5.3.9 Transportation

Under the No Action Alternative, transportation impacts were assessed for each of three ROIs: KAFB; major Albuquerque roadways; and major roadways between Albuquerque and specific waste disposal facilities, vendors, and other DOE facilities. This analysis involved estimating the number of trips made by SNL/NM-associated vehicles under normal operations in each of these transportation corridors. Transportation projections were based on data provided by SNL/NM or material inventory multipliers developed and presented in Appendix A.

5.3.9.1 Transportation of Material and Wastes

The number of material shipments received by SNL/NM is generally proportional to total SNL/NM material consumption. According to facility projections, material consumption under the No Action Alternative would increase by 84 percent overall through the year 2003, and by 96 percent through the year 2008. Therefore, total material shipments would also increase during the same time frame, although not necessarily for all types of material.

Radioactive and explosive material shipments are often delivered through government carriers, unless the quantities and activities being transported are low enough to meet the Federal guidelines and restrictions in place for authorized commercial transporters. Government carriers operate on an as-needed basis; thus, the increase in material inventory under the No Action Alternative would result in a similar increase in these kinds of shipments.

Due to their primary shipment method, there would be very little change to the number of chemical shipments made to SNL/NM. Chemicals that are ordered infrequently and in small quantities under the just-in-time (JIT) program are usually shipped to SNL/NM by way of commercial carriers such as Federal Express and United Parcel Service (UPS). These carriers make daily shipments to SNL/NM to deliver packages other than chemicals, and an increase in the volume of chemicals they handle per shipment would not generally increase shipment frequency. Similarly, major chemical vendors who deliver their own material, rather than use a commercial carrier, also usually make daily shipments to SNL/NM. Therefore, any increase in the volume of material that major vendors ship per load would not have an impact on the frequency of those shipments. Thus, chemical shipments would remain at approximately the same level regardless of the fluctuations in material consumption.

Considering the above factors, overall material transportation due to normal operations would increase by 50 percent over baseline levels through the year 2003 and by 52 percent through the year 2008. The anticipated annual and daily material receipts and shipments for each material category are presented in Table 5.3.9 1. The analysis assumed that SNL/NM has 250 work days per calendar year.

Waste Transportation

With the exception of solid waste, the amount of waste shipped from SNL/NM to disposal facilities correlates directly to SNL/NM waste generation levels. Overall, waste shipments offsite would also increase under the No Action Alternative. Waste numbers for 2003 and 2008 include waste currently disposed of at the KAFB landfill, approximately 741 shipments for all alternatives. The total anticipated waste shipments during all operations for each type of waste are presented in Table 5.3.9 2 and Appendix G, Table G.3 3.

This analysis indicates there would be an actual 302 percent increase in all offsite waste shipments through the year 2003 and a 305 percent increase through the year 2008 under the No Action Alternative (see Appendix G for details). Of this increase, 285 percent is considered to be waste currently disposed of at the KAFB landfill. This leaves real increases of 17 percent through 2003 and 20 percent through the year 2008.

Specials Projects

Two special project wastes, ER Project and legacy, were addressed separately due to their one-time operation/project status and in order to avoid skewing the SNL/NM normal operations impact. Legacy wastes would be anticipated to account for an additional 18 shipments of LLW, 3 shipments of LLMW, and 2 shipments of TRU/MTRU wastes over the 10-year time frame (see Figures 4.12 1, 4.12 2, and 4.12 3). In 1998 through 2000, the ER Project could account for up to an additional 312 offsite shipments of LLW, 101 offsite shipments of LLMW, 2 offsite shipments of RCRA waste, 5 offsite shipments of Toxic Substances Control Act (TSCA) waste, and 75 shipments of nonhazardous waste. Both of these special projects have been included within the total facility risks.

Offsite Receipts and Shipments of Material and Waste

The bounding case for this analysis assumed that each material and waste shipment is composed of two trips: one to and one from SNL/NM. Thus, in 2008, the total

Table 5.3.9 1. SNL/NM Annual Material Receipts/Shipments Under the No Action Alternative

MATERIAL TYPE		BASE YEAR (1997) ANNUAL SHIPMENTS	NO ACTION ALTERNATIVE ANNUAL SHIPMENTS	
			2003	2008
Radioactive		305	562	597
Radioactive (medical isotopes production)	*Receiving*	0	16	16
	Shipping	0	1,140	1,140
Chemical		2,750	2,750	2,750
Explosive		303	557	593
TOTAL		**3,358**	**5,025**	**5,096**

Sources: FWENC 1998a, b; SNL/NM 1998s, 1998z, 1998a

Table 5.3.9 2. Annual (Summary) Waste Shipments from Normal Operations Under the No Action Alternative

WASTE TYPE	BASE YEAR SHIPMENTS	2003 SHIPMENTS	2008 SHIPMENTS
LLW (1996)[a]	4	13	13
LLMW (1996)	1	3	3
Hazardous (RCRA+TSCA) (1997)	102	118	122
Recyclable[a,b] *(Hazardous and Nonhazardous) (1997)*	86	231	231
Solid[b] *(Municipal, Construction, and Demolition) (1997)*	51	650	650

Sources: Rinchem 1998a; SNL/NM 1998a, 1998y, n.d.(d)
LLMW: low-level mixed waste
LLW: low-level waste
MTRU: mixed transuranic
RCRA: *Resource Conservation and Recovery Act*
TRU: transuranic
TSCA: *Toxic Substances Control Act*
[a] Excludes decontamination and decommissioning
[b] Recyclable and solid wastes currently handled by the KAFB landfill could be shipped offsite in the future, contributing an additional 741 shipments.

number of trips made by material and waste transporters under this alternative would be 12,296 (total shipments x 2). Assuming that the year is comprised of 250 work days, the average work day traffic within KAFB contributed by these carriers would be approximately 49 trips. This comprises 0.17 percent of all SNL/NM commuter trips (28,522 trips per day) entering and exiting KAFB in 2008. The total SNL/NM vehicular traffic under this alternative would comprise 36 percent of total 2008 KAFB traffic. SNL/NM waste and material truck traffic would account for 0.06 percent of KAFB traffic. Therefore, the overall KAFB traffic would remain constant under the No Action Alternative.

Shipments of Material and Waste in the Albuquerque Area

Total SNL/NM placarded material and waste shipments comprise 0.96 percent of the total placarded truck traffic shipments entering the greater Albuquerque area during the base year (1996 or 1997). Although a 70-percent increase in SNL/NM placarded material and waste truck traffic would be expected by 2008, the SNL/NM truck component would represent only 1.4 percent of all placarded trucks entering Albuquerque. This increase includes waste currently managed at the KAFB landfill and new shipments from medical isotopes production. ER Project wastes and legacy wastes are addressed

Placarded Trucks

Trucks that carry any quantity of a hazardous material are required to have U.S. Department of Transportation (DOT) markings on each side and end. These trucks are called placarded trucks. These markings, requirements, and exclusions are defined in 49 CFR Part 172.500. There are nine categories of material (hazard class or division number) placards, such as explosive, radioactive, oxygen, flammable gas, and combustible. Examples are shown below.

separately under special projects. Thus, the impacts under the No Action Alternative would be negligible (see Table 5.3.9 3).

Table 5.3.9 3. 24-Hour Placarded Material and Waste Truck Traffic Counts Under the No Action Alternative

ROUTE (ALL TRAFFIC)[a]	BASE YEAR (1995) (480,577)[c]	2003 (526,712)[c]	2008 (555,547)[c]
I-25 North (52,400)	230	253	268
I-25 South (18,000)	94	103	110
I-40 West (16,400)	621	683	725
I-40 East (54,200)	569	626	664
TOTAL (141,000)	**1,514**	**1,665**	**1,767**
SNL/NM[d]	**14.5**	**24.3**	**24.6**

Sources: Scientific Services 1995, SNL/NM 1998a
I: Interstate
[a] Total vehicle count for all types of vehicles entering and departing Albuquerque
[b] All placarded trucks entering the city
[c] Bernalillo county population projections
[d] SNL/NM placarded trucks (daily average)

Shipments of Material and Waste Outside of Albuquerque

All material and waste transported by truck between SNL/NM and locations outside of Albuquerque must enter and depart the city by way of Interstate-25 or Interstate-40. Table 5.3.9 3 presents the impacts to those corridors from material and waste shipments under the No Action Alternative. The specific remote facility locations are listed in Section 4.11. Daily SNL/NM material and waste truck figures were derived for comparison purposes by dividing the annual waste and material shipment totals in Tables 5.3.9 1 and 5.3.9 2 by the approximately 250 work days in a calendar year.

Albuquerque population projections were also taken into consideration. The 2020 Socioeconomic Forecast projects a 30-percent population increase in Bernalillo county from the base year (1995) (MRGCOG 1997b), and it was assumed for the bounding case that this would increase proportionally at a rate of 1.2 percent per year for all traffic. For this analysis, it was assumed the total placarded truck traffic would also increase by 1.2 percent annually.

The SNL/NM overall material and waste truck traffic component would be expected to increase from 14.5 shipments per day to 24.6 shipments per day by 2008. While this would represent a 70-percent increase in SNL/NM shipments per day, SNL/NM shipments of

24.6 per day would represent only 1.4 percent of the total number of shipments (1,767) on the Albuquerque interstates. Furthermore, the SNL/NM truck traffic would comprise less than 0.015 percent of all traffic, including all types of vehicles, projected to be entering and departing Albuquerque in 2008. For the base year (1996 or 1997), waste leaving Albuquerque represented 35 percent of the total shipments, with an additional 20 percent going to Rio Rancho. Because most materials are supplied through the JIT vendors, origination points are generally not known. However, most vendors use local suppliers; therefore, in the base year, 82 percent of material was assumed to be provided locally, with the remaining 18 percent coming from outside Albuquerque. Thus, the impact to this ROI from the No Action Alternative would be negligible.

5.3.9.2 Other Transportation (Traffic)

Overall vehicular traffic impacts under the No Action Alternative were assessed by projecting the total increased number of SNL/NM commuter vehicles traveling to and from SNL/NM in 2003 and 2008. The term commuter includes all vehicles operated by SNL/NM employees, contractors, and visitors; DOE employees; and additional traffic, such as delivery vehicles.

Traffic on KAFB

Table 5.3.9 4 presents general anticipated traffic impacts at KAFB under the No Action Alternative. The number of SNL/NM commuter vehicles traveling to the site each work day was conservatively assumed to increase at the same rate as the SNL/NM work force level (Section 5.3.12, Socioeconomics). KAFB operations and commuter levels were assumed to remain constant through 2008. Based on this analysis, overall KAFB traffic would increase by 1.8 percent under this alternative. Air quality impacts resulting from traffic are discussed in Section 5.3.7.

Table 5.3.9 5 shows projected 24-hour KAFB vehicular flow for each of the three main gates under the No Action Alternative. It was assumed that the Carlisle and Truman gates would be used primarily by KAFB personnel and not by SNL/NM employees. For the bounding case for this analysis, it was assumed that the SNL/NM contribution to total KAFB flow at each gate would fluctuate by the same factor as the total fluctuation in SNL/NM traffic under this alternative.

Based on this analysis, the daily KAFB gate traffic would increase by 1.8 percent under the No Action Alternative. This minimal change would not have an appreciable impact on service at the gates.

Table 5.3.9 4. KAFB Daily Traffic Projections Under the No Action Alternative

COMPONENT	BASE YEAR (1996-1997)			2003			2008			CHANGE IN BASE YEAR BY 2008 (%)
	%	VEHICLES	TRIPS	%	VEHICLES	TRIPS	%	VEHICLES	TRIPS	
SNL/NM Commuters	36	13,582	27,164	37	14,125	28,250	37	14,261	28,522	5
KAFB Commuters	64	24,145	48,290	63	24,145	48,290	63	24,145	48,290	0
Total KAFB Commuter Traffic	**100**	**37,727**	**75,453**	**100**	**38,170**	**76,640**	**100**	**38,406**	**76,812**	**1.8**
SNL/NM Material & Waste Transporters	0.04	14.5	29	0.06	24.3	49	0.06	24.6	49	70[a]

Sources: SNL/NM 1997a, 1998a

[a] This increase represents inclusion of waste currently managed at the KAFB landfill and new shipments from medical isotopes production.

Table 5.3.9 5. Total KAFB Gate Traffic Under the No Action Alternative

GATE	BASE YEAR (1996)			NO ACTION ALTERNATIVE						% CHANGE IN BASE YEAR BY 2008
				2003			2008			
	24-HOUR SNL/NM[a]	24-HOUR TOTAL[b]	PEAK HOUR[c]	24-HOUR SNL/NM	24-HOUR TOTAL	PEAK HOUR	24-HOUR SNL/NM	24-HOUR TOTAL	PEAK HOUR	GATE TOTAL
Wyoming	7,141	19,835	1,941	7,427	20,121	1,972	7,498	20,192	1,976	1.8
Eubank	5,324	14,788	2,683	5,537	15,001	2,726	5,590	15,053	2,731	1.8
Gibson	8,108	22,523	1,571	8,432	22,847	1,596	8,513	22,928	1,599	1.8
Average	6,858	19,048	2,065	7,132	19,323	2,098	7,200	19,391	2,102	1.8

Sources: Bohannan-Huston 1995, SNL/NM 1997a

[a] SNL/NM commuter and transporter trips per day equals 36 percent of total KAFB trips per day

[b] Total KAFB trips per day

[c] Total KAFB trips per hour, 1996 traffic counts

Short-term adverse traffic impacts would potentially occur onsite during routine construction activities at KAFB due to traffic lane restrictions, reduced speeds in construction areas, and traffic increases in slowly moving heavy equipment. These common occurrences would take place during the modification of Gibson Boulevard to Eubank Boulevard, as part of a bypass of KAFB, or any other construction project. The degree of traffic impact would be a function of the location, extent of the project scope, and duration. Building construction and onsite roadway rehabilitation are currently planned under the No Action Alternative. Short-term circulation impacts would potentially occur if vehicles are re-routed to avoid construction areas. However, it is anticipated that adequate detour routes and signage would be provided and that the impacts would be minimal and limited in duration.

Traffic in the Albuquerque Area

To determine the traffic impacts in the Albuquerque traffic corridor, roadways most likely to be affected by SNL/NM traffic were selected for analysis. The bounding case used the projected SNL/NM traffic contributions from Table 5.3.9 5 to approximate the SNL/NM component of the total traffic count for each roadway. For worst-case impacts, the SNL/NM traffic component was assumed to be equivalent to the total SNL/NM traffic at the nearest gate. In actuality, a significant percentage of traffic would likely diffuse onto other nearby roads, which would greatly reduce the magnitude of the SNL/NM component. The SNL/NM component was also assumed to increase at the same rate on each roadway in proportion to the SNL/NM projected work force level.

Albuquerque population projections were also taken into consideration. The 2020 Socioeconomic Forecast (MRGCOG 1997b) projects a 30-percent population increase in Bernalillo county from the base year (1995), and it was assumed for the bounding case that this would increase proportionally at a rate of 1.2 percent per year. For this analysis, it was also assumed the total roadway traffic flow would increase by the same 1.2 percent annually. The projected impacts to these roadways under the No Action Alternative, according to the bounding case factors, are presented in Table 5.3.9 6.

This analysis indicates that although SNL/NM traffic would increase slightly, the SNL/NM component of total Albuquerque traffic would actually decrease from 19 percent to 17 percent by 2008. This is due to the general population growth in Bernalillo county, which would exceed SNL/NM s growth rate.

Traffic Outside of Albuquerque

The additional local SNL/NM traffic under the No Action Alternative would have minimal impacts on transportation routes between Albuquerque and other DOE facilities, vendors, and disposal facilities (see Section 4.11 for a list of these facilities). In a worst-case assessment, the baseline year SNL/NM component would represent an average 18.8 percent of the total traffic count (144,000 vehicles per day) on major roadways entering and departing Albuquerque. This assumes that all SNL/NM traffic would actually enter and depart Albuquerque by way of the interstates every day, although a significant portion of SNL/NM traffic would more likely diffuse onto other roadways and remain in Albuquerque. Regardless, the overall SNL/NM traffic component would actually decrease under the No Action Alternative by the year 2008. This is due to the projected general population growth in Bernalillo county, which would exceed SNL/NM s growth rate.

Offsite and onsite transportation activities were compared to determine if offsite shipments were conservatively bounding for estimating risk to the public (see Appendix G). The primary factor considered was distance traveled and the potential for public exposure. The longest anticipated route for a routine shipment was selected for a conservative analysis. Mountaintop, Pennsylvania, was chosen for radioactive material and Silverdale, Washington, was chosen for explosive material. Both locations exceed 1,500 mi from SNL/NM. The longest distance chosen for onsite transfers was 12 mi. One 1,500-mi shipment would approximate 125 onsite transfers of 12 mi. Onsite transfers would be in areas of very limited public access compared to offsite transportation activities, providing another level of public protection. Based on these assumptions, offsite transportation hazards would bound onsite transfers.

5.3.9.3 Transportation Risks Associated with Normal Operations

Incident-Free Exposure

The bounding case for this analysis used the representative distances traveled by SNL/NM waste and material carriers, as listed in Table 5.3.9 7. These distances were based on the average distance traveled by trucks in route to other facilities under the No Action Alternative.

Truck emissions are a function of the number of truck shipments to and from SNL/NM. The bounding case for

Table 5.3.9 6. Albuquerque Daily Traffic Counts Under the No Action Alternative

ROADWAY		BASE YEAR[a] (480,577)[b]		2003 (526,712)[b]		2008 (555,547)[b]		% CHANGE IN BASE YEAR BY 2008
		DAILY[c]	PEAK[d]	DAILY	PEAK	DAILY	PEAK	DAILY
Gibson west at Louisiana	*TOTAL*	15,671	2,066	17,175	2,264	18,116	2,388	+15.6
	SNL/NM	8,108	1,069	8,432	1,111	8,513	1,122	+5
	% SNL/NM	52		49		47		-9.6
Wyoming south of Lomas	*TOTAL*	37,639	2,293	41,252	2,513	43,511	2,651	+15.6
	SNL/NM	7,141	435	7,427	452	7,498	457	+5
	% SNL/NM	19		18		17		-10.5
Eubank south of Copper	*TOTAL*	14,572	1,852	15,971	2,030	16,845	2,141	+15.6
	SNL/NM	5,324	677	5,537	704	5,590	710	+5
	% SNL/NM	37		35		33		-10.8
Interstate 25 at Gibson[e]	*TOTAL*	91,000		99,736		105,196		+15.6
	SNL/NM	8,108		8,432		8,513		+5
	% SNL/NM	8.9		8.5		8.1		-9.0
Interstate 40 at Eubank[e]	*TOTAL*	90,300		98,969		104,387		+15.6
	SNL/NM	5,324		5,697		5,590		+5
	% SNL/NM	5.9		5.8		5.4		-8.5
Wyoming north of KAFB gate	*TOTAL*	20,272	1,749	22,218	1,917	23,434	2,022	+15.6
	SNL/NM	7,141	612	7,427	636	7,498	642	+5
	% SNL/NM	35		33		32		-8.6

Sources: MRGCOG 1997b, 1997c; SNL/NM 1997b, 1998a; UNM 1997b

[a] The base year varies depending on information provided in the *Facilities and Safety Information Document* (SNL/NM 1997b). Typically, the base year is 1996 or 1997, as appropriate.

[b] Bernalillo county population projections

[c] Vehicles per day, *1996 Traffic Flows for the Greater Albuquerque Area*

[d] Vehicles per hour, *1996 1998 Traffic Counts*

[e] Peak hour counts are not available for this intersection.

a truck emissions impact analysis assumed that the greatest risk occurs when shipments are transported through urban areas, such as the Albuquerque transportation corridor, because these areas are most susceptible to emissions-related problems. To evaluate the actual risk associated with SNL/NM truck shipments, the most common origin and destination of all shipments of concern were compiled to determine the urban distance each material or waste would be transported (Section 4.11). Table 5.3.9 8 presents truck emissions impacts resulting from the No Action Alternative, projected for 2008, the year determined to pose the greatest increased risk.

Based on this analysis, the truck emissions due to increased SNL/NM truck traffic under the No Action Alternative would increase by 71 percent through the year 2008.

The impact analysis of incident-free exposure from material and waste shipments was conducted using the HIGHWAY computer code as part of the RADTRAN 4 modeling program (SNL 1992a). The distance parameters presented in Table 5.3.9 7 were used to project the incident-free exposure impacts to the public and crew resulting from this alternative. The projected public and crew dose calculations are presented in Table 5.3.9 9.

Table 5.3.9 7. Truck Traffic Bounding Case Distances

MATERIAL TYPES[a]	ORIGIN-DESTINATION	DISTANCE (km)
Radioactive	SNL/NM Bounding distance to Mountain Top, PA	3,022
Chemical	Albuquerque to SNL/NM	40
Explosive	SNL/NM to Silverdale, WA	2,406
LLW	SNL/NM to Clive, UT	1,722
LLMW (Receipt)	SNL/CA to SNL/NM	1,780
LLMW (Shipment)	SNL/NM to Savannah River Site, SC	2,548
Hazardous Waste (Shipment)	SNL/NM to Clive, UT	1,722
Hazardous Waste (Receipt)	Local	13
Hazardous Waste (California) (Recyclable)	SNL/NM to Anaheim, CA	1,306
Hazardous Waste (Local) (Recyclable)	SNL/NM to Albuquerque, NM	32
Hazardous Solid Waste (D&D)	Local	32
Nonhazardous Solid Waste (Recyclable)	Local	32
Nonhazardous Landscaping (Recyclable)	SNL/NM to Rio Rancho, NM	50
Solid Waste (Municipal and C&D)	SNL/NM to Rio Rancho Sanitary Landfill, NM	50
TRU/MTRU Waste	SNL/NM to Los Alamos National Laboratory, NM	167
Hazardous Waste TSCA-PCBs (D&D)	SNL/NM to Clive, UT	1,722
Hazardous Waste TSCA-Asbestos (D&D)	SNL/NM to Mountainair, NM	190
LLW (D&D)	SNL/NM to Clive, UT	1,722
Biohazardous Waste (Medical)	SNL/NM to Aragonite, UT	1,114
Legacy LLW (Storage)	SNL/NM to Clive, UT	1,722
Legacy LLMW (Storage)	SNL/NM to Savannah River Site, SC	2,548
Legacy TRU/MTRU (Storage)	SNL/NM to Los Alamos National Laboratory, NM	167
LLW (ER Project)	SNL/NM to Clive, UT	1,722
LLMW (ER Project)	SNL/NM to Savannah River Site, SC	2,548
RCRA Hazardous Waste (ER Project)	SNL/NM to Clive, UT	1,722
Nonhazardous Solid Waste (ER Project)	SNL/NM to Rio Rancho, NM	50

Sources: SNL 1992a, SNL/NM 1998a, DOE 1996h
C&D: construction and demolition
D&D: decontamination and decommissioning
ER: environmental restoration
km: kilometers
LLMW: low-level mixed waste
LLW: low-level waste
MTRU: mixed transuranic waste
PCB: polychlorinated biphenyl
RCRA: *Resource Conservation and Recovery Act*
TRU: transuranic waste
TSCA: *Toxic Substances Control Act*
[a] Material types are used in or generated from normal operations unless otherwise noted.

Table 5.3.9 8. No Action Alternative Incident-Free Exposure: Truck Emissions

CARGO	UNIT RISK FACTOR PER URBAN KILO-METER	URBAN DISTANCE TRAVELED PER SHIPMENT (km)	LCFs PER ROUND TRIP SHIPMENT	ANNUAL SHIPMENTS			ANNUAL LCFs		
				BASE YEAR[a]	2003	2008	BASE YEAR[a]	2003	2008
NORMAL ROUTINE OPERATIONS									
RAD Materials	1.0×10^{-7}	73.0	1.5×10^{-5}	305	562	597	4.6×10^{-3}	8.4×10^{-3}	9.0×10^{-3}
Explosives	1.0×10^{-7}	48.0	9.6×10^{-6}	303	557	593	2.9×10^{-3}	8.3×10^{-3}	5.7×10^{-3}
Chemicals	1.0×10^{-7}	8.0	1.6×10^{-6}	2,750	2,750	2,750	4.4×10^{-3}	4.4×10^{-3}	4.4×10^{-3}
LLW	1.0×10^{-7}	33.0	6.6×10^{-6}	4	13	13	2.6×10^{-5}	8.6×10^{-5}	8.6×10^{-5}
LLMW (shipments)	1.0×10^{-7}	40.6	8.1×10^{-6}	1	3	3	8.1×10^{-6}	2.4×10^{-5}	2.4×10^{-5}
LLMW (receipts)	1.0×10^{-7}	35.6	7.1×10^{-6}	0	1	1	0	7.1×10^{-6}	7.1×10^{-6}
Medical Isotopes Production (receipts)	1.0×10^{-7}	NA	NA	NA	16	16	NA	2.0×10^{-3}	2.0×10^{-3}
Medical Isotopes Production (shipments)					1,140	1,140			
Hazardous Waste	1.0×10^{-7}	33.0	6.6×10^{-6}	64	80	84	4.2×10^{-4}	5.3×10^{-4}	5.5×10^{-4}
Recyclable Hazardous to California	1.0×10^{-7}	23.0	4.6×10^{-6}	2	3	3	9.2×10^{-6}	1.4×10^{-5}	1.4×10^{-5}
Recyclable Hazardous to New Mexico	1.0×10^{-7}	6.4	1.3×10^{-6}	6	8	8	7.8×10^{-6}	1.0×10^{-5}	1.0×10^{-5}
Solid Waste	1.0×10^{-7}	10.0	2.0×10^{-6}	51	51	51	1.0×10^{-4}	1.0×10^{-4}	1.0×10^{-4}
D&D Hazardous Waste TSCA-PCBs	1.0×10^{-7}	33.0	6.6×10^{-6}	1	1	1	6.6×10^{-6}	6.6×10^{-6}	6.6×10^{-6}
D&D Hazardous Waste TSCA-Asbestos	1.0×10^{-7}	10.0	2.0×10^{-6}	14	14	14	2.8×10^{-5}	2.8×10^{-5}	2.8×10^{-5}
Biohazardous Waste	1.0×10^{-7}	24.0	4.8×10^{-6}	1	1	1	4.8×10^{-6}	4.8×10^{-6}	4.8×10^{-6}
Recyclable D&D Hazardous Waste	1.0×10^{-7}	6.4	1.3×10^{-6}	22	22	22	2.9×10^{-5}	2.9×10^{-5}	2.9×10^{-5}
Recyclable Nonhazardous Solid Waste	1.0×10^{-7}	6.4	1.3×10^{-6}	78	78	78	1.0×10^{-4}	1.0×10^{-4}	1.0×10^{-4}
Nonhazardous Landscaping Waste	1.0×10^{-7}	10	2.0×10^{-6}	NA	142	142	NA	2.8×10^{-4}	2.8×10^{-4}

Table 5.3.9 8. No Action Alternative Incident-Free Exposure: Truck Emissions (concluded)

CARGO	UNIT RISK FACTOR PER URBAN KILO-METER	URBAN DISTANCE TRAVELED PER SHIPMENT (km)	LCFs PER ROUND TRIP SHIPMENT	ANNUAL SHIPMENTS			ANNUAL LCFs		
				BASE YEAR[a]	2003	2008	BASE YEAR[a]	2003	2008
Construction and Demolition Solid Waste	1.0×10^{-7}	10	2.0×10^{-6}	NA	599	599	NA	1.2×10^{-3}	1.2×10^{-3}
RCRA Hazardous Waste (receipt)	1.0×10^{-7}	3	6.0×10^{-7}	12	25	25	7.2×10^{-6}	1.5×10^{-5}	1.5×10^{-5}
LLW (D&D)	1.0×10^{-7}	33	6.6×10^{-6}	4	4	4	2.6×10^{-5}	2.6×10^{-5}	2.6×10^{-5}
TOTAL[b]							**1.33×10^{-2}**	**2.3×10^{-2}**	**2.4×10^{-2}**
SPECIAL PROJECT OPERATIONS/TOTAL SHIPMENTS									
TRU/MTRU	1.0×10^{-7}	8.4	1.7×10^{-6}	0	1	3	0	1.7×10^{-6}	5.1×10^{-6}
TRU/MTRU (legacy)	1.0×10^{-7}	8.4	1.7×10^{-6}	0	0	2	0	0	3.4×10^{-6}
LLW (legacy)	1.0×10^{-7}	33	6.6×10^{-6}	0	0	56	0	0	3.7×10^{-4}
LLMW (legacy)	1.0×10^{-7}	40.6	8.1×10^{-6}	0	0	8	0	0	6.5×10^{-5}
LLW (ER)	1.0×10^{-7}	33	6.6×10^{-6}	0	0	136	0	0	9.0×10^{-4}
LLMW (ER)	1.0×10^{-7}	40.6	8.1×10^{-6}	0	0	5	0	0	4.1×10^{-5}
Hazardous Waste (ER)	1.0×10^{-7}	33	6.6×10^{-6}	0	0	113	0	0	7.5×10^{-4}
Nonhazardous Solid Waste(ER)	1.0×10^{-7}	10	2.0×10^{-6}	0	0	9	0	0	1.8×10^{-5}
TOTAL[b]							**0**	**1.7×10^{-6}**	**2.1×10^{-3}**

Sources: DOE 1996h; SNL/NM 1982, 1997b, 1998a; SNL 1992a
D&D: decontamination and decommissioning
ER: environmental restoration
km: kilometers
LCFs: latent cancer fatalities
LLMW: low-level mixed waste
LLW: low-level waste
MTRU: mixed transuranic
NA: Not applicable
PCB: polychlorinated biphenyl
RAD: radiological
RCRA: *Resource Conservation and Recovery Act*
TRU: transuranic
TSCA: *Toxic Substances Control Act*
[a] The base year varies depending on information provided in the *Facilities and Safety Information Document* (SNL/NM 1997b). Typically, the base year is 1996 or 1997, as appropriate.
[b] Lifetime estimated LCFs from annual shipments and total special project shipments

Table 5.3.9 9. Doses to Crew and Public Under the No Action Alternative

CARGO	ANNUAL DOSE/ TRUCK CREW (PERSON-REM)			ANNUAL DOSE/ GENERAL PUBLIC (PERSON-REM)			ANNUAL LCFs		
	BASE YEAR[a]	2003	2008	BASE YEAR[a]	2003	2008	BASE YEAR[a]	2003	2008
NORMAL ROUTINE OPERATIONS									
RAD Materials	9.8	18.0	19.1	82.4	151.7	161.2	$4.5x10^{-2}$	$8.3x10^{-2}$	$8.8x10^{-2}$
LLW	0.21	0.68	0.68	0.6	2.0	2.0	$3.8x10^{-4}$	$1.3x10^{-3}$	$1.3x10^{-3}$
LLMW	$2.6x10^{-2}$	$9.6x10^{-2}$	$9.6x10^{-2}$	0.26	0.88	0.88	$1.4x10^{-4}$	$4.8x10^{-4}$	$4.8x10^{-4}$
Medical Isotopes Production	NA	7.4	7.4	NA	21.2	21.2	NA	$1.4x10^{-2}$	$1.4x10^{-2}$
LLW (D&D)	0.21	0.21	0.21	0.60	0.60	0.60	$3.8x10^{-4}$	$3.8x10^{-4}$	$3.8x10^{-4}$
TOTAL[b]							**$4.6x10^{-2}$**	**$9.9x10^{-2}$**	**0.1**
SPECIAL PROJECT OPERATIONS/TOTAL SHIPMENTS									
TRU/MTRU	0	$1.8x10^{-3}$	$5.4x10^{-3}$	0	$1.0x10^{-2}$	$3.0x10^{-2}$	0	$5.7x10^{-6}$	$1.7x10^{-5}$
TRU/MTRU (legacy)	0	0	$3.6x10^{-3}$	0	0	$2.0x10^{-2}$	0	0	$1.1x10^{-5}$
LLW (legacy+ER)	0	0	10.0	0	0	28.8	0	0	$1.8x10^{-2}$
LLMW (legacy+ER)	0	0	0.34	0	0	3.4	0	0	$1.8x10^{-3}$
TOTAL[b]							**0**	**$5.7x10^{-6}$**	**$2.0x10^{-2}$**

Sources: SNL 1986, 1992a; SNL/NM 1997b, 1998a; DOE 1996h
D&D: decontamination and decommissioning
ER: environmental restoration
LCFs: latent cancer fatalities
LLMW: low-level mixed waste
LLW: low-level waste
MTRU: mixed transuranic
NA: not applicable
RAD: radiological
rem: roentgen equivalent, man
TRU: transuranic
[a] The base year varies depending on information provided in the *Facilities and Safety Information Document* (SNL/NM 1997b). Typically, the base year is 1996 or 1997, as appropriate.
[b] Lifetime estimated total LCFs from annual shipments and total special project shipments

This table shows that the greatest radiological impacts to the truck crew and the public under the No Action Alternative would result from increased radioactive material shipments.

In the absence of an accident that compromises package integrity, no incident-free chemical or explosive exposure would be foreseen to affect the public, workers, or vehicle transport crews under this alternative.

5.3.9.4 Transportation Risks Associated with Accidents

General Accidents

Accident impacts resulting from the No Action Alternative were developed using the projections for 2003 and 2008. The bounding case assumed that the percent increase in accidents would be equal to the percent increase in SNL/NM traffic under this alternative. Therefore, SNL/NM traffic accidents would increase from the base year (1996 or 1997) by 4 percent through 2003 and by 5 percent over the base year occurrences through the year 2008.

Hazardous Material/ Waste-Related Accidents

In conjunction with traffic fatality statistics (SNL 1986a), the SNL/NM material and waste shipments projected in Table 5.3.9 1 and Table 5.3.9 2 were used to project the truck accident fatality incidence rate that would be expected under the No Action Alternative. Details of the analysis are presented in Appendix G. These impacts are presented in Table 5.3.9 10. Based on this analysis, accident fatalities due to SNL/NM truck transportation would nearly double through the year 2008. This would mean that fatalities would go from 0.22 in the base year (1996 or 1997) to 0.49 by 2008.

5.3.9.5 Radiological Transportation Accidents

The annual risks to the population due to transportation accidents that potentially involve radiological releases resulting from the No Action Alternative are presented in Table 5.3.9 11.

This analysis indicates that the incidences of LCFs due to the worst-case radiological transportation accident would increase from 9.0×10^{-6} to 2.6×10^{-5} LCFs by 2008 under the No Action Alternative. In addition, 5.5×10^{-5} LCFs could result from legacy and ER Project waste shipments. For more information, see Appendix G.

Risks due to radiological, chemical, and explosives accidents were evaluated and are discussed in detail in Appendix F. The bounding transportation accident analysis involves explosion of a tractor-trailer containing 40,000 ft^3 of hydrogen. Based on the results presented in Appendix F, Table F.4 1, the hydrogen explosion would result in structural damage to buildings up to a distance of 91 m from the truck. Fatalities would result up to a distance of 15 to 18 m from the truck, while eardrum ruptures would occur up to a distance of 36 m from the truck.

5.3.10 Waste Generation

Implementation of the No Action Alternative would not cause any major changes in the types of waste streams generated onsite. Except for new operations, waste generation levels at SNL/NM would remain constant or increase slightly, consistent with slight increases in laboratory operations. These increased waste volumes would be partially offset by increased waste minimization and pollution prevention programs, which project a 33-percent overall decrease in total waste disposal needs by FY 2000. Therefore, the increased generation activities would not exceed existing waste management disposal capacities.

For projection purposes, the baseline waste generation data were considered to be constant for existing facilities, with no major increases or decreases in the amount of wastes generated. Operations waste are considered to be derived from mission-related work. Nonoperations waste are generated from special programs. New operations are discussed separately in order to show the maximum likely existing operational increases. Waste generation levels for special program waste, such as for the ER Project, are derived separately from the representative facilities projections under special projects. However, the amount of waste generated is anticipated to reflect proportional increases or decreases in SNL/NM activity levels over the next 10 years, with the exception of waste that would be generated by new operations. The waste quantities projected, listed in Table 5.3.10 1, represent a site-wide aggregate of quantities for each type of waste stream from existing selected facilities. As appropriate, the balance of operations (not selected facilities or special projects) waste generated is discussed within the individual waste sections. Units shown for each waste type are based on how industrial facilities charge commercial clients for disposal of these wastes.

Table 5.3.9 10. Truck Transportation Traffic Fatalities Under the No Action Alternative

CARGO	TRAFFIC FATALITY RATE: CREW AND GENERAL PUBLIC PER SHIPMENT[a]	ANNUAL FATALITIES		
		BASE YEAR[b]	2003	2008
NORMAL ROUTINE OPERATIONS				
RAD Material	3.5×10^{-4}	1.1×10^{-1}	2.0×10^{-1}	2.1×10^{-1}
Explosives	2.9×10^{-4}	8.8×10^{-2}	1.6×10^{-1}	1.7×10^{-1}
Chemicals	2.1×10^{-6}	5.8×10^{-3}	5.8×10^{-3}	5.8×10^{-3}
LLW	2.2×10^{-4}	8.8×10^{-4}	2.9×10^{-3}	2.9×10^{-3}
Medical Isotopes Production	NA	NA	6.0×10^{-3}	6.0×10^{-3}
LLMW (shipments)	3.0×10^{-4}	3.0×10^{-4}	9.0×10^{-4}	9.0×10^{-4}
LLMW (receipts)	2.1×10^{-4}	0	2.1×10^{-4}	2.1×10^{-4}
Hazardous Waste	2.2×10^{-4}	1.4×10^{-2}	1.8×10^{-2}	1.9×10^{-2}
Recyclable Hazardous to California	1.5×10^{-4}	3.0×10^{-4}	4.5×10^{-4}	4.5×10^{-4}
Recyclable Hazardous to New Mexico	1.6×10^{-6}	9.6×10^{-6}	1.3×10^{-5}	1.3×10^{-5}
Solid Waste	2.6×10^{-6}	1.3×10^{-4}	1.3×10^{-4}	1.3×10^{-4}
D&D Hazardous Waste TSCA-PCBs	2.2×10^{-4}	2.2×10^{-4}	2.2×10^{-4}	2.2×10^{-4}
D&D Hazardous Waste TSCA-Asbestos	2.2×10^{-5}	3.1×10^{-4}	3.1×10^{-4}	3.1×10^{-4}
Biohazardous Waste	1.4×10^{-4}	1.4×10^{-4}	1.4×10^{-4}	1.4×10^{-4}
Recyclable D&D Hazardous Waste	1.6×10^{-6}	3.5×10^{-5}	3.5×10^{-5}	3.5×10^{-5}
Recyclable Nonhazardous Solid Waste	1.6×10^{-6}	1.2×10^{-4}	1.2×10^{-4}	1.2×10^{-4}
Nonhazardous Landscaping Waste	2.6×10^{-6}	NA	3.7×10^{-4}	3.7×10^{-4}
Construction and Demolition Solid Waste	2.6×10^{-6}	NA	1.6×10^{-3}	1.6×10^{-3}
RCRA Hazardous Waste (receipt)	6.7×10^{-7}	8.0×10^{-6}	1.7×10^{-5}	1.7×10^{-5}
LLW (D&D)	2.2×10^{-4}	8.8×10^{-4}	8.8×10^{-4}	8.8×10^{-4}
TOTAL[c]		**0.22**	**0.40**	**0.42**
SPECIAL PROJECT OPERATIONS/TOTAL SHIPMENTS				
TRU/MTRU	1.9×10^{-5}	0	1.9×10^{-5}	5.7×10^{-5}
TRU/MTRU (Legacy)	1.9×10^{-5}	0	0	3.8×10^{-5}
LLW (Legacy)	2.2×10^{-4}	0	0	1.2×10^{-2}

Table 5.3.9 10. Truck Transportation Traffic Fatalities Under the No Action Alternative (concluded)

CARGO	TRAFFIC FATALITY RATE: CREW AND GENERAL PUBLIC PER SHIPMENT[a]	ANNUAL FATALITIES		
		BASE YEAR[b]	2003	2008
LLMW (Legacy)	3.0×10^{-4}	0	0	2.4×10^{-3}
LLW (ER)	2.2×10^{-4}	0	0	3.0×10^{-2}
LLMW (ER)	3.0×10^{-4}	0	0	1.5×10^{-3}
Hazardous Waste (ER)	2.2×10^{-4}	0	0	2.5×10^{-2}
Nonhazardous Solid Waste(ER)	2.6×10^{-6}	0	0	2.3×10^{-5}
TOTAL[c]		**0**	**1.9×10^{-5}**	**7.1×10^{-2}**

Sources: SNL 1986, 1992a; SNL/NM 1997b, 1998a
D&D: decontamination and decommissioning
ER: environmental restoration
LLW: low-level waste
LLMW: low-level mixed waste
MTRU: mixed transuranic
NA: Not applicable
PCB: polychlorinated biphenyl
RAD: radiological
RCRA: *Resource Conservation and Recovery Act*
TRU: transuranic
TSCA: *Toxic Substances Control Act*
[a] Round trip
[b] The base year varies depending on information provided in the *Facilities and Safety Information Document* (SNL/NM 1997b). Typically, the base year is 1996 or 1997, as appropriate.
[c] Lifetime estimated total fatalities from annual shipments and total special project shipments

Table 5.3.9 11. Doses to Population Due to Transportation Radiological Accident, Maximum Annual Radiological Accident Risk for Highway Shipments

CARGO	ANNUAL DOSE TO POPULATION PERSON-REM			LCFs		
	BASE YEAR[a]	2003	2008	BASE YEAR[a]	2003	2008
NORMAL ROUTINE OPERATIONS						
RAD Materials	1.3×10^{-2}	2.4×10^{-2}	2.7×10^{-2}	6.6×10^{-6}	1.2×10^{-5}	1.3×10^{-5}
LLW	2.3×10^{-3}	7.5×10^{-3}	7.5×10^{-3}	1.2×10^{-6}	3.8×10^{-6}	3.8×10^{-6}
LLMW	3.8×10^{-5}	1.1×10^{-4}	1.1×10^{-4}	1.7×10^{-8}	5.3×10^{-8}	5.3×10^{-8}
Medical Isotopes Production	NA	1.5×10^{-2}	1.5×10^{-2}	NA	7.5×10^{-6}	7.5×10^{-6}
LLW (D&D)	2.3×10^{-3}	2.3×10^{-3}	2.3×10^{-3}	1.2×10^{-6}	1.2×10^{-6}	1.2×10^{-6}
TOTAL[b]				**9.0×10^{-6}**	**2.5×10^{-5}**	**2.6×10^{-5}**
SPECIAL PROJECT OPERATIONS/TOTAL SHIPMENTS						
TRU/MTRU	0	3.4×10^{-6}	1.0×10^{-5}	0	1.7×10^{-9}	5.1×10^{-9}
TRU/MTRU (Legacy)	0	0	6.8×10^{-6}	0	0	3.4×10^{-9}
LLW (Legacy + ER)	0	0	0.11	0	0	5.5×10^{-5}
LLMW (Legacy + ER)	0	0	4.4×10^{-4}	0	0	2.2×10^{-7}
TOTAL[b]				**0**	**1.7×10^{-9}**	**5.5×10^{-5}**

Sources: DOE 1996h; SNL 1992a; SNL/NM 1997b, 1998a
D&D: decontamination and decommissioning
ER: environmental restoration
LCFs: latent cancer fatalities
LLMW: low-level mixed waste
LLW: low-level waste
MTRU: mixed transuranic
RAD: radiological
rem: roentgen equivalent, man
TRU: transuranic
[a] The base year varies depending on information provided in the *Facilities and Safety Information Document* (SNL/NM 1997b). Typically, the base year is 1996 or 1997, as appropriate.
[b] Lifetime estimated total LCFs

Table 5.3.10 1. Total Waste Generation Under the No Action Alternative

ALL WASTE		UNIT	BASE YEAR[a]	NO ACTION ALTERNATIVE	
				5-YEAR	10-YEAR
RADIOACTIVE WASTE					
Low-Level Waste (500 kg/m³)	Existing Operations	m³(kg)	16(8,000)	20(10,000)	20(10,000)
	New Operations	m³(kg)	4(2,000)	75(37,500)	76(38,000)
	SNL/NM Balance of Operations	m³(kg)	74(37,000)	74(37,000)	74(37,000)
	SNL/NM Total LLW	m³(kg)	94(47,000)	169(84,500)	170(85,000)
	Percent change		0.0%	79.2%	80.4%
Low-Level Mixed Waste (550 kg/m³)	Existing Operations	m³(kg)	3.85(2,120)	4.58(2,520)	4.58(2,520)
	New Operations	m³(kg)	0.20(110)	0.48(260)	0.48(260)
	SNL/NM Balance of Operations	m³(kg)	0.28(150)	0.28(150)	0.28(150)
	SNL/NM Total LLMW	m³(kg)	4.33(2,380)	5.34(2,940)	5.34(2,940)
	Percent change		0.0%	23.3%	23.3%
TRU Waste (310 kg/m³)	Existing Operations	m³(kg)	-	0.28(87)	0.28(87)
	New Operations	m³(kg)	-	-	-
	SNL/NM Balance of Operations	m³(kg)	-	-	-
	SNL/NM Total TRU	m³(kg)	-	0.28(987)	0.28(87)
MTRU Waste (76 kg/m³)	Existing Operations	m³(kg)	0.45(34)	0.65(49)	0.65(49)
	New Operations	m³(kg)	-	-	-
	SNL/NM Balance of Operations	m³(kg)	-	-	-
	SNL/NM Total MTRU	m³(kg)	0.45(34)	0.65(49)	0.65(49)
	Percent change		0.0%	43.8%	43.8%
RADIOACTIVE WASTE TOTAL[c]	**Existing Operations**	**m³(kg)**	**20.34 (10,154)**	**25.10 (2,656)**	**25.21 (12,656)**
	New Operations	**m³(kg)**	**4.62(2,110)**	**75.87 (37,760)**	**76.86 (38,260)**
	SNL/NM Balance of Operations	**m³(kg)**	**73.92 (37,150)**	**73.92 (37,150)**	**73.92 (37,150)**
	SNL/NM Total Radioactive Waste	**m³(kg)**	**98.88 (49,414)**	**174.88 (87,566)**	**175.99 (89,066)**
	Percent change		**0.0%**	**76.9%**	**78.0%**

Table 5.3.10 1. Total Waste Generation Under the No Action Alternative (concluded)

ALL WASTE	UNIT	BASE YEAR[a]	NO ACTION ALTERNATIVE	
			5-YEAR	10-YEAR
RCRA HAZARDOUS WASTE				
Existing Operations	kg	16,187	19,682	20,780
New Operations	kg	398	1,243	1,300
SNL/NM Balance of Operations	kg	39,267	49,544	52,278
SNL/NM Total RCRA Hazardous	kg	55,852	70,469	74,358
	m^3	44.3	55.9	59.0
Percent change		0.0%	26.2%	33.1%
SOLID WASTE				
SNL/NM Total Solid Waste[b]	m^3(kg)	0.6M (2,022)	0.6M (2,006)	0.6M (1,955)
Percent change		0.0%	-0.8%	-3.3%
WASTEWATER				
Existing Operations (net increase)	M gal	49	62	84
New Operations	M gal	0	4	4
SNL/NM Balance of Operations	M gal	231	224	216
SNL/NM Total Wastewater	M gal	280	290	304
Percent change		0.0%	+3.6%	+8.6%

Sources: SNL/NM 1997b, 1998a, 1998c, 1998t
m^3: cubic meter
kg: kilogram
LLMW: low-level mixed waste
LLW: low-level waste
M: million
M gal: million gallons
MTRU: mixed transuranic
RCRA: *Resource Conservation and Recovery Act*
TRU: transuranic
[a] The base year varies depending on information provided in the *Facilities and Safety Information Document* (SNL/NM 1997b). Typically, the base year is 1996 or 1997, as appropriate.
[b] Individual breakdowns of solid waste for existing, new, and balance of operations are unavailable because of tracking methods.
[c] Numbers are rounded and may differ from calculated values.
Note: Densities provided are from TableH.3 1.

5.3.10.1 Radioactive Wastes

Under the No Action Alternative, SNL/NM would potentially generate LLW, LLMW, and TRU and MTRU wastes. However, SNL/NM would not generate any high-level waste. Projections for waste generation at selected facilities from new and existing operations are shown in Appendix H.

Existing Operations

Under the No Action Alternative, SNL/NM anticipates a maximum 23 percent increase in the generation of LLW from existing operations over the next 10 years. LLW is shipped offsite for final disposal. LLMW generation would increase by 19 percent for existing operations through 2008. Under the *Resource Conservation and Recovery Act, Part B Permit Application for Hazardous Waste Management Units* (SNL/NM 1996a), some treatment of the hazardous component of LLMW could be performed at SNL/NM (Table 4.12 2). LLMW for which no onsite treatment is available is shipped offsite for treatment and disposal. SNL/NM also projects that approximately 0.28 m^3 of TRU waste would be generated annually. The existing TRU/MTRU wastes stored onsite, as well as all future TRU/MTRU wastes, would be transferred to LANL for certification, prior to disposal at the Waste Isolation Pilot Plant (WIPP), as indicated in the Waste Management Programmatic Environmental Impact Statement (DOE 1997i) Record of Decision (ROD)(DOE 1998n). Projected MTRU waste generation would increase by 0.2 m^3 annually, approximately equal to one 55-gal drum. MTRU waste would also be transferred to LANL for certification. Existing SNL/NM operations would use less than 1 percent (0.21 percent) annually of the available radioactive waste storage capacity. This is considered to be less than significant.

New Operations

SNL/NM anticipates a maximum of 76.4 m^3 of LLW would be generated from new operations annually over the next 10 years. The majority of the increase would be primarily due to the full implementation of medical isotopes production in 2003. These operations, described in the Medical Isotopes Production Project: Molybdenum-99 and Related Isotopes Environmental Impact Statement (DOE 1996b), would account for over 80 percent of the total projected LLW in 2003 and 2008. However, due to the nature of the waste, it would be managed at the generation facility to minimize worker exposure until offsite disposal. LLMW generation from all new onsite sources would be a maximum of 0.48 m^3 annually through 2008.

SNL/NM does not expect to generate TRU or MTRU wastes from new operations. Approximately 190 kg of spent fuel would be generated over the 10-year period. Spent fuel is further discussed in Appendix A as a material resource.

Balance of Operations

The waste generation level for the balance of operations was determined for each type of radioactive waste (Table 5.3.10 1). Only LLW and LLMW would be affected. Because of plant mission operations at SNL/NM would account for an additional 73.6 m^3 per year of LLW. These same operations would account for an additional 0.28 m^3 of LLW per year. The overall operations impact for this alternative would increase by 80 percent for LLW and 23 percent for LLMW.

Current Capacity

Previously generated radioactive wastes (legacy wastes) occupy approximately 494 m^3 of the available 11,866 m^3 of total radioactive waste storage capacity at the RMWMF and its associated storage areas. This represents 4.2 percent of the total available capacity. Therefore, there would be sufficient capacity to accommodate anticipated increases in radioactive wastes.

Special Projects

Projections indicate the ER Project, a special project beyond the scope of normal operations, will be the single largest waste generator at SNL/NM in 1998. The ER Project will produce a total of approximately 2,862 m^3 of LLW and 221 m^3 of LLMW, primarily contaminated soil and debris, prior to the end of the project in 2004. Projected ER Project waste volumes are presented in Table 5.3.10 2. ER Project wastes are stored and handled at the point of generation prior to disposal offsite. Management of ER waste is not expected to impact overall SNL/NM waste management operations. Actual field cleanup is now expected to be completed by 2002, with ER Project waste disposed of by 2004. Prior to disposal, ER Project waste must be properly characterized. Therefore, lag time is built into the project schedule between field remediation and actual disposal of waste.

Table 5.3.10 2. Estimated Volumes of Environmental Restoration Project Waste Generated From 1996 through 2000[a]

YEAR	MATRIX DEBRIS	SOIL	SOIL/ DEBRIS	SOIL/ DEBRIS/ PPE	PURGE WATER	SEPTAGE	LIQUID	TOTAL (ft^3)	TOTAL (m^3)	TOTAL (kg)
HAZARDOUS WASTE (RCRA)										
1996	-	8,944.0	27.0	-	-	378.0	351.0	9,700.0	274.7	314,981
1997	1,080.0	140.4	-	-	-	-	7.0	1,227.4	34.8	39,957
1998	118,152.0	584,388	5,159.7	-	-	764.1	70.2	708,534	20,066.1	23 M
1999	-	16,019.1	8,499.6	-	-	-	7.0	24,525.7	694.6	796,402
2000	54,000	-	-	-	-	-	-	54,000	1,529.3	1.7 M
TOTAL	173,232	609,491.5	13,686.3	-	-	1,142.1	435.2	797,987.1	22,599.5	27.8 M
RADIOACTIVE WASTE (LLW)										
1996	540.0	8,217.7	-	1,809.0	-	2,646.0	-	13,212.7	374.2	429,046
1997	540.0	8,439.6	35.1	-	-	-	-	9,014.7	255.3	292,727
1998	540.0	77,728.7	7.0	-	-	-	-	78,275.7	2,216.8	2.5 M
1999	-	547	-	-	-	-	-	547	15.5	17,762
2000	-	-	-	-	-	-	-	-	-	-
TOTAL	1,620.0	94,933	42.1	1,809.0	-	2,646.0	-	101,050	2,861.8	3.2 M
MIXED WASTE (LLMW)										
1996	2,286.9	61	-	-	-	-	-	347.9	66.5	76,232
1997	3,518.1		-	-	-	-	-	3,572.1	99.6	114,240
1998	1,080.0	-	35.1	-	-	764.1	-	1,879.2	53.2	61,022
1999	27.0	-	35.1	-	-	-	-	62.1	1.8	2,017
2000	-	-	-	-	-	-	-	-	-	-
TOTAL	6,912.0	61	70.2	-	-	-	-	7,807.3	221.1	250,000

Table 5.3.10 2. Estimated Volumes of Environmental Restoration Project Waste Generated From 1996 through 2000[a] (concluded)

YEAR	MATRIX DEBRIS	SOIL	SOIL/ DEBRIS	SOIL/ DEBRIS/ PPE	PURGE WATER	SEPTAGE	LIQUID	TOTAL (ft^3)	TOTAL (m^3)	TOTAL (kg)
TSCA WASTE										
1996	-	135.0	-	-	-	-	-	135.0	3.8	4,384
1997	-	189.0	-	-	-	-	-	189.0	5.4	6,137
1998	-	31,833	-	-	-	-	-	31,833.0	901.5	1.0 M
1999		31,023.0	-	-	-	-	-	31,023.0	878.6	1.0 M
2000	-	-	-	-	-	-	-	-	-	0
TOTAL	-	63,180	-	-	-	-	-	63,180	1,789.3	2.0 M
NONHAZARDOUS WASTE										
1996	-	1,350.0	27.0	-	-	-162.0	-	1,539.0	43.6	49,975
1997	-	-	2,646.0	-	-	-	-	2,646.0	74.9	85,921
1998	-	1,422.9	2,430.0	-	-	-	-	3,852.9	109.1	125,112
1999	-	-	1,350.0	-	-	-	-	1,350.0	38.2	43,837
2000	-	-	-	-	-	-	-	-		0
TOTAL	-	2,772.9	6,453.0	-	-	162.0	-	9,387.9	265.9	310,000
GRAND TOTAL	**181,764.0**	**770,438.4**	**20,251.6**	**1,809.0**	**0.0**	**4,714.2**	**435.2**	**979,412.4**	**27,737.5**	**33.6 M**

Source: SNL/NM 1998m
ft^3: cubic feet
LLW: low-level waste
LLMW: low-level mixed waste
m^3: cubic meters
M: million
PPE: personal protective equipment
RCRA: *Resource Conservation and Recovery Act*
TSCA: *Toxic Substances Control Act*
[a] Baseline totals and projections generated by SNL/NM on 2/9/98
Note: All wastes are assumed to have the average density for the 1997 LLW shipments.

5.3.10.2 Hazardous Waste

Existing Operations

As shown on Table 5.3.10 1, under the No Action Alternative, SNL/NM anticipates a maximum 33 percent increase (over the base year [1996 or 1997])in the overall generation of RCRA hazardous waste through 2008. Projections for selected facilities for new and existing operations are presented in Appendix H. Projected RCRA hazardous waste generation is shown in Figure 4.12 4.

No appreciable change in the generation of explosive waste would occur. Therefore, the TTF, with a treatment capacity of 9.1 kg of waste per burn, would continue to accommodate those wastes generated from the Light-Initiated High Explosive Facility. The majority of explosive waste would be disposed of at SNL/NM or through KAFB.

New Operations

SNL/NM anticipates annual generation of a maximum of 1,300 kg of hazardous waste by new operations over the next 10 years. The majority of the increase would be primarily due to the full implementation of medical isotopes production operations associated with the Medical Isotopes Production Project (MIPP) in 2003. These operations, described in the Medical Isotopes Production Project: Molybdenum-99 and Related Isotopes Environmental Impact Statement (DOE 1996b), would account for less than 2 percent of the total projected hazardous waste in 2003 and 2008.

New SNL/NM operations would use less than 1 percent annually of the available hazardous waste storage capacity, which is considered to be a minimal impact.

Balance of Operations

It was assumed that the RCRA hazardous waste levels for the balance of operations at SNL/NM would increase by the same proportion as RCRA wastes for selected facilities, because selected facilities represent the overall plant. Consequently, multipliers were used to project RCRA hazardous waste levels under all three alternatives. In the base year, the existing selected facilities generated 16,187 kg out of a total of 55,852 kg of all operational RCRA waste. The remainder, 39,267 kg, is the balance of operations RCRA hazardous waste. For 2003, this would increase to a maximum of 49,544 kg, and to 52,278 kg by 2008.

Current Capacity

The total volume of hazardous waste generated requiring offsite disposal at licensed/approved facilities would not exceed the existing 286.5 m^3 of storage and handling capacities at the HWMF and its associated storage buildings. The outside nonpermitted bermed storage area for nonhazardous waste is not included in the onsite storage capacity calculations. Projections indicate that a maximum of 26 percent of the existing hazardous waste capacity would be used. SNL/NM routinely ships hazardous waste to various offsite commercial disposal facilities. Most, if not all, waste is shipped in less than one year to meet regulatory requirements. Based on these projections and continued operations at selected facilities under the No Action Alternative, the hazardous waste generation impacts would continue to be minimal.

Special Projects

During field remediation, the ER Project would produce an additional 26 M kg of hazardous waste by 2002. Final disposal would be accomplished by 2004. Projected ER Project hazardous waste volumes are shown in Table 5.3.10 2. ER Project waste handling is discussed in Section 4.12.6.

Additionally, other facility maintenance and infrastructure support (as outlined in Section 2.3.5) would continue. This program would directly impact the quantity of TSCA hazardous waste requiring disposal. As a result, SNL/NM would continue to generate TSCA hazardous waste, primarily polychlorinated biphenyls (PCBs) and asbestos that are removed from transformers and buildings. Since the main PCB relamping and transformer removal has been completed, quantities of TSCA waste have dropped to approximately 122,000 kg per year, and should remain at that level (Figures 4.12 5 and 4.12 6).

The total volume of TSCA waste would eventually decrease as the targeted facilities are removed. Currently, SNL/NM has 674 buildings providing a total of 5,020,014 gross ft^2 of office and operational space. The number of buildings would be reduced to 465 buildings totaling approximately 4,885,600 gross ft^2. This program would remove 138 small office buildings, temporary structures, and trailers accounting for 179,204 gross ft^2 within FY 1998 and FY 1999 at SNL/NM. During FY 2000 through FY 2002, 49 additional buildings, accounting for 108,937 gross ft^2, are potentially scheduled for removal. During FY 2003 to FY 2008, an additional 29 buildings would be removed with a total of

84,132 gross ft^2. To make up for the loss of office and operational space, seven additional buildings would be built, adding approximately 240,000 gross ft^2. No predictions are made for years beyond FY 2008. Separate NEPA review may be required in the future depending on the scale and extent of the work involvrd.

5.3.10.3 All Other Wastes

SNL/NM operations also involve the four additional waste management activity areas discussed below.

Biohazardous (Medical) Waste

The total volume of medical waste would generally remain a function of the total number of full-time employees and subcontractors at SNL/NM. In 1997, 2,463 kg of medical waste were disposed of at an approved offsite facility. Under the No Action Alternative, biohazardous waste generation would increase to 3,279 kg by 2008. The existing waste handling capabilities would be adequate to accommodate this waste. No additional offsite impacts would occur, because offsite disposal capacity would continue to be sufficient.

Nonhazardous Chemical Waste

In 1998, the ER Project will generate approximately 125,112 kg of nonhazardous waste (Table 5.3.10 2). The maximum quantity of operations nonhazardous waste generated annually at SNL/NM and managed by the HWMF would be 92,290 kg, based on the waste multiplier (see Appendix H) developed for RCRA hazardous waste (Rinchem 1998a). Existing commercial disposal facilities would still have adequate capacities to handle the continued generation of nonhazardous waste, thus no additional impacts would be anticipated.

Municipal Solid Waste

Site-wide solid waste generation trends at SNL/NM would generally remain a function of total building area and the number of full-time and subcontractor employees. This function is based on general building operations activities, such as maintenance and cleaning, and, to a lesser extent, the general office waste created by SNL/NM employees. Over the 10-year time frame, a decrease of an estimated 3 percent is anticipated. Despite the projected 5 percent personnel increase, no appreciable onsite impacts to disposal facilities would occur because existing waste handling capabilities are already in place. As existing buildings are replaced, personnel are moved to make more efficient use of the space. No additional offsite impacts would occur, because offsite disposal capacity would continue to be sufficient. However, a substantial amount of construction and demolition (C&D), a special class of solid waste, would potentially be generated under the facility modernization program described above. Quantities of C&D waste associated with the facility modernization program were projected to be similar to prior years. This waste is disposed of at KAFB and does not currently create an offsite impact. Table 5.3.10 3 summarizes construction debris disposal at the KAFB landfill. If this waste required shipment offsite, similar quantities would go to a regional commercial landfill.

Wastewater

Waste water would increase throughout SNL/NM due to varying levels of operation within each facility. SNL/NM would generate a maximum of approximately 304 M gal of wastewater annually. However, SNL/NM entered into a memorandum of understanding (MOU) with KAFB, the DOE, the city of Albuquerque, and the state of New Mexico to reduce its water use by 30 percent by 2004 (SNL/NM 1997p). The Microelectronics Development Laboratory (MDL) is the single largest generator of wastewater at 77 Mgal per year (Table 3.6 1). Reduction efforts would focus on the MDL in order to reduce the amount of wastewater being generated. See Section 5.3.2 for additional discussion of wastewater quantities and capacities.

5.3.11 Noise and Vibration

The implementation of the No Action Alternative would result in a continuation of the noise and vibration impacts currently experienced during operations at SNL/NM facilities. Section 5.3.11.1 describes potential noise impacts, and Section 5.3.11.2 describes potential impacts from vibrations.

5.3.11.1 Noise

The environmental concern about noise is twofold: first, repetitive exposure to loud noise leads to hearing impairment and eventual hearing loss; and second, noise may be a community nuisance at levels below those that cause hearing impairment. Two noise provisions that apply to SNL/NM address these concerns. The first provision is DOE 5480.10, Contractor Industrial Hygiene Program, which sets standards to protect workers in noisy occupations. Under this provision, workers without hearing protection may only be exposed to continuous sources at 85 dBA for up to 8 hours per

Table 5.3.10 3. SNL/NM Construction and Debris Waste Volumes Managed at KAFB

SOURCE	1996			1997			1998[a]		
	WASTE (yd^3)	TONNAGE CONVERSION	% OF TOTAL	WASTE (yd^3)	TONNAGE CONVERSION	% OF TOTAL	WASTE (yd^3)	TONNAGE CONVERSION	% OF TOTAL
CONSTRUCTION & DEMOLITION									
DOE	324.50	129.80	0.14	167.25	66.90	0.16	104.00	41.60	0.18
DOE Contractors	837.00	334.80	0.37	1,520.00	608.00	1.49	392.00	156.80	0.67
SNL/NM	4,177.05	1,670.82	1.84	4,563.00	1,825.20	4.47	2,140.25	856.10	3.68
SNL/NM Contractors	13,471.00	5,388.40	5.94	10,070.00	4,028.00	9.86%	4,293.00	1,717.20	7.38
TOTAL (yd^3 [m^3])	226,822.30 [172,000]	90,728.92	100	102,119.00 [77,600]	40,847.60	100	58,146.75 [44,200]	23,258.70	100
YARD AND LANDSCAPE									
DOE	10.00	1.50	0.75	-	-	0	-	-	0
DOE Contractors	-	-	0	-	-	0	-	-	0
SNL/NM	386.00	57.90	29.11	19.00	2.85	16.81	-	-	0
SNL/NM Contractors	427.00	64.05	32.20	17.00	2.55	15.04	-	-	0
TOTAL (yd^3 [m^3])	1,326.00 [1,000]	198.90	100	113.00 [86]	16.95	100	-	-	0
COMPOST AND WOODPILE									
DOE	206.25	30.94	1.89	80.00	12.00	1.21	16.00	2.40	0.88
DOE Contractors	-	-	0	2.00	0.30	0.03	-	-	0
SNL/NM	2,607.75	391.16	23.96	1,642.25	246.34	24.79	724.25	108.64	39.78
SNL/NM Contractors	527.00	79.05	4.84	217.00	32.55	3.28	40.00	6.00	2.20
TOTAL	10,885.25 [8,300]	1,632.79	100	6,625.00 [5,000]	993.75	100	1,820.75 [1,400]	273.11	100

Source: Houston 1998b

yd^3: cubic yards

[a] 1998 number represents January through June 1998

day and to impulse noise at 140 dBA per event. The Hearing Conservation Program was initiated by SNL/NM to comply with DOE 5480.10 by limiting the time workers are exposed to noise. The louder the noise, the shorter the allowable exposure time for a worker.

The second provision is the city of Albuquerque Noise Control Ordinance (Ord. 21-1975, §9 9 1). This ordinance sets a limit on the amount of noise that may be produced above ambient levels in the city limits. This ordinance applies to any SNL/NM operation that is loud enough to be heard in neighborhoods bordering KAFB and that exceeds the limits cited in the ordinance. The ordinance allows a maximum allowable limit of 50 dBA, or 10 dBA above the ambient noise level, whichever is greater.

The No Action Alternative provides for 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 are projected to increase 20 percent over 1996 levels for 2003 and 35 percent over the 1996 baseline number of test activities by 2008. Background noise levels would continue at similar levels from generators, air conditioners, and ventilation systems, but would increase due to additional vehicular traffic and aircraft noise. The range of background noise associated with these sources ranges from 50 to 70 dB (SNL/NM 1997a).

Construction noise, resulting from building new facilities, such as Building 701 in TA-I currently under construction, also contributes to the No Action Alternative background noise levels at SNL/NM. Table 5.3.11 1 presents typical noise levels associated with construction equipment that would contribute to the background noise levels at SNL/NM during construction activities. These construction noise levels would contribute to the ambient background noise levels for the duration of construction, after which ambient background noise levels would return to pre-construction levels.

Large-scale impulse noise producing activities, such as explosives detonations, generate a pressure wave that is an atmospheric phenomenon visualized as ripples produced when a stone is thrown into a still body of water. The sudden increase in atmospheric pressure produced by these traveling pressure waves, called overpressure, is initially greater than the ambient atmospheric pressure and is responsible for disturbances such as noise and for building damage such as glass breakage. Building damage is sometimes blamed on ground vibration caused by explosive detonations, whereas the damage is often the result of the traveling pressure waves. These impulse noise levels resemble a dull thud and generally are considered an annoyance because of startle effects and window vibrations.

Table 5.3.11 1. Typical Noise Levels from Construction and Industrial Equipment

CONSTRUCTION ACTIVITY	EQUIPMENT	NOISE LEVEL AT 50 FEET dBA
Constructing Foundation	Truck	91
	Concrete mixer	85
	Jack hammer	88
	Pneumatic Tools	85
Erecting Work	Paver	89
	Derrick	88
Finishing Work	Truck	91
	Paver	89
Miscellaneous	Generator	76
	Compressor	81
	Winch	88

Source: SNL/NM 1997a
dBA: decibels, A-weighted scale

Air blast noise is associated with SNL/NM test activities performed primarily at TA-III, the Coyote Test Field, and other outdoor test facilities. Table 5.3.11 2 presents a summary of the short-term noise impacts from SNL/NM test activities, including expected noise levels at various locations throughout KAFB. The table column labeled Source provides the maximum dB level of the originating test activity at the various test facilities at SNL/NM. The remaining columns present dB levels at various locations throughout SNL/NM and KAFB. The maximum noise level at a given receptor occurs at the ground hazard area boundary for a 1,000-lb explosive test at the 10,000-ft sled track, a 40-pound explosive test at the Terminal Ballistics Complex, and a 155-mm gun firing at the outdoor firing range.

Ground Hazard Area

The ground hazard area boundary is a delineated zone around a test site intended to restrict personnel from potentially harmful operations. These areas protect personnel from potential exposure to noise as well as toxic air emissions, metal fragments, and other potentially hazardous conditions. The ground hazard area is enforced by a combination of warning lights and signs, spotters, fences, barricades, and gates to demarcate the ground hazard area boundary. Personnel are required to leave a test site before testing and must evacuate beyond the ground hazard area boundary. Heavily constructed buildings at the test facilities shield personnel who remain inside the ground hazard area boundary to monitor tests. Procedures require personnel to remain indoors until a test is completed. Personnel wear hearing protection equipment approved by the DOE Line Support, Pollution Prevention, and Environmental Programs Department. The program satisfies the requirements of DOE 5480.10. Monitoring activities conducted by SNL/NM, indicate that exposure of the work force does not exceed allowable exposure limits (SNL/NM 1997a).

Figure 5.3.11 1 presents noise contours at each of the SNL/NM test facilities producing air blast noise. The outside contour represents the 140-dB contour resulting from the maximum sound-producing event at the site. The receptor locations presented in Table 5.3.11 2 are also shown on the figure.

Figure 5.3.11 1 indicates that the 140 dB contour from tests performed at Thunder Range crosses into the Pueblo of Isleta buffer zone. The Thunder Range Complex was used from 1969 through 1993 to support development, safety, reliability, and certification tests of Atomic Energy Commission (AEC)/DOE weapon systems. The testing activity at the complex declined substantially during the early 1990s, and the last test at the complex was conducted during the third quarter of 1993. The current use is for the disassembly and evaluation of special items and siting for radar studies. Although the special items may contain explosive materials, the site is not used for explosives testing by SNL/NM.

Located to the southwest of the Thunder Range is the Air Force Research Laboratory (formerly Philips Laboratory and Air Force Weapons Laboratory) Conventional High Explosives and Simulation Test (CHEST) Site, also shown on maps as Chestnut Site or Range. The Chestnut Range is used for explosive tests. Although SNL/NM explosive testing activities at Thunder Range have ceased, Chestnut Range continues to be used as an active explosives testing site by the USAF and its contractors. Table 5.3.11 2 presents short-term noise impacts at receptor locations located throughout KAFB from test activities performed at Thunder Range.

For each air blast test activity, the distance at which the 50-dB, 24-hour average noise level extends beyond the source is within the 140-dB contour. The city of Albuquerque noise control ordinance is not violated as long as the extent of the 50-dB, 24-hour average noise level remains within the KAFB boundary (SNL/NM 1997a).

Noise from test activities at SNL/NM, including rocket motors, explosives, and large caliber guns, would have minimal effect on the nearby communities. Impulse noise from these activities would be of short duration and would be concentrated in the lower frequency range. Low frequency noises are not perceived well by humans because the human ear hears higher frequencies better. A loud steady or continuous noise above 85 dB would produce adverse effects on exposed people. For example, it would render conversation nearly impossible. A single impulsive noise, on the other hand, even as high as 130 to 140 dB, produced by a sonic boom, explosion, or collision impact test, would be concentrated in the low frequencies that are relatively unimportant in oral communication. In addition, brief noises would tend to be masked by continuous noise or background noise such as vehicular traffic.

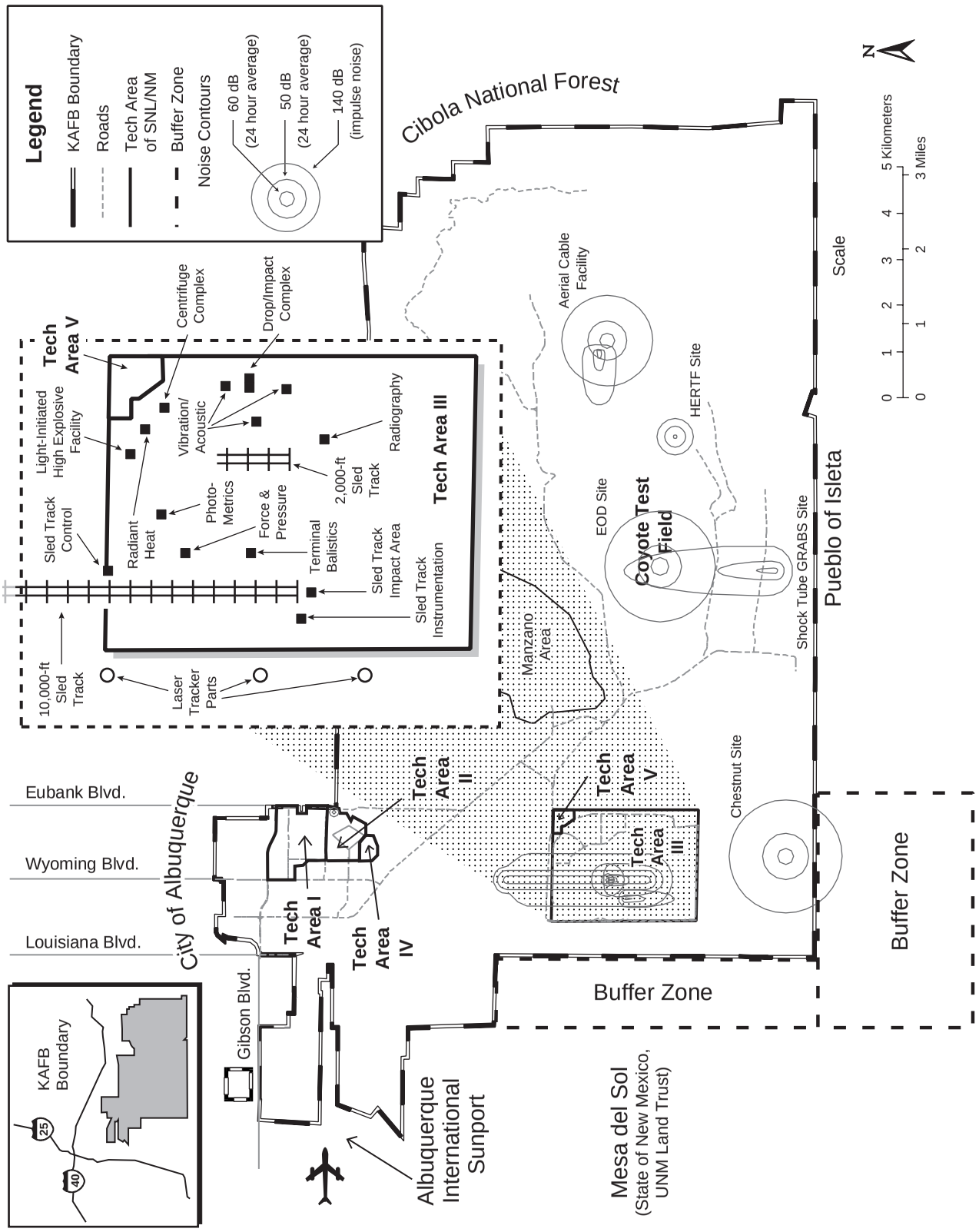
Table 5.3.11 2. Short-Term Noise Impacts of SNL/NM Test Activities (dB)

FACILITY	TIMES PER YEAR	SOURCE[a]	1[b]	2[c]	3[a]	4[a]	5[a]	6[a]	7[a]	8[a]	9[a]	10[a]	11[a]	12[a]	13[a]
10,000-FT SLED TRACK															
Explosive Weight (lbs TNT)															
50	32	151	131	96	96	109	102	103	103	113	123	115	110	111	114
250	4	156	136	101	102	114	108	108	108	118	128	120	115	116	119
1,000	10	161	140	106	106	119	112	113	113	123	132	125	120	120	123
Rocket Motors (numbers type)															
25 HVARs		137	119	100	100	101	96	103	103	107	121	107	106	106	125
1 Sprint	<1	155	137	118	119	120	115	122	122	126	140	126	125	124	143
Sonic Booms	100	149	131	112	112	114	109	116	116	120	134	120	118	118	137
Collision Impacts		145	127	102	102	109	104	106	106	113	123	115	111	111	115
CENTRIFUGE COMPLEX															
Explosives	3	140	126	88	88	93	87	100	100	140	113	116	122	122	107
Collision Impacts	50	117	105	76	76	78	75	83	83	117	93	95	101	101	88
Motors	3	86	64	35	35	37	34	42	42	76	52	54	60	60	47
TERMINAL BALLISTICS COMPLEX															
Explosive Weight (40 lbs TNT)	10	150	140	97	98	108	100	106	105	118	150	119	114	114	119
OUTDOOR FIRING RANGE															
155-mm gun	-	151	140	107	107	121	123	114	114	128	151	128	120	120	121
.30-caliber gun	-	100	80	47	48	54	48	52	52	61	90	62	58	58	62
DROP/IMPACT COMPLEX															
Rockets		135	117	92	92	100	93	98	99	113	107	135	108	111	104
Collision Impacts	100	119	109	76	76	84	77	83	83	97	91	119	92	95	88

Table 5.3.11 2. Short-Term Noise Impacts of SNL/NM Test Activities (dB) (concluded)

FACILITY	TIMES PER YEAR	SOURCE[a]	1[b]	2[c]	3[a]	4[a]	5[a]	6[a]	7[a]	8[a]	9[a]	10[a]	11[a]	12[a]	13[a]
RADIANT HEAT FACILITY															
Explosive Weight (< 1 lb TNT)	15	139	128	88	88	92	85	100	99	125	105	111	121	121	106
NORTH THUNDER RANGE															
Explosive weight (lbs TNT)															
50	150	NA	NA	116	117	121	119	122	124	127	127	130	126	127	124
250		NA	NA	121	123	126	124	127	129	132	132	135	131	132	129
450		NA	NA	123	124	128	126	129	131	134	134	137	133	134	131
SOUTH THUNDER RANGE															
Explosive weight (lbs TNT)															
50	120	NA	NA	115	116	122	121	120	121	124	126	127	124	124	123
1,000		NA	NA	125	126	132	131	130	131	133	135	136	133	133	132
4,000		NA	NA	129	130	136	135	134	135	138	140	141	138	138	137

Source: DOE n.d. (a)
dB: decibel
dBA: decibels, A-weighted scale
ft: foot
HVAR: High Velocity Aircraft Rocket
lb: pound
mm: millimeter
TNT: trinitrotoluene
[a] Area remote from most noise sources except distant aircraft and vehicular traffic Noise range is 40-65 dBA
[b] Affected by aircraft operating from the Albuquerque International Sunport Expected noise range 76-93 dBA
[c] Affected by aircraft operating from the Albuquerque International Sunport Expected noise range 90-102 dBA
1: Ground Hazard Area
2: Military housing along Pennsylvania Street at KAFB
3: Mobile home trailer park in Four Hills
4: Western boundary of KAFB
5: Pueblo of Isleta boundary located south of SNL/NM. There are no residences along this boundary
6: Golf course at KAFB
7: Riding stables at KAFB
8: Centrifuge Complex
9: Terminal Ballistics Complex
10: Drop/Impact Complex
11: Main gate TA-III
12: TA-V
13: Sled Track Complex (Control Building)



Sources: DOE n.d. (a), SNL/NM 1997a

Figure 5.3.11 1. Noise Contours Produced by SNL/NM Test Facilities

Air blast noise produced by SNL/NM test facilities reach receptor locations in TA-III.

5.3.11.2 Vibration

Vibration concerns include annoyance to residents of nearby neighborhoods and potential structural damage to buildings adjacent to KAFB from test activities generating ground vibration at SNL/NM. The threshold range where vibration is viewed as unpleasant varies from 0.1 inch to 4 inches per second. For the typical frequencies generated by explosives, the threshold for annoyance ranges from 0.2 inch per second to 0.5 inch per second. The threshold level at which minor structural damage can begin to occur in 0.01 percent of structures is set at 2.0 inches per second (DOE 1997).

The frequency of impulse noise under the No Action Alternative, based upon projected frequencies of impulse noise testing activities for 2008, would increase approximately 35 percent above the 1996 baseline frequency. Although impulsive noise may produce a startle reaction, window vibrations, or public annoyance in some people, the effects on the public would be minor. Ground vibrations would remain confined to the immediate test area within the ground hazard area.

5.3.12 Socioeconomics

The implementation of the No Action Alternative would result in no changes to the demographic characteristics, economy, and community services in the ROI. The following discussion of impacts is based on a bounding economic analysis.

5.3.12.1 Demographic Characteristics

The No Action Alternative would not likely result in any noticeable change in existing demographic characteristics within the ROI (Section 4.14.3). Overall expenditures and employment at SNL/NM should remain relatively constant through 2008, which would, in turn, tend to maintain demographic characteristics within the ROI.

5.3.12.2 Economic Base

The No Action Alternative would not likely result in any noticeable change in the existing economic base within the ROI (Section 4.14.3). The total estimated economic activity associated with SNL/NM in 1996 was $3.93 B (Table 5.3.12 1). This represented 9.3 percent of the activity in the ROI (DOE 1997j). Overall expenditures and employment should remain relatively constant through 2008. Historically, increases or decreases in operational levels of activities at SNL/NM have been gradual and/or have fluctuated by 1 or 2 percent per year (SNL/NM 1997a).

Blast Overpressure Versus Ground Vibration

An explosion creates both blast overpressure and ground vibration, either of which is capable of causing disturbance and/or damage. When an explosive charge is detonated in air, the gaseous products expand rapidly and compress the surrounding air. The compressed air moves outward like a ripple on a pond with great speed, thus initiating a shock wave or region of blast overpressure. Depending on the difference between the region of high pressure and the surrounding air, the potential exists for disturbance or damage to be done to objects that are within the path of the pressure wave. For example, if an overpressure wave hits a glass window, the glass is subject to momentary high pressure on one side, which can result in its breaking. The potential for damage depends on how close a structure is to the blast and the magnitude of the explosion.

An explosion will also cause the ground to shake upon detonation. Like blast overpressure, this ground vibration moves out from the point of detonation like waves on a pond due to the elasticity of the earth. The potential for damage from ground vibration depends on how much the earth moves or shakes. The greater the movement, which is measured as inches per second, the more likely it is that structural damage will occur. As with blast overpressure, damage will be greater if a structure is closer to a large explosion.

For analysis and consideration, Table 5.3.12 1 presents an estimate of the impacts under the No Action Alternative on the ROI economy from a 5-percent increase in operational levels of activity and associated increases in expenditures, income, and employment, both direct and indirect, at SNL/NM. The 5-percent increase was selected to bound increases for the selected facilities under the alternative and potential indirect increases across all other SNL/NM facilities. Additionally, the historical increases have been gradual; the 5-percent increase was projected over the 10-year period of the SWEIS (SNL/NM 1998a, SNL/NM 1997a). If operations at SNL/NM were to increase by 5 percent over current levels, overall economic activity within the ROI would be expected to increase by about 0.4 percent, with slightly smaller increases in income and

Table 5.3.12-1. SNL/NM's Impact on Central New Mexico's Economy if Operations Were to Increase 5 Percent

ECONOMIC MEASURE	FY 1996[a]			ASSUMING A 5% INCREASE IN OPERATIONS			
	SNL/NM	TOTAL ROI	PERCENT OF ROI	SNL/NM	TOTAL ROI	PERCENT OF ROI	PERCENT CHANGE
ECONOMIC ACTIVITY ($ BILLIONS)							
Direct expenditures	1.43			1.50			
Indirect and induced	2.50			2.63			
Total economic activity	**3.93**	**42.40**	**9.3**	**4.13**	**42.60**	**9.7**	**0.4**
Economic activity multiplier: 2.75[b]							
INCOME ($ BILLIONS)							
Net wages and salaries	0.48			0.50			
Indirect and induced	0.58			0.61			
Total income	**1.07**	**13.40**	**8.0**	**1.11**	**13.45**	**8.3**	**0.3**
Income multiplier: 2.21[b]							
EMPLOYMENT (NUMBER OF EMPLOYEES)							
SNL/NM employment	7,652			8,035			
Indirect and induced	18,826			19,765			
Total employment	**26,478**	**331,800**	**8.0**	**27,800**	**333,122**	**8.3**	**0.3**
Employment multiplier: 3.46[b]							

Source: DOE 1997j
FY: fiscal year
ROI: region of influence
[a] Modeled results from DOE 1997j
[b] The use of multipliers in calculating economic impacts in the ROI is explained in Section 4.14.3.

employment at about 0.3 percent. As presented in Table 5.3.12-1, a 5-percent increase in SNL/NM activity operational levels by 2008 would generate an increase in total economic activity in the ROI from $42.4 B to $42.6 B. This would amount to a total increase of $200 M in additional economic activity (an average increase of $20 M per year) within the ROI. Total income at SNL/NM would increase from $1.07 B to $1.11 B, for a total of $40 M in additional income (an average increase of $4 M per year). Total employment in the ROI would increase from 331,800 to 333,122 or a total of 1,322 additional jobs (an average increase of 132 jobs per year) within the ROI. The increased economic activity over the baseline would be small.

During the next 10-year period, contributory effects from other industrial and economic sectors within the ROI would reduce or mask some of SNL/NM's effects on the ROI economy. This reduction or masking would occur if the estimated total employment in the ROI increases from 331,800 to 403,605 by 2008 (UNM 1997b). The ROI is experiencing and is expected to continue to experience strong growth. For a discussion on socioeconomic cumulative impacts, see Section 6.4.11.

5.3.12.3 Housing and Community Services

The No Action Alternative would not likely result in any noticeable change in existing housing and community services within the ROI (Section 4.14.3). Overall expenditures and employment at SNL/NM should remain relatively constant through 2008, which would, in turn, tend to maintain housing availability, value, and levels of service. Contributory effects from other

industrial and economic sectors within the ROI should reduce or mask SNL/NM s proportional impact.

5.3.13 Environmental Justice

As indicated in Sections 5.3.1, 5.3.2, 5.3.3, 5.3.5, 5.3.10, 5.3.11, and 5.3.12, no discernible adverse impacts to land and visual resources, infrastructure, geology and soils, biological and ecological resources, waste generation, noise, or socioeconomics are anticipated under the No Action Alternative. Thus, no disproportionately high and adverse impacts to minority or low-income communities are anticipated for these resource areas. The small potential impacts to geology and soils would be further reduced through the ER Project (see Section 5.3.3).

The city of Albuquerque s water supply system operates by interconnecting all areas of the city. The overlapping capability means the entire population shares impacts to the aquifer equally regardless of the location of a specific community. Impacts to the basin-wide aquifer are dominated by the city of Albuquerque (including citizens, businesses, and nonbusiness entities) by a 70 to 1 ratio with respect to SNL/NM. A localized impact of aquifer drawdown occurs as a result of SNL/NM operations; however, the local communities dominate this impact (see Section 5.3.4). Because the potential adverse impact from SNL/NM operations affects all communities equally, no disproportionately high and adverse impacts to minority or low-income communities are anticipated for this resource area.

As discussed in Section 5.3.6, the potential for impacts to cultural resources from explosive test debris, off-road vehicle traffic, and unintended fires would be minimal. Continued SNL/NM security would likely result in a positive impact on the resources, as archaeological sites remain protected. As a result of the ongoing consultation with 15 Native American tribes, no TCPs have been identified at SNL/NM; however, 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 ROI. These consultations will continue. If specific TCPs are identified, 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.

The concentrations of chemical contaminants from air emissions and the dose to the ROI from radiological air emissions would be below regulatory standards and human health guidelines. The potential impacts to nonradiological air quality and radiological air quality would be minimal (see Sections 5.3.7.1 and 5.3.7.2). Thus, no disproportionately high and adverse impacts to minority or low-income communities would be anticipated for this resource area.

As presented in Section 5.3.8, SNL/NM operations would have minimal potential to adversely affect human health for offsite residents or onsite workers. Thus, no disproportionately high and adverse impacts to minority or low-income communities would be anticipated for this resource area.

As shown in Section 5.3.9, impacts to public health from transporting materials and waste to offsite facilities would be estimated to be 0.1 excess LCFs per year from incident-free transportation and 0.65 deaths or injuries per year from transportation accidents. Transportation along Gibson, Louisiana, Wyoming, and Eubank Boulevards includes low-income and minority neighborhoods. According to the April 1997 Sandia Report Addressing Environmental Justice Under the National Environmental Policy Act at Sandia National Laboratories/New Mexico (SNL 1997f), five block groups located near KAFB gates have high potential for environmental justice-related impacts. Four of these block groups lie between Louisiana and Wyoming Boulevards south of Central (see Figure 4.15 3). No disproportionately high and adverse impacts to minority or low-income communities would be anticipated for this resource area.

Based on the analyses of all the resource areas and topic areas, impacts that would result during the course of normal operations would not pose disproportionally high and adverse health or environmental impacts on minority and low-income populations. Table 5.3.13 1 provides a brief summary of potential impacts to each resource or topic area.

Table 5.3.13 1. Summary of Potential Environmental Justice Impacts Under the No Action Alternative

RESOURCE OR TOPIC AREA	SUMMARIZED EFFECT	EFFECT ON RESOURCE OR TOPIC AREA ROI	PROPORTIONAL EFFECT ON	
			LOW-INCOME	MINORITY NEIGHBORHOODS
Land Use and Visual Resources	No changes in land use; minor changes in developed areas of SNL/NM	Not adverse	Not adverse	Not adverse
Infrastructure	All projected activities within capacities of existing road and utility systems	Not adverse	Not adverse	Not adverse
Geology and Soils	SNL/NM activities are not anticipated to destabilize slopes. Minimal deposition of contaminants to soils and continued removal of existing contaminants under the ER Program	Not adverse	Not adverse	Not adverse
Water Resources and Hydrology	SNL/NM groundwater use is projected to account for 11% of local aquifer drawdown.	Adverse	Not adverse	Not adverse
Biological and Ecological Resources	No significant adverse impacts are projected for biological and ecological resources.	Not adverse	Not adverse	Not adverse
Cultural Resources (A TCP study is being conducted)	Explosive testing debris, off-road vehicle traffic, and unintended fires would present a low potential for impacts.	Not adverse	Not adverse	Not adverse
Air Quality Nonradiological Air	Emissions 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. Concentrations would be below regulatory standards and human health guidelines. SNL/NM carbon monoxide emissions would account for 5.7% of Bernalillo county carbon monoxide emissions.	Not adverse	Not adverse	Not adverse
Air Quality Radiological Air	MEI: 0.15 mrem/yr Collective ROI dose: 5.0 person-rem/yr Average collective ROI dose: 6.8×10^{-3} mrem/yr	Not adverse	Not adverse	Not adverse

Table 5.3.13 1. Summary of Potential Environmental Justice Impacts Under the No Action Alternative (concluded)

RESOURCE OR TOPIC AREA	SUMMARIZED EFFECT	EFFECT ON RESOURCE OR TOPIC AREA ROI	PROPORTIONAL EFFECT ON	
			LOW-INCOME	MINORITY NEIGHBORHOODS
Human Health and Worker Safety	MEI lifetime risk of fatal cancer increases by 7.5×10^{-8} 2.5×10^{-3} fatal cancers (additional ROI)/yr Risk of cancer fatality to workforce is 6.8×10^{-3}	Not adverse	Not adverse	Not adverse
Transportation	Total annual material shipments: 5,096 Total KAFB traffic (daily vehicles): 38,406 Incident-free exposure, truck emissions - annual LCFs: 2.4×10^{-2} Incident-free exposure, dose - annual LCFs: 0.1	Not adverse	Not adverse	Not adverse
Waste Generation	All waste projections within capacities of existing waste management operations	Not adverse	Not adverse	Not adverse
Noise and Vibration	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).	Not adverse	Not adverse	Not adverse
Socioeconomics	SNL/NM employees: 8,035 SNL/NM total economic activity: $4.13 B/yr Percent of ROI total economic activity: 9.7%	Not adverse[a]	Not adverse	Not adverse

Source: Original
B: billion
dB: decibel
ER: environmental restoration
LCF: latent cancer fatality
MEI: maximally exposed individual
mrem: millirem
ROI: region of influence
SNL/NM: Sandia National Laboratories/New Mexico
TCP: traditional cultural property
yr: year
[a] SNL/NM represents approximately 10% of the total economic activity in the ROI.

5.4 EXPANDED OPERATIONS ALTERNATIVE

Under the Expanded Operations Alternative, DOE and interagency programs and activities at SNL/NM would increase to the highest reasonable activity levels that current facilities could support.

5.4.1 Land Use and Visual Resources

The implementation of the Expanded Operations Alternative would not affect the existing land use patterns or visual resources at SNL/NM facilities on KAFB. Sections 5.4.1.1 and 5.4.1.2 discuss these resource areas in relation to the Expanded Operations Alternative.

5.4.1.1 Land Use

Under the Expanded Operations Alternative, there would be no additional impacts to existing land resources on KAFB. The extent of DOE land and USAF-permitted acreage currently available for use by SNL/NM facilities on KAFB would remain the same. Similarly, operations would remain consistent with industrial/research park uses and would have no foreseeable effects on established land-use patterns or requirements. Any new SNL/NM facilities, upgrades, and other actions associated with this alternative would not require changes to current land ownership or classification status because these activities would take place in or near existing facilities, within previously disturbed or developed areas, or on land already under DOE control. SNL/NM does not anticipate a need for additional land at testing sites on permitted or withdrawn areas in association with this alternative. At locations on permitted land where operations would be declining or shut down by the owning organization, SNL/NM would continue to hold the sites to conduct periodic safety checks and complete any environmental restoration actions (Section 5.3.3.1). Before the land could be returned to the USAF, SNL/NM would be responsible for conducting any demolition work and restoring the land to its condition when originally acquired (SNL 1997a).

5.4.1.2 Visual Resources

No additional impacts to visual resources are anticipated that would adversely change the overall appearance of the existing landscape, obscure views, or alter the visibility of SNL/NM structures. Any new facilities, expansions, and upgrades would be planned at or near existing facilities and in areas with common scenic quality. The efforts initiated by SNL/NM to incorporate campus-style design would continue. This style contains established principles and design guidance that provide a framework for the physical development and redevelopment of SNL/NM sites. The guidance covers building massing, facades, colors, building orientation and entries, traffic circulation corridors, standardized signage, and landscaping, including low-water-use plant selections. These efforts would be consistent with the high concern for scenery due to the number of observers and users in the area.

Based on increased operational levels associated under the Expanded Operations Alternative, activities at outdoor testing facilities in the Coyote Test Field and the Withdrawn Area would increase; however, there would be no development at these areas that would alter existing visual resources. Some testing activities that produce smoke and dust of variable quantity and duration would take place, but these conditions would be periodic and short-term and would not change the visual characteristics of the area. Where decommissioning, demolition, or ER work are planned, actions would be taken such as backfilling, reducing sideslopes, applying topsoil, reseeding, and establishing plant growth to restore the area to its condition when originally acquired by SNL/NM.

5.4.2 Infrastructure

As discussed in Section 5.3.2, the infrastructure analysis looked for potential incremental changes to SNL/NM services, utilities, and facilities by alternative. The two areas where incremental changes were identified are site-wide utility demands and four selected infrastructure facilities, including the steam plant, RMWMF, HWMF, and TTF. See Section 2.3 for a discussion of how the four infrastructure facilities were selected.

With regard to site-wide utility demands, most SNL/NM facilities do not meter utility use. For the Expanded Operations Alternative, the highest number reported under the No Action Alternative was used as the basis for projecting utility use. Any incremental changes from the base year and Expanded Operations Alternative projections in utility demands for the selected facilities (see Chapter 2) were taken into account by adjusting site-wide demand accordingly, as presented in Table 5.4.2 1. Facility-specific utility data are presented in Chapter 3, Table 3.6 1.

As discussed in Section 5.3.2, analysis of the selected infrastructure facilities relied on the projected throughput and operational capacities as presented in Table 5.4.2 2.

Table 5.4.2 1. Annual[a] SNL/NM Utility Usage (Plus 10%) and Capacities Under the Expanded Operations Alternative

RESOURCE/ DATA SOURCE	BASE YEAR USAGE	EXPANDED OPERATIONS ALTERNATIVE ANNUAL USAGE	SYSTEM CAPACITY[b]	SNL/NM USAGE[c] AS PERCENT OF CAPACITY	OTHER KAFB USAGE AS PERCENT OF CAPACITY
WATER USE (PLUS 10%, see note)					
Site-Wide Demand[d]	440 M gal	440 M gal	2 B gal	22	32
Selected Facilities/ Facility Groups[e]	0 M gal	55 M gal	NA		
TOTAL	**440 M gal**	**495 M gal (545 M gal)**	**2 B gal**	**25 (27)**	**32**
WASTEWATER DISCHARGE (PLUS 10%)					
Site-Wide Demand[d]	280 M gal	280 M gal	850 M gal	33	25
Selected Facilities/ Facility Groups[e]	0 M gal	41.6 M gal	NA		
TOTAL	**280 M gal**	**322 M gal (354 M gal)**	**850 M gal**	**38 (42)**	**25**
ELECTRICAL USE (PLUS 10%)					
Site-Wide Demand[d]	197,000 MWh	197,000 MWh	1,095,000[f] MWh	18	28
Selected Facilities/ Facility Groups[e]	0 MWh	525 MWh	NA		
TOTAL	**197,000 MWh**	**198,000 MWh (218,000 MWh)**	**1,095,000[f] MWh**	**18 (20)**	**28**
NATURAL GAS USE (PLUS 10%)					
Site-Wide Demand[d,g]	475 M ft^3	475 M ft^3	2.3 B ft^3	22	31
Selected Facilities/ Facility Groups[e,h]	0 M ft^3	0 M ft^3	NA		
TOTAL	**475 M ft^3**	**475 M ft^3 (522.5 M ft^3)**	**2.3 B ft^3**	**22 (24)**	**31**

Table 5.4.2 1. Annual[a] SNL/NM Utility Usage (Plus 10%) and Capacities Under the Expanded Operations Alternative (concluded)

RESOURCE/ DATA SOURCE	BASE YEAR USAGE	EXPANDED OPERATIONS ALTERNATIVE ANNUAL USAGE	SYSTEM CAPACITY[b]	SNL/NM USAGE[c] AS PERCENT OF CAPACITY	OTHER KAFB USAGE AS PERCENT OF CAPACITY
MISCELLANEOUS					
Fuel Oil[h,i]	7,000 gal	7,000 gal	Not limited by infrastructure	NA	NA
Propane[h]	383,000 gal	383,000 gal	Not limited by infrastructure	NA	NA

Sources: SNL 1997a; SNL/NM 1998a, c; USAF 1998a, 1997
B: billion
ft³: cubic feet
FY: fiscal year
gal: gallon
M: million
MW: megawatt
MWh: megawatt hour
NA: Not applicable
psi: pounds per square inch
[a] Base Year is 1996 or 1997, the most representative of usage. Not necessarily the same as in Chapter 4. Although not accounted for in the table, SNL/NM expects to reduce water usage by 0 percent by the year 2004 (see Table5.3.2 1for conservation-based scenario).
[b] Capacity means the actual or calculated maximum amount of water, wastewater, or other resource that can be used, discharged, or consumed.
[c] Usage means the annual actual or calculated amount of water, wastewater, or other resource used, discharged, or consumed.
[d] Prorated based on the following square footage: Base Year = 5.266 M; FY 2003 = 5.143 M; FY 2008 = 4.986 M
[e] Adjustment for contribution from selected facilities/facility groups as reported in SNL/NM 1998a
[f] Based on 125-MW rating
[g] Estimated based on 60 psi
[h] No adjustments were reported in SNL/NM 1998a
[i] Fuel oil is used in emergency situations at the steam plant and is not dependent upon square footage.
Note: Ten percent was added to show that system capacities are more than adequate.

Table 5.4.2 2. Selected (Infrastructure) Facility Annual Throughput[a] and Capacities Under the Expanded Operations Alternative

FACILITY[d]	BASE YEAR ANNUAL 1997	EXPANDED OPERATIONS ANNUAL THROUGHPUT	FACILITY CAPACITY ANNUAL	THROUGHPUT AS PERCENT OF CAPACITY
Steam Plant (Steam Produced)[e]	544 M lb	544 M lb	3.33 B lb[b]	16
HWMF (Waste Handled)[e]	203,000 kg	214,000 kg	579,000 kg[c]	38
RMWMF (Waste Handled)[e]	1.6 M lb	2.7 M lb	2.7 M lb	100
TTF (Waste Handled)[e]	Minimal	1,200 lb	7,300 lb[b]	16

Source: SNL/NM 1998a
B: billion
ft³: cubic feet
HWMF: Hazardous Waste Management Facility
kg: kilogram
lb: pound
M: million
RMWMF: Radioactive and Mixed Waste Management Facility
TTF: Thermal Treatment Facility
[a] Throughput means the amount of steam produced or waste handled.
[b] Permit capacity
[c] This is the capacity for single-shift work with current employment level, not permit capacity.
[d] See Section 2.3 for a discussion on how these facilities were selected.
[e] See Table3.6 1, Infrastrudure category

Implementation of the Expanded Operations Alternative would result in demands on infrastructure generally increasing over the next 10 years (Table 5.4.2 1). Annual consumption of water, electricity, natural gas, fuel oil, and propane would be consistent with recent historic levels (SNL/NM 1998c). Small fluctuations in projected utility consumption rates would occur due to annual changes in weather. Table 5.4.2 1 includes a 10-percent increase for water, wastewater, electricity, and natural gas to show that system capacity would not be adversely affected if actual consumption exceeded projected consumption. More than 35 percent of the KAFB capacity would remain available.

Under the Expanded Operations Alternative, the current infrastructure resources would be capable of accommodating SNL/NM facility requirements and no major additional infrastructure facilities are proposed to be built. Generally, infrastructure facilities operational levels and levels of support activities are projected to remain consistent with recent historical support levels. Although accounted for, SNL/NM D&D programs would reduce overall impacts to SNL/NM infrastructure. Specific details on infrastructure systems are presented in the *1998 Sites Comprehensive Plan* (SNL 1997a). Additional details on water resources are provided in Section 5.4.4. Traffic-related impacts are presented in Section 5.4.9. KAFB utility usage is specifically discussed in Section 6.2.

Steam production would continue at 544 M lb per year, which represents 16 percent of capacity. A discussion on the steam distribution system production capacity is provided in Section 5.3.2.

The HWMF would manage approximately 579,000 kg of waste per year (Table 5.4.2 2). Annual waste management would increase to 37,707 ft^3 per year at the RMWMF. Additional capacity exists with the HWMF and RMWMF by adding more hours to the work schedule. The TTF would process wastes at recent historical levels. Small fluctuations would occur due to normal operations. Actual generation rates would likely decrease over the next 10 years due to ongoing waste minimization and waste avoidance efforts and improved efficiencies (SNL/NM 1997a). Projected waste generation rates and waste facilities are further discussed in Section 5.4.10.

5.4.3 Geology and Soils

The implementation of the Expanded Operations Alternative would increase activities at SNL/NM, thereby increasing the potential for soil contamination, as described in Section 5.4.3.1. As with the No Action Alternative, there would be no increase in the likelihood of impacts to slope stability (Section 5.4.3.2).

5.4.3.1 Soil Contamination

Section 5.3.3 describes the methods used to evaluate soil contamination at SNL/NM. It focuses on near-surface (zero to 1 ft deep) soil contamination at SNL/NM sites, particularly those investigated for the ER Project. The DOE has committed to managing 162 of 182 ER sites as inactive; the remaining 20 sites are still listed active. Of concern to the DOE among these active sites are outdoor testing areas where normal operations or accidents could result in the deposition of contaminants on the ground surface.

The more frequently tests are undertaken, the greater the probability of an occurrence that results in soil contamination. The Expanded Operations Alternative would increase the likelihood of soil contamination over the No Action Alternative. The number of Lurance Canyon certification burn tests, for example, would increase from 12 to 55 per year. Accordingly, the once in 10 years event, which would require decontamination and cleanup of up to 7,000 µg of DU per g of soil over a 1,000-ft^2 area, might be expected to occur once every 2 years. SNL/NM conducts immediate cleanup actions (SNL/NM 1998a) and periodic site surveys (SNL 1997e) to clean up these sites to levels that meet future land use standards.

5.4.3.2 Slope Stability

Section 5.3.3 describes the relevance of and methods used to evaluate slope stability. Four areas were selected for a detailed, qualitative evaluation: the southern boundary of TA-IV, the Aerial Cable Facility, the Lurance Canyon Burn Site, and the Electro-Explosive Research Facility. The likelihood of slope failure at these locations would be remote.

Under the Expanded Operations Alternative, no changes in activity types or frequencies would be projected for TA-IV and the Electro-Explosive Research Facility (SNL/NM 1998a). An increase in testing would be expected at the Aerial Cable Facility and the Lurance Canyon Burn Site, with some tests increasing by a factor of five over 1996 levels (SNL/NM 1998a). No slope destabilizing activities have been identified at the Lurance Canyon Burn Site. Accidental burns of vegetation from hot missile debris could become more frequent at the Aerial Cable Facility. This could cause a decrease in vegetation cover. However, this area is mostly bedrock with a thin soil veneer, and no evidence of slope instability was observed in a previously burned area. Therefore, no effect on slope stability would be projected under the Expanded Operations Alternative, with the likelihood of slope failure continuing to remain remote.

5.4.4 Water Resources and Hydrology

Impacts from the implementation of the Expanded Operations Alternative would not differ substantively from impacts described in Section 5.3.4 for the No Action Alternative. Impacts to groundwater quality and quantity and surface water quality and quantity are described in Sections 5.4.4.1, 5.4.4.2, 5.4.4.3, and 5.4.4.4, respectively.

5.4.4.1 Groundwater Quality

Section 5.3.4 identifies sources of groundwater contamination and presents modeling of the CWL. All groundwater quality impacts described in Section 5.3.4.1 are alternative-independent the Expanded Operations Alternative would not cause any change in the nature or extent of groundwater contamination. Contamination of groundwater would remain an adverse impact as discussed in Section 5.3.4.1. No changes in rate and scope of ER Project remediation activities are projected for the Expanded Operations Alternative.

5.4.4.2 Groundwater Quantity

Under the Expanded Operations Alternative, using the groundwater quantity analysis described in Section 5.3.4.2 and projected SNL/NM water use for 1998 to 2008, 628 M ft^3 of water would be withdrawn over the 10-year operational period in comparison with 605 M ft^3 under the No Action Alternative. Under the Expanded Operations Alternative, this amount would account for approximately 12 percent of the 5,384 M ft^3 of groundwater withdrawal in the vicinity of KAFB from 1998 to 2008, compared to 11 percent under the No Action Alternative.

The impacts described in Section 5.3.4.2 would not vary in any significant manner under the Expanded Operations Alternative. Aquifer drawdown would remain an adverse impact.

5.4.4.3 Surface Water Quality

SNL/NM impacts to surface water quality are discussed in Section 5.3.4. This discussion compares results of water quality analyses in Tijeras Arroyo (from samples collected during storm events), near the downstream boundary of KAFB, with NMWQCC stream standards. No constituents in the analyses exceeded these standards. Further, the three major potential contributors to surface water contamination (ER Project sites; permitted storm water discharges from TAs-I, -II, and -IV; and outdoor testing facilities) were evaluated based on potential contaminants and likelihood of migration.

Under the Expanded Operations Alternative, two changes could occur in the potential contributors to surface water contamination.

A projected increase in staff of 10 percent over current levels (Section 5.4.12) could potentially add to the quantity of oil and grease runoff from permitted storm water discharges in TAs-I, -II, and -IV. The most recent storm water monitoring shows oil and grease concentrations ranging from 0.60 to 1.4 mg/L (SNL 1997d). Although there are no quantitative NPDES or state limits for oil and grease, these concentrations are near detection limits. A 10-percent increase in these values would have no discernible environmental consequence, especially considering dilution that would occur in Tijeras Arroyo during periods of runoff.

An increase in the frequency of outdoor tests could result in an increase of radioactive materials deposited on the ground surface. Surface water sampling in Tijeras Arroyo has shown concentrations of radionuclides consistent with background levels. Only two outdoor testing sites, the Aerial Cable Facility and the Lurance Canyon Burn Site, have a defined path to Tijeras Arroyo. Some types of tests at both of these facilities would increase by a factor of five from the baseline year (1996) under the Expanded Operations Alternative. However, to date, surface water sampling has not shown evidence of contamination resulting from tests, and both sites are located at least 10 mi upstream of the point where Tijeras Arroyo exits KAFB. Therefore, concentrations of radionuclides at the exit point of Tijeras Arroyo from KAFB would be anticipated to remain the same under the Expanded Operations Alternative.

5.4.4.4 Surface Water Quantity

The method used to estimate the SNL/NM contribution to surface water quantity is described under the No Action Alternative (Section 5.3.4) and Appendix B. The analysis calculates the quantities of excess surface water runoff from developed areas of SNL/NM and the discharge of process and sanitary water to Albuquerques Southside Water Reclamation Plant. Under the No Action Alternative, the estimated total excess surface water contribution to the Rio Grande would be between 40.7 and 41.3 M ft^3 annually. The vast majority of this contribution (40.6 M ft^3) would be from discharges to the water reclamation plant.

Storm Water Runoff

The Expanded Operations Alternative would result in only minor net differences in building and parking lot areas.

These differences would not significantly change the developed (impervious) area of SNL/NM from the 0.72-mi^2 area projected under the No Action Alternative. Therefore, excess surface water runoff would continue at 100,000 to 700,000 ft^3 per year, as estimated under the No Action Alternative (Appendix B).

Discharge to Sanitary Sewer

The estimated annual volume of water to be discharged to the sanitary sewer under the Expanded Operations Alternative would be 43.0 M ft^3 (322 M gal), a 6 percent increase from the No Action Alternative (Section 5.3.4). Combined with the excess surface water runoff, the estimated total SNL/NM effect on surface water quantity would be between 43.1 and 43.7 M ft^3 annually. This would represent approximately 0.07 percent of Rio Grande flow at the discharge points. Under the Expanded Operations Alternative, no detrimental effects to the Rio Grande from the quantity of SNL/NM water discharged would be likely.

5.4.5 Biological and Ecological Resources

Implementation of the Expanded Operations Alternative would result in impacts to biological and ecological resources similar to those under the No Action Alternative (see Section 5.3.5). There would be slightly increased levels of noise and activity under this alternative due to more frequent outdoor explosions. Impacts to biological and ecological resources would be minimal. Inventory and management of the biological resources by SNL/NM, KAFB, and the USFS would continue to protect the animals, plants, and sensitive species on KAFB.

Outdoor activities would have a slight increase in the probability of unintended fires, off-road vehicular traffic, noise, small explosive debris, and plumes of smoke. The increased level of activity would be unlikely to cause the loss of any known species or plant community at KAFB. The area of disturbed vegetation would be increased, but the effect on the viability of plant communities would be negligible.

There would be no effect to the Federally endangered peregrine falcon, as discussed in Section 5.3.5. It is not anticipated that there would be adverse effects to the viability of populations of any sensitive species.

Potential increases in contaminant loads due to increased operations affecting animals and plants would be negligible based on annual ecological monitoring data (SNL/NM 1997u). See Section 5.4.3 for a discussion of contaminant loads and geology and soils impacts.

5.4.6 Cultural Resources

The implementation of the Expanded Operations Alternative would have low to negligible impacts to cultural resources due to 1) the absence of prehistoric or historic archaeological sites on DOE-administered land, 2) the nature of the cultural resources found in the ROI (see Appendix C), 3) compliance with applicable regulations and established procedures for the protection and conservation of cultural resources located on lands administered by the DOE and on lands administered by other agencies and used by the DOE (see Section 4.8.3.2 and Chapter 7), and 4) the largely benign nature of SNL/NM activities near cultural resources. Implementation of the regulations and procedures would make unlikely adverse impacts from construction, demolition, decontamination, renovation, or ER Project activities.

Under the Expanded Operations Alternative, prehistoric and historic cultural resources could potentially be affected by activities performed at five SNL/NM facilities, although the potential for impact would be low to negligible. These facilities consist of the Aerial Cable Facility, Lurance Canyon Burn Site, Thunder Range, Sled Track Complex, and Terminal Ballistics Complex. The first three facilities are located on land not owned by the DOE. Impacts could potentially result from three activities at these facilities: production of explosive testing debris and shrapnel, off-road vehicle traffic, and unintended fires and fire suppression. An increase in the frequency of these activities under the Expanded Operations Alternative would not result in a change in the potential for impacts from the No Action Alternative the potential would remain low to negligible.

Another source of potential impact derives from the restricted access present at KAFB and at individual SNL/NM facilities. Restriction of access to areas within the ROI would have positive effects on cultural resources themselves. Under the Expanded Operations Alternative, current security levels that restrict access would be maintained for KAFB in general and would increase in frequency for specific SNL/NM facilities during various activities. These added restrictions would result in an increased level of protection for cultural resources located within the ROI and especially within the facility secure zones.

5.4.7 Air Quality

The implementation of the Expanded Operations Alternative would result in the nonradiological and radiological impacts to air quality described in Sections 5.4.7.1 and 5.4.7.2, respectively. The methods used to calculate these impacts are similar to those used to calculate air quality impacts for the No Action Alternative (Section 5.3.7).

5.4.7.1 Nonradiological Air Quality

Criteria Pollutants

Impacts of criteria pollutant concentrations resulting from the Expanded Operations Alternative were estimated by modeling emission sources using the EPA *ISCST3* (dated 97363) model. The emission rates for the steam plant, which were used as input in the model, are the same as those presented under the No Action Alternative. It is estimated that this level of operation would be sufficient to supply steam to all facilities under the Expanded Operations Alternative because no additional floor space is anticipated. In addition to the steam plant emissions, emissions from the four 600-kw emergency generators in Building 862, the boiler and emergency generator in Building 701, and the 600-kw generator in Building 870b were used as input into the model.

The OLM was used to calculate the nitrogen dioxide concentration as was done under the No Action Alternative. Background concentrations of nitrogen dioxide from monitoring station 2ZR for the 24-hour average concentration and the annual average concentration of 0.029 ppm (46 µg/m^3) and 0.008 ppm (13 µg/m^3) respectively, were added to the modeled nitrogen dioxide concentrations. The resulting concentrations of criteria pollutants are estimated to be comparable to the No Action Alternative concentrations presented in Table 5.3.7 1. Criteria pollutant concentrations under the Expanded Operations Alternative would be below applicable Federal and New Mexico state standards.

Mobile Sources

Mobile source (motor vehicle) emissions under the Expanded Operations Alternative would include carbon monoxide emissions estimated from increased commuter traffic. The estimated commuter traffic would be 110 percent of that under the No Action Alternative, or 14,940 commuter vehicles and 660 on-base vehicles.

The carbon monoxide emission factor was determined by the EPA mobile source emission factor model *MOBILE5a,* projected to 2005, and would be 28.5 g per mile (SNL 1996c).

The projected carbon monoxide emissions for SNL/NM under the Expanded Operations Alternative, based on the aforementioned assumptions and modeled emission factor, would be 3,837 tons per year. This represents an increase of 348 tons per year from the No Action Alternative; however, this still represents a decrease of 250 tons per year from the 1996 baseline (see TableD.1 30). Projected carbon monoxide emissions for Bernalillo county for 2005 are 206 tons per day, or 75,190 tons per year (AEHD 1998). The contribution of carbon monoxide emissions from vehicles commuting to and from SNL/NM and SNL/NM-operated on-base vehicles in 2005, as a percent of the total county highway mobile source carbon monoxide emissions, would be 5.1 percent.

Total carbon monoxide emissions are shown in Table 5.4.7 1. Estimates from construction activities are included and are the same as those described in Section 5.3.7.1 for the No Action Alternative.

Total carbon monoxide emissions for the Expanded Operations Alternative are 243 tons per year less than the 1996 baseline, well below the 100 tons per year incremental increase above baseline that would require a conformity determination. In addition, the total carbon monoxide emissions for the Expanded Operations Alternative were found to be approximately 3 percent of the maintenance areas emissions of carbon monoxide. As a result, the DOE has concluded that no conformity

Table 5.4.7 1. Carbon Monoxide Emissions (tons per year) from SNL/NM under the Expanded Operations Alternative

STATIONARY SOURCES	MOBILE SOURCES	CONSTRUCTION ACTIVITIES	BURN SITE	TOTAL
18.36[a]	3,837	132	4.5[b]	3,991.86

Sources: SNL/NM 1998a, SNL 1996c
lb: pound
SNL/NM: Sandia National Laboratories/New Mexico
[a] Includes incremental carbon monoxide emissions from an insignificant boiler and emergency generator in Building 701 and a 600-kw-capacity generator in Building 870b added between 1996 and 2008.
[b] Represents carbon monoxide emissions from combustion of 400,200 lb of JP-8 fuel.

determination is required for the Expanded Operations Alternative.

Lurance Canyon Burn Site

Estimates of the criteria pollutant emissions under the Expanded Operations Alternative for the Lurance Canyon Burn Site were based on a reasonable upper bound quantity of JP-8 fuel burned (1,000 gal), which is equal to that used to estimate criteria pollutant emissions under the No Action Alternative. The frequency of tests is expected to increase for the Expanded Operations Alternative, therefore, increasing the throughput of JP-8 fuel burned for the year. The proposed operating permit limits for the Lurance Canyon Burn Site were based on the following fuel throughputs:

36,000 lb of sawdust or wood

12,000 lb for a sawdust-propellant-acetone mixture

400,200 lb of JP-8 fuel

14,400 lb of urethane foam

100 lb of explosives

Concentrations of pollutants resulting from test emissions were calculated using the *OBODM* (Bjorklund et al. 1997). The results for the criteria pollutants are presented in Table 5.4.7 2 along with applicable Federal (40 CFR Part 50) and New Mexico state standards (20 NMAC 2.3) for each pollutant. The maximum percent of a criteria pollutant standard is 4.3 percent for the NMAAQS for the 24-hour average PM_{10}.

Eighty-nine chemical pollutants, resulting from the tests performed at the Lurance Canyon Burn Site, were also evaluated. Each of these pollutants was compared with the respective OEL/100 guideline and each comparison indicated the chemical concentrations would be below the guideline. Appendix D contains the list of chemical concentrations resulting from the estimated Expanded Operations Alternative tests at the Lurance Canyon Burn Site.

Table 5.4.7 2. Criteria Pollutant Concentrations from Lurance Canyon Burn Site with Applicable National and New Mexico Ambient Air Quality Standards Under the Expanded Operations Alternative

POLLUTANT	AVERAGE TIME	NAAQS (ppm[µg/m^3])	NMAAQS (ppm[µg/m^3])	EXPANDED OPERATIONS CONCENTRATION (ppm[µg/m^3])	PERCENT OF STANDARD
Carbon Monoxide	8 hours	9[8,564]	8.7[8,279]	0.023[21.45]	< 1
	1 hour	35[33,305]	13.1[12,466]	0.18[171.6]	1.4
Nitrogen Dioxide	Annual	0.053[83]	0.05[78]	6.4×10^{-7}[0.001]	< 1
	24 hours	-	0.10[156]	1.18×10^{-4}[0.184]	< 1
PM_{10}[a]	Annual	50	-	0.018[b]	< 1
	24 hours	150	-	6.51[b]	4.3
Sulfur Dioxide	Annual	0.03[65]	0.02[44]	4.6×10^{-7}[0.001]	< 1
	24 hours	0.14[305]	0.10[218]	1.7×10^{-4}[0.367]	< 1
	3 hours	0.50[1,088]	-	0.001[2.94]	< 1
TSP[a]	Annual	-	60[b]	0.018[b]	< 1
	24 hours	-	150[b]	6.51[b]	4.3

Sources: 20 NMAC 2.3, 40 CFR 50, Bjorklund et al. 1997, SNL 1997a,
µg/m^3: micrograms per cubic meter
°R: degrees Rankin
ft: feet
NAAQS: National Ambient Air Quality Standards
NMAAQS: New Mexico Ambient Air Quality Standards
PM_{10}: particulate matter smaller than 10 microns in diameter
ppm: parts per million
TSP: total suspended particulates
[a] PM_{10} assumed equal to TSP
[b] µg/m^3
Note: The standards for some of the pollutants are stated in ppm. These values were converted to µg/m^3 with appropriate corrections for temperature (530° R) and pressure (elevation 5,400 ft) following New Mexico Dispersion Modeling Guidelines (NMAPCB 1996).

Noncarcinogenic Chemical Screening

Estimates of noncarcinogenic chemical emissions under the Expanded Operations Alternative were determined by extrapolating the No Action Alternative noncarcinogenic chemical emissions to the level of expanded operations for each of the selected facilities. The same screening process described for the No Action Alternative was performed to reduce the number of chemicals to those that exceed the screening level. The screening analysis considered those chemicals screened under the No Action Alternative from the same 12 facilities located in TAs-I, -II, -III, -IV, and -V and shown in Table 5.3.7 5. One noncarcinogenic chemical, chromium trioxide from Building 870, would exceed the screening level under the Expanded Operations Alternative.

Carcinogenic Chemical Screening

Carcinogenic chemical emissions under the Expanded Operations Alternative were determined by extrapolating the No Action Alternative carcinogenic chemical emissions to the level of expanded operations for each of the selected facilities. The same screening process described for the No Action Alternative was performed to reduce the number of carcinogenic chemicals to those that exceed the screening level. The screening analysis considered those chemicals screened under the No Action Alternative from the same 12 facilities located in TAs-I, -II, -III, -IV, and -V and shown in Table 5.3.7 5. Ten carcinogenic chemicals from five facilities would exceed the screening level. Table 5.4.7 3 presents concentrations for those carcinogenic chemicals with estimated emission rates greater than the screening level.

Under the Expanded Operations Alternative, nonradiological air quality concentrations for criteria and chemical pollutants would be below regulatory standards and human health guidelines. 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 at a public access area. Noncarcinogenic chemicals that exceed the screening levels, based upon emission rates calculated from purchased quantities (Appendix D, Tables D.1 6, D.1 10, D.1 14, and D.1 18), do not exceed the screening levels based upon process engineering estimates of actual emission rates, with the exception of chromium trioxide from Building 870 (Appendix D, Table D.1 21). Further analysis of chromium trioxide is performed in Section 5.3.8 to determine human health impacts from noncarcinogenic chemical emissions from SNL/NM. The risk due to exposure of the 10 carcinogenic chemicals that exceed the carcinogenic chemical screening guidelines (Appendix D, TableD.1 25) are further evaluated in Section 5.4.8, Human Health and Worker Safety.

Table 5.4.7 3. Annual Carcinogenic Chemical Concentrations from Facility Emissions Under the Expanded Operations Alternative

CHEMICALS EXCEEDING SCREENING LEVELS	BUILDING SOURCE	EXPANDED OPERATIONS CONCENTRATION (ppb[µg/m^3])
Chloroform (Trichloromethane)	6580	$1.09x10^{-3}$[$4.42x10^{-3}$]
Dichloromethane (Methylene Chloride)	870	$7.31x10^{-2}$[$2.11x10^{-1}$]
Dichloromethane (Methylene Chloride)	878	$3.53x10^{-3}$[$1.02x10^{-2}$]
Formaldehyde	878	$6.36x10^{-4}$[$6.49x10^{-4}$]
Trichloroethene	878	$1.16x10^{-2}$[$5.20x10^{-2}$]
1,2-Dichloroethane (Ethylene Dichloride)	893	$5.86x10^{-4}$[$1.97x10^{-3}$]
1,4-Dichloro-2-Butene	897	$3.96x10^{-5}$[$1.68x10^{-4}$]
Acrylonitrile	897	$1.52x10^{-4}$[$2.74x10^{-4}$]
Chloroform (Trichloromethane)	897	$1.25x10^{-3}$[$5.07x10^{-3}$]
Trichloroethene	897	$1.58x10^{-3}$[$7.06x10^{-3}$]

Source: SNL/NM 1998a
ppb: parts per billion
µg/m^3: micrograms per cubic meter
Bldg. 6580 Hot Cell Facility (HCF)
Bldg. 870 Neutron Generator Facility (NGF)
Bldg. 878 Advanced Manufacturing Processes Laboratory (AMPL)
Bldg. 893 Compound Semiconductor Research Laboratory (CSRL)
Bldg. 897 Integrated Materials Research Laboratory (IMRL)

5.4.7.2 Radiological Air Quality

The SWEIS analysis reviewed the radiological emissions from all SNL/NM facilities. Section 4.9.2 identifies 17 SNL/NM facilities as producing radiological emissions. Based on historic SNL/NM radionuclide emissions data, NESHAP compliance reports, and the FSID (SNL/NM 1998ee), 10 of the 17 SNL/NM facilities were modeled for radiological impacts (Table 5.4.7 4). ACRR operations under DP configuration were assumed comparable to Annular Core Pulsed Reactor II (ACPR-II)

Table 5.4.7 4. Radiological Emissions from Sources at SNL/NM Under the Expanded Operations Alternative

FACILITY NAME	TECHNICAL AREA	RADIONUCLIDE[a]	RELEASE (Ci/yr)
Annular Core Pulsed Reactor (ACPR-II DP configuration), Building 6588	V	Argon-41	7.8
Annular Core Research Reactor (ACRR, medical isotopes production configuration), Building 6588	V	Argon-41 Tritium	2.2 2.2
Explosive Components Facility (ECF), Building 905	II	Tritium	2.0×10^{-3}
High-Energy Radiation Megavolt Electron Source (HERMES III), Building 970	IV	Nitrogen-13 Oxygen-15	3.603×10^{-3} 3.603×10^{-4}
Hot Cell Facility (HCF), Building 6580	V	Iodine-131 Iodine-132 Iodine-133 Iodine-134 Iodine-135 Krypton-83m Krypton-85 Krypton-85m Krypton-87 Krypton-88 Xenon-131m Xenon-133 Xenon-133m Xenon-135 Xenon-135m	3.90 10 18 0.72 11 660 0.63 970 190 1,600 5.9 7,200 340 6,900 1,200
Mixed Waste Landfill (MWL)	III	Tritium	0.29
Neutron Generator Facility (NGF), Building 870	I	Tritium	156
Radioactive and Mixed Waste Management Facility (RMWMF), Building 6920	III	Tritium	2.203[b]
Radiographic Integrated Test Stand (RITS), Building 970	IV	Nitrogen-13	0.16
Sandia Pulsed Reactor (SPR), Building 6590	V	Argon-41	30

Source: SNL/NM 1998a
DP: Defense Programs
Ci/yr: curies per year
SNL/CA: Sandia National Laboratories/California
[a] Radiological emissions are projections based on planned activities, projects, and programs. Radionuclide releases are not the same as those presented in Chapter 4.
[b] Because SNL/CA tritium-contaminated oil levels handled at RMWMF during the base year were abnormally high, this maximum level of emissions was assumed to be released in any year and, therefore, was constant for all alternatives.

operations, and, for the purpose of conservative analysis, the ACRR was evaluated under simultaneous operation of both configurations. For analysis purposes, based on the review of historical dose evaluations, other facilities that would not contribute more than 0.01 mrem/yr (0.1 percent of the NESHAP limit) to the MEI were screened from further consideration in the SWEIS. The modeled releases to the environment would result in a calculated dose to the MEI and the population within 50 mi of TA-V. TA-V was selected as a center for the population within a 50-mi radius, because the majority of radiological emissions would be from TA-V, specifically the HCF, and TA-V is historically addressed for annual SNL/NM NESHAP compliance (SNL/NM 1996u).

The *CAP88-PC* computer model (DOE 1997e) was used to calculate the doses. Details on the *CAP88-PC* model, radionuclide emissions, model and source parameters, exposures, meteorological data, and population data are presented in Appendix D. Figure 5.3.7 3 shows the locations of the 10 facilities modeled in the SWEIS. Table 5.4.7 4 presents the estimated radiological emissions from the 10 SNL/NM facilities under the Expanded Operations Alternative. The radiological emissions from each facility were estimated based on SNL/NM planned operations and tests projected into the future. Detailed information is available in the FSID (SNL/NM 1998ee). The ACRR and HCF emissions for base year 1996 are different due to the refurbishing operations to change over to medical isotope production configuration. The SPR emissions were estimated to be higher than emissions during the base year. This is due to instituting NESHAP requirements for confirmatory measurements of radiological air emissions where measured emission factors were determined for both the SPR and the ACRR. These measured emission factors were found to be higher than the calculated emission factors. These measurements are source-specific to the SPR and ACRR and would not affect the calculations or measurements for other facilities.

Because the general public and USAF personnel have access to SNL/NM, 14 core receptor locations and 2 offsite receptor locations of public concern were considered for dose impact evaluations (see Appendix D.2). Based on NESHAP reports, 16 onsite and 6 offsite additional receptor locations were also evaluated. A total of 38 receptor locations were evaluated for dose impacts. The core receptor locations include schools, hospitals, a museum, and clubs, and were considered for analysis because of potential impacts to children, the sick, and the elderly. The 32 modeled onsite and core receptor locations are shown in Figure 5.3.7 4.

The dose to an individual at each receptor location and to the population within 50 mi from the radionuclide emission from each source were calculated using the *CAP88-PC* model. The public receptor receiving the maximum dose was identified as the MEI. The model-calculated dose contributions, including external, inhalation, and ingestion exposure pathways from each of the 10 sources, calculated individually at each receptor location, were combined at each modeled receptor to determine the overall SNL/NM site-wide normal operations dose to the MEI. Under the Expanded Operations Alternative, the maximum EDE to the MEI from all exposure pathways from all modeled sources was calculated to be 0.51 mrem/yr. The MEI having the highest combined dose would be located at the KUMMSC, north of TA-V. This location is consistent with the location of the MEI historically identified in the annual NESHAP compliance reports. The EDE contributions from these 10 sources to this combined MEI dose are presented in Table 5.4.7 5. Table 5.4.7 6 presents the doses at the 38 onsite, core, and offsite receptor locations. The potential doses for these additional locations would be much lower than the highest combined MEI dose. The total collective dose to the population of 732,523 within a 50-mi radius of TA-V was calculated to be 15.8 person-rem per year under the Expanded Operations Alternative. The contributions from all of the 10 modeled sources to the overall SNL/NM site-wide normal operations collective dose to the population within 50 mi are also presented in Table 5.4.7 4. The average dose to an individual in the population within 50 mi of TA-V (collective dose divided by the total population) would be 2.16×10^{-2} mrem/yr.

The calculated total MEI dose of 0.51 mrem/yr would be much lower than the regulatory limit of 10 mrem/yr to an MEI from SNL/NM site-wide total airborne releases of radiological materials (40 CFR Part 61). This dose would be small compared to an individual background radiation dose of 360 mrem/yr (see Figure 4.10 2). The calculated collective dose from SNL/NM operations to the population within 50 mi, 15.8 person-rem per year, would be much lower than the collective dose to the population from background radiation. Based on this individual background radiation dose, the population within 50 mi of TA-V would receive 263,700 person-rem per year.

Table 5.4.7 5. Summary of Dose Estimates from Radioactive Air Emissions to the SNL/NM Public Under the Expanded Operations Alternative

SOURCE	ANNUAL MEI DOSE, EDE (mrem)	ANNUAL POPULATION DOSE (person-rem)
Annular Core Pulsed Reactor II (ACPR-II) (DP configuration)	1.3×10^{-3}	2.16×10^{-2}
Annular Core Research Reactor (ACRR) (medical isotopes production configuration)	4.2×10^{-4}	1.07×10^{-2}
Explosive Components Facility (ECF)	9.9×10^{-9}	4.19×10^{-6}
High-Energy Radiation Megavolt Electron Source (HERMES III)	3.0×10^{-8}	6.06×10^{-7}
Hot Cell Facility (HCF)	5.0×10^{-1}	1.54×10^{1}
Mixed Waste Landfill (MWL)	4.0×10^{-6}	6.16×10^{-4}
Neutron Generator Facility (NGF)	7.4×10^{-4}	3.22×10^{-1}
Radioactive and Mixed Waste Management Facility (RMWMF)	7.5×10^{-6}	3.24×10^{-3}
Radiographic Integrated Test Stand (RITS)	1.3×10^{-6}	2.69×10^{-5}
Sandia Pulsed Reactor (SPR)	4.3×10^{-3}	8.01×10^{-2}
TOTAL MEI DOSE	**0.51**	**-**
50-MILE POPULATION COLLECTIVE DOSE	**-**	**15.8**

Sources: DOE 1997e, SNL/NM 1998a
DP: Defense Programs
EDE: effective dose equivalent
MEI: maximally exposed individual
mrem: millirem
rem: Roentgen equivalent, man
Note: Although the Annular Core Pulsed Reactor-II is expected to be operated under DP configuration intermittently, for this analysis, it was assumed to be operated simultaneously with the ACRR under medical isotopes production configuration. Its contribution to the total dose would not be appreciable.

Table 5.4.7 6. Summary of Dose Estimates from Radioactive Air Emissions to 38 Onsite and Offsite Receptors Under the Expanded Operations Alternative

RECEPTOR	ANNUAL RECEPTOR DOSE, EDE (mrem)
ONSITE AND NEAR-SITE RECEPTORS	
Albuquerque International Sunport (Bldg. 1064)	$5.7x10^{-2}$
Albuquerque International Sunport (Bldg. 760)	$1.2x10^{-1}$
Building 20706	$7.8x10^{-2}$
Building 24499	$5.5x10^{-2}$
Child Development Center-East	$5.4x10^{-2}$
Child Development Center-West	$6.2x10^{-2}$
Civil Engineering Research Facility (Bldg. 5701)	$4.0x10^{-2}$
Coronado Club	$5.5x10^{-2}$
Coyote Canyon Control Center	$4.0x10^{-2}$
Golf Course Clubhouse	$2.3x10^{-2}$
Golf Course Maintenance Area	$1.5x10^{-1}$
Kirtland Elementary School	$6.1x10^{-2}$
KAFB Firestation #4 (Bldg. 9002)	$5.9x10^{-2}$
KAFB Landfill	$9.1x10^{-2}$
Kirtland Underground Munitions and Maintenance Storage Complex (KUMMSC)	$5.1x10^{-1}$
Loop Housing	$5.3x10^{-2}$
Lovelace Hospital	$4.5x10^{-2}$
Lovelace Respiratory Research Institute	$4.2x10^{-2}$
Manzano Offices (Fire Station)	$1.1x10^{-1}$
Maxwell Housing	$7.2x10^{-2}$
National Atomic Museum	$6.9x10^{-2}$
Pershing Park Housing	$5.1x10^{-2}$
Riding Stables	$2.1x10^{-1}$
Sandia Base Elementary	$4.3x10^{-2}$
Sandia Federal Credit Union	$7.7x10^{-2}$
Shandiin Day Care Center	$6.3x10^{-2}$
Technical Onsite Inspection Facility	$9.8x10^{-2}$
Veterans Affairs Medical Center	$8.4x10^{-2}$
Wherry Elementary School	$5.2x10^{-2}$
Zia Park Housing	$6.6x10^{-2}$

Table 5.4.7 6. Summary of Dose Estimates from Radioactive Air Emissions to 38 Onsite and Offsite Receptors Under the Expanded Operations Alternative (concluded)

RECEPTOR	ANNUAL RECEPTOR DOSE, EDE (mrem)
OFFSITE RECEPTORS	
Albuquerque City Offices	$1.5x10^{-1}$
East Resident	$5.8x10^{-2}$
Eubank Gate Area (Bldg. 8895)	$1.1x10^{-1}$
Four Hills Subdivision	$1.1x10^{-1}$
Isleta Gaming Palace	$6.6x10^{-2}$
Northeast Resident	$7.8x10^{-2}$
Seismic Center (USGS)	$6.8x10^{-2}$
Tijeras Arroyo (West)	$1.9x10^{-1}$

Sources: DOE 1997e, SNL/NM 1998a
EDE: effective dose equivalent
mrem: millirem
USGS: U.S. Geological Survey

5.4.8 Human Health and Worker Safety

Implementation of the Expanded Operations Alternative would result in the human health and worker safety impacts described in the following sections for normal operations and accident conditions.

5.4.8.1 Normal Operations

This section provides information on public health and worker health and safety under the Expanded Operations Alternative. It assesses the potential human health effects associated with routine releases of radioactive and nonradioactive hazardous material from SNL/NM normal operations. For detailed discussions of analytical methods and results, along with terminology, definitions, and descriptions, see Appendix E.

Health risk analyses are presented for potential exposures at specific receptor locations and for the potential maximum exposures to radiation and chemical air releases. For a description of receptor locations, exposure scenarios, and environmental pathways selected for assessing human health impacts, see Section 5.3.8.

Chemical Air Release Pathways

Under the Expanded Operations Alternative, chemical use would be more than the quantities projected under the No Action Alternative. As a result, air exposure concentrations at receptor locations are projected to increase slightly (Appendix E, Table E.3 3). The chemical assessment process, described in Section 5.3.8 for chemical air release pathways, identified seven COCs (see Appendix E, Table E.3 3). Three of the seven COCs are the same for different buildings These COCs are associated with SNL/NM operations in Buildings 878 (AMPL), 893 (CSRL), 897 (IMRL), 6580 (HCF), and 870 (NGF).

Several receptor locations, individual exposure scenarios, and a hypothetical worst-case exposure scenario present the range of health risks from chemicals in the air in the SNL/NM vicinity. Adult, child, residential, and visitor risk assessments were calculated. Table 5.4.8 1 lists the human health impacts from the estimated exposures to chemical air releases from SNL/NM facility operations. These potential health risks are low and no adverse health effects would occur at these risk levels. Assessing the hypothetical worst-case exposure scenario establishes the upper bound value for health risk. Under the Expanded Alternative, the upper bound values for health risk from noncarcinogenic chemicals would be HIs of less than 1; the ELCRs would be less than 10^{-6} from carcinogenic chemicals (Table E.6 4).

Radiation Air Release Pathways

Projected air releases of radionuclides under the Expanded Operations Alternative would result in slightly higher radiation exposures to both the potential MEI and the population in the ROI. The maximum radiation doses calculated are presented in Section 5.4.7.2. The risk estimator of 500 fatal cancers per 1 M person-rem to the public was used to convert dose to fatal cancer risk.

Table 5.4.8 1. Human Health Impacts in the SNL/NM Vicinity from Chemical Air Emissions Under the Expanded Operations Alternative

RECEPTOR LOCATIONS	RECEPTOR	TOTAL HAZARD INDEX RME/AEI	TOTAL EXCESS LIFETIME CANCER RISK RME/AEI
RESIDENTIAL SCENARIOS			
Four Hills Subdivision[a]	Adult	<0.01/<0.01	$2.1x10^{-10}/1.3x10^{-10}$
	Child	<0.01/<0.01	$8.5x10^{-11}/8.5x10^{-11}$
Isleta Gaming Palace	Adult	<0.01/<0.01	$4.6x10^{-10}/4.7x10^{-12}$
	Child	<0.01/<0.01	$3.2x10^{-10}/3.6x10^{-12}$
KAFB Housing (Zia Park Housing)	Adult	<0.01/<0.01	$8.1x10^{-10}/8.4x10^{-12}$
	Child	<0.01/<0.01	$5.7x10^{-10}/6.4x10^{-12}$
VISITOR SCENARIOS			
Child Development Center-East	Child	<0.01/<0.01	$5.5x10^{-10}/6.2x10^{-12}$
Child Development Center-West	Child	<0.01/<0.01	$1.2x10^{-10}/1.4x10^{-12}$
Coronado Club	Adult	<0.01/<0.01	$1.0x10^{-9}/1.0x10^{-11}$
	Child	<0.01/<0.01	$7.0x10^{-10}/7.8x10^{-12}$
Golf Course (Club House)	Adult	<0.01/<0.01	$5.1x10^{-10}/5.3x10^{-12}$
Kirtland Elementary School	Child	<0.01/<0.01	$4.7x10^{-11}/5.2x10^{-13}$
Kirtland Underground Munitions and Maintenance Storage Complex (KUMMSC)[b]	Adult	<0.01/<0.01	$3.5x10^{-10}/3.7x10^{-12}$
Lovelace Hospital	Adult	<0.01/<0.01	$2.8x10^{-10}/2.9x10^{-12}$
	Child	<0.01/<0.01	$1.9x10^{-10}/2.2x10^{-12}$
National Atomic Museum	Adult	<0.01/<0.01	$2.1x10^{-9}/2.1x10^{-11}$
	Child	<0.01/<0.01	$1.4x10^{-9}/1.6x10^{-11}$
Riding Stables	Adult	<0.01/<0.01	$3.0x10^{-10}/3.1x10^{-12}$
Sandia Base Elementary School	Child	<0.01/<0.01	$6.3x10^{-10}/7.2x10^{-12}$
Shandiin Day Care Center	Child	<0.01/<0.01	$8.2x10^{-10}/9.3x10^{-12}$
Veterans Affairs Medical Center	Adult	<0.01/<0.01	$3.4x10^{-10}/3.5x10^{-12}$
Wherry Elementary	Child	<0.01/<0.01	$4.2x10^{-10}/4.7x10^{-12}$

Source: SmartRISK 1996
RME: Reasonable maximum exposed
AEI: Average exposed individual
[a] Four Hills Subdivision receptor location impacts were based on Lurance Canyon Burn Site open burning air emissions, not SNL/NM building air emissions.
[b] This receptor location was analyzed using a worker scenario, as discussed in Appendix E.5
Note: See Section 5.3.8 for a discussion of selection of receptor locations.

The maximum annual exposure dose resulting from SNL/NM sources would occur in the KAFB boundary at the KUMMSC and would increase the MEI s lifetime risk of fatal cancer by $2.6x10^{-7}$. In other words, the likelihood of the MEI developing fatal cancer from a 1-year dose from SNL/NM operations would be less than 1 chance in 4 M. The annual collective dose to the population due to these releases would increase the number of fatal cancers in the entire population within the ROI by $7.9x10^{-3}$. This value is less than 1; therefore, no LCFs would be likely to occur in the ROI population due to SNL/NM radiological air releases.

To estimate a range in the potential for human health effects, radiation doses were calculated at specific receptor locations in the SNL/NM vicinity and are presented in Table 5.4.7 6. Table 5.4.8 2 lists the associated radiological health risks to receptors at several of these locations. Receptors at most of these locations would have a considerably lower risk than the highest lifetime risk determined for the potential onsite MEI at the KUMMSC.

Receptors in the SNL/NM vicinity also have the potential to be exposed to air releases of radionuclides by way of the indirect air pathway: ingesting food that contains radionuclides. *CAP88-PC* integrates doses from this pathway in the collective dose estimation for the population within the ROI, but does not integrate it into the dose evaluation for the potential onsite MEI receptor. The estimated percentage of the population dose from ingesting potentially contaminated food would be approximately 10 percent (1.62 person-rem of the 15.8 person-rem annual collective population dose), which means it would also account for approximately 10 percent of the health risk value. When the same percent contribution is assumed, the lifetime risk of fatal cancer to the MEI from a 1-year dose would be increased by $2.6x10^{-8}$ (10 percent). The overall cancer risk to the MEI from radiation would still remain less than 1 chance in 4 M.

Table 5.4.8 2. Human Health Impacts in the SNL/NM Vicinity from Radiological Air Emissions Under the Expanded Operations Alternative

RECEPTOR LOCATIONS	LIFETIME RISK OF FATAL CANCER FROM A 1-YEAR DOSE
Child Development Center-East	$2.7x10^{-8}$
Child Development Center-West	$3.1x10^{-8}$
Coronado Club	$2.8x10^{-8}$
Four Hills Subdivision	$5.5x10^{-8}$
Golf Course (Club House)	$1.2x10^{-7}$
Kirtland Elementary School	$3.1x10^{-8}$
KAFB Housing (Zia Park Housing)	$3.3x10^{-8}$
Kirtland Underground Munitions and Maintenance Storage Complex (KUMMSC)[a]	$2.6x10^{-7}$
Lovelace Hospital	$2.3x10^{-8}$
National Atomic Museum	$3.5x10^{-8}$
Riding Stables	$1.1x10^{-7}$
Sandia Base Elementary School	$2.2x10^{-8}$
Shandiin Day Care Center	$3.2x10^{-8}$
Isleta Gaming Palace	$3.3x10^{-8}$
Veterans Affairs Medical Center	$4.2x10^{-8}$
Wherry Elementary School	$2.6x10^{-8}$

Sources: DOE 1997e, SNL/NM 1998a
MEI: maximally exposed individual

[a] The radiological MEI location for normal operations.
Note: Calculations were completed using *CAP88-PC*

Nonfatal Cancers and Genetic Disorders

Radiation exposures can cause nonfatal cancers and genetic disorders. The NCRP has adopted risk estimators recommended by the ICRP for the public for assessing these health effects from radiation (ICRP 1991). The SNL/NM maximum annual dose to the MEI would increase the lifetime risk of nonfatal cancers and genetic disorders by 5.1×10^{-8} and 6.6×10^{-8}, respectively, which would be less than 1 chance in 15 M. The SNL/NM annual collective radiation dose to the population within the ROI would increase the number of nonfatal cancers and genetic disorders by 1.6×10^{-3} and 2.1×10^{-3}, respectively. This means that no additional nonfatal cancers or genetic disorders would be likely to occur within the ROI population from SNL/NM radiological air releases.

Transportation

The potential human health risks and accident fatalities for transporting of various radiological materials for SNL/NM operations are discussed in Section 5.4.9. The radiological dose to the population along the route within the ROI was estimated by assuming that 10 percent of the total travel distance would occur within the ROI. Therefore, 10 percent of the total radiological dose (off link and on link), calculated for all radiological materials transport, would be considered as an additional human health impact to the population along the route within the ROI (see Appendix G). This percentage of the annual collective population dose from transportation activity would increase the ROI number of LCFs by 2.5×10^{-3}. Adding this to the number of LCFs associated with the annual collective population dose due to routine air releases would change the risk to 1.0×10^{-2}. In other words, no additional LCFs in the ROI would likely occur from SNL/NM radiological materials transportation activities.

Composite Cancer Risk

Annual radiation dose accumulates over the total number of years the person is exposed. The radiological MEI lifetime risk of fatal cancer following a 30-year exposure time would be 7.8×10^{-6}, or less than 1 chance in 128,000. Thirty years is consistent with the exposure used in calculating the lifetime chemical cancer risk. To assess a composite cancer risk capturing the greatest potential cancer risk from radiation exposure, the fatal cancer risk to the MEI and the chemical ELCR at the same location (KUMMSC) were summed. For the KUMMSC location, the contribution of risk from exposure to chemicals would not increase the risk from radiation exposure (the increased lifetime risk of fatal cancer would remain 7.8×10^{-6}), and it was concluded that the majority of the risk would be from the potential exposure to radiation (see Table E.6 2).

To assess a composite cancer risk capturing the highest potential risk from chemicals, the upper bound risk value for cancer risk from chemicals, which assumes a hypothetical worst-case exposure scenario, was added to the radiological MEI (KUMMSC) cancer risk (see Table E.6 4). This is an implausible scenario used only to bound the analysis. The composite cancer risk would be 7.9×10^{-6}. This would still be within the EPAs cancer risk range established for the protection of human health of 10^{-6} to 10^{-4} (40 CFR Part 300). This would be a risk of less than 1 chance in 126,000. The SNL/NM potential contribution (from potential exposures to chemicals and radiation) to an individuals lifetime cancer risk would be very low, considering that, overall in the U.S., men have a 1-in-2 lifetime risk of developing cancer and for women the risk is 1-in-3. Approximately 1 of every 4 deaths in the U.S. is from cancer (ACS 1997).

Worker Health and Safety

Under the Expanded Operations Alternative, worker safety impacts would vary only slightly from under the No Action Alternative. Impacts to the entire workforce were assessed based on a 10 percent increase in the worker population (see Section 5.4.12) and the assumption that the SNL/NM worker injury/illness rate per 100 workers would remain consistent with the 5-year average derived for 1992 through 1996. Impacts expected would be zero fatalities per year, approximately 326 nonfatal injuries/illnesses per year, an average of 47 mrem per year radiation dose (TEDE) to the radiation-badged worker, and 1 or 2 confirmed chemical exposures per year.

Routine air emissions evaluated for potential exposures to specific receptors in the SNL/NM vicinity would have the potential to impact noninvolved workers at SNL/NM. A noninvolved worker is not exposed to chemical or radiological work-related activities, but is potentially exposed because they work at SNL/NM in the vicinity of facility releases. Potential noninvolved worker exposures to airborne radiation were identified using the KUMMSC receptor location (Table 5.4.8 2). Potential noninvolved worker exposures to airborne chemicals were identified using a receptor location at the center of TA-I, near SNL/NM s chemical facility sources. Based on an exposure scenario for a worker, health risks from chemicals to the noninvolved worker would be

below a HI of 1 and less than 10^{-6} for an ELCR (see Appendix E, Table E.6 4).

The risks of cancer fatality from the annual average individual worker dose, annual maximum worker dose, and annual workforce collective dose (to the radiation worker population) are shown in Table 5.4.8 3. Health risks from the annual average individual and annual maximum worker doses would remain constant for each alternative (based on the REMS database dose information for 1996) (see Appendix E, Section E.6.1.1). The ICRP risk estimator of 400 fatal cancers per 1 M person-rem among workers was used to convert dose to risk of LCF. The annual workforce collective dose would be associated with $7.6x10^{-3}$ additional fatal cancers for the entire radiation worker population (those working in radiation-designated areas). For assessment purposes, this would equate to no additional LCFs in the radiation worker population under the Expanded Operations Alternative.

Table 5.4.8 3. Radiation Doses (TEDE[a]) and Health Impacts to Workers from SNL/NM Operations Under the Expanded Operations Alternative

RADIATION WORKER DOSE RATES	RADIATION DOSE	RISK OF CANCER FATALITY FROM A 1-YEAR DOSE
Annual Average Individual Worker Dose	47[b] (mrem/year)	$1.9x10^{-5}$
Annual Maximum Worker Dose	845[b] (mrem/year)	$3.4x10^{-4}$
RADIATION WORKER DOSE RATES	**RADIATION DOSE**	**NUMBER OF LCFs**
Annual Workforce Collective Dose	19 (person-rem/year)	$7.6x10^{-3}$

Source: SNL/NM 1997k
LCFs: latent cancer fatalities
mrem/yr: millirems per year
rem: roentgen equivalent, man
TEDE: total effective dose equivalent
[a] Average measured TEDE means the collective TEDE divided by the number of individuals with a measured dose greater than 10 mrem.
[b] Annual average individual and annual maximum worker doses would be expected to remain consistent with the base year, 1996 (see Section 4.10).
Note: Because not all badged workers are radiation workers, radiation workers means those badges with greater than 10 mrem above background measurements used in the calculations.

Nonfatal Cancer and Genetic Disorders

The SNL/NM maximum annual dose to the radiation worker population would increase the number of nonfatal cancer and genetic disorders by $1.5x10^{-3}$, based on the risk estimator of 80 health effects per 1 M person-rem used for both effects. In other words, no additional nonfatal cancers or genetic disorders would be likely to occur in the radiation worker population due to operations under the Expanded Operations Alternative.

Nonionizing Radiation

Sources of nonionizing radiant energy at SNL/NM include both laser and accelerator facilities. The SAs for the SNL/NM laser facilities report that the lasers are operated according to ANSI guidelines, which require that light paths are isolated from workers and from other equipment (SNL/NM 1996b). For accelerators that generate EMP and that could present a high-voltage hazard to personnel, ANSI guidelines require mitigation measures such as shielding to block high-voltage hazards from personnel and, during tests shots, exclude personnel from high-bay areas. Based on measurements from SNL/NM s pulsed power facilities, the EMP exposures to personnel outside the high-bay would be less than the American Conference of Governmental Industrial Hygienists (ACGIH) standard of 100 kV/m (SNL/NM 1996b). Therefore, routine high-voltage impacts to SNL/NM workers and the public would not occur.

5.4.8.2 Accidents

This section describes, under the Expanded Operations Alternative, the potential impacts to workers and the public of potential accidents involving the release of radioactive and/or chemical materials, explosions, and other hazards. Additional details on the accident analyses and impacts are presented in Appendix F.

Site-Wide Earthquake

An earthquake in the Albuquerque, New Mexico, area has the potential for human injury and building damage throughout the local region. Due to differences in structural design, SNL/NM buildings and structures vary in their capabilities to withstand earthquake forces. Any magnitude earthquake has the potential to cause injury to workers in and around buildings and damage to structures from the physical forces and effects of the earthquake. Additional injury to workers and the public would be possible from explosions and from exposure to chemical and radioactive materials that could be released

from buildings and storage containers. Facilities in TA-I are the predominant source of chemical materials that could be released during an earthquake. Facilities in TA-V are the predominant source of radioactive materials that could be released. The ECF in TA-II is the predominant source of explosive materials. Lesser quantities of radioactive materials in TAs-I and -II could also be released and cause exposures to workers and the public.

In the event of an earthquake (UBC, 0.17 *g*), various buildings in TA-I could be affected and various chemicals could be released (see Appendix F, Table F.7 7). Larger magnitude earthquakes could cause more serious impacts. The shape and direction of the chemical plumes would depend upon local meteorological conditions and physical structures. All potential plumes and concentration levels exceeding ERPG-2 are shown as shaded areas in Figure 5.4.8 1. Some of the potentially affected area extends offsite. Within the shaded area, out to a distance of 3,800 ft, there could be as many as 5,300 persons at risk of exposure depending on the time of day and plume shape and direction. However, in the event of a release of chemicals, the plumes would cause exposures in excess of ERPG-2 to only a portion of the 5,300 persons at risk. Mitigation features designed to limit the release of chemicals from storage containers, rooms, and buildings would limit or reduce plume size, concentration levels, and exposures. Emergency procedures and sheltering would also minimize exposures to workers and the public.

Nuclear facilities in TAs-I, -II, and -V could also be damaged during an earthquake. The frequency of an earthquake (0.17 *g*) that could cause the release of radioactive materials from TAs-I and -II facilities is 1.0×10^{-3} per year, or 1 chance in 1,000 per year. The frequency of an earthquake (0.22 *g*) that could cause the release of radioactive materials from TAs-I (NG-1), -II (ECF-1), and -V facilities is 7.0×10^{-4} per year, or 1 chance in 1,500 per year. The consequences are shown in Table 5.4.8 4. Descriptions of accident scenarios are given in Section 5.3.8.2 and Appendix F. If a 0.22-*g* earthquake was to occur, there would be an estimated 6.4×10^{-2} additional LCFs in the total population within 50 mi of the site associated with the HC-1 accident scenario. The MEI and noninvolved worker would have an increased probability of LCF of 6.9×10^{-6} and 3.0×10^{-2}, respectively, associated with the HC-1 accident. The risks for these receptors can be estimated by multiplying these consequence values by the probability (frequency) of earthquake. If a stronger earthquake was to occur, larger releases of radioactive materials would be possible and could cause greater impacts.

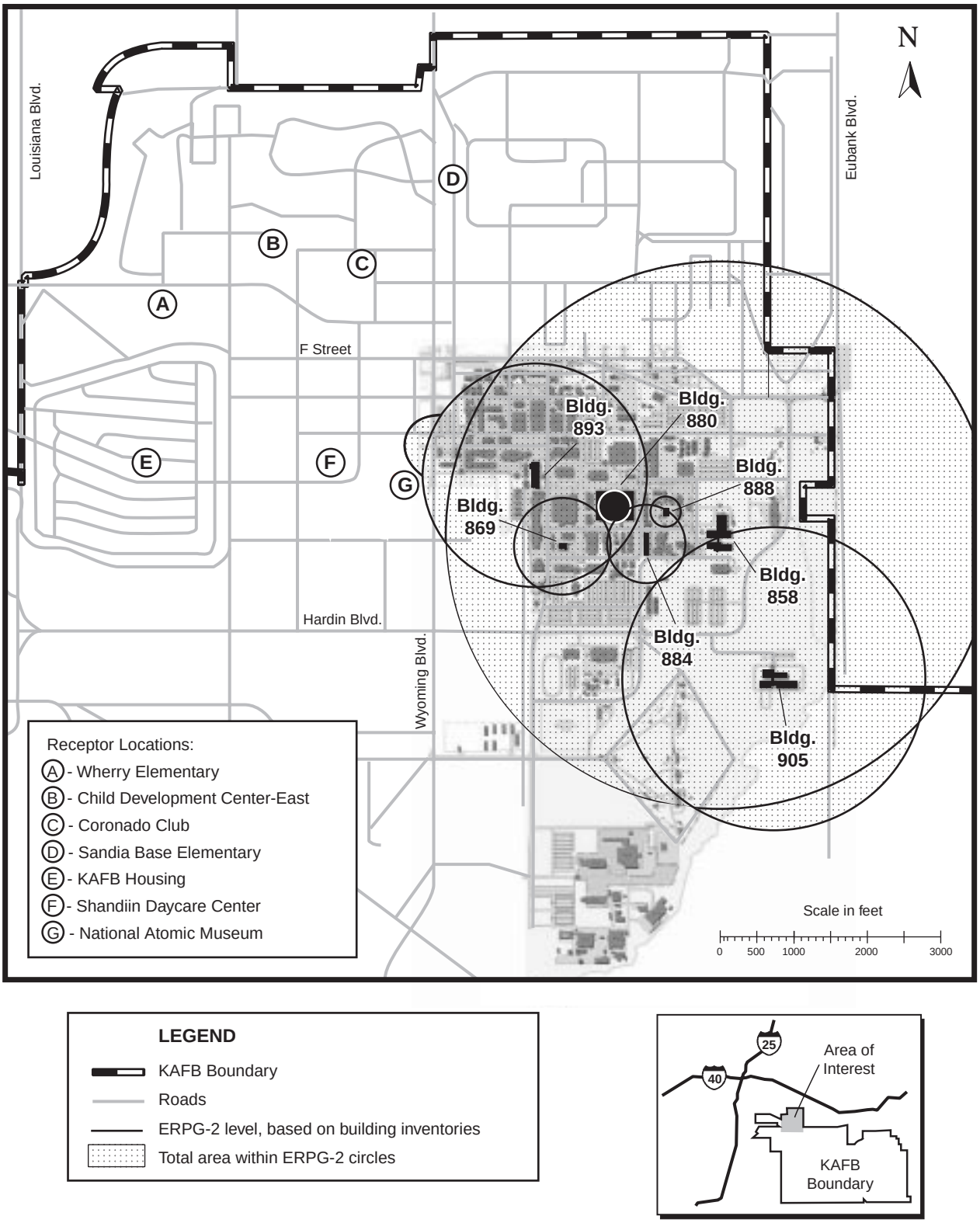
A severe earthquake could also cause damage to other SNL/NM facilities and result in environmental impacts. For example, the large quantities of oil stored in external tanks and in accelerator buildings in TA-IV could potentially be spilled and cause impacts to the ecosystem and water resources. Underground natural gas lines could break and ignite causing brush and forest fires that could further damage facilities and persons in the vicinity. Hydrogen storage tanks in TA-I could be damaged, causing hydrogen combustion or explosion and potential injury to persons in the vicinity. Explosives in the ECF in TA-II and smaller quantities in other facilities could also be accidentally detonated during an earthquake with an injury to persons in the vicinity. Occupants of all facilities would be at risk of injury as a result of the earthquake forces and building damage.

Facility Hazards

Some of the facilities at SNL/NM contain occupational hazards with the potential to endanger the health and safety of involved workers in the vicinity of an accident. Some of these facilities also contain hazardous materials that, in the event of an accident, could endanger the health and safety of people within the immediate vicinity and beyond. These people include noninvolved SNL/NM workers, members of the military assigned to KAFB, members of the public located within the KAFB boundary and offsite. Offsite consequences were determined to a 50-mi radius around the affected facility.

Radiological, chemical, and explosion accidents with the largest impacts to workers and the public have been analyzed as discussed in the following sections. Potential accidents associated with other facility hazards such as lasers, electricity, X-rays, transformer oil, noise, shrapnel, pyrotechnics, and compressed gases could affect the health and safety of the involved workers. However, the impacts to noninvolved workers and the public for these other accidents would be lower than the impacts from radiological, chemical, and explosion accidents described in the SWEIS (Appendix F, Table F.6 3).

The DOE recognizes the potential adverse effects for workers, the public, and the environment that could result for the deterioration of SNL/NM equipment, structures, and facilities. However, the analysis of potential accidents discussed in this section assumes that the expected deterioration of equipment, structures, and facilities would not affect the occurrence, progression, and effects of accidents. The basis for this assumption is that the DOE safety analysis process, specified in DOE Orders and standards, would require periodic



Source: Original
Note: see Appendix F.7, Figure F.7 1

Figure 5.4.8 1. Areas Above ERPG-2 Levels from a Site-Wide Earthquake Under the Expanded Operations Alternative

The encircled areas represent locations where approximately 5,300 people would be at risk of exposure to chemical concentrations above ERPG-2.

Table 5.4.8 4. Site-Wide Earthquake Radiological Impacts Under the Expanded Operations Alternative

ACCIDENT ID[a]	FREQUENCY (per year)	ADDITIONAL LATENT CANCER FATALITIES IN 50-MILE POPULATION	INCREASED PROBABILITY OF LATENT CANCER FATALITY	
			MAXIMALLY EXPOSED INDIVIDUAL[b]	NONINVOLVED WORKER[c]
TECHNICAL AREA-I				
NG-1	7.0×10^{-4}	5.1×10^{-5}	1.4×10^{-9}	3.2×10^{-6}
TECHNICAL AREA-II				
ECF-1	7.0×10^{-4}	3.0×10^{-6}	1.5×10^{-10}	1.9×10^{-7}
TECHNICAL AREA-V				
AM-2	7.0×10^{-4}	2.0×10^{-3}	2.4×10^{-7}	7.4×10^{-5}
HC-1	7.0×10^{-4}	6.4×10^{-2}	6.9×10^{-6}	3.0×10^{-2}
SP-1	7.0×10^{-4}	9.2×10^{-3}	5.8×10^{-7}	2.7×10^{-4}

Source: Original (See also Appendix F, Tables F.7 4 and F.7 5)

[a] Facility Accident Descriptors:
Neutron Generator Facility: NG-1
Explosive Component Facility: ECF-1
Annular Core Research Reactor-Medical Isotope Production: AM-2
Hot Cell Facility: HC-1
Sandia Pulsed Reactor: SP-1

[b] The maximally exposed individual is located at the Golf Course and the consequences can be added.

[c] Because the uninvolved worker is located 100 meters from the release point, the location varies relative to each technical area. Therefore, the consequences to the noninvolved worker can only be added for a given technical area.

assessments of facility safety to ensure that operations are being performed in an approved safety envelop. The process would also require an assessment of all unresolved safety questions that would result from any change in a facility or operation that could affect the operation s authorization basis. Depending on the results of the assessment, modifications to the facility and/or operational procedures would be implemented to maintain operations in the authorization basis.

Explosion Accidents

Explosive materials are stored, handled, transported, and used at some SNL/NM facilities. Administrative controls and facility design would help prevent an explosion accident and limit the impacts to personnel, if an accident was to occur. The ECF, for example, contains large quantities of explosives for use in its testing programs. Hydrogen trailers are another large source of explosive material. There would be approximately five hydrogen trailers parked near facilities or routinely transported to facilities from remote locations.

The largest quantity of hydrogen with the highest potential for consequences to both SNL/NM workers and facilities is a set of horizontally mounted cylinders, with storage capacity of approximately 90,000 SCF, located approximately east of the CSRL, Building 893, in TA-I. An explosion at the hydrogen storage cylinders located near the CSRL was selected for detailed analysis to estimate the bounding impacts of an explosion accident. If a hydrogen explosion was to occur in this relatively populated area of TA-I, individuals in the area could be injured and nearby property could be damaged. Involved workers within 61 ft of an explosion could be seriously injured and would have a 50 percent chance of survival. Involved workers out to a distance of 126 ft from the explosion could receive damage to their eardrums and lungs. The resulting overpressure from this explosion and impacts to personnel and property would diminish with distance, as shown in Table 5.4.8 5.

The actual number of persons in the vicinity of the accident depends upon many factors and the actual number of potential fatalities is uncertain. Factors include the time of day (start of work day, lunchtime, after hours), the actual location of the people (amount of shielding between the hydrogen tank and the person), and the actual spread of the pressure waves in a very complex arrangement of buildings, alleys, and walkways.

This bounding facility explosion was postulated to occur from an accidental uncontrolled release of hydrogen stored in a tank outside the CSRL building caused by human errors (such as mishandling activities) or equipment failures (such as a pipe joint failure) and the presence of an ignition source (such as a spark) near the

Table 5.4.8 5. Impacts of an Explosion Accident Under the Expanded Operations Alternative

DISTANCE TO RECEPTOR OR PROPERTY (ft)	PEAK REFLECTIVE PRESSURE (psi) (472 lbm TNT EQUIVALENT)	COMMENTS
25	650	Peak pressure.
61	50	For individual workers, there would be a 50% survival rate for pressures in excess of 50 psi.
126	10	For individual workers, there would be a 50% rate of ear rupture for pressures in excess of 10 psi. Total destruction of buildings could be expected for pressures in excess of 10 psi.
370	2	Pressures in excess of 2 to 3 psi would cause concrete or cinder block walls to shatter.
657	1	Pressures in excess of 1 psi would cause a house to be demolished.

Source: DOE 1992b (See also Appendix F, Table F.4 1)
ft: feet
lbm: pound mass
psi: pounds per square inch
TNT: trinitrotoluene

location of release. Because multiple failures would have to occur for an uncontrolled release of hydrogen to lead to an explosion, this accident scenario would be extremely unlikely (that is, between $1x10^{-6}$ and $1x10^{-4}$ per year).

The human organs most vulnerable to shock explosions are the ears and lungs because they contain air or other gases. The damage would be done at the gas-tissue interface, where flaking and tearing could occur. Both the ear and the lung responses would be dependent not only on the overpressure, but also on impulse and body orientation. The shorter the pulse width, the higher the pressure the body could tolerate. An overpressure of approximately 50 psi would result in a 50 percent fatality rate; approximately 10 psi would result in eardrum rupture. These overpressure estimates are based on a square pressure wave with a pulse duration greater than 10 msec, and their effects could vary depending on body orientation to the pressure wave.

Structural damage produced by airblasts would depend on the type of structural material. An overpressure of on the order of 1 psi would cause partial demolition of houses (rendering them uninhabitable). An overpressure of 2 to 3 psi would shatter unreinforced concrete or cinder block walls; and an overpressure of 10 psi would probably cause total destruction of buildings.

Radiological Accidents

The largest quantities of radioactive materials at risk for radiological accidents are located in TA-V. The Manzano Waste Storage Facilities and TAs-I, -II, and -IV also contain radioactive material, but in smaller amounts. The nuclear facilities in TA-V include the ACRR, SPR, HCF and GIF. The NGIF is under construction in TA-V. The planned primary use of the ACRR is medical isotope production (primarily molybdenum-99). The HCF has been reconfigured for medical isotope production and the accidents analyzed reflect this mode of operation. The DP configuration would be conducted in a new Annular Core Pulsed Reactor II (ACPR-II) located in TA-V. It was assumed that the ACPR-II would be a reconstituted version of the ACRR and would behave during accidents exactly as described in the ACRR SAR. Accidents have also been analyzed for storage of radioactive materials in the HCF not associated with molybdenum-99 production. Potential accidents at TA-I, TA-IV, and the Manzano Waste Storage Facilities are discussed in Appendix F.2.

The most serious radiological accident impacts under the Expanded Operations Alternative are shown in Table 5.4.8 6. The table lists a set of accidents and their consequences in terms of an increased probability of an LCF for an exposed individual and an increased number of LCFs for the offsite population. Other radiological accidents could also occur at these facilities, but their consequences would be within the envelope of the selected set of accidents.

The accident with the highest consequences to the public would be a fire in Room 108 at the HCF in TA-V (HS-2). If this accident was to occur, there would be

Table 5.4.8 6. Potential Impacts of Radiological Facility Accidents Under the Expanded Operations Alternative

FACILITY	ACCIDENT ID	SCENARIO	FREQUENCY (per year)	ADDITIONAL LATENT CANCER FATALITIES TO 50-MILE POPULATION	INCREASED PROBABILITY OF LATENT CANCER FATALITY	
					MAXIMALLY EXPOSED INDIVIDUAL	NONINVOLVED WORKER
Annular Core Research Reactor-Medical Isotopes Production Configuration	AM-1	Airplane crash - collapse of bridge crane	6.3×10^{-6}	2.0×10^{-3}	2.4×10^{-7}	7.4×10^{-5}
	AM-3	Rupture of waterlogged fuel element	1.0×10^{-2} to 1.0×10^{-4}	4.9×10^{-4}	5.4×10^{-8}	3.8×10^{-6}
	AM-4	Rupture of one molybdenum-99 target	1.0×10^{-4} to 1.0×10^{-6}	3.9×10^{-4}	4.3×10^{-8}	3.0×10^{-6}
	AM-5	Fuel handling accident - irradiated element	1.0×10^{-4} to 1.0×10^{-6}	4.9×10^{-3}	6.1×10^{-7}	7.6×10^{-5}
	AM-6	Airplane crash and fire in reactor room with unirradiated fuel and targets present	6.3×10^{-6}	1.6×10^{-6}	1.0×10^{-10}	4.9×10^{-8}
	AM-7	Target rupture during Annular Core Research Reactor to Hot Cell Facility transfer	$< 1.0 \times 10^{-6}$	3.9×10^{-4}	4.9×10^{-8}	1.4×10^{-5}
Hot Cell Facility-Medical Isotopes Production	HM-1	Operator error - molybdenum-99 target processing	1.0×10^{-1} to 1.0×10^{-2}	3.8×10^{-5}	3.3×10^{-9}	1.6×10^{-7}
	HM-2	Operator error iodine-125 target processing	1.0×10^{-1} to 1.0×10^{-2}	1.6×10^{-6}	1.0×10^{-10}	4.2×10^{-9}
	HM-4	Fire in steel containment box	1.0×10^{-2} to 1.0×10^{-4}	2.6×10^{-3}	2.4×10^{-7}	2.3×10^{-6}
Hot Cell Facility Room 108 Storage	HS-1	Fire in room 108, average inventories	3.3×10^{-5}	2.1×10^{-3}	1.8×10^{-7}	2.0×10^{-7}
	HS-2	Fire in room 108, maximum inventories	2.0×10^{-7}	7.9×10^{-2}	6.6×10^{-6}	7.4×10^{-6}

Table 5.4.8 6. Potential Impacts of Radiological Facility Accidents Under the Expanded Operations Alternative (concluded)

FACILITY	ACCIDENT ID	SCENARIO	FREQUENCY (per year)	ADDITIONAL LATENT CANCER FATALITIES TO 50-MILE POPULATION	INCREASED PROBABILITY OF LATENT CANCER FATALITY	
					MAXIMALLY EXPOSED INDIVIDUAL	NONINVOLVED WORKER
Sandia Pulsed Reactor	S3M-2	Control element misadjustment before insert	1.0×10^{-4} to 1.0×10^{-6}	1.2×10^{-3}	1.5×10^{-7}	2.5×10^{-4}
	S3M-3	Failure of a fissionable experiment	1.0×10^{-4} to 1.0×10^{-6}	7.9×10^{-3}	8.4×10^{-7}	3.8×10^{-1}
	SS-1	Airplane crash into North Vault storage vault	6.3×10^{-6}	9.2×10^{-3}	5.8×10^{-7}	5.5×10^{-4}
	S4-1	Control-element misadjustment before insert	1.0×10^{-4} to 1.0×10^{-6}	2.2×10^{-3}	2.7×10^{-7}	4.7×10^{-4}
Annular Core Pulsed Reactor-II, Defense Programs	AR-1	Uncontrolled addition of reactivity	$<1.0\times10^{-6}$	7.3×10^{-3}	9.3×10^{-7}	1.2×10^{-4}
	AR-2	Rupture of waterlogged fuel element	1.0×10^{-1} to 1.0×10^{-2}	1.3×10^{-3}	1.7×10^{-7}	1.2×10^{-5}
	AR-4	Fire in reactor room with experiment present	1.0×10^{-4} to 1.0×10^{-6}	9.0×10^{-3}	1.0×10^{-6}	1.4×10^{-4}
	AR-6	Airplane crash, collapse of bridge crane	6.3×10^{-6}	5.9×10^{-3}	8.4×10^{-7}	2.2×10^{-4}

Source: Original
ACPR: Annular Core Pulsed Reactor
ACRR: Annular Core Research Reactor
SPR: Sandia Pulsed Reactor
TA: technical area
TA-V Facility Accident Descriptors:
ACRR - Medical Isotope Production: AM-1, AM-3, AM-4, AM-5, AM-6, AM-7
Hot Cell - Medical Isotope Production: HM-1, HM-2, HM-4
Hot Cell - Room 108 Storage: HS-1, HS-2
SPR: S3M-2, S3M3, SS-1, S4-1
ACPR-II-Defense Programs: AR-1, AR-2, AR-4, AR-6

$7.9x10^{-2}$ additional LCFs in the offsite population within 50 mi of the site. There would be increased probabilities of an LCF for the MEI and a noninvolved worker of $6.6x10^{-6}$ and $7.4x10^{-6}$, respectively. The estimated frequency of occurrence for this accident would be $2.0x10^{-7}$ per year or less than 1 chance in 5,000,000 per year.

Involved workers run the highest risk of injury or fatality in the event of many radiological accidents discussed in this section as well as the many others that could occur. Although there are protective measures and administrative controls to protect involved workers, they are usually in the immediate vicinity of the accidents where they could be exposed to radioactivity.

Accident scenarios for the Expanded Operations Alternative have been described in Section 5.3.8.2.

The impacts to all other receptors would be less than for the MEI. Details on the impacts to all receptors analyzed are provided in Appendix F.2.

Chemical Accidents

Many SNL/NM facilities store and use a variety of hazardous chemicals. For the chemical with the highest RHI in a building, a catastrophic accident and total release of the building inventory was postulated as the bounding event, and estimates were made of the chemicals concentrations at various distances from the accident. The source terms are shown in Table 5.4.8 7. Building inventory and 50 percent of the largest single source are shown to reflect the variability and uncertainty in the actual amount of the chemical that could be present in inventory at the time of an accident. Similarly, estimates are shown for the range of distances within which the ERPG-2 would be exceeded. The ERPG-2 is an accepted guideline for public exposure (see Appendix F.3 for an explanation of ERPG levels).

In the event of a severe chemical accident in TA-I, involved workers, noninvolved workers, KAFB personnel, onsite residents, and onsite members of the public would be at risk of being exposed to chemical concentrations in excess of ERPG-2 levels. The number of individuals at risk during normal business hours is shown in Table 5.4.8 8. Although Table 5.4.8 8 shows the maximum number of people at risk, the actual number exposed would depend on the time of day, location of people, wind conditions, and other factors, and would be much less than that shown.

As shown in Table 5.4.8 8, the worst-case chemical accident would be a catastrophic release of arsine from Building 893 in TA-I. If this accident was to occur and the average inventory (source term) of 20 lb of arsine was released, individuals within 2,640 ft of the point of release would receive exposures that exceed the ERPG-2. If the building inventory of 65 lb of arsine was released, individuals within a distance of 4,884 ft from the point of release would receive exposures that exceed the ERPG-2. Figure 5.4.8 2 illustrates the KAFB locations that would be affected by these worst-case chemical accident scenarios involving the release of arsine or chlorine from Buildings 893 and 858, respectively. The circles on the figure correspond to the distances within which the ERPG-2 would be exceeded. However, the actual affected area within the circles would depend upon wind conditions, and only a small portion of the area would be affected. In the event of a release, the area exceeding the ERPG-2 would be shaped by the wind and nearby buildings, perhaps affecting $1/16^{th}$ to $1/10^{th}$ of the circular area out to the indicated distance. All individuals exposed for 1 hour or more at these distances could experience or develop irreversible or other serious health effects or symptoms that could impair their abilities to take protective action. For any release, the seriousness of an exposure would generally decrease for distances further from the point of release.

In the event of an aircraft crash or earthquake involving buildings with various chemical inventories, multiple chemicals would be released. Although the impacts of mixed chemicals could be greater than individual chemicals, their behavior, dispersion, and health effects can be complex and have therefore, not been considered quantitatively. An earthquake could also cause the release of like chemicals from multiple buildings and lead to increased concentration where individual plumes overlap. The potential and impacts for overlapping plumes are discussed in Appendix F.3.

Other Accidents

Other types of potential accidents were identified whose impacts are not measured in terms of LCFs or chemical concentrations. These could cause serious injury or fatality for humans and/or impacts to the nonhuman environment such as the ecology, historical sites, or sensitive cultural sites.

Brush Fires Small fires are expected and planned for during outdoor testing that involves propellants and explosives. The potential exists for brush and forest fires when hot test debris or projectiles come in contact with combustible elements in the environment. One such incident was reported in 1993 in TA-III when a rocket motor detonated

Table 5.4.8 7. Potential Impacts of Chemical Accidents Under the Expanded Operations Alternative

BUILDING	CHEMICAL	SOURCE TERM		ERPG-2 LEVEL OF CONCERN (ppm)	EXCEEDANCE DISTANCE		FREQUENCY (per year)
		BUILDING INVENTORY (lb)	50% OF LARGEST SINGLE SOURCE (lb)		BUILDING INVENTORY (ft)	50% OF LARGEST SINGLE SOURCE (ft)	
823	Nitrous oxide	32.17	15.26	125	348	237	$1.0x10^{-3}$ to $1.0x10^{-4}$
858	Chlorine	106.4	53.2	3	3,726	2,598	$1.0x10^{-3}$ to $9.7x10^{-5}$
869	Nitric acid	18.6	9.3	15	666	465	$1.0x10^{-3}$ to $1.0x10^{-4}$
878	Nitrous oxide	50	25	125	438	309	$1.0x10^{-3}$ to $3.2x10^{-5}$
880	Hydrofluoric acid	2	1	20	219	153	$1.0x10^{-3}$ to $1.0x10^{-4}$
883	Phosphine	6.8	3.4	2.5	1,440	1,002	$1.0x10^{-3}$ to $1.0x10^{-4}$
884	Hydrofluoric acid	10	5	20	504	351	$1.0x10^{-3}$ to $1.0x10^{-4}$
888	Fluorine	0.07	0.04	1	207	93	$1.0x10^{-3}$ to $1.0x10^{-4}$
893	Arsine	65	20	1	4,884	2,640	$1.0x10^{-3}$ to $1.0x10^{-4}$
897	Chlorine	4.4	2.2	3	699	486	$1.0x10^{-3}$ to $6.6x10^{-5}$
905	Thionyl chloride	101.1	50.5	5	2,067	1,434	$1.0x10^{-3}$ to $9.0x10^{-5}$

Sources: NSC 1995, SNL/NM 1998a (See also Appendix F, Tables F.3 3 and F.3 4)
ERPG: Emergency Response Planning Guideline
ft: feet
lb: pound
ppm: parts per million

Table 5.4.8 8. Maximum Impacts of Chemical Accidents on Individuals Within the KAFB Under the Expanded Operations Alternative

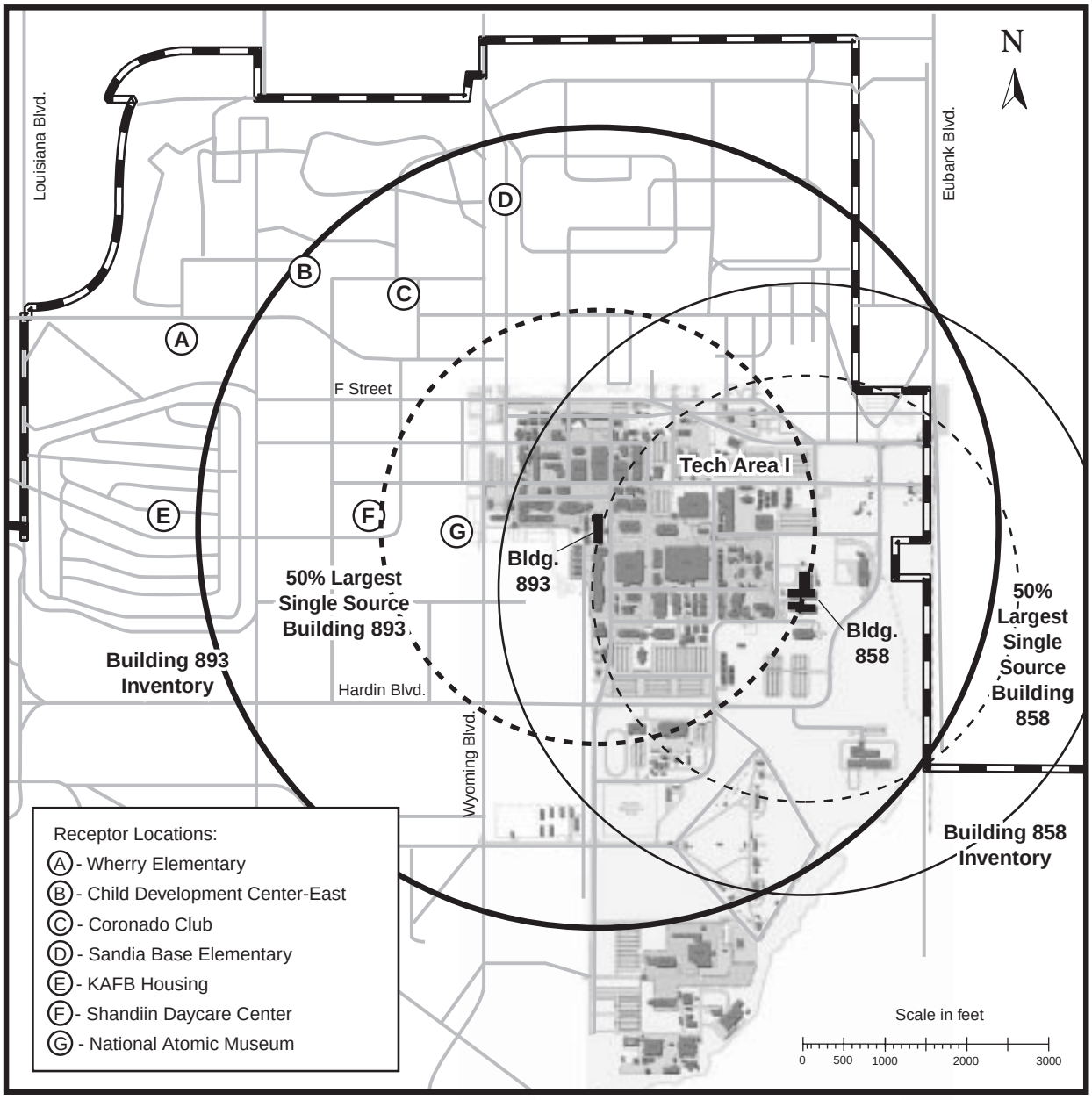
BUILDING	CHEMICAL NAME	RELEASE (lb)	ALOHA RADIUS REQUIRED TO REACH ERPG-2 LEVEL (ft)	NUMBER OF PEOPLE WITHIN ERPG-2
823	Nitrous oxide	32.17	348	844
858	Chlorine	106.41	3,726	3,783
869	Nitric acid	18.6	666	1,511
878	Nitrous Oxide	50	438	880
880	Hydrofluoric acid	2	219	529
883	Phosphine	6.8	1,440	3,743
884	Hydrofluoric acid	10	504	800
888	Fluorine	0.07	207	0
893	Arsine	65	4,884	8,254
897	Chlorine	4.4	699	625
905	Thionyl chloride	101.1	2,067	1,356

Source: Bleakly 1998c (See also Appendix F, Table F.3 6)
ALOHA: Areal Locations of Hazardous Atmospheres (model)
ERPG: Emergency Response Planning Guideline
ft: feet
lb: pound

during a sled track impact test and resulted in a 40-ac brush fire. Another accident occurred at the Aerial Cable Facility in the Coyote Test Field, which resulted in a fire that swept up the side of a mountain before being extinguished by SNL/NM workers. Many others have also occurred that were contained in the immediate vicinity of the test area. Measures would be taken to prevent fires and, should a fire occur, the effects would be mitigated by activating fire fighting facilities in the test area (DOE 1995a, SNL/NM 1993d, SNL/NM 1998i).

Natural Phenomena Naturally occurring events such as tornadoes, lightning, floods, and heavy snow, as documented in existing SNL/NM safety documentation, have been considered for their potential to initiate the accidental release of radioactive, chemical, and other hazardous materials that affect workers and the public. Any of these events, should they occur, could also lead to serious injury or fatality as a result of the physical and destructive forces associated with the events. The risks of such events to workers and the public would be equivalent to everyday risks from naturally occurring events to the general public wherever they work and reside.

Spills and Leaks The potential would exist throughout SNL/NM for the accidental spill of radioactive, chemical, or other hazardous materials. The effects of such spills on workers and the public through airborne pathways were considered earlier in this section. The impacts from pathways other than airborne would normally be bounded by exposure from airborne pathways. Any spill of a hazardous substance would have the potential for impacts to the nonhuman elements of the environment. A spill could make its way into surface and groundwater systems, affecting water quality and aquatic life. Spills of flammable substances could cause fires that damage plant and animal life and other land resources. There have been spills of hazardous substances at the SNL/NM site that had the potential to affect the nonhuman elements of the environment. In 1994, over 100 gal of oil were spilled at the Centrifuge Complex in TA-III when a hydraulic pump failed during a centrifuge test, causing a potential impact to the nonhuman elements of the environment. Also in 1994, a small spill of transformer oil occurred from an oil storage tank in TA-IV when a gasket failed and, at the Coyote Test Field, a leaking underground storage tank containing ethylene glycol was discovered.



Sources: Original
Note: see Table 5.4.8 8

Figure 5.4.8 2. Projected Extent of ERPG-2 Levels from Accidental Release of Arsine (Bldg. 893) and Chlorine (Bldg. 858)

Circled areas represent the distances within which an ERPG-2 level would be exceeded for an accidental release of arsine (Building 893) and/or chlorine (Building 858) under the Expanded Operations Alternative.

Radiological and Chemical Contamination Some accidents analyzed in this section and others, that were considered but not analyzed, could potentially impact the nonhuman elements of the environment. Any accidentally released chemicals would result in concentrations that would typically decrease with increasing distance from the point of release. While chemical concentrations would diminish over distance to a point where a human hazard would no longer be present, the concentrations could still affect other elements of the environment such as the ecology, water quality, and cultural resources. Radiological releases could also affect nonhuman elements of the environment. After an accident, SNL/NM, through their spill and pollution control and radiological emergency response plans, would be required to assess the potential for ground contamination; if contamination exceeds guidance levels, plans would be developed for remediation.

Industrial Besides radioactive and chemical materials and explosives, many SNL/NM facilities conduct operations and use materials and equipment that could be potentially hazardous to workers. These hazards are typically referred to as normal industrial hazards, not unlike similar hazards that workers are exposed to throughout the nation, and include working with electricity, climbing ladders, welding, and driving forklifts. All operations and activities at SNL/NM facilities, as well as all DOE facilities, would be subject to administrative procedures and safety features designed to prevent accidents and mitigate their consequences should they occur.

5.4.9 Transportation

The implementation of the Expanded Operations Alternative would result in transportation impacts for each of three ROIs: KAFB; major Albuquerque roadways; and major roadways between Albuquerque and specific waste disposal facilities, vendors, and other DOE facilities. This analysis involved estimating the number of trips made by SNL/NM-associated vehicles under normal operations in each of these transportation corridors. Transportation evaluation and multipliers are discussed in Section 5.3.9, Appendix A, and Appendix G.

5.4.9.1 Transportation of Material and Wastes

In general, the number of material shipments received by SNL/NM would be proportional to total SNL/NM material consumption. According to facility projections, material consumption under the Expanded Operations Alternative would increase by 484 percent over baseline levels. Thus, total material shipments would also increase, although not necessarily for all types of material.

Radioactive and explosive material shipments are often delivered by government carriers, unless the quantities and activities being transported are low enough to meet the Federal guidelines and restrictions in place for authorized commercial transporters. Government carriers operate on an as-needed basis, thus the general increase in material inventory under the Expanded Operations Alternative would result in a similar increase in these kinds of shipments.

Due to their shipment method, there would be very little impact to the number of chemical shipments that are made to SNL/NM. JIT chemicals, which are ordered infrequently and in small quantities, are usually shipped to SNL/NM by way of commercial carriers such as Federal Express and UPS. These carriers make daily shipments to SNL/NM to deliver packages other than chemicals, and an increase in the volume of chemicals they handle per shipment would not increase their frequency. Similarly, major chemical vendors who deliver their own material, rather than use a commercial carrier, also generally make daily shipments to SNL/NM. Therefore, any increase in the volume of material that major vendors ship per load would not have an impact on the frequency of those shipments. Thus, chemical shipments would remain at approximately the same level regardless of the fluctuations in material consumption.

Considering the above factors, overall material transportation due to normal operations would increase by 123 percent over baseline levels. The anticipated changes in annual and daily material shipments for each material category are presented in Table 5.4.9 1. The analysis assumed that SNL/NM has 250 work days per calendar year.

Waste Transportation

The amount of waste shipped from SNL/NM to disposal facilities would correlate directly to SNL/NM waste generation levels. The overall offsite waste shipments would increase by 320 percent under the Expanded Operations Alternative. Of this increase, 285 percent is considered to be waste currently disposed of at the KAFB landfill. This leaves a real projected increase of 35 percent under the Expanded Operations Alternative.

Table 5.4.9 1. SNL/NM Annual Material Shipments Under the Expanded Operations Alternative

MATERIAL TYPE		ANNUAL SHIPMENTS	
		BASE YEAR[a]	EXPANDED OPERATIONS
Radioactive		305	1,782
Radioactive (medical isotopes production configuration)	*Receiving*	0	55
	Shipping	0	1,140
Chemical		2,750	2,750
Explosive		303	1,771
TOTAL		**3,358**	**7,498**

Sources: SNL/NM 1997b, 1998a

[a] The base year varies depending on information provided in the *Facilities and Safety Information Document* (SNL/NM 1997b). Typically, the base year is 1996 or 1997, as appropriate.

The total anticipated changes in waste shipments during all operations for each type of waste are presented in Table 5.4.9 2 and Appendix G, Table G.3 3.

Table 5.4.9 2. Annual Waste Shipments from Normal Operations Under the Expanded Operations Alternative

WASTE TYPE	BASE YEAR SHIPMENTS	EXPANDED OPERATIONS SHIPMENTS
LLW[a] (1996)	4	21
LLMW (1996)	1	3
Hazardous (RCRA+TSCA)[a] (1997)	102	150
Recyclable (Hazardous and Nonhazardous)[a,b] (1997)	86	233
Solid[a] (Municipal, Construction, and Demolition)[b] (1996)	51	650

Sources: Rinchem 1998a; SNL/NM 1998a, 1998y, n.d. (d)
LLMW: low-level mixed waste
LLW: low-level waste
MTRU: mixed transuranic
RCRA: *Resource Conservation and Recovery Act*
TRU: transuranic
TSCA: *Toxic Substances Control Act*
[a] Excludes decontamination and decommissioning
[b] Recyclable and solid wastes currently handled by the KAFB landfill could be shipped offsite, contributing an additional 741 shipments.

Specials Projects

Two special project wastes, ER Project and legacy, were addressed separately due to their one-time operation/project status and in order to avoid skewing the SNL/NM normal operations impact. Legacy wastes would be anticipated to account for an additional 18 shipments of LLW, 3 shipments of LLMW, and 2 shipments of TRU/MTRU wastes over the 10-year time frame (see Figures 4.12 1, 4.12 2, and 4.12 3). In 1998 through 2000, the ER Project could account for up to an additional 312 offsite shipments of LLW, 101 offsite shipments of LLMW, 2 offsite shipments of RCRA waste, 5 offsite shipments of TSCA waste, and 75 shipments of nonhazardous waste. Both of these special projects have been included within the total facility risks.

Offsite Receipts and Shipments of Material and Waste

The bounding case for this analysis assumed that each material and waste shipment is composed of two trips: one to and one from SNL/NM. Thus, the total number of trips made by material and waste transporters under the Expanded Operations Alternative would be 17,182 (total shipments x 2). Assuming that the year is comprised of 250 work days, the average work day traffic within KAFB contributed by these carriers would be 69 trips. This would be small in comparison to the 29,880 trips of SNL/NM vehicles entering and exiting KAFB under this alternative (SNL/NM 1998a, SNL 1996c). Therefore, the overall traffic impacts on

KAFB from increased SNL/NM material and waste shipments under the Expanded Operations Alternative would be negligible.

Shipments of Material and Waste in the Albuquerque Area

The total SNL/NM placarded material and waste shipment traffic would comprise 1.9 percent, or 69 trips per day, of the total placarded truck traffic (1,767) entering the greater Albuquerque area during the applicable base year (1996 or 1997). Although a 137-percent increase in SNL/NM placarded material and waste truck traffic would be expected, this increase would represent the inclusion of waste currently managed at the KAFB landfill and new shipments from the MIPP. ER Project wastes and legacy wastes are addressed separately under special projects. Thus, the impacts under the Expanded Operations Alternative would be minimal.

Shipments of Material and Waste Outside of Albuquerque

All material and waste transported to and from SNL/NM from outside Albuquerque must enter and depart the city by way of Interstate-25 or Interstate-40. Table 5.4.9 3 presents the impacts to those corridors from material and waste shipments under the Expanded Operations Alternative. Specific remote facility locations are listed in Section 4.11. Daily SNL/NM shipment figures were derived for comparison purposes by dividing the annual waste and material shipment totals in Tables 5.4.9 1 and 5.4.9 2 by the approximately 250 work days in a calendar year.

Table 5.4.9 3. 24-Hour Placarded Material and Waste Truck Traffic Counts Under the Expanded Operations Alternative

ROUTE (ALL TRAFFIC)[a]	BASE YEAR[b]	EXPANDED OPERATIONS
I-25 North (52,400)	230	268
I-25 South (18,000)	94	110
I-40 West (16,400)	621	725
I-40 East (54,200)	569	664
TOTAL (141,000)	1,514	1,767
SNL/NM[c]	14.5	34.4

Sources: SNL/NM 1997b, 1998a; Scientific Services 1995
I: Interstate
[a] Total vehicle count for all types of vehicles entering and departing Albuquerque
[b] The base year varies depending on information provided in the *Facilities and Safety Information Document* (SNL/NM 1997b). Typically, the base year is 1996 or 1997, as appropriate.
[c] SNL/NM placarded trucks

Based on this analysis, SNL/NM material and waste shipments would be expected to increase in frequency by 137 percent under this alternative. However, the SNL/NM truck traffic would only comprise 0.021 percent, or 34.4 shipments per day, of all traffic (165,000 vehicles per day), including all types of vehicles, projected to be entering and departing Albuquerque by way of interstates. For the applicable base year (1996 or 1997), waste leaving Albuquerque represented 35 percent of the total shipments, with an additional 20 percent going to Rio Rancho. Because most materials are supplied through the JIT vendors, origination points are generally not known. However, most vendors use local suppliers; therefore, in the base year, 82 percent of material was assumed to be provided locally, with the remaining 18 percent coming from outside Albuquerque. Thus, the impact to this ROI from the Expanded Operations Alternative would be negligible.

5.4.9.2 Other Transportation (Traffic)

Overall vehicular traffic impacts under the Expanded Operations Alternative were assessed by projecting the total increased number of SNL/NM commuter vehicles traveling to and from SNL/NM. The term commuter includes all vehicles operated by SNL/NM employees, contractors, and visitors; DOE employees; and additional traffic, such as delivery vehicles.

Traffic on KAFB

Table 5.4.9 4 presents general anticipated traffic impacts at KAFB under the Expanded Operations Alternative. The number of SNL/NM commuter vehicles traveling to and from the site each work day was conservatively assumed to increase at the same rate as the SNL/NM work force level (see Section 5.4.12). Based on this analysis, overall KAFB traffic would increase by 3.6 percent under this alternative.

Table 5.4.9 5 shows projected 24-hour KAFB vehicular flow for each of the three main gates under the Expanded Operations Alternative. It was assumed that the Carlisle and Truman gates would be used primarily by KAFB personnel and not by SNL/NM employees. For the bounding case for this analysis, it was assumed that the SNL/NM contribution to total KAFB flow at each gate would fluctuate by the same factor as the total

Table 5.4.9 4. KAFB Daily Traffic Projections Under the Expanded Operations Alternative

COMPONENT	BASE YEAR[a]			EXPANDED OPERATIONS			% CHANGE IN BASE YEAR VERSUS EXPANDED
	%	VEHICLES	TRIPS	%	VEHICLES	TRIPS	
SNL/NM Commuters	36	13,582	27,164	38	14,940	29,880	10
KAFB Commuters	64	24,145	48,290	63	24,145	48,290	0
TOTAL KAFB COMMUTER TRAFFIC	**100**	**37,727**	**75,453**	**100**	**39,085**	**78,170**	**3.6**
SNL/NM Waste & Material Transporters	0.04	14.5	29	0.09	34.4	69	137[b]

Sources: SNL/NM 1997a, 1997b

[a] The base year varies depending on information provided in the *Facilities and Safety Information Document* (SNL/NM 1997b). Typically, the base year is 1996 or 1997, as appropriate.

[b] SNL/NM commuter and transporter trips per day equals 36 percent of total KAFB trips per day.

[c] Total KAFB trips per day.

[d] Total KAFB trips per hour, traffic counts

Table 5.4.9 5. Total KAFB Gate Traffic Under the Expanded Operations Alternative

GATE	BASE YEAR[a]			EXPANDED OPERATIONS ALTERNATIVE			% CHANGE
	24-HOUR SNL/NM[b]	24-HOUR TOTAL[c]	PEAK HOUR[d]	24-HOUR SNL/NM	24-HOUR TOTAL	PEAK HOUR	GATE TOTAL
Wyoming	7,141	19,835	1,941	7,855	20,549	2,011	3.6
Eubank	5,324	14,788	2,683	5,856	15,320	2,951	3.6
Gibson	8,108	22,523	1,571	8,919	23,334	1,628	3.6
AVERAGE	**6,858**	**19,048**	**2,065**	**7,543**	**19,734**	**2,197**	**3.6**

Sources: SNL/NM 1997a, 1997b; Bohannan-Huston 1995

[a] The base year varies depending on information provided in the *Facilities and Safety Information Document* (SNL/NM 1997b). Typically, the base year is 1996 or 1997, as appropriate.

[b] This increase represents inclusion of waste managed at the KAFB landfill and new shipments from medical isotopes production.

fluctuation in SNL/NM traffic under the Expanded Operations Alternative.

Based on this analysis, the daily KAFB gate traffic would increase by 3.6 percent under the Expanded Operations Alternative (Table 5.4.9 5). This minimal change would not have an appreciable impact on service at the gates.

Short-term adverse traffic impacts would potentially occur onsite during routine construction activities at KAFB due to traffic lane restrictions, reduced speeds in construction areas, and traffic increases in slower moving heavy equipment. These common occurrences would be similar to those under the No Action Alternative. Building construction and onsite roadway rehabilitation are currently planned under the Expanded Operations Alternative. Short-term circulation impacts would potentially occur if vehicles are re-routed to avoid construction areas. However, it is anticipated that adequate detour routes and signage would be provided and that the impacts would be minimal and limited in duration.

Traffic in the Albuquerque Area

To determine the traffic impacts in the Albuquerque traffic corridor, roadways most likely to be affected by SNL/NM traffic were selected for analysis. The bounding case used the projected SNL/NM traffic contributions from Table 5.4.9 5 to approximate the SNL/NM component of the total traffic count for each roadway. For worst-case impacts, the SNL/NM traffic component was assumed to be equivalent to the total SNL/NM traffic at the nearest gate. In actuality, a

significant percentage of traffic would likely diffuse onto other nearby roads, which would greatly reduce the magnitude of the SNL/NM component. The projected impacts to these roadways under the Expanded Operations Alternative, according to the bounding case factors, are presented in Table 5.4.9 6.

This represents an overall average increase of 10 percent of the SNL/NM traffic component on these roadways. However, the total traffic on these roadways would only increase by 2.9 percent overall under the Expanded Operations Alternative.

Traffic Outside of Albuquerque

The additional local SNL/NM traffic under the Expanded Operations Alternative would have minimal impacts on transportation routes between Albuquerque and other DOE facilities, vendors, and disposal facilities (see Section 4.11 for a list of these facilities). In a worst-case assessment, the applicable base year (1996 or 1997) SNL/NM component represents an average 19 percent of the total traffic count (141,000 vehicles per day) on major roadways entering and departing Albuquerque (MRGCOG 1997b). Under the Expanded Operations Alternative, the SNL/NM component would decrease to 18.1 percent of total vehicular traffic due to the increase in Albuquerque population and commuters. This assumes that all SNL/NM traffic would actually enter and depart Albuquerque by way of the interstates every day, although a significant portion of SNL/NM traffic would more likely diffuse onto other roadways and remain in Albuquerque.

Table 5.4.9 6. Albuquerque Daily Traffic Counts Under the Expanded Operations Alternative

ROADWAY		BASE YEAR[a]		EXPANDED OPERATIONS		% CHANGE
		DAILY[b]	PEAK[c]	DAILY	PEAK	DAILY
Gibson West at Louisiana	*Total*	15,671	2,066	16,482	2,172	+5
	SNL/NM	8,108	1,069	8,919	1,176	+10
	% SNL/NM	52		54		+4
Wyoming South of Lomas	*Total*	37,639	2,293	38,353	2,337	+2
	SNL/NM	7,141	435	7,855	479	+10
	% SNL/NM	19		20		+5
Eubank South of Copper	*Total*	14,572	1,852	15,104	1,920	+4
	SNL/NM	5,324	677	5,856	744	+10
	% SNL/NM	37		39		+5
Interstate-25 at Gibson[d]	*Total*	91,000	-	91,811	-	+1
	SNL/NM	8,108	-	8,919	-	+10
	% SNL/NM	8.9		9.7		+9
Interstate-40 at Eubank[d]	*Total*	90,300	-	90,832	-	+0.6
	SNL/NM	5,324	-	5,856	-	+10
	% SNL/NM	5.9		6.5		+10
Wyoming North of KAFB Gate	*Total*	20,272	1,749	20,986	1,811	+4
	SNL/NM	7,141	612	7,855	673	+10
	% SNL/NM	35		37		+6

Sources: MRGCOG 1997b, 1997c; SNL/NM 1997b, 1998a; UNM 1997b

[a] The base year varies depending on information provided in the *Facilities and Safety Information Document* (SNL/NM 1997b). Typically, the base year is 1996 or 1997, as appropriate.

[b] Vehicles per day, *1996 Traffic Flows for the Greater Albuquerque Area*

[c] Vehicles per hour, *1996 1998 Traffic Counts*

[d] Peak hour counts for this intersection are not available.

5.4.9.3 Transportation Risk Associated with Normal Operations

Incident-Free Exposure

The bounding case for this analysis used the representative distances traveled by SNL/NM waste and material carriers, as listed in Table 5.3.9 7. These distances were based on the average distance traveled by trucks in route to other facilities under all alternatives.

Truck emissions impacts are a function of the number of truck shipments to and from SNL/NM. The bounding case for truck emissions impact analysis assumed that the greatest risk is when these shipments are transported through urban areas, such as the Albuquerque transportation corridor, because these areas are most susceptible to emissions related problems. To evaluate the actual risk associated with SNL/NM truck shipments, the most common origin and destination of all shipments of concern were compiled to determine the urban distance each material or waste would be transported (Section 4.11). Table 5.4.9 7 presents projected truck emissions impacts resulting from the Expanded Operations Alternative.

Based on this analysis, the emissions impacts due to increased truck traffic under the Expanded Operations Alternative would increase from 1.33×10^{-2} to 6.4×10^{-2} annual LCFs.

The impact analysis of incident-free exposure from material and waste shipments was conducted using the *HIGHWAY* computer code as part of the *RADTRAN 4* modeling program (SNL 1992q). The distance parameters presented in Table 5.3.9 7 were used to project the incident-free exposure impacts to the public and crew resulting from this alternative. The projected public and crew dose calculations are presented in Table 5.4.9 8. This table shows that the greatest radiological impacts to the truck crew and the public under the Expanded Operations Alternative would result from increased radioactive material shipments.

In the absence of an accident that compromises package integrity, no incident-free chemical or explosive exposure would be foreseen to affect the public, workers, or vehicle transport crews under this alternative.

5.4.9.4 Transportation Risks Associated with Accidents

General Accidents

The bounding case for general vehicular traffic impacts under the Expanded Operations Alternative assumes that the percent increase in accidents would be equal to the percent increase in SNL/NM traffic. Therefore, SNL/NM traffic accidents would increase by 10 percent under this alternative.

Hazardous Material/ Waste-Related Accidents

In conjunction with traffic fatality statistics (SNL 1986), the SNL/NM material and waste shipments projected in Tables 5.4.9 1 and 5.4.9 2 were used to project the truck accident fatality incidence rate that would be expected under the Expanded Operations Alternative. These impacts for the bounding case are presented in Table 5.4.9 9 with details in Appendix G. Based on this analysis, accident fatalities due to SNL/NM truck transportation would increase from 0.22 to 1.3 (1.2 plus 7.1×10^{-2}) under this alternative.

5.4.9.5 Radiological Transportation Accidents

The annual risk to population due to transportation accidents that potentially involve radiological releases resulting from the Expanded Operations Alternative are presented in Table 5.4.9 10.

This analysis indicates that under normal routine operations, LCFs would increase from 9.0×10^{-6} to 1.3×10^{-4} in incidents of LCFs due to the worst-case radiological transportation accident under the Expanded Operations Alternative. In addition, 5.5×10^{-5} LCFs would result from legacy and ER Project waste shipments. For more information, see Appendix G.

Risks due to radiological, chemical, and explosives accidents are evaluated in detail in Appendix F. The bounding transportation accident analysis involves explosion of a tractor-trailer containing 40,000 ft^3 of hydrogen. Based on the results presented in Appendix F, Table F.4 1, the hydrogen explosion would result in structural damage to buildings up to a distance of 91 m from the truck. Fatalities would result up to a distance of 15 to 18 m from the truck, while eardrum ruptures would occur up to a distance of 36 m from the truck.

5.4.10 Waste Generation

The implementation of the Expanded Operations Alternative would not result in any major changes in the types of waste streams generated onsite. However, waste generation activities would increase overall if each facility were to operate at total production capacity. These increased waste volumes would be partially offset by increased waste minimization and pollution prevention programs, which project a 33-percent overall decrease in total waste disposal needs by FY 2000. Therefore, the increased generation

Table 5.4.9 7. Expanded Operations Alternative Incident-Free Exposure: Truck Emissions

CARGO	UNIT RISK FACTOR PER URBAN KILOMETER	URBAN DISTANCE TRAVELED PER SHIPMENT (km)	LCFs PER ROUND TRIP SHIPMENT	ANNUAL NO. SHIPMENTS		ANNUAL LCFs	
				BASE YEAR[a]	EXPANDED OPERATIONS	BASE YEAR[a]	EXPANDED OPERATIONS
NORMAL ROUTINE OPERATIONS							
RAD Materials	$1.0x10^{-7}$	73	$1.5x10^{-5}$	305	1,782	$4.6x10^{-3}$	$2.8x10^{-2}$
Explosives	$1.0x10^{-7}$	48	$9.6x10^{-6}$	303	1,771	$2.9x10^{-3}$	$1.7x10^{-2}$
Chemicals	$1.0x10^{-7}$	8	$1.6x10^{-6}$	2,750	2,750	$4.4x10^{-3}$	$4.4x10^{-3}$
LLW	$1.0x10^{-7}$	33	$6.6x10^{-6}$	4	21	$2.6x10^{-5}$	$1.4x10^{-4}$
Medical Isotopes Production (Receipts)	NA	NA	NA	0	55	0	$1.0x10^{-2}$
Medical Isotopes Production (Shipments)				0	1,140		
LLMW (Shipments)	$1.0x10^{-7}$	40.6	$8.1x10^{-6}$	1	3	$8.1x10^{-6}$	$2.4x10^{-5}$
LLMW (Receipts)	$1.0x10^{-7}$	35.6	$7.1x10^{-6}$	0	1	0	$7.1x10^{-6}$
Hazardous Waste	$1.0x10^{-7}$	33	$6.6x10^{-6}$	64	112	$4.2x10^{-4}$	$7.4x10^{-4}$
Recyclable Hazardous to CA	$1.0x10^{-7}$	23	$4.6x10^{-6}$	2	4	$9.2x10^{-6}$	$1.8x10^{-5}$
Recyclable Hazardous to NM	$1.0x10^{-7}$	6.4	$1.3x10^{-6}$	6	11	$7.8x10^{-6}$	$1.4x10^{-5}$
Solid Waste	$1.0x10^{-7}$	10	$2.0x10^{-6}$	51	51	$1.0x10^{-4}$	$1.0x10^{-4}$
D&D Hazardous Waste TSCA-PCBs	$1.0x10^{-7}$	33	$6.6x10^{-6}$	1	1	$6.6x10^{-6}$	$6.6x10^{-6}$
D&D Hazardous Waste TSCA-Asbestos	$1.0x10^{-7}$	10	$2.0x10^{-6}$	14	14	$2.8x10^{-5}$	$2.8x10^{-5}$
Biohazardous Waste	$1.0x10^{-7}$	24	$4.8x10^{-6}$	1	1	$4.8x10^{-6}$	$4.8x10^{-6}$
Recyclable D&D Hazardous Waste	$1.0x10^{-7}$	6.4	$1.3x10^{-6}$	22	22	$2.9x10^{-5}$	$2.9x10^{-5}$
Recyclable Nonhazardous Solid Waste	$1.0x10^{-7}$	6.4	$1.3x10^{-6}$	78	78	$1.0x10^{-4}$	$1.0x10^{-4}$
Nonhazardous Landscaping Waste	$1.0x10^{-7}$	10	$2.0x10^{-6}$	NA	142	NA	$2.8x10^{-4}$
Construction and Demolition Solid Waste	$1.0x10^{-7}$	10	$2.0x10^{-6}$	NA	599	NA	$1.2x10^{-3}$
RCRA Hazardous Waste (Receipt)	$1.0x10^{-7}$	3	$6.0x10^{-7}$	12	25	$7.2x10^{-6}$	$1.5x10^{-5}$
LLW (D&D)	$1.0x10^{-7}$	33	$6.6x10^{-6}$	4	4	$2.6x10^{-5}$	$2.6x10^{-5}$
TOTAL[b]						$1.33x10^{2}$	$6.2x10^{-2}$

Table 5.4.9 7. Expanded Operations Alternative Incident-Free Exposure: Truck Emissions (concluded)

CARGO	UNIT RISK FACTOR PER URBAN KILOMETER	URBAN DISTANCE TRAVELED PER SHIPMENT (km)	LCFs PER ROUND TRIP SHIPMENT	ANNUAL NO. SHIPMENTS		ANNUAL LCFs	
				BASE YEAR[a]	EXPANDED OPERATIONS	BASE YEAR[a]	EXPANDED OPERATIONS
SPECIAL PROJECT OPERATIONS/TOTAL SHIPMENTS							
TRU/MTRU	1.0×10^{-7}	8.4	1.7×10^{-6}	0	4	0	6.8×10^{-6}
TRU/MTRU (Legacy)	1.0×10^{-7}	8.4	1.7×10^{-6}	0	2	0	3.4×10^{-6}
LLW (Legacy)	1.0×10^{-7}	33	6.6×10^{-6}	0	56	0	3.7×10^{-4}
LLMW (Legacy)	1.0×10^{-7}	40.6	8.1×10^{-6}	0	8	0	6.5×10^{-5}
LLW (ER)	1.0×10^{-7}	33	6.6×10^{-6}	0	136	0	9.0×10^{-4}
LLMW (ER)	1.0×10^{-7}	40.6	8.1×10^{-6}	0	5	0	4.1×10^{-5}
Hazardous Waste (ER)	1.0×10^{-7}	33	6.6×10^{-6}	0	113	0	7.5×10^{-4}
Nonhazardous Solid Waste(ER)	1.0×10^{-7}	10	2.0×10^{-6}	0	9	0	1.8×10^{-5}
TOTAL[b]						**0**	**2.1×10^{-3}**

Sources: DOE 1996h; SNL 1992a; SNL/NM 1997b, 1982, 1998a
D&D: decontamination and decommissioning
ER: environmental restoration
km: kilometers
LCFs: latent cancer fatalities
LLMW: low-level mixed waste
LLW: low-level waste
MTRU: mixed transuranic
NA: not applicable
PCB: polychlorinated biphenyl
RAD: radiological
RCRA: Resource Conservation and Recovery Act
TRU: transuranic
TSCA: *Toxic Substances Control Act*
[a] The base year varies depending on information provided in the *Facilities and Safety Information Document* (SNL/NM 1997b). Typically, the base year is 1996 or 1997, as appropriate.
[b] Lifetime estimated total LCFs

Table 5.4.9 8. Doses to Crew and Public Under the Expanded Operations Alternative

CARGO	ANNUAL DOSE/TRUCK CREW (person-rem)		ANNUAL DOSE/GENERAL PUBLIC (person-rem)		ANNUAL LCFs	
	BASE YEAR[a]	EXPANDED OPERATIONS	BASE YEAR[a]	EXPANDED OPERATIONS	BASE YEAR[a]	EXPANDED OPERATIONS
NORMAL ROUTINE OPERATIONS						
RAD Materials	9.8	57.0	82.4	481.1	4.5×10^{-2}	0.26
LLW	0.21	1.1	0.6	3.2	3.8×10^{-4}	2.0×10^{-3}
LLMW	2.6×10^{-2}	9.6×10^{-2}	0.26	0.88	1.4×10^{-4}	4.8×10^{-4}
Medical Isotopes Production	0	25.4	0	73	0	4.7×10^{-2}
LLW (D&D)	0.21	0.21	0.60	0.60	3.8×10^{-4}	3.8×10^{-4}
TOTAL[b]					**4.6×10^{-2}**	**0.31**
SPECIAL PROJECT OPERATIONS/TOTAL SHIPMENTS						
TRU/MTRU	0	7.2×10^{-3}	0	4.0×10^{-2}	0	2.3×10^{-5}
TRU/MTRU (Legacy)	0	3.6×10^{-3}	0	2.0×10^{-2}	0	1.1×10^{-5}
LLW (Legacy + ER)	0	10	0	28.8	0	1.8×10^{-2}
LLMW (Legacy + ER)	0	0.34	0	3.4	0	1.8×10^{-3}
TOTAL[b]					**0**	**2.0×10^{-2}**

Sources: DOE 1996h, SNL 1992a; SNL/NM 1997b, 1998a
D&D: decontamination and decommissioning
ER: environmental restoration
LCFs: latent cancer fatalities
LLMW: low-level mixed waste
LLW: low-level waste
MTRU: mixed transuranic
RAD: radiological
rem: Roentgen equivalent, man
TRU: transuranic

[a] The base year varies depending on information provided in the *Facilities and Safety Information Document* (SNL/NM 1997b). Typically, the base year is 1996 or 1997, as appropriate.

[b] Lifetime estimated total fatalities from annual shipments and total special shipments

Table 5.4.9 9. Truck Transportation Traffic Fatalities Under the Expanded Operations Alternative

CARGO	TRAFFIC FATALITY RATE: CREW AND GENERAL PUBLIC PER SHIPMENT (ROUND TRIP)	ANNUAL FATALITIES	
		BASE YEAR[a]	EXPANDED OPERATIONS
NORMAL ROUTINE OPERATIONS			
RAD Materials	3.5×10^{-4}	0.11	0.62
Explosives	2.9×10^{-4}	8.8×10^{-2}	0.51
Chemicals	2.1×10^{-6}	5.8×10^{-3}	5.8×10^{-3}
LLW	2.2×10^{-4}	8.8×10^{-4}	4.6×10^{-3}
Medical Isotopes Production	NA	NA	2.1×10^{-2}
LLMW (Shipments)	3.0×10^{-4}	3.0×10^{-4}	9.0×10^{-4}
LLMW (Receipts)	2.1×10^{-4}	0	2.1×10^{-4}
Hazardous Waste	2.2×10^{-4}	1.4×10^{-2}	2.5×10^{-2}
Recyclable Hazardous to California	1.5×10^{-4}	3.0×10^{-4}	6.0×10^{-4}
Recyclable Hazardous to New Mexico	1.6×10^{-6}	9.6×10^{-6}	1.8×10^{-5}
Solid Waste	2.6×10^{-6}	1.3×10^{-4}	1.3×10^{-4}
D&D Hazardous Waste TSCA-PCBs	2.2×10^{-4}	2.2×10^{-4}	2.2×10^{-4}
D&D Hazardous Waste TSCA-Asbestos	2.2×10^{-5}	3.1×10^{-4}	3.1×10^{-4}
Biohazardous Waste	1.4×10^{-4}	1.4×10^{-4}	1.4×10^{-4}
Recyclable D&D Hazardous Waste	1.6×10^{-6}	3.5×10^{-5}	3.5×10^{-5}
Recyclable Nonhazardous Solid Waste	1.6×10^{-6}	1.2×10^{-4}	1.2×10^{-4}
Nonhazardous Landscaping Waste	2.6×10^{-6}	NA	3.7×10^{-4}
Construction and Demolition Solid Waste	2.6×10^{-6}	NA	1.6×10^{-3}
RCRA Hazardous Waste (Receipt)	6.7×10^{-7}	8.0×10^{-6}	1.7×10^{-5}
Low Level Waste (D&D)	2.2×10^{-6}	8.8×10^{-4}	8.8×10^{-4}
TOTAL[b]		**0.22**	**1.2**
SPECIAL PROJECT OPERATIONS			
TRU/MTRU	1.9×10^{-5}	0	3.8×10^{-5}
TRU/MTRU (Legacy)	1.9×10^{-5}	0	3.8×10^{-5}
LLW (Legacy)	2.2×10^{-4}	0	1.2×10^{-2}
LLMW (Legacy)	3.0×10^{-4}	0	2.4×10^{-3}
LLW (ER)	2.2×10^{-4}	0	3.0×10^{-2}

Table 5.4.9 9. Truck Transportation Traffic Fatalities Under the Expanded Operations Alternative (concluded)

CARGO	TRAFFIC FATALITY RATE: CREW AND GENERAL PUBLIC PER SHIPMENT (ROUND TRIP)	ANNUAL FATALITIES	
		BASE YEAR[a]	EXPANDED OPERATIONS
LLMW (ER)	3.0×10^{-4}	0	1.5×10^{-3}
Hazardous Waste (ER)	2.2×10^{-4}	0	2.5×10^{-2}
Nonhazardous Solid Waste (ER)	2.6×10^{-6}	0	2.3×10^{-5}
TOTAL[b]		**0**	**7.1×10^{-2}**

Sources: SNL/NM 1997b, 1998a
D&D: decontamination and decommissioning
ER: environmental restoration
LLMW: low-level mixed waste
LLW: low-level waste
MTRU: mixed transuranic
NA: not applicable
PCB: polychlorinated biphenyl
RAD: radiological
RCRA: *Resource Conservation and Recovery Act*
TRU: transuranic
TSCA: *Toxic Substances Control Act*
[a] The base year varies depending on information provided in the *Facilities and Safety Information Document* (SNL/NM 1997b). Typically, the base year is 1996 or 1997, as appropriate.
[b] Lifetime estimated total traffic fatalities from annual shipments

Table 5.4.9 10. Doses to Population Due to Transportation Radiological Accident, Maximum Annual Radiological Accident Risk for Highway Shipments

CARGO	ANNUAL DOSE TO POPULATION person-rem		LCFs	
	BASE YEAR[a]	EXPANDED OPERATIONS	BASE YEAR[a]	EXPANDED OPERATIONS
NORMAL ROUTINE OPERATIONS				
Radioactive	1.3×10^{-2}	7.7×10^{-2}	6.6×10^{-6}	3.9×10^{-5}
LLW	2.3×10^{-3}	1.2×10^{-2}	1.2×10^{-6}	6.0×10^{-6}
LLMW	3.8×10^{-5}	1.1×10^{-4}	1.7×10^{-8}	5.3×10^{-8}
Medical Isotopes Production	0	5.2×10^{-2}	0	3.0×10^{-5}
LLW (D&D)	2.3×10^{-3}	2.3×10^{-3}	1.2×10^{-6}	1.2×10^{-6}
TOTAL[b]			**9.0×10^{-6}**	**7.6×10^{-5}**
SPECIAL PROJECT OPERATIONS/TOTAL SHIPMENTS				
TRU/MTRU	0	1.0×10^{-5}	0	5.0×10^{-9}
TRU/MTRU (Legacy)	0	6.8×10^{-6}	0	3.4×10^{-9}
LLW (Legacy+ER)	0	0.11	0	5.5×10^{-5}
LLMW (Legacy+ER)	0	4.4×10^{-4}	0	2.2×10^{-7}
TOTAL[b]			**0**	**5.5×10^{-5}**

Sources: DOE 1996a, SNL 1992a, SNL/NM 1998a
D&D: decontamination and decommissioning
ER: environmental restoration
LCFs: latent cancer fatalities
LLMW: low-level mixed waste
LLW: low-level waste
MTRU: mixed transuranic
rem: roentgen equivalent, man
TRU: transuranic
[a] The base year varies depending on information provided in the *Facilities and Safety Information Document* (SNL/NM 1997b). Typically, the base year is 1996 or 1997, as appropriate.
[b] Lifetime estimated LCFs

activities would not exceed existing waste management disposal capacities.

For projection purposes, the baseline waste generation data were considered to be constant for existing facilities, with no major increases or decreases in the amount of wastes generated. Operations waste are considered to be derived from missions-related work. Nonoperations waste are generated from special programs. New operations are discussed separately in order to show the maximum existing operational increases that could be expected. Waste generation levels for special program waste, such as for the ER Project, are derived separately from the representative facilities projections under special operations. The waste quantities projected, listed in Table 5.4.10 1, represent a site-wide aggregate of quantities for each type of waste stream from existing selected facilities. As appropriate, the balance of operations (not selected facilities or special projects) waste generated is discussed within the individual waste sections. Units shown for each waste type are based on how industrial facilities charge commercial clients for disposal of these wastes.

5.4.10.1 Radioactive Wastes

Under the Expanded Operations Alternative, SNL/NM would potentially generate LLW, LLMW, and TRU and MTRU waste. However, SNL/NM would not generate any high-level waste. Projections for waste generation at selected facilities from new and existing operations are shown in Appendix H.

Existing Operations

Under the Expanded Operations Alternative, SNL/NM anticipates a maximum 61 percent increase in the generation of LLW from existing operations at selected facilities over the next 10 years. LLW generated by SNL/NM is and will continue to be transported offsite to appropriate DOE-approved disposal facilities, such as the NTS. Similarly, LLMW generation would increase by 49 percent for existing operations at selected facilities through 2008. Under the *Resource Conservation and Recovery Act Part B, Permit Application for Hazardous Waste Management Units* (SNL/NM 1996a), some treatment of the hazardous component of LLMW could be performed at SNL/NM (Table 4.12 2). LLMW for which no onsite treatment is available would be shipped offsite for treatment and disposal. SNL/NM also projects that approximately 0.59 m^3 of TRU waste would be generated annually. The existing TRU/MTRU wastes stored onsite, as well as future TRU/MTRU wastes, would be transferred to LANL for certification, prior to their disposal at the WIPP as indicated in the Waste Management Programmatic Environmental Impact Statement (DOE 1997i) ROD (DOE 1998n). Projected MTRU waste generated would increase 100 percent to a level of 0.91 m^3 annually. Existing SNL/NM operations would use less than 1 percent annually of the available radioactive waste storage capacity. This would be a minimal impact.

New Operations

SNL/NM anticipates a maximum of 181 m^3 of LLW would be generated from new operations annually over the next 10 years. The majority of the increase would be due primarily to the full implementation of the medical isotopes production operations in 2003. These operations, described in the *Medical Isotopes Production Project: Molybdenum-99 and Related Isotopes Environmental Impact Statement* (DOE 1996b), would account for more than 83 percent of the total projected LLW under the Expanded Operations Alternative. However, due to the nature of the waste, it would be managed at the generation facility to minimize worker exposure until disposal offsite. LLMW generation from all new onsite sources would be a maximum of 7.31 m^3 annually through 2008.

SNL/NM does not expect to generate TRU and MTRU wastes from new operations. Approximately 399 kg of spent fuel would be generated over the 10-year period. Spent fuel is further discussed in Appendix A as a material resource.

Balance of Operations

The waste generation level for the balance of operations was determined for each type of radioactive waste (Table 5.4.10 1). Only LLW and LLMW would be affected. Balance of operations mission operations at SNL/NM would account for an additional 74 m^3 per year of LLW. These same operations would account for an additional 0.28 m^3 of LLMW per year. The overall operations impacts for this alternative would increase by approximately 198 percent for LLW and 69 percent for LLMW.

Current Capacity

Previously generated radioactive wastes (legacy waste) occupy approximately 494 m^3 of the available 11,866 m^3 of total radioactive waste storage capacity at the RMWMF and its associated storage areas. This represents approximately 4.2 percent of the total available capacity.

Table 5.4.10 1. Waste Generation for Existing Selected SNL/NM Facilities Under the Expanded Operations Alternative

ALL WASTE		UNIT	BASE YEAR[a]	EXPANDED OPERATIONS ALTERNATIVE
RADIOACTIVE WASTE				
Low-Level Waste (500 kg/m³)	Existing Operations	m³(kg)	16(8,000)	26(13,000)
	New Operations	m³(kg)	4(2,000)	181(90,500)
	SNL/NM Balance of Operations	m³(kg)	74(37,000)	74(37,000)
	SNL/NM Total LLW	m³(kg)	94(47,000)	280(140,000)
	Percent change	m³(kg)	0.0%	197.9%
Low-Level Mixed Waste (550 kg/m³)	Existing Operations	m³(kg)	3.85(2,120)	5.75(3,160)
	New Operations	m³(kg)	0.20(110)	1.27(700)
	SNL/NM Balance of Operations	m³(kg)	0.28(150)	0.28(40)
	SNL/NM Total LLMW	m³(kg)	4.33(2,380)	7.31(3,900)
	Percent change	m³(kg)	0.0%	68.7%
TRU Waste (310 kg/m³)	Existing Operations	m³(kg)	-	0.59(180)
	New Operations	m³(kg)	-	0.14(40)
	SNL/NM Balance of Operations	m³(kg)	-	-
	SNL/NM Total TRU	m³(kg)	-	0.74(210)
MTRU Waste (76 kg/m³)	Existing Operations	m³(kg)	0.45(34)	0.91(70)
	New Operations	m³(kg)	-	0.14(10)
	SNL/NM Balance of Operations	m³(kg)	-	-
	SNL/NM Total MTRU	m³(kg)	0.45(34)	1.05(80)
	Percent change		0.0%	131.3%
RADIOACTIVE WASTE TOTAL[c]	**Existing Operations**	**m³(kg)**	**20.34 (10,154)**	**33.06(16,550)**
	New Operations	**m³(kg)**	**4.62(2,110)**	**182.41(91,450)**
	SNL/NM Balance of Operations	**m³(kg)**	**73.92 (37,150)**	**73.92(37,050)**
	SNL/NM Total Radioactive Waste	**m³(kg)**	**98.88 (49,414)**	**289.39(145,050)**
	Percent change		**0.0%**	**192.7%**

Table 5.4.10 1. Waste Generation for Existing Selected SNL/NM Facilities Under the Expanded Operations Alternative (concluded)

ALL WASTE	UNIT	BASE YEAR[a]	EXPANDED OPERATIONS ALTERNATIVE
RCRA HAZARDOUS WASTE			
Existing Operations	kg	16,187	25,074
New Operations	kg	398	2,337
SNL/NM Balance of Operations	kg	39,267	64,902
SNL/NM Total RCRA Hazardous	kg m^3	55,852 44.3	92,314 73.2
Percent Change		0.0%	65.3%
SOLID WASTE			
SNL/NM Total Solid Waste[b]	m^3(kg)	2,022 (0.6M)	2,022 (0.6M)
Percent Change		0.0%	0.0%
WASTEWATER			
Existing Operations	M gal	49	86
New Operations	M gal	0	5
SNL/NM Balance of Operations	M gal	231	231
SNL/NM Total Wastewater	M gal	280	322
Percent Change		0.0%	15%

Sources: SNL/NM 1998a, 1997b, 1998c, 1998t
kg: kilogram
LLMW: low-level mixed waste
LLW: low-level waste
M: million
M gal: million gallons
m^3: cubic meters
MTRU: mixed transuranic
RCRA: *Resource Conservation and Recovery Act*
TRU: transuranic
[a] The base year varies depending on information provided in the *Facilities and Safety Information Document* (SNL/NM 1997b). Typically, the base year is 1996 or 1997, as appropriate.
[b] Individual breakdowns of solid waste for existing, new, and balance of operations are unavailable because of tracking methods.
[c] Numbers are rounded and may differ from calculated values.

Therefore, there would be sufficient capacity to accommodate the anticipated increases in radioactive wastes.

Special Projects

Projections indicate that the ER Project, a special project beyond the scope of existing operations, will be the single largest waste generator at SNL/NM in 1998. The ER Project would produce approximately 2,862 m^3 of LLW and 221 m^3 of LLMW, primarily contaminated soil and debris prior to the end of the project in 2004. ER Project wastes are stored and handled at the point of generation prior to offsite disposal. Management of ER Project waste would not be expected to impact overall SNL/NM waste management operations. Actual cleanup is now expected to be completed by 2002, with ER waste disposed of by 2004. ER Project waste must be properly characterized. Therefore, lag time is built into the project schedule between field remediation and actual disposal of waste.

5.4.10.2 Hazardous Waste

Existing Operations

As shown on Table 5.4.10 1, under the Expanded Operations Alternative, SNL/NM anticipates an increase in the generation of RCRA hazardous waste from existing operations from 16,187 kg in the base year to 25,074 kg per year. Projections for selected facilities for new and existing operations are shown in Appendix H. Projected RCRA hazardous waste generation is presented in Figure 4.12 4.

No appreciable change in the generation of explosive waste would occur. Therefore, the TTF, with a treatment capacity of 9.1 kg of waste per burn, would continue to accommodate those wastes generated from the Light-Initiated High Explosive Facility at SNL/NM. The majority of explosive waste would be disposed of at SNL/NM or through KAFB.

New Operations

SNL/NM anticipates annual generation of a maximum of 2,337 kg of hazardous waste by new operations over the next 10 years. The majority of the increase would be primarily due to the full implementation of medical isotopes production operation, associated with the MIPP in 2003. These operations, described in the *Medical Isotopes Production Project: Molybdenum-99 and Related Isotopes Environmental Impact Statement* (DOE 1996b), would account for less than 3 percent (2.5 percent) of the total projected hazardous waste generation under the Expanded Operations Alternative.

New SNL/NM operations would use less than 1 percent annually of the available hazardous waste storage capacity, which is considered to be a minimal impact.

Balance of Operations

It was assumed that the RCRA hazardous waste levels for the balance of operations at SNL/NM would increase by the same proportion as RCRA waste for selected facilities, because selected facilities represent the overall plant. Consequently, multipliers were used to project RCRA hazardous waste levels under all three alternatives. In the base year, balance of operations generated 39,267 kg of RCRA hazardous waste. For the Expanded Operations Alternative, the maximum projected balance of operations amount would be 64,902 kg.

Current Capacity

Under the Expanded Operations Alternative, the total volume of hazardous waste generated at SNL/NM requiring offsite disposal at licensed/approved facilities, would not exceed the existing 286.5 m^3 of storage and handling capacities at the HWMF and its associated storage buildings. The outside nonpermitted bermed storage area for nonhazardous waste was not included in the onsite storage capacity calculations. SNL/NM routinely ships hazardous waste to various offsite commercial disposal facilities. Projections provide that a maximum of 26 percent of the existing hazardous waste capacity would be used. Most, if not all, waste would be shipped in less than 1 year to meet regulatory requirements. Based on these projections and on continued operations at selected facilities under the Expanded Operations Alternative, the hazardous waste generation impacts would continue to be minimal.

Special Projects

During field remediation, the ER Project would be the single largest waste generator at SNL/NM and would produce approximately 26 M kg of hazardous waste by 2002. Final disposal would be accomplished by 2004. Projected ER hazardous waste volumes are presented in Table 5.3.10 2. ER waste handling is discussed in Section 4.12.6.

D&D operations would continue (as outlined in Section 2.3.5). This program would directly impact the quantity of TSCA hazardous waste requiring disposal. Under this modernization program, SNL/NM would continue to generate TSCA hazardous waste, primarily PCBs and asbestos that are removed from transformers and buildings. Since the main PCB relamping and transformer removal has been completed, quantities of TSCA waste have dropped to approximately 122,000 kg per year and should remain at that level (Figures 4.12 5 and 4.12 6).

The total volume of TSCA waste would eventually decrease as the targeted facilities are removed. Currently, SNL/NM has 674 buildings providing a total of 5 M gross ft^2 of office and operational space. Through this facility modernization program, the number of buildings would be reduced to 465, totaling approximately 4.9 M gross ft^2. This program would remove 138 buildings accounting for 179,204 gross ft^2 within FY 1998 and FY 1999 at SNL/NM. During FY 2000 through FY 2002, 49 additional buildings, accounting for 108,937 gross ft^2, are potentially scheduled for removal. Over the long term, an additional 29 buildings would be removed with a total of 84,132 gross ft^2. To make up for the loss of office and operational space, seven additional buildings would be built, adding a total of approximately 240,000 gross ft^2. No predictions are made for years beyond 2007.

5.4.10.3 All Other Wastes

All SNL/NM operations also involve four additional waste management activity areas, discussed below.

Biohazardous (Medical) Waste

The total volume of medical waste would generally remain a function of the total number of full-time employees and subcontractors at SNL/NM. In 1997,

2,463 kg of medical waste were disposed of at an approved offsite commercial facility. Under the Expanded Operations Alternative, approximatgely 4,071 kg of medical waste would be generated. The existing waste handling capabilities would be adequate to accommodate this waste. No additional offsite impacts would occur, because offsite disposal capacity would continue to be sufficient.

Nonhazardous Chemical Waste

In 1998, the ER Project will generate approximately 125,112 kg of nonhazardous waste (Table 5.3.10 2). The maximum quantity of nonhazardous waste generated annually at SNL/NM and managed by the HWMF would be 114,576 kg, based on the waste multiplier (see Appendix H) developed for RCRA hazardous waste (Rinchem 1998a). Existing commercial disposal facilities would still have adequate capacities to handle the continued generation of nonhazardous waste, thus no additional impacts would be anticipated.

Municipal Solid Waste

Site-wide solid waste generation trends at SNL/NM would generally remain a function of total building area and the number of full-time and subcontractor employees. This function is based on general build operations activities, such as maintenance and cleaning, and, to a lesser extent, the general office waste created by SNL/NM employees. Despite the projected 10 percent personnel increase, no appreciable onsite impacts to disposal facilities would be anticipated because existing waste handling capabilities are already in place. As existing buildings are replaced, personnel are moved to make more efficient use of the space. No additional offsite impacts would occur, because offsite disposal capacity would continue to be sufficient. However, a significant amount of C&D waste, a special class of solid waste, would potentially be generated under the facility modernization program described above. Quantities of C&D waste associated with the facility modernization program projected to be similar to prior years. This waste is disposed of at KAFB and does not currently create an offsite impact. Table 5.3.10 3 summarizes construction debris disposal.

Wastewater

Under the Expanded Operations Alternative, increases in process and domestic water use would occur throughout SNL/NM due to varying levels of operation within each facility. SNL/NM would generate approximately 322 M gal of wastewater annually. However, SNL/NM entered into an MOU with KAFB, the DOE, the city of Albuquerque, and the state of New Mexico to reduce its water use by 30 percent by 2004 (SNL/NM 1997p). The MDL would be the single facility discharging the largest wastewater volume at SNL/NM. Reduction efforts would focus on the MDL to reduce the amount of process wastewater being generated. See Section 5.3.2 for additional discussion of wastewater quantities and capacities.

5.4.11 Noise and Vibration

Projections of the number of impulse noise tests under the Expanded Operations Alternative indicate a 250 percent increase in tests over those of the 1996 baseline 73.2 number and a 184 percent increase above No Action Alternative levels. These test activities originate from facilities located in TA-III and the Coyote Test Field and are remote from other SNL/NM TAs and the site boundary. There would be no increase in the magnitude of explosions during test activities that would result in a larger impulse noise for the Expanded Operations Alternative.

The level of impulse noise activities under the Expanded Operations Alternative would be an average of approximately one impulse noise event per hour for an 8-hour 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 would be expected to be below background noise levels for receptor locations beyond the KAFB boundary and would, therefore, be unnoticed by those neighborhoods bounding the site. Building damage is sometimes blamed on ground vibrations caused by explosive detonations, whereas the damage is often the result of the traveling pressure waves. The impulse noise levels resemble a dull thud and generally are considered an annoyance because of startle effects, including window vibrations. The effects on the public would be minor. Ground vibrations would remain confined to the immediate test area within the ground hazard area.

5.4.12 Socioeconomics

Implementation of the Expanded Operations Alternative would result in no appreciable impacts to demographic characteristics, economy, and community services in the ROI, as discussed below. The discussion of impacts is based on a bounding economic analysis based on projections in *SNL/NM Facility Source Documents* (SNL/NM 1998a) and potential indirect increases across all SNL/NM facilities, as discussed in Section 5.2.11.

5.4.12.1 Demographic Characteristics

The Expanded Operations Alternative would not be likely to have any noticeable change in existing demographic characteristics within the ROI (Section 4.14.3). Under this alternative, overall expenditures and employment at SNL/NM would expand gradually at a steady rate through 2008.

5.4.12.2 Economic Base

The Expanded Operations Alternative would not be likely to have a noticeable change in the existing economic base in the ROI (Section 4.14.3). Historically, increases or decreases in operational levels of activities at SNL/NM have been gradual and/or fluctuated about 1 or 2 percent per year (SNL/NM 1997a). Under this alternative, overall expenditures and employment at SNL/NM would expand at a gradual steady rate through 2008.

Table 5.4.12 1 presents an estimate of the Expanded Operations Alternative impacts on the ROI economy from a 10-percent increase in operational levels of activity and associated increases in expenditures, income, and employment, both direct and indirect, at SNL/NM. Operational activities associated with selected facilities are included in the totals presented in the table. If operations at SNL/NM were to increase by 10 percent over current levels, overall economic activity within the ROI would be expected to increase by about 0.8 percent, with slightly smaller increases in income and employment at about 0.7 percent. As presented in Table 5.4.12 1, a 10-percent increase in operational levels of activity at SNL/NM through 2008 would help generate

Table 5.4.12 1. SNL/NM s Impact on Central New Mexico s Economy if Operations Were to Increase by 10 Percent

ECONOMIC MEASURE	FY 1996[a]			ASSUMING A 10% INCREASE IN OPERATIONS			
	SNL/NM	TOTAL ROI	PERCENT OF ROI	SNL/NM	TOTAL ROI	PERCENT OF ROI	PERCENT CHANGE
ECONOMIC ACTIVITY ($ BILLIONS)							
Direct Expenditures	1.43			1.57			
Indirect & Induced	2.50			2.75			
TOTAL ECONOMIC ACTIVITY	**3.93**	**42.40**	**9.3**	**4.32**	**42.80**	**10.1**	**0.8**
Economic Activity Multiplier: 2.75[b]							
INCOME ($ BILLIONS)							
Net Wages & Salaries	0.48			0.53			
Indirect & Induced	0.58			0.64			
TOTAL INCOME	**1.06**	**13.40**	**7.9**	**1.17**	**13.51**	**8.7**	**0.8**
Income Multiplier: 2.21[b]							
EMPLOYMENT (NUMBER OF EMPLOYEES)							
SNL/NM Employment	7,652			8,417			
Indirect & Induced	18,826			20,706			
TOTAL EMPLOYMENT	**26,478**	**331,800**	**8**	**29,123**	**334,446**	**8.7**	**0.7**
Employment Multiplier: 3.46[b]							

Source: DOE 1997j
FY: fiscal year
ROI: region of influence

[a] Modeled results from DOE 1997j
[b] The use of multipliers in calculating economic impacts in the ROI is explained in Section 4.14.3.

$4.33 B in economic activity out of a total ROI activity of $42.8 B, contribute $1.17 B in income out of a total ROI income level of $13.51 B, and represent 29,123 jobs out of a total of 334,446 jobs within the ROI.

Section 6.4.11 discusses the cumulative impact of the Expanded Operations Alternative within the ROI and the expected growth from other industrial and economic sectors.

5.4.12.3 Housing and Community Services

The Expanded Operations Alternative would not create a noticeable change in existing housing and community services within the ROI (Section 4.14.3). Under this alternative, overall expenditures and employment at SNL/NM would expand at a steady rate through 2008; however, the contributory effects from other industrial and economic sectors within the ROI would be greater than SNL/NM s (Section 6.4.11).

5.4.13 Environmental Justice

In general, SNL/NM operations under the Expanded Operations Alternative would have no known disproportionately high or adverse health or environmental impacts on low-income or minority populations within the ROI. One area of concern is water resources and hydrology. Anticipated water resources adverse impacts would equally affect all communities in the area (see Section 5.4.4). Thus, no disproportionately high and adverse impacts to minority and low-income communities would be anticipated for this resource area.

Table 5.4.13 1 provides a brief summary of impacts for each resource or topic area under the Expanded Operations Alternative. It also identifies areas where the impacts do not vary from the No Action Alternative. See Section 5.3.13 for an expanded discussion of environmental justice issues by resource area.

Table 5.4.13 1. Summary of Potential Environmental Justice Impacts Under the Expanded Operations Alternative

RESOURCE OR TOPIC AREA	SUMMARIZED EFFECT	EFFECT ON RESOURCE OR TOPIC AREA ROI	PROPORTIONAL EFFECT ON	
			LOW-INCOME	MINORITY NEIGHBOR-HOODS
Land Use and Visual Resources, Infrastructure, Geology and Soils, Biological and Ecological Resources, Cultural Resources[a], Waste Generation	Same as under the No Action Alternative	Same as under the No Action Alternative	Same as under the No Action Alternative	Same as under the No Action Alternative
Water Resources and Hydrology	SNL/NM groundwater use is projected to account for 12% of local aquifer drawdown.	Adverse effect	Not adverse effect	Not adverse effect
Air Quality Nonradiological Air	Emissions 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. Concentrations would be below regulatory standards and human health guidelines. SNL/NM carbon monoxide emissions would account for 6.3% of Bernalillo county carbon monoxide emissions.	Not adverse	Not adverse	Not adverse
Air Quality Radiological Air	MEI 0.51: mrem/yr Collective ROI dose: 15.8 person-rem/yr Average collective ROI dose: 2.16×10^{-2} mrem/yr	Not adverse	Not adverse	Not adverse
Human Health and Worker Safety	MEI lifetime risk of fatal cancer increases by 2.6×10^{-7} Fatal cancers (additional ROI): 7.9×10^{-3} Risk of cancer fatality to workforce is 7.6×10^{-3}	Not adverse	Not adverse	Not adverse
Transportation	Total annual material shipments: 6,303 Total KAFB traffic (daily vehicles): 39,085 Incident-free exposure, truck emissions - annual LCFs: 6.2×10^{-2} Incident-free exposure, dose - annual LCFs: 0.31	Not adverse	Not adverse	Not adverse

Table 5.4.13 1. Summary of Potential Environmental Justice Impacts Under the Expanded Operations Alternative (concluded)

RESOURCE OR TOPIC AREA	SUMMARIZED EFFECT	EFFECT ON RESOURCE OR TOPIC AREA ROI	PROPORTIONAL EFFECT ON	
			LOW-INCOME	MINORITY NEIGHBOR-HOODS
Noise and Vibration	Four-fold increase in test activities over 1996 levels, an average of less than one impulse noise event per hour for an 8-hour work day and a 261-day work year. Only a fraction of these tests would be of sufficient magnitude to be heard or felt beyond the site boundary. The vast majority of tests would be expected to be below background noise levels for receptor locations beyond the KAFB boundary and would, therefore, be unnoticed in neighborhoods bounding the site.	Not adverse	Not adverse	Not adverse
Socioeconomics	SNL/NM employees: 8,417 SNL/NM total economic activity: $4.32 B/yr Percent of ROI total economic activity: 10.1%	Not adverse	Not adverse	Not adverse

Source: Original
B: billion
KAFB: Kirtland Air Force Base
LCF: latent cancer fatalities
MEI: maximally exposed individual
mrem: millirem
rem: Roentgen equivalent, man
ROI: region of influence
TCPs: traditional cultrual properties
SNL/NM: Sandia National Laboratories/New Mexico
yr: year
[a] No TCPs have been identified; ongoing consultations may yet result in determination of impacts.

5.5 REDUCED OPERATIONS ALTERNATIVE

Under the Reduced Operations Alternative, DOE and interagency programs and activities at SNL/NM would decrease to the minimal operations needed to maintain SNL/NM facilities and equipment in an operational readiness mode. This section describes the impacts that would result from this alternative.

5.5.1 Land Use and Visual Resources

The implementation of the Reduced Operations Alternative would not affect the existing land use patterns or visual resources at SNL/NM facilities on KAFB. Sections 5.5.1.1 and 5.5.1.2 discuss these resource areas in relation to the Reduced Operations Alternative.

5.5.1.1 Land Use

Under the Reduced Operations Alternative, there would be no additional impacts to existing land resources on KAFB. The extent of DOE land and USAF-permitted acreage currently available for use by SNL/NM facilities on KAFB would remain relatively the same. Similarly, operations would remain consistent with industrial/research park uses and would have no foreseeable effect on established land use patterns or requirements. At locations on permitted land where operations would decline or be shut down bythe owning organization, SNL/NM would continue to hold the sites to conduct periodic safety checks and complete any ER actions (Section 5.3.3.1). Before returning the land to the USAF, SNL/NM would be responsible for conducting any demolition work and restoring the land to its condition when originally acquired (SNL 1997a).

5.5.1.2 Visual Resources

No additional impacts to visual resources would be likely to adversely change the overall appearance of the existing landscape. Efforts initiated by SNL/NM to incorporate and maintain campus-style design would continue. This style contains established principles and design guidance that provide a framework for the physical development and redevelopment of SNL/NM sites. The guidance covers building massing, facades, colors, building orientation and entries, traffic circulation corridors, standardized signage, and landscaping, including low-water-use plant selections. These efforts would be consistent with the high concern for scenery due to the numbers of observers and users in the area.

Based on the reduced levels of operation association with this alternative, activities at outdoor testing facilities in the Coyote Test Field and the Withdrawn Area would decline. Some testing activities that produce smoke and dust of variable quantity and duration would take place, but these conditions would be periodic, short-term, and would not change the visual characteristics of the area. Where decommissioning, demolition, or ER work are planned, actions would be taken such as backfilling, reducing side slopes, applying topsoil, reseeding, and establishing plant growth to restore the area to its condition when originally acquired.

5.5.2 Infrastructure

As discussed in Section 5.3.2, the infrastructure analysis looked for potential incremental changes to SNL/NM services, utilities, and facilities by alternative. The two areas where incremental changes were identified are site-wide utility demands and four selected infrastructure facilities: the steam plant, RMWMF, HWMF, and TTF. See Section 2.3 for a discussion of how the four facilities were selected for analysis.

With regard to site-wide utility demands, most SNL/NM facilities do not meter utility use. For the Reduced Operations Alternative, the lowest number reported in the No Action Alternative was used as the basis for projecting utility use. Any incremental changes between the base year and the Reduced Operations Alternative projections in utility demands for the selected facilities (see Chapter 2) were taken into account by adjusting site-wide demand accordingly as presented in Table 5.5.2 1. Facility-specific utility data are presented in Chapter 3, Table 3.6 1.

As discussed in Section 5.3.2, analysis of the selected infrastructure facilities relied on the projected throughput and operational capacities as presented in Table 5.5.2 2.

The implementation of the Reduced Operations Alternative would generally lessen the demands on infrastructure (Table 5.5.2 1). Water consumption would decrease approximately 24 M gal per year to 416 M gal per year. SNL/NM would generate approximately 268 M gal of wastewater per year. Annual electrical consumption would decline to 185,000 MWh. Small fluctuations in projected utility consumption rates would occur due to annual changes in weather.

The current infrastructure resources would be capable of accommodating SNL/NM facility requirements under the Reduced Operations Alternative. These levels of

Table 5.5.2 1. Annual[a] SNL/NM Utility Usage and Capacities Under the Reduced Operations Alternative

RESOURCE/ DATA SOURCE	BASE YEAR USAGE	REDUCED OPERATIONS ALTERNATIVE ANNUAL USAGE	SYSTEM CAPACITY	SNL/NM USAGE AS PERCENT OF CAPACITY
WATER USE[b]				
Site-wide demand[c]	440 M gal	417 M gal	2.0 B gal	21
Selected facilities[g]	0 M gal	-1.4 M gal	NA	
TOTAL	**440 M gal**	**416 M gal**	**2.0 B gal**	**21**
WASTEWATER DISCHARGE				
Site-wide demand[c]	280 M gal	265 M gal	850 M gal	31
Selected facilities[g]	0 M gal	3.3 M gal	NA	
TOTAL	**280 M gal**	**268 M gal**	**850 M gal**	**32**
ELECTRICAL USE				
Site-wide demand[c]	197,000 MWh	186,000 MWh	1,095,000[d] MWh	16
Selected facilities[g]	0 MWh	-775 MWh	NA	
TOTAL	**197,000 MWh**	**185,000 MWh**	**1,095,000[d] MWh**	**16**
NATURAL GAS USE				
Site-wide demand[c,e]	475 M ft^3	450 M ft^3	2.3 B ft^3	20
Selected facilities[g,h]	0 M ft^3	-65 M ft^3	NA	
TOTAL	**475 M ft^3**	**385 M ft^3**	**2.3 B ft^3**	**18**
MISCELLANEOUS				
Fuel oil[f,h]	7,000 gal	7,000 gal	Not limited by infrastructure	NA
Propane[h]	383,000 gal	362,000 gal	Not limited by infrastructure	NA

Sources: DOE 1997k; SNL 1997a; SNL/NM 1998a, c; USAF 1998a
B: billion
ft^3: cubic feet
FY: fiscal year
gal: gallon
M: million
MW: megawatt
MWh: megawatt hour
NA: Not applicable
psi: pounds per square inch

[a] Base Year is 1996 or 1997, the most representative of usage. Not necessarily the same as in Chapter 4.
[b] Although not accounted for in the table, SNL/NM expects to reduce water by 30 percent by the year 2004 (see Table 5.3.2 1 for conservation based scenario).
[c] Prorated based on the following M square footage: Base Year = 5.266; FY 2003 = 5.143; FY 2008 = 4.986
[d] Based on 125-MW rating
[e] Estimated based on 60 psi
[f] Fuel oil is used in emergency situations at the Steam Plant and is not dependent upon square footage.
[g] Adjustment for contribution from selected facilities as reported in SNL/NM 1998a
[h] No adjustments were reported in SNL/NM 1998a. Estimate based on 260 M ft^3 (at 14.7 psi) reduction at steam plant converted to 65 M ft^3 at 60 psi

Table 5.5.2 2. Selected (Infrastructure) Facility Annual Throughput[a] and Capacities Under the Reduced Operations Alternative

FACILITY[d]	BASE YEAR 1997	REDUCED OPERATIONS ANNUAL THROUGHPUT	SYSTEM CAPACITY ANNUAL	THROUGHPUT AS PERCENT OF CAPACITY
Steam Plant (steam produced)[e]	544 M lb	362 M lb	3.33 B lb	11
HWMF (waste handled)[e]	203,000 kg	175,000 kg	579,000 kg[c]	30
RMWMF (waste handled)[e]	1.6 M lb	0.8 M lb	2.7 M lb[c]	30
TTF (waste handled)[e]	Minimal	Minimal	7,300 lb/yr[b]	1

Source: SNL/NM 1998a
B: billion
ft^3: cubic feet
HWMF: Hazardous Waste Management Facility
kg: kilogram
lb: pound
M: million
RMWMF: Radioactive and Mixed Waste Management Facility
TTF: Thermal Treatment Facility
yr: year
[a] Throughput means the amount of steam produced or waste handled.
[b] Permit capacity
[c] This is the capacity for single-shift work with current employment level, not permit capacity.
[d] See Section 2.3 for discussion on how these facilities were selected.
[e] See Table 3.6 1, Infrastrudure category.

support would be compatible with system requirements and less than those under the No Action Alternative. Specific details on these systems are presented in the *1998 Sites Comprehensive Plan* (SNL 1997a). KAFB utility usage is discussed in Section 6.2.

Impacts associated with the four facilities analyzed would be less than those expected under the No Action Alternative. Throughput and capacities are presented in Table 5.5.2 2. As shown in the table, ample capacity exists for the four facilities.

5.5.3 Geology and Soils

The implementation of the Reduced Operations Alternative would result in the continuation or lessening of impacts related to soil contamination and slope stability, as described in Sections 5.5.3.1 and 5.5.3.2, respectively.

5.5.3.1 Soil Contamination

Section 5.3.3 presents the methods used in evaluating soil contamination at SNL/NM. It focuses on near-surface (zero to 1 ft deep) soil contamination at SNL/NM sites, particularly those investigated under the ER Project. The DOE has committed to clean up 162 of 182 ER sites. The remaining 20 sites would be listed as active. Of concern among these active sites are outdoor testing areas where normal operations or accidents could result in the deposition of contaminants on the ground surface.

Under the Reduced Operations Alternative, the frequency of tests would be curtailed such that future soil contamination occurrences requiring cleanup would be unlikely. For example, at the Lurance Canyon Burn site, certification tests would decrease from 12 to 1 per year. Accordingly, the once-in-10-year event (contamination and cleanup of up to 7,000 µg of DU per g of soil over a 1,000-ft^2 area) might be expected to occur once every 120 years.

SNL/NM conducts immediate cleanup actions (SNL/NM 1998a) and periodic site surveys (SNL 1997e) to clean up these sites to levels that meet future land use standards.

5.5.3.2 Slope Stability

Section 5.3.3 presents the relevance of and methods used to evaluate slope stability. Four areas were selected for a detailed, qualitative evaluation: the southern boundary of TA-IV, the Aerial Cable Facility, the Lurance Canyon Burn Site, and the Electro-Explosive Research Facility. Slope failure at these locations would be remote.

Under the Reduced Operations Alternative, no changes in activity types or frequencies would be projected for TA-IV and the Electro-Explosive Research Facility (SNL/NM 1998a). A decrease in testing would be

expected at the Aerial Cable Facility and the Lurance Canyon Burn Site (SNL/NM 1998a). No slope destabilizing activities have been identified at the Lurance Canyon Burn Site. Accidental burns of vegetation from hot missile debris could become less frequent at the Aerial Cable Facility, although no evidence of slope instability has been observed from a previous burn. The likelihood of slope failure resulting from SNL/NM activities would continue to be remote under this alternative.

5.5.4 Water Resources and Hydrology

Impacts from the implementation of the Reduced Operations Alternative would not differ substantively from the impacts described in Section 5.3.4 for the No Action Alternative. Impacts to groundwater quality and quantity and surface water quality and quantity are described in Sections 5.5.4.1, 5.5.4.2, 5.5.4.3, and 5.5.4.4, respectively.

5.5.4.1 Groundwater Quality

Section 5.3.4 identifies sources of groundwater contamination and presents modeling of the CWL. All groundwater quality impacts described in Section 5.3.4.1 would be alternative-independent the Reduced Operations Alternative would not cause any change in the nature or extent of groundwater contamination. Contamination of groundwater would remain an adverse impact as discussed in Section 5.3.4.1. No changes in rate and scope of ER Project remediation activities are projected under the Reduced Operations Alternative.

5.5.4.2 Groundwater Quantity

Using the groundwater quantity analysis described in Section 5.3.4.2 and the projected SNL/NM water use from 1998 to 2008 under the Reduced Operations Alternative, 571 M ft^3 of water would be withdrawn over the 10-year operational period, in comparison to 605 M ft^3 under the No Action Alternative. Both these amounts account for approximately 11 percent of the projected 5,326 M ft^3 of groundwater withdrawal in the KAFB vicinity from 1998 to 2008. The SNL/NM water use for either alternative, therefore, corresponds to 11 percent of this projected withdrawal.

The impacts described in Section 5.3.4.2 would not vary in any significant manner under the Reduced Operations Alternative. Aquifer drawdown would remain an adverse impact.

5.5.4.3 Surface Water Quality

SNL/NM impacts to surface water quality are discussed in the No Action Alternative (Section 5.3.4). This discussion compares results of water quality analyses in Tijeras Arroyo (from samples collected during storm events) near the downstream boundary of KAFB, with NMWQCC stream standards. No constituents in the analyses exceeded these standards. Further, the three major potential contributors to surface water contamination (ER Project sites; permitted storm water discharges from TAs-I, -II, and -IV; and outdoor testing facilities) were evaluated based on potential contaminants and likelihood of migration.

Under the Reduced Operations Alternative, the following two changes could occur in the major potential contributors to surface water contamination:

A projected 5 percent decrease in staff below current levels (Section 5.5.12) could potentially reduce the quantity of oil and grease runoff from permitted storm water discharges in TAs-I, -II, and -IV. The most recent storm water monitoring shows oil and grease concentrations ranging from 0.60 to 1.4 mg/L (SNL 1997a). Although there are no quantitative NPDES or state limits for oil and grease, these concentrations are near detection limits. A further reduction would have no deleterious effects.

A reduction in the frequency of outdoor tests could result in a decrease of radioactive materials deposited on the ground surface. To date, surface water sampling has not shown evidence of contamination resulting from tests; reducing the frequency of outdoor tests would further reduce the likelihood of such contamination. Therefore, concentrations of radionuclides at the exit point of Tijeras Arroyo from KAFB would be anticipated to remain substantially the same under the Reduced Operations Alternative.

5.5.4.4 Surface Water Quantity

The method used to estimate the SNL/NM contribution to surface water quantity is described in Section 5.3.4 and in Appendix B. The analysis calculates the quantities of excess surface water runoff from developed areas of SNL/NM, and the discharge of process and sanitary water to Albuquerque s Southside Water Reclamation Plant. Under the No Action Alternative, the estimated total excess surface water contribution to the Rio Grande would be between 40.7 and 41.3 M ft^3 annually. The vast majority of this contribution (40.6 M ft^3) would be from discharge to the water reclamation plant.

Storm Water Runoff

Under the Reduced Operations Alternative, only minor net differences in building and parking lot areas would be likely. These differences would not significantly change the developed (impervious) area of SNL/NM from the 0.72-mi^2 area projected under the No Action Alternative. Therefore, excess storm water runoff would continue at 100,000 to 700,000 ft^3 per year, as estimated under the No Action Alternative (Appendix B).

Discharge to Sanitary Sewer

The estimated annual volume of water to be discharged to the sanitary sewer under the Reduced Operations Alternative would be 35.8 M ft^3 (268 M gal), 13 percent less than under the No Action Alternative (Section 5.3.4). Combined with the excess storm water runoff, the total estimated SNL/NM effect on surface water quantity would be between 35.9 and 36.5 M ft^3 annually. This would represent approximately 0.06 percent of Rio Grande flow at the discharge points. Under the Reduced Operations Alternative, no detrimental effects to the Rio Grande from the quantity of SNL/NM water discharged would be likely.

5.5.5 Biological and Ecological Resources

Impacts to biological and ecological resources resulting from implementation of the Reduced Operations Alternative would be similar to those under the No Action Alternative. There would be slightly decreased levels of noise and activity under this alternative. Impacts to biological and ecological resources would be minimal. Inventory and management of the biological resources by SNL/NM, KAFB, and the USFS would continue to protect the animals, plants, and sensitive species on KAFB.

Outdoor activities would result in a slight decrease in the probability of unintended fires, off-road traffic, noise, small explosive debris, and plumes of smoke. The decreased level of activity would be unlikely to cause the loss of any known species or plant community at KAFB. The area of vegetation disturbed would be decreased, and the effect on the viability of plant communities would be negligible.

Under the Reduced Operations Alternative, there would be no effect to the Federally endangered peregrine falcon, as discussed in Section 5.3.5. It is not anticipated that there would be adverse effects to the viability of populations of any sensitive species.

Potential contaminant loads due to this alternative impacting plants and animals would be expected to be smaller than under the No Action Alternative and continue to be negligible based on annual ecological monitoring data (SNL/NM 1997u). See Section 5.5.3 for a discussion of contaminant loads and geology and soils impacts.

5.5.6 Cultural Resources

Implementation of the Reduced Operations Alternative would have low to negligible impacts to cultural resources due to 1) the absence of prehistoric or historic archaeological sites on DOE-administered land, 2) the nature of the cultural resources found in the ROI (see Appendix C), 3) compliance with applicable regulations and established procedures for the protection and conservation of cultural resources located on lands administered by the DOE and on lands administered by other agencies and used by the DOE (see Section 4.8.3.2 and Chapter 7), and 4) the nature of SNL/NM activities near cultural resources. Implementation of the regulations and procedures would make unlikely any adverse impacts resulting from construction, demolition, decontamination, renovation, or ER Project activities.

Under the Reduced Operations Alternative, prehistoric and historic cultural resources could potentially be affected by activities performed at five SNL/NM facilities, although the potential for impact would be low to negligible. These facilities consist of the Aerial Cable Facility, Lurance Canyon Burn Site, Thunder Range, Sled Track Complex, and Terminal Ballistics Complex. The first three facilities are located on land not owned by the DOE. Impacts could potentially result from three activities at these facilities: production of explosive testing debris and shrapnel, off-road vehicle traffic, and unintended fires and fire suppression. A decrease in the frequency of these activities under the Reduced Operations Alternative would result in a lower potential for impacts than the No Action Alternative.

Another source of potential impact derives from the restricted access present at KAFB and at individual SNL/NM facilities. Restricted access to areas within the ROI would have positive effects on cultural resources themselves. Under the Reduced Operations Alternative, current security levels that restrict access would be maintained for KAFB in general, but would diminish in frequency for specific SNL/NM facilities during various activities due to the reduced frequency of these activities. This would result in a decreased frequency of added protection at SNL/NM facilities for cultural resources.