)	1,688
	Low-level waste		ft^3	4	5	7	8 (8.1)	3
	Process electricity		kWh	28.6 M	28.6 M	28.6 M	28.6 M (40 M)	28.6 M

Table 3.6–1. Comparison of Activity Levels at 10 Selected Facilities/Facility Groups Under the No Action, Expanded Operations, and Reduced Operations Alternatives (continued)

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (PER YEAR)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
	Expenditures[k]		dollars	4.0 M	5.0 M	7.5 M	7.5 M (300 M)	2.7 M
	Personnel[k]		FTEs	267	333	467	500 (500)	178
	Process water		gal	44.1 M	55.1 M	77.2 M	77.2 M (81 M)	44.1 M
	Process wastewater		gal	44 M	55 M	77 M	77 M (80.8)	44 M
Advanced Manufacturing Processes Laboratory	Development or production of devices, processes, and systems	Materials, ceramics/glass, electronics, processes, and systems	operational hours	248,000	310,000	310,000	347,000	248,000
	Expenditures		dollars	32 M	40 M	40 M	45 M	32 M
	Hazardous waste		kg	4,732	5,915	5,915	6,625	4,732
	Personnel		FTEs	150	184	184	204	150
Integrated Materials Research Laboratory	Other	Research and development of materials	operational hours	395,454	395,454	395,454	395,454	363,817
	Expenditures		dollars	45 M	55 M	60 M	62 M	48 M
	Hazardous waste		kg	2,400	2,100	1,850	2,000	2,000[i]
	Nuclear inventory	Depleted uranium	mCi	0.93	1.0	1.0	1.0	0
	Personnel		FTEs	250	250	250	250	230
Explosive Components Facility	Test activities	Neutron generator tests	tests	200 (FY 1998)	500	500	500	500
		Explosive testing	tests	600	750	850	900	300

Table 3.6–1. Comparison of Activity Levels at 10 Selected Facilities/Facility Groups Under the No Action, Expanded Operations, and Reduced Operations Alternatives (continued)

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (PER YEAR)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
Explosive Components Facility (continued)		Chemical analysis	analyses	900	950	1,000	1,250	500
		Battery tests	tests	50	60	60	100	10
	Boiler energy consumption	Natural gas	ft^3	24 M	27 M	27 M	29 M	16 M
	Expenditures		dollars	1.7 M	2.1 M	2.1 M	2.5 M	1.4 M
	Hazardous waste		kg	360	400	500	500	200
	Low-level waste		ft^3	95	190	190	190	190
	Low-level mixed waste		kg	1,000	1,000	1,000	1,000	1,000
	Nuclear inventory	Tritium	Ci	49	49	49	49	49
	Radioactive air emissions	Tritium	Ci	$1x10^{-3}$	$2x10^{-3}$	$2x10^{-3}$	$2x10^{-3}$	$2x10^{-3}$
	Personnel		FTEs	81	94	94	102	94
	Process electricity		kWh	2.9 M	3.1 M	3.1 M	3.4 M	2.5 M
	Process water		gal	6 M	6.5 M	6.5 M	7 M	4 M
	Process wastewater		gal	4.8 M	5 M	5 M	6.4 M	3.2 M
PHYSICAL TESTING AND SIMULATION FACILITIES								
Terminal Ballistics Complex	Test activities	Projectile impact testing	tests	50	80	100	350	10
		Propellant testing	tests	25	40	50	100	4
	Expenditures		dollars	8,500	9,500	11,000	12,000	3,000
	Hazardous waste		kg	0.25	0.50	0.50	0.75	0
	Personnel		FTEs	0.3	0.4	0.6	2	0.05

Table 3.6–1. Comparison of Activity Levels at 10 Selected Facilities/Facility Groups Under the No Action, Expanded Operations, and Reduced Operations Alternatives (continued)

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (PER YEAR)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
Drop/Impact Complex	Test activities	Drop test	tests	18	20	20	50	0
		Water impact	tests	1	1	1	20	1
		Submersion	tests	1	1	1	5	0
		Underwater blast	tests	0	2	2	10	0
Drop/Impact Complex (continued)	Expenditures		dollars	50,000	55,000	60,000	146,000	31,000
	Personnel		FTEs	2.5	2.5	2.5	8	2.5
Sled Track Complex	Test activities	Rocket sled test	tests	10	10	15	80	2
		Explosive testing	tests	12	12	12	239	0
		Rocket launcher	tests	3	4	4	24	0
		Free-flight launch	tests	40	40	40	150	0
	Expenditures		dollars	334,000	376,000	451,000	2.0 M	190,000
	Hazardous waste		kg	15	15	15	50	3
	Personnel		FTEs	8	8	8	40	8
Centrifuge Complex	Test activities	Centrifuge	tests	32	46	46	120	2
		Impact	tests	0	10	10	100	0
	Expenditures		dollars	400,000	450,000	480,000	750,000	250,000
	Hazardous waste		kg	10	12	12	15	12
	Personnel		FTEs	3.5	4.5	4.5	10	3.5

Table 3.6–1. Comparison of Activity Levels at 10 Selected Facilities/Facility Groups Under the No Action, Expanded Operations, and Reduced Operations Alternatives (continued)

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (PER YEAR)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
ACCELERATOR FACILITIES								
SATURN	Test activities	Irradiation of components or materials	shots	65	200	200	500	40
	Expenditures		dollars	1.5 M	3 M	3 M	5.4 M	1.2 M
	Hazardous waste		kg	167	501	501	1,286	100
	Personnel		FTEs	5	10	10	18	4
HERMES III	Test activities	Irradiation of components or materials	shots	262	500	500	1,450	40
	Expenditures		dollars	2.4 M	3.0 M	3.0 M	4.4 M	1.98 M
	Hazardous waste		kg	167	316	316	915	25
	Low-level waste		ft^3	0.25	0.48	0.48	1.38	0.04
	Radioactive air emissions	Nitrogen-13	Ci	$6.55x10^{-4}$	$12.45x10^{-4}$	$12.45x10^{-4}$	$36.03x10^{-4}$	$1x10^{-4}$
		Oxygen-15	Ci	$6.55x10^{-5}$	$12.45x10^{-5}$	$12.45x10^{-5}$	$36.03x10^{-5}$	$1x10^{-5}$
	Personnel		FTEs	12	15	15	22	10
Sandia Accelerator & Beam Research Experiment	Test activities	Irradiation of components or materials	shots	187	225	225	400	0
	Expenditures		dollars	640,000	800,000	800,000	960,000	80,000
	Hazardous waste		kg	63	76	76	132	0
	Low-level waste		ft^3	4.0	4.8	4.8	8.4	0.0
	Personnel		FTEs	4.0	5.0	5.0	6.0	0.5

Table 3.6–1. Comparison of Activity Levels at 10 Selected Facilities/Facility Groups Under the No Action, Expanded Operations, and Reduced Operations Alternatives (continued)

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (PER YEAR)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
Short-Pulse High Intensity Nanosecond X-Radiator	Test activities	Irradiation of components or materials	shots	1,185	2,500	2,500	6,000	200
	Expenditures		dollars	300,000	500,000	500,000	710,000	70,000
	Hazardous waste		kg	21	45	45	107	3.6
	Personnel		FTEs	2.7	3.5	3.5	5	0.5
Repetitive High Energy Pulsed Power Unit I	Test activities	Accelerator tests	tests	500	5,000	5,000	10,000	100
Repetitive High Energy Pulsed Power Unit I (continued)	Expenditures		dollars	1.5 M	2.5 M	2.5 M	5.5 M	750,000
	Hazardous waste		kg	0	5	5	10	0
	Nuclear consumption	Depleted uranium	µg	0	10	10	100	0
	Nuclear inventory	Depleted uranium	µg	0	10	10	100	0
	Personnel		FTEs	5	8	8	10	2
Repetitive High Energy Pulsed Power Unit II	Test activities	Radiation production	tests	80	160	160	800	40
	Expenditures		dollars	252,000	353,000	353,000	754,000	126,000
	Hazardous waste		kg	0	1	1	1	0
	Personnel		FTEs	0.9	1.4	1.4	3	0.45
Z-Machine	Test activities	Accelerator shots	shots	150	300	300	350	84
	Expenditures		dollars	1.2 M	3 M	3 M	40 M	800,000
	Hazardous waste		kg	750	1,000	1,000	1,250	400

Table 3.6–1. Comparison of Activity Levels at 10 Selected Facilities/Facility Groups Under the No Action, Expanded Operations, and Reduced Operations Alternatives (continued)

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (PER YEAR)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
	Low-level waste		ft^3	44	20	20	28	12
	Nuclear consumption	Tritium	Ci	0	2,500	2,500	7,500	0
		Deuterium[b]	L	0	3,750	3,750	5,000	0
		Plutonium-239	mg	0	800	800	2,000	0
		Depleted uranium	mg	0	800	800	2,000	0
	Nuclear inventory	Tritium	Ci	0	1,000	1,000	50,000	0
		Deuterium[b]	L	0	1,000	1,000	5,000	0
Z-Machine (continued)	Nuclear inventory (continued)	Plutonium-239	mg	0	200	200	200	0
		Depleted uranium	mg	0	200	200	200	0
	Radioactive air emissions	Nitrogen-13	Ci	0.042	0	0	0	0
		Oxygen-15	Ci	0.005	0	0	0	0
	Personnel		FTEs	50	85	85	115	50
TESLA	Test activities	Accelerator shots	shots	40	1,000	1,000	1,300	40
	Expenditures		dollars	500,000	1 M	1 M	1.6 M	500,000
	Hazardous waste		kg	2	50	50	65	2
	Personnel		FTEs	1	3	3	5	1
Advanced Pulsed Power Research Module	Test activities	Accelerator shots	shots	500	1,000	1,000	2,000	40
	Expenditures		dollars	3.5 M	5 M	5 M	5.5 M	1.5 M
	Hazardous waste		kg	50	100	100	200	5
	Personnel		FTEs	5	7	7	7	5

Table 3.6–1. Comparison of Activity Levels at 10 Selected Facilities/Facility Groups Under the No Action, Expanded Operations, and Reduced Operations Alternatives (continued)

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (PER YEAR)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
Radiographic Integrated Test Stand	Test activities	Accelerator shots	shots	0[c]	400	600	800	100
	Expenditures		dollars	0	2.25 M	2.25 M	4 M	1.75 M
	Hazardous inventories	Insulator oil	gal	0	40,000	40,000	40,000	40,000
	Hazardous waste		kg	0	136	204	272	34
	Low-level waste		kg	0	60	90	120	15
	Radioactive air emissions	Nitrogen-13	Ci	0	0.08	0.12	0.16	0.02
Radiographic Integrated Test Stand (continued)	Radioactive materials inventory	Activated hardware	kg	0	500	500	500	500
	Personnel		FTEs	0	6	6	10	4
REACTOR FACILITIES								
New Gamma Irradiation Facility	Test activities	Tests	hours	0[c]	13,000	13,000	24,000	0
	Expenditures		dollars	0	6 M	500,000	1 M	0
	Hazardous waste		ft^3	0	14	14	14	7
	Low-level waste		ft^3	0	92	92	126	56
	Personnel		FTEs	0	3	3	4	2
	Process water		gal	0	166,000	166,000	255,000	0
	Radioactive consumption	Cobalt-60	Ci	0	142,000	142,000	246,000	0
Gamma Irradiation Facility	Test activities	Tests	hours	1,000	0	0	8,000	0
	Hazardous waste		ft^3	7	0	0	14	7
	Low-level waste		ft^3	56	0	0	126	56

Table 3.6–1. Comparison of Activity Levels at 10 Selected Facilities/Facility Groups Under the No Action, Expanded Operations, and Reduced Operations Alternatives (continued)

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (PER YEAR)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
	Nuclear inventory	Depleted uranium	kg	13,600	13,600	13,600	13,600	13,600
	Personnel		FTEs	2	0	0	3	2
	Process water		gal	17,000	0	0	17,000	17,000[l]
Sandia Pulsed Reactor	Test activities	Irradiation tests	tests	100	100	100	200	30
	Expenditures		dollars	0	5 M	0	6 M	0
	Hazardous waste		ft^3	7	14	14	30	7
	Low-level waste		kg	440	440	440	900	440
Sandia Pulsed Reactor (continued)	Low-level mixed waste		ft^3	4	4	4	14	4
	Nuclear inventory	Plutonium-239	g	53	10,000	10,000	10,000	53
		Enriched uranium	kg	550	900	550	1,000	550
	Radioactive air emissions	Argon-41	Ci	9.5	9.5	9.5	30.0	2.85
	Personnel		FTEs	10	12	10	17	8
Annular Core Research Reactor (DP for No Action and Reduced Operations Alternatives, ACPR-II for Expanded Operations Alternative)	Test activities	Irradiation tests	test series	0	1	0	2 to 3	0
	Expenditures		dollars	200,000	5 M	200,000	12 M	200,000
	Explosives inventory	Bare UNO 1.2[d]	g	0	500	500	500	0
	Hazardous waste		ft^3	0	2	0	14	0
	Low-level mixed waste		ft^3	0	35	0	170	0
	Low-level waste		ft^3	0	0	0	5	0
	Nuclear consumption	Enriched uranium	g	0	0	0	2	0

Table 3.6–1. Comparison of Activity Levels at 10 Selected Facilities/Facility Groups Under the No Action, Expanded Operations, and Reduced Operations Alternatives (continued)

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (PER YEAR)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
	Nuclear material inventory	Cobalt-60	Ci	33.6	19	10	33.6	33.6
		Enriched uranium	kg	12	37	37	85	12
		Plutonium-239	g	148	148	148	8,800	148
	Personnel		FTEs	1	1	1	8	1
	Process wastewater		gal	0	10,000	0	50,000	0
	Process water		gal	0	10,000	0	100,000	0
	Radioactive air emissions	Argon-41	Ci	2.6	2.6	2.6	7.8	0
Annular Core Research Reactor DP (continued)	Transuranic mixed waste		ft^3	0	0	0	5	0
	Transuranic waste		ft^3	0	0	0	5	0
Annular Core Research Reactor (medical isotopes production configuration)	Test activities	Irradiation of production targets	targets	8[e]	375	375	1,300	40
	Expenditures		dollars	200,000	4.5 M	4 M	0	0
	Explosives inventory	Bare UNO 1.2[d]	g	0	500	500	500	0
	Hazardous waste		ft^3	7	14	14	30	7
	Low-level waste		ft^3	56	370	370	1,090	56
	Nuclear consumption	Enriched uranium	kg	0	0.38	10.6	16	0
	Nuclear inventory	Enriched uranium	kg	25.8	56.7	56.7	56.7	18.3
	Radioactive air emissions	Tritium	Ci	0	1.1	1.1	2.2	0.24
		Argon-41	Ci	35.4	1.1	1.1	2.2	0.24
	Personnel		FTEs	9	14	14	22	7

Table 3.6–1. Comparison of Activity Levels at 10 Selected Facilities/Facility Groups Under the No Action, Expanded Operations, and Reduced Operations Alternatives (continued)

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (PER YEAR)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
	Process water		gal	600,000	5 M	5 M	11 M	1.2 M
	Process wastewater		gal	125,000	1M	1 M	2.2 M	240,000
	Spent fuel	Spent fuel from fuel elements	kg	0	0	189	399	42
Hot Cell Facility	Development or production of devices, processes, and systems	Processing of production targets	targets	8	375	375	1,300	40
	Expenditures		dollars	0	4 M	0	0	0
	Hazardous waste		ft^3	7	14	14	22	7
	Low-level waste		ft^3	100	2,200	2,200	5,000	270
	Low-level mixed waste		ft^3	7	17	17	40	5
	Nuclear consumption	Enriched uranium	kg	0.2	9.4	9.4	32.5	1.0
	Nuclear inventory	Enriched uranium	g	25	25	25	125	25
	Radioactive air emissions	Iodine-131	Ci	0.00196	1.17	1.17	3.9	0.117
		Iodine-132	Ci	0.000129	3.0	3.0	10.0	0.3
		Iodine-133	Ci	0.00951	5.4	5.4	18.0	0.54
		Iodine-135	Ci	0.00132	3.3	3.3	11	0.33
		Krypton-83m	Ci	0.0000957	198.0	198.0	660.0	19.8
		Krypton-85	Ci	0.00153	0.19	0.19	0.63	0.019
		Krypton-87	Ci	0.0294	57.0	57.0	190	5.7
		Krypton-88	Ci	0.527	480.0	480.0	1,600	48.0
		Xenon-133	Ci	17.5	2,160.0	2,160.0	7,200.0	216.0
		Xenon-133m	Ci	0.768	102.0	102.0	340.0	10.2
		Xenon-135	Ci	14.7	2,070.0	2,070.0	6,900.0	207.0

Table 3.6–1. Comparison of Activity Levels at 10 Selected Facilities/Facility Groups Under the No Action, Expanded Operations, and Reduced Operations Alternatives (continued)

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (PER YEAR)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
		Iodine-134	Ci	0	0.22	0.22	0.72	0.022
		Xenon-135m	Ci	0.976	360	360	1,200	36
		Krypton-85m	Ci	0.587	290.0	290.0	970.0	29.0
		Xenon-131m	Ci	0.000345	1.8	1.8	5.9	0.18
	Personnel		FTEs	12	32	32	55	12
OUTDOOR TEST FACILITIES								
Aerial Cable Facility	Test activities	Drop/pull-down	Tests	21	32	38	100	2
	Test activities (continued)	Aerial target	tests	6	6	6	30	0
		Scoring system tests	series	0	1	1	2	0
	Expenditures		dollars	250,000	350,000	380,000	725,000	150,000
	Explosives consumption	Bare UNO 1.4[d]	g	410	625	741	2,314	71
		Bare UNO 1.1[d]	kg	18.9	28.4	34.6	78.8	0
		Bare UNO 1.3[d]	kg	1,514	3,268	3,814	22,930	480
	Hazardous waste		kg	5	5	5	9	5
	Personnel		FTEs	8	8	10	24	6
Lurance Canyon Burn Site	Test activities	Certification testing	tests	12	12	12	55	1
		Model validation	tests	56	56	56	100	0
		User testing	tests	37	37	37	50	0
	Expenditures		dollars	250,000	275,000	300,000	625,000	150,000
	Hazardous waste		kg	900	900	900	900	900
	Personnel		FTEs	4.5	4.5	4.5	11	3.5

Table 3.6–1. Comparison of Activity Levels at 10 Selected Facilities/Facility Groups Under the No Action, Expanded Operations, and Reduced Operations Alternatives (continued)

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (PER YEAR)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
	Process wastewater		gal	25,000	25,000	25,000	25,000	25,000
Containment Technology Test Facility - West	Test activities	Survivability testing	tests	1	1	0	2	1
	Expenditures		dollars	2 M	2 M	0	2 M	2 M
	Hazardous waste		g	100	100	0 [j]	100	100
	Personnel		FTEs	12	12	0	12	12
Explosives Applications Laboratory	Test activities	Explosive testing	tests	240	240	240	275 to 360	50
	Expenditures		dollars	650,000	747,500	859,625	975,000	435,500
	Hazardous waste		kg	1	1	1	1.5 to 2	0.5
	Personnel		FTEs	3	3	3	6	2
Thunder Range Complex	Other	Equipment disassembly and evaluation	days	60	82	82	144	42
	Test activities	Ground truthing tests	test series	1	5	8	10	1
	Nuclear inventory	Plutonium-239	Ci	≤ 0.52	≤ 0.52	≤ 0.52	0.52	0
		Plutonium-238	Ci	≤ 0.62	≤ 0.62	≤ 0.62	0.62	0
		Americium-241	Ci	≤ 0.52	≤ 0.52	≤ 0.52	0.52	0
		Americium-243	Ci	≤ 0.52	≤ 0.52	≤ 0.52	0.52	0
		Normal uranium	Ci	≤ 4.2	≤ 4.2	≤ 4.2	4.2	0
	Personnel		FTEs	1.1	1.5	1.5	2.6	0.8
	Expenditures[k]		dollars	110,000	150,000	150,000	260,000	80,000

Table 3.6–1. Comparison of Activity Levels at 10 Selected Facilities/Facility Groups Under the No Action, Expanded Operations, and Reduced Operations Alternatives (continued)

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (PER YEAR)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
INFRASTRUCTURE FACILITIES								
Steam Plant	Infrastructure	Generate and distribute steam to DOE, TA-I, KAFB East, Coronado Club	lbs	544 M	544 M	544 M	544 M	362 M
	Boiler energy consumption	Natural gas[f]	ft^3	779 M	779 M	779 M	779 M	519 M
	Expenditures		dollars	2.8 M	2.83 M	2.83 M	2.87 M	2.4 M
Steam Plant (continued)	Personnel		FTEs	17	17	17	17	12
	Process electricity		kWh	1.2 M	1.2 M	1.2 M	1.2 M	0.8 M
	Process water		gal	14.3 M	17 M	17 M	20 M	9.5 M
Hazardous Waste Management Facility[g] (with MESA)	Infrastructure	Collection, packaging, handling, and short-term storage of hazardous and other toxic waste	kg	203,000	192,000	196,000	214,000 (215,200)	175,000
	Expenditures		dollars	950,000	890,000	890,000	1.0 M	820,000
	Waste managed	RCRA hazardous waste	kg	55,852	70,469	74,358	92,314 (93,514)	53,123
	Personnel		FTEs	13	12	13	14	11

Table 3.6–1. Comparison of Activity Levels at 10 Selected Facilities/Facility Groups Under the No Action, Expanded Operations, and Reduced Operations Alternatives (concluded)

FACILITY NAME	CATEGORY	ACTIVITY TYPE OR MATERIAL	UNITS (PER YEAR)	NO ACTION ALTERNATIVE			EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
				BASE YEAR[a]	FIVE-YEAR	TEN-YEAR		
Radioactive and Mixed Waste Management Facility	Infrastructure	Receipt, packaging, and shipping of radioactive waste	lb	1.6 M	2.1 M	2.1 M	2.7 M[i]	0.8 M
	Expenditures		dollars	320,000	416,000	416,000	528,000	160,000
	Waste managed	Low-level waste	ft^3 (m^3)	11,874 (337)	15,436 (438)	15,436 (438)	19,592 (556)[i]	5,937 (168)
		Low-level mixed waste	ft^3 (m^3)	5,353 (152)	6,959 (197)	6,959 (197)	8,833 (251)	2,677 (76)
		Transuranic	ft^3 (m^3)	214 (6.1)	278 (7.9)	278 (7.9)	353 (10)	107 (3.0)
Radioactive and Mixed Waste Management Facility (continued)	Waste managed	Mixed transuranic	ft^3 (m^3)	16 (0.45)	21 (0.60)	23 (0.65)	37 (1.05)	8 (0.23)
	Radioactive air emissions	Tritium	Ci	2.203	2.203	2.203	2.203	2.203
	Personnel		FTEs	30	39	39	49	15
Thermal Treatment Facility	Infrastructure	Treatment of waste	lb	minimal	336	336	1,200	minimal
	Expenditures		dollars	10,000	20,000	20,000	100,000	10,000
	Hazardous waste		kg	minimal	76	76	272	minimal
	Personnel		FTEs	0.1	0.2	0.2	1	0.1

Table 3.6–1. Comparison of Activity Levels at 10 Selected Facilities/Facility Groups Under the No Action, Expanded Operations, and Reduced Operations Alternatives (concluded)

Source: SNL/NM 1998a
Ci: curie
DP: Defense Programs
ft^3: cubic foot
FTE: full-time equivalent
FY: fiscal year
g: gram
gal: gallon
GIF: Gamma Irradiation Facility
IMRL: Integrated Materials Research Laboratory
HWMF: Hazardous Waste Management Facility
kg: kilogram
kWh: kilowatt-hour
L: liter
lb: pound
M: million
mCi: millicurie
MESA: Microsystems and Engineering Sciences Applications
mg: milligram
RCRA: *Resource Conservation and Recovery Act*
RMWMF: Radioactive and Mixed Waste Management Facility
TA: technical area
TSCA: *Toxic Substances Control Act*
yr: year
µg: microgram
≤: less than or equal to

[a] Base year is the year selected as most representative of normal operations (SNL/NM 1998ee).
[b] Deuterium is not a radionuclide; however, it is considered as accountable nuclear material.
[c] Facility not completed as of publication of this SWEIS
[d] The United Nations Organization (UNO) Classification System is used to identify hazard class for explosives.
[e] Eight tests are planned for the base year to test and evaluate Molybdenum-99 separation process
[f] At 14.7 pounds per square inch
[g] Infrastructure and waste management quantities differ from waste generation quantities in Table 3.6–2, because the HWMF does not manage explosive (RCRA hazardous) waste, does not manage all TSCA wastes generated at SNL/NM, and does not manage all other types of wastes (non-RCRA hazardous) generated at SNL/NM.
[h] Infrastructure and waste management quantities differ from waste generation quantities in Table 3.6–2 because the RMWMF manages legacy waste inventories that were previously generated by SNL/NM facilities and activities.
[i] IMRL hazardous waste projection of 2,000 kg per year, under the Reduced Operations Alternative, is based on the assumption that the DOE would implement the alternative immediately and does not consider future potential waste avoidance and pollution prevention measures.
[j] At this time, there are no scheduled tests beyond 2000, so there were no waste projections.
[k] Estimated from Selected Facility/Facility Group data.
[l] GIF process water projection of 17,000 gal, under the Reduced Operations Alternative, is based on the assumption that the DOE would implement the alternative immediately and does not consider decommissioning the reactor water pool.

Table 3.6–2. Comparison of Parameters Used to Analyze Selected Facilities Under the No Action, Expanded Operations, and Reduced Operations Alternatives

RESOURCE AREA	UNITS	BASELINE	NO ACTION ALTERNATIVE (2008)	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
LAND USE					
SNL/NM Land Use Within KAFB	ac	8,824	8,824	8,824	8,824
DOE Buffer Zones	ac	9,093	9,093	9,093	9,093
INFRASTRUCTURE					
Utilities (Annual Basis)	Note: Expanded Operations Alternative quantities do not include 10% margin.				
Water Use Water Use with MESA/ Water Capacity	gal/yr	440 M 2.0 B	463 M 2.0 B	495 M (499 M) 2.0 B	416 M 2.0 B
Sanitary Sewer Discharge (Sewer Discharge with MESA)/ Sanitary Sewer Capacity	gal/yr	280 M 850 M	304 M 850 M	322 M (325 M) 850 M	268 M 850 M
Natural Gas Use (Natural Gas Use with MESA)/ Natural Gas Capacity	ft^3/yr[a]	475 M 2.3 B ft^3	450 M 2.3 B ft^3	475 M (481 M) 2.3 B ft^3	385 M 2.3 B ft^3
Electrical Use (Electrical Use with MESA)/ Electrical Capacity	MWh/yr	197,000 1.1 M	186,000 1.1 M	198,000*(204,000) 1.1 M	185,000 1.1 M
GEOLOGY AND SOILS					
Potential Soil/Subsurface Contamination Sites Identified	sites	182	182	182	182
Active Sites[b]	sites	20	20	20	20
SNL/NM Usage Areas Near 10% Or Greater Slopes	areas	4	4	4	4

Table 3.6–2. Comparison of Parameters Used to Analyze Selected Facilities Under the No Action, Expanded Operations, and Reduced Operations Alternatives (continued)

RESOURCE AREA	UNITS	BASELINE	NO ACTION ALTERNATIVE (2008)	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
WATER RESOURCES AND HYDROLOGY					
Total SNL/NM Projected Groundwater Use, through 2008 [c] ***(Projected Groundwater Use with MESA)***	ft^3/10 yr	575 M	605 M	628 M (635 M)	571 M
Developed Area	mi^2	0.72	0.72	0.72	0.72
BIOLOGICAL/ECOLOGICAL RESOURCES					
Change in Habitat Area		NA	No change	No change	No change
CULTURAL RESOURCES					
Cultural Resources Located in all Areas of Potential Effect	number	192	192	192	192
AIR QUALITY					
Nonradioactive Emissions					
Nitrogen Oxides	tons/yr	153.92	162.36	162.36	162.36
Carbon Monoxide					
Stationary Sources	tons/yr	15.21	18.36	18.36	18.36
Mobile Sources	tons/yr	4,087	3,489	3,837	3,385
Construction Activities	tons/yr	132	132	132	132
Lurance Canyon Burn Site	tons/yr	0.78	0.78	4.5	0.78
Particulate Matter	tons/yr	3.65	7.46	7.46	7.46
Sulfur Dioxide	tons/yr	0.32	1.10	1.10	1.10
Radioactive Emissions					
Argon-41	Ci/yr	44.9	13.2	40.0	3.1
Tritium	Ci/yr	4.52	159.6	161	158.7
Nitrogen-13	Ci/yr	4.2×10^{-2}	0.12	0.16	0.02

Table 3.6–2. Comparison of Parameters Used to Analyze Selected Facilities Under the No Action, Expanded Operations, and Reduced Operations Alternatives (continued)

RESOURCE AREA	UNITS	BASELINE	NO ACTION ALTERNATIVE (2008)	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
Oxygen-15	Ci/yr	$2.6x10^{-2}$	$1.25x10^{-4}$	$3.60.10^{-4}$	$1.0x10^{-5}$
Iodine-131	Ci/yr	$1.96x10^{-3}$	1.17	3.90	0.117
Iodine-132	Ci/yr	$1.29x10^{-4}$	3.0	10.0	0.3
Iodine-133	Ci/yr	$9.51x10^{-3}$	5.4	18.0	0.54
Iodine-134	Ci/yr		0.22	0.72	0.022
Iodine-135	Ci/yr	$1.32x10^{-3}$	3.3	11.0	0.33
Krypton-83m	Ci/yr	$9.57x10^{-5}$	198.0	660.0	19.8
Krypton-85	Ci/yr	$1.53x10^{-3}$	0.19	0.63	0.019
Krypton-85m	Ci/yr	0.587	290	970	29.0
Krypton-87	Ci/yr	0.029	57	190	5.7
Krypton-88	Ci/yr	0.527	480	1,600	48.0
Xenon-131m	Ci/yr	$3.45x10^{-4}$	1.8	5.9	0.18
Xenon-133	Ci/yr	17.5	2,160	7,200	216
Xenon-133m	Ci/yr	0.768	102	340	10.2
Xenon-135	Ci/yr	14.7	2,070	6,900	207
Xenon-135m	Ci/yr	0.976	360	1,200	36.0
TRANSPORTATION (Normal Operations)					
Material (Annual Shipments/Receipts Radioactive, Chemical, and Explosives)	trips	3,358	5,096	7,498	4,170
Radioactive Waste (LLW & LLMW)	shipments	5	16	24	11
Chemical Waste	shipments	102	122	150	95
Solid Waste (Includes Construction/Demolition)	shipments	51	650	650	650
Recyclable Waste (Excludes D&D)	shipments	86	231	233	8

Table 3.6–2. Comparison of Parameters Used to Analyze Selected Facilities Under the No Action, Expanded Operations, and Reduced Operations Alternatives (continued)

RESOURCE AREA		UNITS	BASELINE	NO ACTION ALTERNATIVE (2008)	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
Site Related Traffic - Total KAFB Daily traffic		vehicles	37,727	38,406	39,085	37,319
SNL/NM Daily Hazardous Materials Transports		shipments	14.5	24.6	34.4	20.7
WASTE GENERATION [d] (Selected Facilities plus Balance of Operations)						
Radioactive Waste[i]	Low-Level	ft^3 (m^3)	3,322 (94)	5,993 (170)	9,897 (280)	3,616 (102)
	Low-level Mixed	ft^3 (m^3)	153 (4.33)	189 (5.34)	258 (7.31)	134 (3.79)
	Transuranic Waste	ft^3 (m^3)	0 (0)	10 (0.28)	26 (0.74)	0 (0)
	Mixed Transuranic Waste	ft^3 (m^3)	16 (0.45)	23 (0.65)	37 (1.05)	8 (0.23)
	Total Radioactive Waste	ft^3 (m^3)	3,493 (98.9)	6,215 (176.0)	10,220 (289.4)	3,758 (106.4)
Chemical Waste	RCRA Hazardous Waste[e] (with MESA)	kg	55,852	74,358	92,314 (93,514)	53,123
	TSCA (PCBs and Asbestos)[f]	kg	147,055[c]	122,000	122,000	122,000
	Non-RCRA Chemicals[g]	kg	69,321[c]	92,290	114,576	65,934
	Biohazardous[g]	kg	2,463[c]	3,279	4,071	2,343
	Recyclable Materials[g]	kg	60,768[c]	80,903	100,439	57,799
	Total Chemical Waste (with MESA)	kg	340,317	379,298	441,429 (442,629)	305,819
Solid Waste		kg	0.6 M	0.6 M	0.6 M	0.6 M
		m^3	2,022	1,955	2,022	1,955
NOISE/VIBRATION						
SNL/NM Estimated Number of Noise/Vibration-Producing Tests		tests/day	4.1	5.5	15.6	1.5

Table 3.6–2. Comparison of Parameters Used to Analyze Selected Facilities Under the No Action, Expanded Operations, and Reduced Operations Alternatives (concluded)

RESOURCE AREA	UNITS	BASELINE	NO ACTION ALTERNATIVE (2008)	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
SOCIOECONOMICS[h]					
Employment[i]	FTEs	7,652 SNL/NM 18,826 (indirect)	8,035 SNL/NM 19,765 (indirect)	8,417 SNL/NM 20,706 (indirect)	7,422 SNL/NM 18,259 (indirect)
Payroll	dollars	480 M SNL/NM 580 M (indirect)	500 M SNL/NM 610 M (indirect)	530 M SNL/NM 640 M (indirect)	470 M SNL/NM 560 M (indirect)
Expenditures	dollars	1.43 B SNL/NM 2.50 B (indirect)	1.50 B SNL/NM 2.63 B (indirect)	1.57 B SNL/NM 2.75 B (indirect)	1.39 B SNL/NM 2.43 B (indirect)

Source: SNL/NM 1998a
ac: acre
B: billion
Ci: curies
D&D: decontamination and decommissioning
FTE: full-time equivalent
ft^3: cubic feet
g: gram
gal: gallon
HSWA: *Hazardous Solid Waste Amendment*
HWMF: Hazardous Waste Management Facility
KAFB: Kirtland Air Force Base
kg: kilogram
M: million
m^3: cubic meter
mi: mile
mi^2: square mile
MWh: megawatt-hour
MESA: Microsystems and Engineering Sciences Applications
PCB: polychlorinated biphenyls
RCRA: *Resource Conservation and Recovery Act*
yr: year

[a] 60 psi
[b] Sites that cannot be removed from HSWA permit because of ongoing activities
[c] Ten-year quantities are sums of annual interpolated quantities.
[d] Quantities do not include special operations or legacy waste and differ from those in Table 3.6–1.
[e] HWMF managed.
[f] 1997 was used as the base year as 1996 was abnormal for PCBs and asbestos wastes.
[g] Multipliers, based on the proportional increase/decrease of hazardous waste, were used for projection of other wastes and materials recycled.
[h] Bounding analysis based on parameters presented in DOE 1997j.
[i] Section 4.12, Affected Environment, differs slightly, using 6,824 full-time employees.
[j] Includes wastes from MESA, which are small in quantity.
[k] Excludes MESA construction costs.

Note: Waste totals bound SNL/NM, DOE, and other small DOE-funded activities. Unless otherwise noted, MESA would not change quantities presented in the Expanded Operations Alternative.

Table 3.6–3. Comparison of Potential Consequences of Continued Operations at SNL/NM

RESOURCE AREA		NO ACTION ALTERNATIVE	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
Land Use		No changes projected in classification or ownership	Same as No Action Alternative	Same as No Action Alternative
Visual Resources		Changes would be minor and transitory. Projected new construction in already developed areas	Same as No Action Alternative	Same as No Action Alternative
Infrastructure		All projected activities within capacities of existing road, waste management, and utility systems	Same as No Action Alternative	Same as No Action Alternative
Water Use (with MESA)		440-463 M gal/yr	495 M gal/yr (499 M gal/yr)	416 M gal/yr
Geology and Soils	Slope Stability	SNL/NM activities are not anticipated to destabilize slopes.	Same as No Action Alternative	Same as No Action Alternative
	Soil Contamination	Minimal deposition of contaminants to soils and continued removal of existing contaminants under the ER Project	Same as No Action Alternative	Same as No Action Alternative
Water Resources and Hydrology	Groundwater Quality	TCE above MCL from SNL/NM disposal activities is present in groundwater beneath the Chemical Waste Landfill (TA-III) and TA-V. Petroleum hydrocarbon components have been detected in groundwater beneath the Lurance Canyon Burn Site. No future activities are anticipated to cause further groundwater contamination.	Same as No Action Alternative	Same as No Action Alternative
	Groundwater Quantity	SNL/NM groundwater use is projected to account for 11% of local aquifer drawdown and 1% of basin-wide use. The potential consequence is considered adverse.	SNL/NM groundwater use is projected to account for 12% of local aquifer drawdown and 1% of basin-wide use.	Same as No Action Alternative

Table 3.6–3. Comparison of Potential Consequences of Continued Operations at SNL/NM (continued)

RESOURCE AREA		NO ACTION ALTERNATIVE	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
Water Resources and Hydrology (continued)	Surface Water Quality	No contaminants attributable to SNL/NM activities have been detected in water samples collected onsite. No future activities are anticipated to cause surface water contamination.	Same as No Action Alternative	Same as No Action Alternative
	Surface Water Quantity	SNL/NM s projected portion of Rio Grande flow is 0.07%.	Same as No Action Alternative	Projected portion of Rio Grande flow is 0.06%
Biological and Ecological Resources		Impacts projected for biological or ecological resources are low to negligible.	Same as No Action Alternative	Same as No Action Alternative
Cultural Resources[a]		Potential for impacts to cultural resources is low to negligible. Explosive testing debris and shrapnel, off-road vehicle traffic, and unintended fires present a low to negligible potential for impacts. SNL/NM security would likely result in continued protection of archaeological sites.	Same as No Action Alternative	Same as No Action Alternative
Air Quality	Stationary Source Criteria Pollutants	Concentrations would be below the most stringent standards, which define the pollutant concentrations below which there are no adverse impacts to human health and the environment.	Same as No Action Alternative	Same as No Action Alternative
	Nonradiological Air Quality	Modeling results (summary) Carbon monoxide (8 hours): 57% of standard Lead (quarterly): 0.07% of standard Nitrogen dioxide (annually): 30% of standard Total suspended particulates (annually): 69% of standard Sulfur dioxide (annually)		

Table 3.6–3. Comparison of Potential Consequences of Continued Operations at SNL/NM (continued)

RESOURCE AREA		NO ACTION ALTERNATIVE	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
Air Quality (continued)	Chemical Pollutants	Concentrations are below regulatory standards and human health guidelines.	Same as No Action Alternative	Same as No Action Alternative
Nonradiological Air Quality (continued)	Mobile sources (percent of Bernalillo county mobile-source carbon monoxide emissions)	4.6	5.1	4.5
	Fire testing facilities	Chemical concentrations are below OEL/100 guideline.	Same as No Action Alternative	Same as No Action Alternative
Radiological Air Quality	MEI dose	0.15 mrem/yr	0.51 mrem/yr	0.02 mrem/yr
	Collective ROI dose	5.0 person-rem/yr	15.8 person-rem/yr	0.80 person-rem/yr
	Average individual dose within ROI	6.8×10^{-3} mrem/yr	2.16×10^{-2} mrem/yr	1.1×10^{-3} mrem/yr
Human Health and Worker Safety	MEI public risk (from radiation)	7.5×10^{-8} LCF/yr	2.6×10^{-7} LCF/yr	8.0×10^{-9} LCF/yr
	ROI population risk to public (from radiation)	2.5×10^{-3} LCF/yr	7.9×10^{-3} LCF/yr	4.0×10^{-4} LCF/yr
	Fatal SNL/NM worker occupational injuries	none	Same as No Action Alternative	Same as No Action Alternative
	Average radiation-badged SNL/NM worker dose (risk)	47 mrem/yr (1.9×10^{-5} LCF/yr)	Same as No Action Alternative	Same as No Action Alternative

Table 3.6–3. Comparison of Potential Consequences of Continued Operations at SNL/NM (continued)

RESOURCE AREA		NO ACTION ALTERNATIVE	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
Human Health and Worker Safety (continued)	Nonfatal SNL/NM worker occupational injuries/illnesses	311/yr	326/yr	287/yr
	Occupational SNL/NM worker chemical exposures	1-2/yr	Same as No Action Alternative	Same as No Action Alternative
	Environmental risk to public (from chemical exposures)	$<1x10^{-6}$ ELCR	Same as No Action Alternative	Same as No Action Alternative
Transportation	Transportation population risk within ROI (from radiation)	$8.3x10^{-4}$ LCF/yr (1.7 person-rem)	$2.5x10^{-3}$ LCF/yr (4.9 person-rem)	$2.0x10^{-4}$ LCF/yr (0.4 person-rem)
	Total transportation population risk (from radiation)	0.1 LCF/yr	0.33 LCF/yr	$4.5\ x10^{-2}$ LCF/yr
	Traffic accident fatalities	0.49/yr	1.3/yr	0.18/yr
	Total transportation population risk (from truck emissions)	0.03 LCF/yr	0.06 LCF/yr	0.01 LCF/yr
Waste Generation (Annual)	Management capability (infrastructure)	All projected activities are within capacities of existing facilities and systems.	Same as No Action Alternative	Same as No Action Alternative
	Total radioactive waste	Up to 176 m^3	Up to 289 m^3	Up to 106 m^3
	Total chemical waste	Up to approximately 379,000 kg	Up to approximately 441,000 kg (with MESA approximately 443,000 kg)	Up to approximately 306,000 kg

Table 3.6–3. Comparison of Potential Consequences of Continued Operations at SNL/NM (concluded)

RESOURCE AREA		NO ACTION ALTERNATIVE	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
Noise and Vibration		Impulse noise-producing test activities projected to increase 35% over 1996 level to 1,435 tests by 2008. Effects would be limited to windows rattling or startle reaction. Background noise levels would continue at current levels from generators, air conditioners, and ventilation systems, but increase due to additional vehicular traffic, aircraft noise, and temporary construction projects (range from 50 to 70 dB).	There would be a 250% increase in test activities over 1996 levels, to 2,638 per year, approximately one impulse noise event per hr for an 8-hr work day and a 261-day work year. Only a small fraction of these tests would be of sufficient magnitude to be heard or felt beyond the site boundary. The vast majority of tests expected to be below background noise levels for receptor locations beyond the KAFB boundary and would, therefore, be unnoticed in neighborhoods bounding the site.	Test activities would be 65% less than the 1996 level, 371 tests per year, an average of approximately 1.5 impulse noise tests per day. Only a small fraction of these tests would be of sufficient magnitude to be heard or felt beyond the site boundary. The vast majority of tests expected to be below background noise levels for receptor locations beyond the KAFB boundary and would, therefore be unnoticed in neighborhoods bounding the site.
Socioeconomics[a,b]	SNL/NM employment[c]	8,035	8,417	7,422
	SNL/NM total economic activity within the ROI	$4.13 B/yr	$4.33 B/yr	$3.81 B/yr
	Percent of ROI total economic activity	9.7	10.1	9.0
Environmental Justice[d]		No disproportionately high and adverse impacts to minority or low-income communities are anticipated.	Same as No Action Alternative	Same as No Action Alternative

B: billion
dB: decibel
ELCR: excess lifetime cancer risk
gal: gallon
hr: hour
kg: kilogram
LCF: latent cancer fatality
M: million
m^3: cubic meter
MCL: maximum contaminant level
MEI: maximally exposed individual
MESA: Microsystems and Engineering Sciences Applications
mrem: millirem
OEL: occupational exposure limit
ROI: region of influence
TA: technical area
TCE: trichloroethene
TCP: traditional cultural property
yr: year

[a] Under one of two configurations within the Expanded Operations Alternative, a developing proposal, still undergoing final conceptual design, the $300 million MESA Complex could be constructed starting in 2001 and ending in 2003, pending additional NEPA review (an environmental assessment).
[b] Bounding analysis is based on parameters presented in DOE 1997j.
[c] Section 4.12, Affected Environment, differs slightly, using 6,824 full-time employees. Base year in Section 5.3.12, Environmental Consequences (also see Table 3.6–2), used 7,652 full-time employees.
[d] No TCPs have been identified at SNL/NM. If specific TCPs are identified, Native American tribes will be consulted.

Table 3.6–4. Comparison of Potential High Consequences (condensed version) for Accident Scenarios at SNL/NM

RESOURCE AREA	NO ACTION ALTERNATIVE	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
SITE-WIDE EARTHQUAKE			
RADIOLOGICAL IMPACTS			
50-Mile Population (Additional Latent Cancer Fatalities)	8.1×10^{-2}	7.5×10^{-2}	7.5×10^{-2}
Maximally Exposed Individual (Increased Probability of Latent Cancer Fatality)	8.6×10^{-6}	7.7×10^{-6}	7.7×10^{-6}
Noninvolved Worker (Increased Probability of Latent Cancer Fatality)	3.1×10^{-2}	3.0×10^{-2}	3.0×10^{-2}
CHEMICAL IMPACTS			
Onsite Persons at Risk of Exposure Exceeding ERPG-2 Levels	423	423(306)[a]	Same as No Action Alternative
CATASTROPHIC ACCIDENT SINGLE FACILITY			
RADIOLOGICAL IMPACTS			
ACRR Medical Isotopes Production			
50-mile population (additional latent cancer fatalities)	1.6×10^{-6} to 4.9×10^{-3}	Same as No Action Alternative	Same as No Action Alternative
Maximally Exposed Individual (increased probability of latent cancer fatality)	1.0×10^{-6} to 4.9×10^{-7}	Same as No Action Alternative	Same as No Action Alternative
Noninvolved Worker (increased probability of latent cancer fatality)	4.9×10^{-8} to 7.6×10^{-5}	Same as No Action Alternative	Same as No Action Alternative
Hot Cell Facility			
50-mile population (additional latent cancer fatalities)	1.6×10^{-6} to 7.9×10^{-2}	Same as No Action Alternative	Same as No Action Alternative
Maximally Exposed Individual (increased probability of latent cancer fatality)	1.0×10^{-10} to 6.6×10^{-6}	Same as No Action Alternative	Same as No Action Alternative
Noninvolved Worker (increased probability of latent cancer fatality)	4.2×10^{-9} to 7.4×10^{-6}	Same as No Action Alternative	Same as No Action Alternative
Sandia Pulsed Reactor			
50-mile population (additional latent cancer fatalities)	1.2×10^{-3} to 9.2×10^{-3}	Same as No Action Alternative	Same as No Action Alternative
Maximally Exposed Individual (increased probability of latent cancer fatality)	1.5×10^{-7} to 8.4×10^{-7}	Same as No Action Alternative	Same as No Action Alternative
Noninvolved Worker (increased probability of latent cancer fatality)	2.5×10^{-4} to 3.8×10^{-3}	Same as No Action Alternative	Same as No Action Alternative

ACRR: Annular Core Research Reactor
ERPG-2: Emergency Response Planning Guideline Level 2

Table 3.6–4. Comparison of Potential Consequences for Accident Scenarios at SNL/NM (concluded)

RESOURCE AREA	NO ACTION ALTERNATIVE	EXPANDED OPERATIONS ALTERNATIVE	REDUCED OPERATIONS ALTERNATIVE
ACRR-Defense Programs Configuration			
50-mile population (additional latent cancer fatalities)	1.3×10^{-3} to 9.0×10^{-3}	Same as No Action Alternative	Not operational
Maximally Exposed Individual (increased probability of latent cancer fatality)	1.7×10^{-7} to 1.0×10^{-6}	Same as No Action Alternative	Not operational
Noninvolved Worker (increased probability of latent cancer fatality)	1.2×10^{-5} to 2.2×10^{-4}	Same as No Action Alternative	Not operational
CHEMICAL IMPACTS			
Technical Area-I			
Persons at risk of exposure exceeding ERPG-2 Levels			
Arsine	409	409/(558)[a]	Same as No Action Alternative
Chlorine	141	Same as No Action Alternative	Same as No Action Alternative
Phosphine	100	Same as No Action Alternative	Same as No Action Alternative
Thionyl Chloride	55	Same as No Action Alternative	Same as No Action Alternative
EXPLOSIVE IMPACTS			
Technical Area-I			
Distance (feet) to reach 2 psi (Damage to cinder block walls)	617	Same as No Action Alternative	Same as No Action Alternative
Distance (feet) to reach 10 psi (rupture of 50% of eardrums)	210	Same as No Action Alternative	Same as No Action Alternative
Distance (feet) to reach 50 psi (50% fatalities)	101	Same as No Action Alternative	Same as No Action Alternative

ERPG: emergency response planning guideline
ACRR: Annular Core Research Reactor
MESA: Microsystems and Engineering Sciences Applications
psi: pounds per square inch
[a] Expanded Operations Alternative with MESA Complex configuration

3.6.3 Geology and Soils

No activities planned for any of the alternatives would present a potential for slope destabilization. Slope instability has not been an issue in past SNL/NM operations and probably would not be a concern in the future. Existing soil contamination is being cleaned up through SNL/NM's Environmental Restoration (ER) Project, which is scheduled for completion between 2003 and 2005. Under the Expanded Operations Alternative, there would be the potential for increased deposition of soil contaminants in outdoor testing areas. Potential contaminants would include DU fragments, explosive residue, and metals contained in the weapons used in the tests. SNL/NM performs periodic sampling and radiation surveys in these testing areas. DU fragments are collected after tests. These areas are not accessible to the general public.

If implemented, the MESA Complex configuration for the Expanded Operations Alternative would have a negligible effect on geology or soil resources.

3.6.4 Water Resources and Hydrology

Groundwater contamination attributable to known SNL/NM activities is present at three sites: the Chemical Waste Landfill (CWL) in TA-III; beneath the liquid waste disposal system, septic tanks, and leach fields in TA-V; and the Lurance Canyon Burn Site in the eastern portion of KAFB. Investigations and cleanup planning are ongoing at these sites, and final plans must be approved by the New Mexico Environment Department. Under a no-cleanup scenario at the CWL, the only contaminant exceeding U.S. Environmental Protection Agency concentration limits in groundwater would be trichloroethene (TCE), which occurs in a plume extending 410 ft from the CWL. It is important to note the contamination at these sites is believed to be a result of past activities and the level of contamination is not expected to increase under the alternatives. The TCE would not impact drinking water supplies because the nearest water supply well is approximately 4 mi from the CWL. Groundwater investigation would continue at an additional location where the source of potential contamination has not been identified. Investigation and cleanup at locations with groundwater contamination would continue at the same rate under each of the three alternatives.

The estimated SNL/NM portion of local (in the immediate vicinity of KAFB) aquifer drawdown from 1998 to 2008 would range from 11 to 12 percent for all alternatives. Local drawdown would range from less than 1 to 28 ft across KAFB during this period. The potential consequence is considered adverse. This drawdown would not have an immediate effect on other water users, spring flow, or land subsidence. Water demand under each alternative would be within existing KAFB water rights.

No contaminants attributable to SNL/NM activities have been detected in surface water samples collected onsite.

SNL/NM has little effect on the quantity of surface water in arroyos or the Rio Grande. The combined excess storm water runoff from SNL/NM facilities and discharge to Albuquerque's Southside Water Reclamation Plant would contribute from 0.06 to 0.07 percent to the annual Rio Grande flow under all alternatives, with no measurable impacts to the Rio Grande.

If implemented, the MESA Complex configuration for the Expanded Operations Alternative would further increase local drawdown and SNL/NM's contribution of runoff and wastewater discharge.

3.6.5 Biological and Ecological Resources

Beneficial impacts to biological and ecological resources would occur under all alternatives. Restricted access and limited development and use have benefited biological resources at the KAFB. For example, the absence of livestock grazing has improved the quality of the grasslands in relation to the region.

SNL/NM operations in TAs-I, -II, and -V would continue to occur primarily inside buildings. Under all alternatives, proposed construction (analyzed and approved in separate NEPA documents) would remove small areas of vegetation, but would not affect the viability of the plant communities. Proposed activities could result in the local displacement of wildlife. There would be slightly increased levels of noise and activity under the Expanded Operations Alternative. Observations indicate that wildlife has become accustomed to the noise and activities that currently exist. Data from raptor surveys of KAFB support this conclusion, as raptor species at KAFB return to the same nest sites each year. Outdoor activities at TA-III and the Coyote Test Field would continue to affect small localized areas.

Limited site access and management of the biological resources by SNL/NM, KAFB, and the U.S. Forest Service would continue to benefit the animals and plants, including sensitive species on KAFB.

If implemented, the MESA Complex configuration for the Expanded Operations Alternative would have a negligible effect on biological and ecological resources. The MESA Complex would be built in a heavily developed area on land that has been largely disturbed and that currently contains structures.

3.6.6 Cultural Resources

Restricted access in association with activities at certain facilities would continue to have a beneficial effect on prehistoric and historic archaeological resources because it would protect the resources from vandalism, theft, or unintentional damage. For all three SWEIS alternatives, there would continue to be a potential for impacts to prehistoric and historic archaeological resources. These impacts would derive from explosive testing debris and shrapnel produced as a result of outdoor explosions, off-road vehicle traffic, and unintended fires and fire suppression. However, the potential for impacts due to these factors would be minimal under all three alternatives.

As a result of consultations with 15 Native American tribes, no traditional cultural properties (TCPs) were identified at SNL/NM; however, consultations are continuing with some tribes. Several tribes have requested that they be consulted under the *Native American Graves Protection and Repatriation Act* (NAGPRA) if human remains are discovered within the region of influence. If specific TCPs are identified in the future, any impacts of SNL/NM activities on the TCP and any impacts of restricting access to the TCP would be determined in consultation with Native American tribes, and further NEPA review would be conducted, if appropriate.

If implemented, the MESA Complex configuration for the Expanded Operations Alternative would have a negligible effect on cultural resources. The MESA Complex would be built in a heavily developed area on land that has been largely disturbed and that currently contains structures.

3.6.7 Air Quality

Concentrations of criteria and chemical pollutants in air would be below regulatory standards and human health guidelines. Under a worst-case, 24-hour scenario, the maximum concentrations of criteria pollutants from operation of the steam plant, electric power generator plant, boiler and emergency generator in Building 701, and 600-kw-capacity generator in Building 870b would represent a maximum of 96 percent of the allowable regulatory limit for several criteria pollutants (nitrogen dioxide, total suspended particulates (TSP), and particulate matter smaller than 10 microns in diameter [PM_{10}]) at a public access area (See Table 5.3.7–1).

The Federal and state regulatory standards, in general, are set to provide for an ample margin of safety below any pollutant concentration that might be of concern.

The methodology used in the criteria pollutant analysis also produces maximum concentration projections that are very conservative. For example, 100 percent of the maximum concentration of air pollutants projected for Cobisa Power Station (located 5 mi west of the National Atomic Museum) was added to the background concentration calculated for the Steam Plant location (near the museum). Also, the maximum concentrations of air pollutants, from a monitoring station measuring contributions from the surrounding community that are dominated by traffic emissions, were added to the worst-case contribution of pollutants from operating SNL/NM's diesel fuel-powered backup generators and fuel oil-powered Steam Plant boilers. Consequently, though close to the thresholds, these calculated concentrations for nitrogen dioxide, TSP, and PM_{10} are considered to be very conservative.

Based on the analysis of stationary and mobile source emissions, annual carbon monoxide emissions from SNL/NM would be less than 1996 emissions under any alternative.

With the exception of one chemical (chromium trioxide), concentrations of noncarcinogenic chemicals emitted from 12 facilities on SNL/NM were projected to be below screening levels based on occupational exposure limit (OEL) guidelines generally referenced to determine human health impacts. Concentrations of carcinogenic chemical emissions would pose little cancer risk (less than 1 in 1 million) to onsite workers or the general public. Chemical emissions would be highest for the Expanded Operations Alternative, although they would still be below levels that would affect public health.

The impact from emissions of criteria pollutants for the No Action and Expanded Operations Alternatives would be essentially the same. The major source of criteria pollutants (other than mobile sources) would be the steam plant that supplies steam to the facilities for heating. No increase in floor space is anticipated under the Expanded Operations Alternative; therefore, no increase in steam production would be required. The Reduced Operations Alternative would require less steam, resulting in lower emissions from the steam plant.

If implemented, the MESA Complex configuration for the Expended Operations Alternative would become operational after 2003, and CSRL operations would be relocated and emissions of 1,2-dichloroethane would no longer occur (see Table 5.4.7–3) due to changes in chemical inventory requirements. No new or additional carcinogenic chemicals would be associated with MESA operations. Airborne particulate matter levels would be elevated during the construction period. The temporary increases are expected to be small and would result in negligible air quality impacts.

The radiological dose impacts due to the annual air emissions from SNL/NM facilities during normal operations under each of the alternatives would be much lower than the regulatory National Emissions Standards for Hazardous Air Pollutants (NESHAP) limit of 10 mrem/yr to a maximally exposed individual (MEI). The calculated radiological dose to an MEI would be 0.15 mrem/yr under the No Action Alternative; 0.51 mrem/yr under the Expanded Operations Alternative; and 0.02 mrem/yr under the Reduced Operations Alternative. The dose to an MEI under each alternative would be small in comparison to the average individual background radiation dose of 360 mrem/yr.

The calculated collective dose to the population within 50 mi of SNL/NM from the annual radiological air emissions due to the SNL/NM operations under each alternative would be 5.0 person-rem per year under the No Action Alternative; 15.8 person-rem per year under the Expanded Operations Alternative; and 0.80 person-rem per year under the Reduced Operations Alternative. The collective dose would be much lower than the collective dose of 263,700 person-rem to the same population from background radiation.

If implemented, the MESA Complex configuration for the Expanded Operations Alternative would not produce radiological emissions.

3.6.8 Human Health

Routine releases of hazardous radiological and chemical materials would occur during SNL/NM operations. These releases would have the potential to reach receptors (workers and members of the public) by way of different environmental pathways. The levels of exposure to chemicals and radionuclides were assessed for each environmental medium determined to be a pathway for these releases.

The SWEIS impact analyses identified air as the primary environmental pathway having the potential to transport hazardous material from SNL/NM facilities to receptors in the SNL/NM vicinity. In the assessment of human health risk from air emissions, a number of receptor locations and possible exposure scenarios were analyzed. The total composite cancer health risk is the sum of potential chemical and radiation exposures, calculated from the radiation cancer health risk to the MEI, plus the upper bound chemical cancer health risk from a hypothetical worst-case exposure scenario. This very conservative estimate of maximum health risk is greater than any of the individual health risks based on more likely exposure estimates at specific receptor locations.

Maximally Exposed Individual

A hypothetical person who could potentially receive the maximum dose of radiation or hazardous chemicals.

Both the composite cancer health risk estimate of 1 in 385,000 and the cancer health risk estimates for specific receptor locations are below levels that regulators consider protective of public health. No adverse health effects would be expected from any of the three alternatives for SNL/NM. The small amounts of chemical carcinogens and radiation released from SNL/NM facilities would increase the maximally exposed individual lifetime risk of cancer for the hypothetical MEI by less than 1 chance in 434,000 under the No Action Alternative and by less than a possible 1 chance in 126,000 under the Expanded Operations Alternative. Noncancer health effects would not be expected based on hazard index values of less than 1. No additional nonfatal cancers, genetic disorders, or latent cancer fatalities (LCFs) would be expected in the population living within a 50-mi radius.

If the CSRL were replaced, as described in the MESA Complex configuration for the Expanded Operations Alternative, the number of chemicals of concern would decrease to six because there would be no emissions of 1,2-dichloroethane. A corresponding decrease in total excess lifetime cancer risk would occur (see Section 5.4.8.1).

3.6.9 Transportation

The SNL/NM material and waste truck traffic offsite would be projected to increase from 14.5 shipments per day (1996) to 34.4 shipments per day under the Expanded Operations Alternative. However, the SNL/NM truck traffic would comprise less than

0.03 percent of the total traffic, including all types of vehicles entering and leaving the Albuquerque area by way of interstate highways. Therefore, the impact under the Expanded Operations Alternative would be minimal. The total local traffic on roadways would be expected to increase by a maximum of 3.6 percent overall under the Expanded Operations Alternative.

The overall maximum lifetime fatalities from SNL/NM annual shipments of all types of materials and wastes due to SNL/NM operations were estimated to be 1.7 fatalities under the Expanded Operations Alternative. Of these estimates, 1.2 fatalities would be due to traffic accidents; 0.33 fatalities would be due to incident-free transport of radiological materials and wastes; and 0.06 fatalities would be due to air pollution from truck emissions.

The maximum lifetime LCFs in the population within a 50-mi radius were estimated, based on a population dose of 4.93 person-rem, to be 0.0025 from the annual transport of radiological materials and wastes.

If implemented, the MESA Complex configuration for the Expanded Operations Alternative would not change the number of shipments of materials and wastes. The SNL/NM workforce traffic would not increase because there would be no new employees.

3.6.10 Waste Generation

Generation of radioactive waste, hazardous waste, process wastewater, and nonhazardous solid wastes was reviewed. The goal of the review was to determine the adequacy of existing onsite and offsite storage, treatment, and disposal capabilities. Storage capacity for all anticipated waste types would be adequate. Limited onsite hazardous and mixed waste treatment capacity would be within current permit limits. Most hazardous waste would be treated and disposed of offsite within the commercial sector. Commercial offsite capacity is currently adequate and would exceed anticipated future demand.

The recycling of wastes was not included in the modeling to bound actual projected waste quantities. LLW and LLMW would increase by a maximum of 198 percent (from 3,322 ft^3 to 9,897 ft^3 per year, Table 3.6–2) and 69 percent (from 153 ft^3 to 258 ft^3 per year, Table 3.6–2), respectively, under the Expanded Operations Alternative. One new operation, the Medical Isotopes Production Project, would be the major contributor to the LLW increase. Capacity currently exists to manage the waste generated from all operations at the Expanded Operations Alternative level.

If implemented, the MESA Complex configuration for the Expanded Operations Alternative would increase hazardous waste and LLW generation slightly (see Table 3.6–2). Under this configuration, the CSRL would undergo decontamination, decommissioning, and demolition and would generate approximately 2,000 tons of demolition debris (see Section 5.4.10.2, Special Projects).

Trends for all hazardous waste clearly show a significant reduction due to the implementation of pollution prevention protocols at SNL/NM. New procedures and recycling for the solid waste and process wastewater would have similar impacts on the nonhazardous waste volumes being generated.

3.6.11 Noise and Vibration

The No Action Alternative would enable SNL/NM to operate at current planned levels, which include baseline background noise levels and short-term noise impacts from SNL/NM test activities. Impulse noise-producing test activities would increase an estimated 35 percent over the 1996 number of test activities by 2008.

Projections under the Expanded Operations Alternative indicate a 250 percent increase in the number of impulse noise tests over 1996 levels. This would result in an average of approximately 1 impulse noise event per hour for an 8-hour work day, based on a 261-day work year.

The projected frequency of impulse noise events for the Reduced Operations Alternative would be 65 percent less than the 1996 levels, resulting in an average of 1.5 impulse noise tests per day.

Only a small fraction of these tests would be loud enough to be heard or felt beyond the site boundary. The vast majority of tests would be below background noise levels for locations beyond the KAFB boundary and would be unnoticed in neighborhoods bounding the site. Ground vibrations would remain confined to the immediate test area.

If implemented, the MESA Complex configuration for the Expanded Operations Alternative would not affect baseline background noise levels and short-term noise events. Temporary increases in noise levels during construction are expected from operation of heavy construction equipment and vehicle traffic.

3.6.12 Socioeconomics

Direct SNL/NM employment projections range from 7,422 (Reduced Operations Alternative) to 8,417

(Expanded Operations Alternative), in comparison to 7,652 full-time SNL/NM employees in the base year. These employment changes would change regional population, employment, personal income, and other socioeconomic measures in the region by less than 1 percent.

If implemented, the MESA Complex configuration for the Expanded Operations Alternative would cost approximately $300 M. The DOE anticipates that the construction of the facility would employ several hundred short-term workers and would probably result in a small temporary increase in total employment within the region. A substantial portion of the dollars spent on materials would flow through the wholesale and retail trade sectors of the regional economy. MESA would be designed for 500 to 550 employees. New employees would be unlikely because the DOE would transfer employees working in existing facilities to the new facilities.

3.6.13 Environmental Justice

Based on the analyses of other impact areas, the DOE would not expect any environmental justice-related impacts from the continued operation of SNL/NM under any of the alternatives. Resource areas of potential concern were evaluated on an individual basis with respect to minority populations and low-income populations. Three resource areas evaluated individually were water resources, cultural resources, and transportation.

If implemented, the MESA Complex configuration for the Expanded Operations Alternative would not create any environmental justice-related impacts.

3.6.14 Accidents

At SNL/NM, accidents could occur that would affect workers and the public. Potential accidents with the largest impacts would involve radioactive materials in TA-V facilities and hazardous chemicals in TA-I facilities. In most instances, involved workers (those individuals located in the immediate vicinity of an accident) would incur the largest risk of serious injury or fatality, because, for most accidents, the magnitude of the damaging effects are highest at the point of the accident and diminish with increasing distance. This would apply, for example, to releases of radioactive and chemical materials, explosions, fires, airplane crashes, earthquakes, and similar events. In some situations, however, the mitigating effects of structural barriers, personal protection equipment, and engineered safety features may offer greater protection for close-in workers than for others in the general vicinity of the accident.

In TA-I, under all three alternatives, there could be numerous situations in laboratory rooms where workers could be accidentally exposed to small amounts of dangerous chemicals. The potential also exists in TA-I for a catastrophic accident, such as an airplane crash into a facility or an earthquake, in which multiple dangerous chemicals could be released and expose onsite individuals to harmful or fatal chemical concentrations. Large quantities of hydrogen stored in outside areas of TA-I could also explode as a result of a catastrophic event and cause serious injury or fatality to involved workers and other nearby onsite individuals. The probability of a catastrophic chemical or explosive accident with serious consequences is low (less than once in a thousand years). Should such an accident occur, emergency procedures, mitigating features, and administrative controls would minimize its adverse impacts.

Under the Expanded Operations Alternative, the MDL and the CSRL have two configurations.

First, the MDL and the CSRL would remain in their present configuration. In the event of a catastrophic accident, such as an airplane crash into either facility (but not both), the dominant chemical release would be as much as 106.41 pounds of chlorine from the MDL or as much as 65 pounds of arsine from the CSRL. If one of these accidents were to occur, 141 persons in the vicinity of the MDL or 409 persons in the vicinity of the CSRL could be exposed to Emergency Response Planning Guideline Level 2 (ERPG-2) concentration. In the event of an earthquake, simultaneous release of chemicals is possible and as many as 423 persons could be exposed in TA-I.

In the second configuration, the chemical inventory and operations that were part of the CSRL missions would be performed in the proposed MESA Complex. In the event of a catastrophic accident such as an airplane crash into MESA, the dominant chemical released would be 80 pounds of arsine under the conservative assumption that all the arsine is stored in one location. The catastrophic release of 80 pounds of arsine could result in the exposure of as many as 558 persons, which includes both onsite and offsite people. In the event of an earthquake, the MESA arsine storage facility would remain intact and no arsine would be released. However, other facilities could fail, resulting in the exposure of as many as 306 persons to ERPG-2 concentration.

The potential for accidents would exist in TA-V that would cause the release of radioactive materials, causing injury to workers, onsite individuals, and the public. The magnitudes of impacts for the worst-case accident, an earthquake, would be minimal for all alternatives. If an earthquake occurred, the impacts would range from an approximate 1 in 33 increase in probability of an LCF for a noninvolved worker on the site to 1 in 120,000 for a maximally exposed member of the public. For the entire population residing within 50 mi of SNL/NM, less than one additional LCF would be expected. Involved workers, as in the case of chemical accidents, would incur the largest risk of injury or fatality in the event of almost any accident because of their close proximity to the hazardous conditions.

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