Section 5.8, Cumulative Impacts—Discusses the potential cumulative impacts that could result at each site as a result of the construction and operations of the MPF.

Sections 5.9, 510, and 5.11—Discusses the resources commitments required for the Proposed Action including unavoidable adverse impacts, the relationship between short-term and long-term use, and irreversible/irretrievable commitment of resources.

5.2 LOS ALAMOS SITE

The following sections discuss the environmental impacts associated with the No Action Alternative, the MPF Alternative, and the TA-55 Upgrade Alternative at LANL. The environmental impacts are presented below for each of the following environmental resource areas: land use, visual resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural and paleontological resources, socioeconomics, human health and safety, accidents, environmental justice, transportation, and waste management.

5.2.1 Land Use and Visual Resources

5.2.1.1 Land Use

This section presents a discussion of the environmental impacts associated with the No Action Alternative, the MPF Alternative, and the TA-55 Upgrade Alternative.

The proposed concept for MPF is a multibuilding aboveground configuration. There would be three separate process buildings: Material Receipt, Unpacking, and Storage; Feed Preparation; and Manufacturing. They would be flanked by a number of smaller support facilities which would include: the Analytical Support Building, Production Support Building, Process Building Entry Control Facilities, Operations Support Facilities, Engineering Support Facility, Perimeter Intrusion Detection and Assessment System (PIDAS), Safe Havens, Standby Diesel Generator Buildings, Diesel Fuel Storage Tank, Chillers/Chemical Feed and Chilled Water Pump Buildings, Cooling Towers, Alternate Power Electrical Transformers, Truck Loading Docks, Liquid Nitrogen/Argon Storage Tanks, Chemical Storage Tanks, Bottled Gas Storage and Metering Buildings, Heating Ventilation, and Air Conditioning (HVAC) Exhaust Stacks, Waste Staging/Transuranic (TRU) Packaging Building, Commodities Warehouse, Roads and Parking Areas, and a Runoff Detention Area. In addition to these structures, a Construction Laydown Area and a Concrete Batch Plant would be built for the construction phase only. Upon construction completion, they would be removed and the area would be returned to its original state.

All buildings would be either one or two stories. The site would require two HVAC exhaust stacks; the tallest, standing 30 m (100 ft), would be located inside the PIDAS. Facility exhausts would be HEPA-filtered prior to discharge through the stacks.

Under the multibuilding configuration, production rates would dictate the size of the facilities proposed. The three potential facility capacities are 125, 250, and 450 ppy. Required acreage for each of the facility capacities during construction and operations is presented in

Table 5.2.1.1–1. As discussed in Section 3.1.2.4, these areas are for a generic campus type layout and the actual facility footprint covers much less area.

Table 5.2.1.1–1. MPF Acreage Required for Three Facility Capacities

	Facility Capacity 125 ppy	Facility Capacity 250 ppy	Facility Capacity 450 ppy
During Construction	56 ha	58 ha	69 ha
Post Construction	44 ha	46 ha	56 ha
Total Facilities Footprint	5.5 ha	5.9 ha	7.5 ha

Source: MPF Data 2003.

The reference location for the MPF at LANL is in TA-55. Land use at TA-55 has been categorized as Research and Development (R&D) (see Figure 4.2.1.1–2). TA-55 is a 38-ha (93-ac) site that is situated 1.7 km (1.1 mi) south of the city of Los Alamos.

The TA-55 Upgrade Alternative would involve expanding the pit production capability of the Plutonium Facility, Building 4 (PF-4), the current plutonium facility at TA-55, through modifications and consolidations only, and not expanding the size of the facility. However, additional office space, change space, and a new cold laboratory would be required in TA-55, and a new small glovebox decontamination and handling facility would be required in TA-54, a designated waste management and disposal area.

No Action Alternative

Under the No Action Alternative, TA-55 operational capabilities and material storage would continue at current levels. Since no new buildings or facilities would be built and operations would not change, there would be no impact on land use at the site.

Modern Pit Facility Alternative

Construction Impacts

Depending on the facility capacity, an estimated 56-69 ha (138-171 ac) of land for buildings, walkways, building access, parking, buffer space, and construction-related workspace would be required to construct the MPF. The MPF would be located near or adjacent to previously developed areas. The land required for the proposed MPF construction would represent approximately 0.5-0.7 percent of LANL's total land area of 104 km^2 (40 mi^2), an extremely small proportion. However, with respect to the 38-ha (93-ac) TA-55, 47 percent of the site has already been developed. The remaining space within TA-55 is adequate to handle the total facilities footprint. The National Nuclear Security Administration (NNSA) believes that, should LANL be selected for the MPF site, the proposed facility design could be adapted to the space available. If the LANL site were selected to host the MPF, a tiered-EIS would serve to explore all reasonable siting options.

Should LANL be selected and the MPF be placed in the existing TA-55 location, there would be a change in land use. There might also be a modification to the current land use designation, R&D, for this area.

Operations Impacts

Depending on the facility capacity, an estimated 44-56 ha (110-138 ac) of land for buildings, walkways, building access, parking, and buffer space would be required to operate the MPF. The reduction in required acreage from construction to operations represents the removal of the Construction Laydown Area and the Concrete Batch Plant upon construction completion. The land required for the proposed MPF operations would represent approximately 0.4-0.5 percent of LANL's total land area of 104 km^2 (40 mi^2), an extremely small proportion. As detailed above, NNSA believes that, should LANL's TA-55 be selected for the MPF site, the proposed facility design could be adapted to the space available. If the LANL site were selected to host the MPF, a tiered-EIS would serve to explore all reasonable siting options.

Should LANL be selected and the MPF be placed in the existing TA-55 location, there would be a change in land use. There might also be a modification to the current land use designation, R&D, for this area.

Sensitivity Analysis

Doubling shifts for any of the three proposed facility capacities would not have any additional effect on land use for this alternative.

TA-55 Upgrade Alternative

Construction Impacts

The TA-55 Upgrade would require the modification of the PF-4 structure as well as additional new construction. New facilities within TA-55 would have to be constructed to provide additional office space, change space, and a cold laboratory. Office space at TA-55 is currently oversubscribed and increasing pit production capacity would necessitate additional space. Likewise, the increase in pit production would necessitate an increase in the ingress/egress and change room capacity for plutonium workers. A cold laboratory would be required for cold process development, staging, training, and as space for uncleared workers. Additionally, a small glovebox decontamination/handling facility designed to prepare decommissioned gloveboxes for shipment to WIPP would be required and constructed in TA-54. TA-54 contains a number of other decontamination/handling facilities. The construction of all new facilities would result in an additional footprint of approximately 2.5 ha (6.2 ac) of land area. Considering that only 47 percent of TA-55 has previously been developed, land is available for the construction of additional facilities. The land required for the construction of the additional facilities would represent approximately 0.02 percent of LANL's total land area.

Should the TA-55 Upgrade be selected, there would be a small change in land use. There might also be a modification to the current land use designation, R&D, for TA-55. The R&D/Waste Disposal land use designation for TA-54 would no change.

Operations Impacts

The operation of the TA-55 Upgrade with new facilities would result in an additional footprint of approximately 1 ha (2.5 ac) of land area. The reduction of hectares reflects construction completion and the removal of all construction-related facilities and equipment. As detailed above, TA-55 would experience an increase in office space, ingress/egress and change room capacity for plutonium workers, as well as adding a new cold laboratory. Again, considering that only 47 percent of TA-55 has previously been developed, land is available for the operation of the additional facilities. TA-54, already host to a number of other decontamination/handling facilities, would gain one more small glovebox decontamination/handling facility. The land required for the operation of all additional facilities would represent approximately 0.01 percent of LANL's total land area.

Should the TA-55 Upgrade be selected, there would be a small change in land use. There might also be a modification to the current land use designation, R&D, for TA-55. The R&D/Waste Disposal land use designation for TA-54 would no change.

5.2.1.2 Visual Resources

No Action Alternative

Under the No Action Alternative, there would be no impact on visual resources at LANL or TA-55 since no new facilities would be built.

Modern Pit Facility Alternative

Construction Impacts

Activities related to the construction of new buildings required for the MPF Alternative would result in a change to the visual appearance of TA-55 due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. Native grasses, shrubs, trees, and pines would be cleared from the site. These changes would be temporary and, because of its interior location on the LANL site, would only be noticeable from higher elevations to the west along the upper reaches of the Parajito Plateau rim. Thus, impacts on visual resources during construction would be minimal.

Operations Impacts

The MPF, which would include one- and two-story buildings, storage tanks, and two HVAC exhaust stacks, would change the appearance of TA-55. While not visible from lower elevations, the new facilities would be visible from higher elevations beyond the LANL boundary. As a result of the Cerro Grande Fire, there would be an increased visibility of newly built structures (as well as the entire TA-55 area). However, this change would be consistent with the currently developed areas of TA-55. Thus, new construction within TA-55 boundaries would not change the current Class IV Bureau of Land Management (BLM) Visual Resource Management rating of developed areas within TA-55.

Sensitivity Analysis

Doubling shifts for any of the three proposed facility capacities would not change the layout or physical features of the MPF reference location. Therefore, there would be no additional impacts to Visual Resources.

TA-55 Upgrade Alternative

Construction Impacts

Activities related to the construction of new buildings required for the TA-55 Upgrade Alternative would result in a change to the visual appearance of TA-55 due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. Native grasses, shrubs, trees, and pines may be cleared for the various sites. These changes would be temporary and, because of TA-55's interior location on the LANL site, would only be noticeable from higher elevations to the west along the upper reaches of the Parajito Plateau rim. Thus, impacts on visual resources during construction at TA-55 would be minimal.

Activities related to the construction of a new glovebox decontamination/handling facility at TA-54 would result in a change to the visual appearance of the TA-54 due to the presence of construction equipment, the new building in various stages of construction, and possibly increased dust. Native grasses, shrubs, trees, and pines may be cleared for the site. At lower elevations, at a distance of several miles away from LANL, TA-54 is primarily distinguishable in the daytime by views of its water storage towers and white domes. TA-54's 5-km (3-mi) northern border forms the boundary between LANL and San Ildefonso Pueblo, and its southeastern boundary borders the town of White Rock in Los Alamos County. Although construction activities would be visible offsite, these changes would be temporary and the resulting structure would be placed among other structures of similar appearance and function. Thus, impacts on visual resources during construction at TA-55 would be minimal.

Operations Impacts

The new office, ingress/egress, change room, and cold laboratory facilities would change the appearance of TA-55. While not visible from lower elevations, the new buildings would be visible from higher elevations beyond the LANL boundary. As a result of the Cerro Grande Fire, there would be an increased visibility of newly built structures (as well as the entire TA-55 area). However, this change would be consistent with the currently developed areas of TA-55. Thus, new construction within TA-55 boundaries would not change the current Class IV BLM Visual Resource Management rating of developed areas within TA-55.

The new glovebox decontamination/handling facility would slightly change the appearance of TA-54. However, this change would be consistent with current development in the area. Thus, a new facility at TA-54 would not change the current Class IV BLM Visual Resource Management rating of the developed areas within TA-54.

5.2.2 Site Infrastructure

This section describes the impact on site infrastructure at LANL for the No Action Alternative and the modifications that would be needed for the construction and operations of the MPF Alternative and the TA-55 Upgrade Alternative. These impacts are evaluated by comparing current site infrastructure to key facility resource needs for the No Action, MPF, and TA-55 Upgrade Alternatives.

5.2.2.1 No Action Alternative

Under the No Action Alternative, there would be no change to the site infrastructure at LANL. The environment and operations (current and planned) described in Chapter 4 (Affected Environment) would continue.

5.2.2.2 Modern Pit Facility Alternative

Construction Impacts

The projected demand on key site infrastructure resources associated with construction activities of the three proposed plant sizes (125, 250, or 450 ppy) for the MPF Alternative on an annual basis are shown in Table 5.2.2.2–1. Existing infrastructure at LANL would be adequate to support annual construction requirements for the proposed plant sizes for the projected 6-year construction period. Infrastructure requirements for construction activities would have a minor impact on current site infrastructure.

Table 5.2.2.2–1. Annual Site Infrastructure Requirements for Construction of MPF at LANL

Proposed Alternatives	Electrical		Fuel		Process Gases
	Energy (MWh/yr)	Peak Load (MWe)	Liquid (L/yr)	Natural Gas (m^3/yr)	Gases (m^3/yr)
Site capacity	963,600	107[a]	Not limited[b]	229,400,000[c]	Not limited[b]
Available site capacity	472,414	24	Not limited	159,400,000	Not limited
No Action Alternative[d]					
Total site requirement	491,186[a]	83[a]	Negligible	70,000,000[e]	Not limited
Percent of site capacity	51%	78%	Not limited	31%	Not limited
MPF Alternative					
125 ppy					
Total site requirement	492,000	86	Negligible	70,000,000	Not limited
Percent of site capacity	51%	80%	Not limited	31%	Not limited
Change from No Action	1,000	3	1,520,000	0	2,200
Percent of available capacity	0.21%	13%	Not limited	0	Not limited
Peak requirement	NA	NA	2,600,000	0	4,000
250 ppy					
Total site requirement	492,000	86.5	Negligible	70,000,000	Not limited
Percent of site capacity	51%	81%	Not limited	31%	Not limited
Change from No Action	1,125	3.5	1,700,000	0	2,502
Percent of available capacity	0.24%	15%	Not limited	0%	Not limited
Peak requirement	NA	NA	2,900,000	0	4,248

Table 5.2.2.2–1. Annual Site Infrastructure Requirements for Construction of MPF at LANL *(continued)*

Proposed Alternatives	Electrical		Fuel		Process Gases
	Energy (MWh/yr)	Peak Load (MWe)	Liquid (L/yr)	Natural Gas (m^3/yr)	Gases (m^3/yr)
`450 ppy					
Total site requirement	492,000	87	Negligible	70,000,000	Not limited
Percent of site capacity	51%	81%	Not limited	31%	Not limited
Change from No Action	1,333	4.0	2,170,000	0	3,200
Percent of available capacity	0.28%	17%	Not limited	0	Not limited
Peak requirement	NA	NA	3,700,000	0	5,700

[a] Electrical site capacity and current requirements are for the entire Los Alamos Power Pool, which include LANL and other Los Alamos County users.
[b] Not limited due to offsite procurement.
[c] Entire service area capacity which includes LANL and other Los Alamos area users.
[d] Projected requirements over 25 years under the LANL SWEIS Expanded Operations Alternative (DOE 1999a). Revised projections for electrical energy, peak load, and natural gas also include usage for other Los Alamos County users that rely upon the same utility system (DOE 1999i).
[e] Usage value for LANL plus baseline usage for other Los Alamos County users.
NA = Not Applicable.
Source: MPF Data 2003.

Operations Impacts

The estimated annual site infrastructure requirements for the pit production capacities of 125, 250, or 450 ppy are presented in Table 5.2.2.2–2. Existing site infrastructure would be adequate to support pit production capacities of 125 and 250 ppy. For the production of 450 ppy, peak electrical load would be exceeded and LANL would have to procure additional power. Impacts to fuel and process gases would be negligible.

Table 5.2.2.2–2. Annual Site Infrastructure Requirements for Facility Operations Under the MPF Alternative

Proposed Alternatives	Electrical		Fuel		Process Gases	
	Energy (MWh/yr)	Peak Load (MWe)	Liquid (L/yr)	Natural Gas (m^3/yr)	Nitrogen (m^3/yr)	Argon (m^3/yr)
Site Capacity	963,600	107	Not limited[c]	229,400,000[d]	Not limited[c]	Not limited[c]
Available site capacity	472,414	24	Not limited	159,400,000	Not limited	Not limited
No Action Alternative						
Total site requirement	491,186	83	Negligible	70,000,000[e]	Not limited	Not limited
Percent of site capacity	51%	78%	Not limited	31%	Not limited	Not limited
MPF Alternative						
125 ppy[a,b]						
Total site requirement	571,000	103.5	Negligible	74,400,000	Not limited	Not limited
Percent of site capacity	59%	97%	Not limited	32%	Not limited	Not limited
Change from No Action	79,800	20.5	259,650	4,400,000[f]	223,900	4,200
Percent of available capacity	17%	85%	Not limited	3%	Not limited	Not limited

Table 5.2.2.2–2. Annual Site Infrastructure Requirements for Facility Operations Under the MPF Alternative *(continued)*

Proposed Alternatives	Electrical		Fuel		Process Gases	
	Energy (MWh/yr)	Peak Load (MWe)	Liquid (L/yr)	Natural Gas (m^3/yr)	Nitrogen (m^3/yr)	Argon (m^3/yr)
250 ppy[a,b]						
Total site requirement	605,000	106.5	Negligible	75,000,000	Not limited	Not limited
Percent of site capacity	63%	100%	Not limited	33%	Not limited	Not limited
Change from No Action	114,000	23.5	360,000	4,990,000[f]	245,000	7,300
Percent of available capacity	24%	98%	Not limited	3%	Not limited	Not limited
450 ppy[a,b]						
Total site requirement	670,000	119.5	Negligible	77,700,000	Not limited	Not limited
Percent of site capacity	69%	112%	Not limited	34%	Not limited	Not limited
Change from No Action	176,000	36.5	580,000	7,730,000[f]	303,000	11,800
Percent of available capacity	37%	152%	Not limited	5%	Not limited	Not limited

[a] Peak load is based on electrical demands of HVAC, lighting, and miscellaneous electrical systems. Peak load and annual electrical consumption estimates for the three pit production capacities are based on ratioing SRS FY99 Pit Manufacturing data (MPF Data 2003) to the multiple facility sizes. Estimates based on 24 hrs/day, 365 days per year.
[b] Diesel fuel estimates based on vendor fuel consumption data ratioed for expected diesel generator size. Diesel generator testing of 1 hour per week.
[c] Not limited due to offsite procurement.
[d] Entire service area capacity which includes LANL and other Los Alamos area users.
[e] Usage value for LANL plus baseline usage for other Los Alamos County users.
[f] Used to make steam.
Source: MPF Data 2003.

Sensitivity Analysis

There would be negligible impacts to liquid fuel or process gases from surge production capacity. Additional electrical power would have to be procured to meet surge operation demands.

5.2.2.3 TA-55 Upgrade Alternative

Construction Impacts

The projected demand for key site infrastructure resources associated with the TA-55 Upgrade Alternative at PF-4 to produce 80 ppy is shown in Table 5.2.2.3–1. The TA-55 Upgrade Alternative would have a negligible impact on site infrastructure resources at LANL.

Operations Impacts

The estimated annual electrical power capacity requirements for the production of 80 ppy are shown in Table 5.2.2.3–2. Existing site electrical energy would be adequate to support the production of 80 ppy. There would be no impacts to other site infrastructure resources.

Table 5.2.2.3–1. Annual Site Infrastructure Requirements for Construction of the TA-55 Upgrade Alternative

Proposed Alternative	Electrical Energy (MWh/yr)	Process Gases (m^3/yr)
Site Capacity	963,600	Not limited
Available Site Capacity	472,414	Not limited
No Action Alternative		
Total site requirement	491,186	Not limited
Percent of site capacity	51%	Not limited
80 ppy		
Total site requirement	491,000	Not limited
Percent of site capacity	51%	Not limited
Change from No Action	2	3,000
Percent of available capacity	Negligible	Not limited

Source: MPF Data 2003.

Table 5.2.2.3–2. Annual Site Infrastructure Requirements for the Operation of the TA-55 Upgrade Alternative

Proposed Alternative	Electrical	
	Energy (MWh/yr)	Peak Load (MWe)
Site Capacity	963,600	107
Available Site Capacity	472,414	24
No Action Alternative		
Total site requirement	491,186	83
Percent of site capacity	51%	78
80 ppy		
Total site requirement	497,000	93
Percent of site capacity	52%	87
Change from No Action	5,480	10
Percent of available capacity	1.2%	42

Source: DOE 2002k, MPF Data 2003.

5.2.3 Air Quality and Noise

5.2.3.1 Nonradiological Releases

No Action Alternative

Construction Impacts

There would be no nonradiological releases to the environment because this alternative would not involve construction.

Operations Impacts

Under the No Action Alternative, small quantities of criteria and toxic pollutants would continue to be generated. These emissions are part of the baseline described in Chapter 4. No increases in emissions or air pollutant concentrations are expected under the No Action Alternative. Therefore, a Prevention of Significant Deterioration (PSD) increment analysis is not required.

As part of its evaluation of the impact of air emissions, the U.S. Department of Energy (DOE) consulted the Guidance on *Clean Air Act* Conformity requirements (DOE 2000d). DOE determined that the General Conformity rule does not apply because LANL is located in an attainment area for all criteria pollutants; therefore, no conformity analysis is required.

Modern Pit Facility Alternative

Construction Impacts

Construction of new structures would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. Exhaust emissions from these sources would result in releases of sulfur dioxide, nitrogen oxides, particulate matter (particulate matter less that 10 microns in diameter [PM_{10}] and total suspended particulates), and carbon monoxide. The calculation of emissions from construction equipment was based on emission factors provided in the U.S. Environmental Protection Agency (EPA) document AP-42, "Compilation of Air Pollutant Emission Factors" (EPA 1995). For highway vehicles (worker commuting vehicles and delivery vehicles) emission factors were obtained from the EPA Mobile Source Emission Factor Model, MOBILE6.2 (EPA 2002).

Fugitive dust generated during the clearing, grading, and other earth-moving operations is dependent on a number of factors including silt and moisture content of the soil, wind speed, and area disturbed. A common procedure to estimate fugitive emissions from an entire construction site is to use the EPA emission factor of 2.69 metric tons per hectare (120 tons per acre) per month of activity (EPA 1995). This emission factor represents total suspended particulates (i.e., particles less than 30 microns in diameter). A multiplication factor of 0.75 was used to correct the emission rate to one for PM_{10} (EPA 1995). Also, it was assumed that water would be applied to disturbed areas. This would reduce emission rates by about 50 percent. Facility construction would necessitate a Concrete Batch Plant at the building site. Particulate matter, consisting primarily of cement dust, would be the only regulated pollutant emitted in the concrete mixing process. Emission factors for the Concrete Batch Plant were obtained from AP-42 (EPA 1995).

The estimated maximum annual pollutant emissions resulting from construction activities are presented in Table 5.2.3.1–1. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts. The temporary increases in pollutant emissions due to construction activities are too small to result in violations of the National Ambient Air Quality Standards (NAAQS) beyond the LANL site boundary. Therefore, air quality impacts resulting from construction would be small.

Table 5.2.3.1–1. Estimated Peak Nonradiological Air Emissions for the MPF—Construction

Pollutant	Estimated Annual Emission Rate (metric tons/yr)		
	125 ppy	**250 ppy**	**450 ppy**
Carbon monoxide	409.6	451.4	582.7
Carbon dioxide	7,084.2	7,802.9	10,062.5
Nitrogen dioxide	177.7	195.7	252.4
Sulfur dioxide	11.6	12.8	16.5
Volatile organic compounds	28.7	31.6	40.8
PM_{10}	694.4	720.3	857.0
Total Suspended Particulates	926.3	960.9	1,143.5

Source: MPF Data 2003.

The impacts on the public and on a hypothetical non-involved worker in the vicinity of the processing facilities resulting from nonradiological air emissions are presented in Section 5.2.9, Human Health and Safety.

Operations Impacts

Pit manufacturing activities would result in the release of criteria and toxic pollutants into the surrounding air. The primary volume contributors are nitrogen and argon, used to maintain inert atmospheres for glovebox operations. Carbon dioxide would be used as a cleaning agent and helium would be used for leak testing operations. Hydrogen and nitrogen dioxide are reaction products from aqueous purification operations (pyrochemical purification would produce lower amounts of hydrogen and nitrogen dioxide). The chemicals used for dye-penetrant testing of welds are assumed to be volatilized and released to the atmosphere. Organic solvents used for cleaning and chemicals used in the Analytical Laboratory for various analyses would not be expected to contribute any appreciable quantities of any other chemicals to the annual nonradioactive air emissions. Air emissions from periodic functional testing support systems (primarily standby diesel generators) would include carbon monoxide, nitrogen dioxide, PM_{10}, sulfur dioxide, volatile organic compounds (VOCs), and total suspended particulates (WSRC 2002e). The estimated emission rates (kg/yr) for nonradiological pollutants emitted under each of the three new facility scenarios are presented in Table 5.2.3.1–2. Although a portion of these emissions would be offset by the transfer of current pit manufacturing activities to the new facilities, the emissions would be incremental to the LANL baseline. If LANL is selected as the preferred site, a PSD increment analysis would be performed under a project-specific tiered EIS to determine whether the pit manufacturing activities would cause a significant pollutant emission increase.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on *Clean Air Act* Conformity requirements (DOE 2000d). DOE determined that the General Conformity rule does not apply because LANL is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

Table 5.2.3.1–2. Annual Nonradiological Air Emissions for the MPF—Operations

Chemical Released	Quantity Released (kg/yr)		
	125 ppy	**250 ppy**	**450 ppy**
Acetone	2.5	5	8.5
Argon	1.4×10^4	2.6×10^4	4.4×10^4
Carbon dioxide	5.5×10^5	1.03×10^6	1.86×10^6
Carbon monoxide	3,180	4,380	7,150
1,2-Dicarboxylic acid	2.5	5	8.5
Helium	0.6	1.2	2.1
Hydrogen	22	43	77
Isobutane	7	14	25
Isopropanol	6	12	21
Mineral oil	6	12	21
Naptha	22	44	84
Nitrogen	2.6×10^5	2.8×10^5	3.5×10^5
Nitrogen dioxide	15,580	22,040	36,340
PM_{10}	390	530	870
Sulfur dioxide	975	1,340	2,190
Total suspended particulates	1,045	1,440	2,350
Trichloroethane	1	1.5	2
Volatile organic compounds	975	1,340	2,190

Source: WSRC 2002e.

The maximum concentrations (microgram per cubic meter [$\mu g/m^3$]) at the LANL site boundary that would be associated with the release of criteria pollutants under each of the three plant capacity scenarios (i.e., 125, 250, and 450 ppy) were modeled and are presented in Table 5.2.3.1–3. These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. For each of the three capacity scenarios, incremental concentration increases would be small. For most pollutants, there would be an incremental increase of less than 1 percent of the baseline. The greatest increase would occur for the 24-hour nitrogen dioxide concentration under the 450 ppy scenario, but the ambient concentration would remain below the 24-hour ambient air quality standard. Since estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative.

The impacts on the public and on a hypothetical non-involved worker in the vicinity of the processing facilities resulting from nonradiological air emissions are presented in Section 5.2.9, Human Health and Safety.

Table 5.2.3.1–3. Criteria Pollutant Concentrations at the LANL Site Boundary for the MPF—Operations

Pollutant	Averaging Period	Most Stringent Standard or Guideline [a] (μg/m³)	Maximum Incremental Concentration (μg/m³)			
			Baseline [b]	MPF Alternative		
				125 ppy	250 ppy	450 ppy
Carbon monoxide	8-hour	7,800	1,440	5.4	7.4	12
	1-hour	11,700	2,710	7.7	11	17
Nitrogen dioxide	Annual	73.7	9	2.8	3.8	5.7
	24-hour	147	90	14	19	28.7
Sulfur dioxide	Annual	41	18	0.19	0.26	0.42
	24-hour	205	130	0.95	1.3	2.1
	3-hour	1,030	254	2.1	2.9	4.8
PM_{10}	Annual	50	1	0.075	0.10	0.17
	24-hour	150	9	0.38	0.51	0.84
Total Suspended Particulates	Annual	60	2	0.20	0.28	0.46
	24-hour	150	18	1.0	1.4	2.3

[a] The more stringent of the Federal and state standards will be presented if both exist for the averaging period.
[b] The No Action Alternative is represented by the baseline.
Source: MPF Data 2003, 20 NMAC 2.3.

Sensitivity Analysis

As discussed in Chapter 3, each plant could operate two shifts, increasing the number of pits produced per year. This increased capacity would result in increased releases of criteria pollutants. The increase in releases of criteria pollutants from the 125 ppy plant operating at surge capacity would be bounded by the 250 ppy facility releases. Similarly, the increase of criteria pollutants from the 250 ppy plant operating at surge capacity would be bounded by the 450 ppy plant releases (see Table 5.2.3.1–3). A review of the maximum incremental concentrations in Table 5.2.3.1–3 indicates that if the maximum incremental concentration of most criteria pollutants for the 450 ppy facility were conservatively doubled for surge capacity, concentrations would still not approach the most stringent standards or guideline concentrations. The only exception would be the 24-hour nitrogen dioxide concentration, which would exceed the corresponding standard by 4.7 percent. As noted above, estimated emissions are maximum potential emissions; actual emissions would be less.

TA-55 Upgrade Alternative

Construction Impacts

As discussed above, construction of new structures and modifications to existing structures would result in temporary increases in air quality impacts from construction equipment, trucks, and employee vehicles. Fugitive dust would be generated during the clearing, grading, and other earth moving operations, and particulate matter, consisting primarily of cement dust, would be emitted from the Concrete Batch Plant.

The estimated maximum annual pollutant emissions resulting from construction activities are presented in Table 5.2.3.1–4. Actual construction emissions are expected to be less, since conservative emission factors and other assumptions were used in the modeling of construction activities and tend to overestimate impacts. The temporary increases in pollutant emissions due to construction activities are too small to result in violations of the NAAQS beyond the LANL site boundary. Therefore, air quality impacts resulting from construction would be small.

Table 5.2.3.1–4. Estimated Peak Nonradiological Air Emissions Under the LANL TA-55 Upgrade Alternative—Construction

Pollutant	Estimated Annual Emission Rate (metric tons per year)
Carbon monoxide	57.060
Carbon dioxide	52.015
Nitrogen dioxide	0.119
Sulfur dioxide	0.035
Volatile organic compounds	3.199
PM_{10}	0.345
Total Suspended Particulates	0.561

Source: MPF Data 2003.

The impacts on the public and on a hypothetical non-involved worker in the vicinity of the processing facilities resulting from nonradiological air emissions are presented in Section 5.2.9, Human Health and Safety.

Operations Impacts

As discussed above, pit-manufacturing activities would result in the release of criteria and toxic pollutants into the surrounding air. These emissions would be incremental to the LANL baseline. If the TA-55 Upgrade Alternative is selected as the Preferred Alternative, a PSD increment analysis would be performed under a project-specific tiered EIS to determine whether the pit manufacturing activities would cause a significant pollutant emission increase.

As part of its evaluation of the impact of air emissions, DOE consulted the Guidance on *Clean Air Act* Conformity requirements (DOE 2000d). DOE determined that the General Conformity rule does not apply because LANL is located in an attainment area for all criteria pollutants. Therefore, although each alternative would emit criteria pollutants, a conformity review is not necessary.

The maximum concentrations ($\mu g/m^3$) at the LANL site boundary that would be associated with the release of criteria pollutants under the TA-55 Upgrade Alternative are presented in Table 5.2.3.1–5. These concentrations were compared to the most stringent (Federal or state) ambient air quality standards. Incremental concentration increases would be small. For most pollutants, there would be an incremental increase of less than 1 percent of the baseline. The greatest increase would occur for the annual PM_{10} concentration, but the ambient concentration would remain below the ambient air quality standard. Since estimated emissions are maximum potential emissions and all emergency generators would not operate at the same time, the estimated emissions and resulting concentrations are conservative.

Table 5.2.3.1–5. Criteria Pollutant Concentrations at the LANL Site Boundary for the TA-55 Upgrade Alternative—Operations

Pollutant	Averaging Period	Most Stringent Standard or Guideline[a] (mg/m^3)	Maximum Incremental Concentration (mg/m^3)	
			Baseline[b]	TA-55 Upgrade
Carbon monoxide	8-hour	7,800	1,440	1.81
	1-hour	11,700	2,710	NA
Nitrogen dioxide	Annual	73.7	9	NA
	24-hour	147	90	7.64
Sulfur dioxide	Annual	41	18	1.3
	24-hour	205	130	NA
	3-hour	1,030	254	NA
PM_{10}	Annual	50	1	8
	24-hour	150	9	NA
Total Suspended Particulates	Annual	60	2	0.06[b]
	24-hour	150	18	NA

[a] The more stringent of the Federal and state standards will be presented if both exist for the averaging period.
[b] The No Action Alternative is represented by the baseline.
NA = not available.
Source: MPF Data 2003.

The impacts on the public and on a hypothetical non-involved worker in the vicinity of the processing facilities resulting from nonradiological air emissions are presented in Section 5.2.9, Human Health and Safety.

5.2.3.2 Radiological Releases

No Action Alternative

Construction Impacts

There would be no radiological releases to the environment because this alternative would not involve construction.

Operations Impacts

Under the No Action Alternative, small quantities of radionuclides would continue to be emitted. These emissions are part of the baseline described in Chapter 4. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the processing facilities resulting from radiological air emissions are presented in Section 5.2.9, Human Health and Safety.

Modern Pit Facility Alternative

Construction Impacts

No radiological releases to the environment are expected in association with construction activities. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

Operations Impacts

Radioactive air emissions from pit manufacturing activities would involve plutonium, americium and enriched uranium. The pit manufacturing activities would be performed within gloveboxes or vaults for radiological containment and would include plutonium recovery using aqueous or pyrochemical processes, foundry, machining, assembly, post assembly operations, inspection and certification, waste handling, and preparing the final product (pits) for shipment. Analytical operations would normally be conducted in laboratories consisting of rooms with gloveboxes and hoods for radiological containment. Each module would be separated from occupied areas of the laboratory facility by airlocks. Sample transfers would occur using a vacuum tube transfer system from the Feed Preparation and Manufacturing Facilities to the Analytical Support Facility. The ventilation exhaust from process and laboratory facilities would be filtered through double banks of HEPA filters before being released to the air via a 30-m (100-ft) tall stack. HEPA filters are the best available control technology for particulate emissions and are capable of removing more than 99.99 percent of entrained particles from the exhaust air.

DOE estimated routine radionuclide air emissions for three different plant capacities: 125, 250, and 450 ppy (see Table 5.2.3.2–1). While releases under each of the three capacity scenarios would be small, the total radionuclide emissions at LANL would increase by a factor of 10. This is primarily due to increased emissions of plutonium isotopes. To ensure that total emissions are not underestimated, DOE's method for estimating emissions was conservative. Therefore, actual emissions from pit manufacturing operations would be smaller.

Table 5.2.3.2–1. Annual Radiological Air Emissions for the MPF at LANL—Operations

Isotope	Annual Emissions (Ci/yr)			
	Baseline[a]	**125 ppy**	**250 ppy**	**450 ppy**
Americium-241	2.6×10^{-7}	2.08×10^{-7}	3.81×10^{-7}	7.61×10^{-7}
Plutonium-239		7.72×10^{-6}	1.19×10^{-5}	2.05×10^{-5}
Plutonium-240		2.01×10^{-6}	3.10×10^{-6}	5.35×10^{-6}
Plutonium-241		1.48×10^{-4}	2.28×10^{-4}	3.94×10^{-4}
Total Plutonium	$\mathbf{9.3 \times 10^{-6}}$	$\mathbf{1.58 \times 10^{-4}}$	$\mathbf{2.43 \times 10^{-4}}$	$\mathbf{4.20 \times 10^{-4}}$
Uranium-234		4.19×10^{-9}	5.58×10^{-9}	8.38×10^{-9}
Uranium-235		1.32×10^{-10}	1.76×10^{-10}	2.64×10^{-10}
Uranium-236		2.13×10^{-11}	2.84×10^{-11}	4.26×10^{-11}
Uranium-238		1.18×10^{-12}	1.58×10^{-12}	2.36×10^{-12}
Total Uranium	$\mathbf{7.3 \times 10^{-6}}$	$\mathbf{4.34 \times 10^{-9}}$	$\mathbf{5.79 \times 10^{-9}}$	$\mathbf{8.69 \times 10^{-9}}$
Total	$\mathbf{1.69 \times 10^{-5}}$	$\mathbf{1.58 \times 10^{-4}}$	$\mathbf{2.43 \times 10^{-4}}$	$\mathbf{4.21 \times 10^{-4}}$

[a] The No Action Alternative is represented by the baseline.
Source: WSRC 2002f.

DOE estimated the radiation doses to the maximally exposed offsite individual (offsite MEI) and to the offsite population surrounding LANL. As shown in Table 5.2.3.2–2, the expected annual radiation dose to the maximally exposed offsite individual would be much smaller than the limit of 10 mrem/yr set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within an 80-km (50-mi) radius would also be very low. The impacts on the public and on a hypothetical non-involved worker in the vicinity of the processing facilities resulting from radiological air emissions are presented in Section 5.2.9, Human Health and Safety.

Table 5.2.3.2–2. Annual Doses Due to Radiological Air Emissions from MPF Operations at LANL

Receptor	125 ppy	250 ppy	450 ppy
Offsite MEI[a] (mrem/yr)	4.1×10^{-8}	6.6×10^{-8}	1.2×10^{-7}
Population within 80 km (person-rem per year)	3.4×10^{-7}	5.5×10^{-7}	1.0×10^{-6}

[a] The offsite MEI is assumed to reside at the site boundary.

Sensitivity Analysis

As discussed in Chapter 3, each plant could operate two shifts, increasing the number of pits produced per year. This increased capacity would result in increased radiological air emissions. The increase in radiological air emissions from the 125 ppy plant operating at surge capacity would be bounded by the 250 ppy facility emissions. Similarly, the increase in radiological air emissions from the 250 ppy plant operating at surge capacity would be bounded by the 450 ppy plant releases (see Table 5.2.3.2–1). A review of the annual radiological emissions in Table 5.2.3.2–2 indicates that if the emissions for the 450 ppy facility were conservatively doubled for surge capacity, concentrations remain very low. The additional dose represented by these emissions would be well below regulatory limits.

TA-55 Upgrade Alternative

Construction Impacts

No radiological releases to the environment are expected in association with the construction of new buildings at TA-54 and TA-55. However, the potential exists for contaminated soils and possibly other media to be disturbed during excavation and other site preparation activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the nature and extent of any contamination and would be required to remediate any contamination in accordance with established site procedures.

Modifications to the facility would include a major upgrade of the residue recovery/metal feed area (the 400 Area) of PF-4. Various manufacturing equipment would be added to or replaced in the fabrication areas of PF-4 to enhance capacity and reliability. There would also be significant glovebox decontamination/decommissioning/disposal operations as new process development and certification operations are moved into other areas of PF-4. These activities have the potential to release small quantities of radionuclides to the environment. Release of airborne radioactivity would be controlled by conducting all operations with such potential in an existing process facility having an appropriate HEPA-filtered ventilation system or in the glovebox decontamination/handling facility that would be constructed in TA-54.

Operations Impacts

Radioactive air emissions from pit manufacturing activities would involve plutonium, americium and enriched uranium. The pit manufacturing activities would be performed within gloveboxes or vaults for radiological containment and would include plutonium recovery using aqueous or pyrochemical processes, foundry, machining, assembly, post assembly operations, inspection and certification, and waste handling. Analytical operations would normally be conducted in laboratories consisting of rooms with gloveboxes and hoods for radiological containment. The ventilation exhaust from process and laboratory facilities would be filtered through double banks of HEPA filters before being released to the air via a 30-m (100-ft) tall stack. HEPA filters are the best available control technology for particulate emissions and are capable of removing more than 99.99 percent of entrained particles from the exhaust air.

DOE estimated routine radionuclide air emissions for the TA-55 Upgrade Alternative are shown in Table 5.2.3.2–3. While releases under each of the three capacity scenarios would be small, the total radionuclide emissions at LANL would nearly double. This is primarily due to increased emissions of plutonium isotopes. To ensure that total emissions are not underestimated, DOE's method for estimating emissions was conservative. Therefore, actual emissions from pit manufacturing operations would be smaller.

Table 5.2.3.2–3. Annual Radiological Air Emissions from Operations Under the TA-55 Upgrade Alternative

Isotope	Annual Emissions (Curies per year)	
	Baseline[a]	TA-55 Upgrade Alternative[b]
Americium-241	2.6×10^{-7}	1.72×10^{-8}
Plutonium-239		5.38×10^{-7}
Plutonium-239		1.40×10^{-7}
Plutonium-241		1.03×10^{-5}
Total Plutonium	**9.3×10^{-6}**	**1.1×10^{-5}**
Uranium-234		2.52×10^{-10}
Uranium-235		7.95×10^{-12}
Uranium-236		1.28×10^{-12}
Uranium-238		7.14×10^{-14}
Total Uranium	**7.3 × 10-6**	**2.62 × 10-10**
Total	**1.69×10^{-5}**	**1.1×10^{-5}**

[a] The No Action Alternative is represented by the baseline.
[b] Assumed same isotopic distribution as that used for the Modern Pit Facility Alternative.
Source: MPF Data 2003.

DOE estimated the radiation doses to the offsite MEI and the offsite population surrounding LANL. As shown in Table 5.2.3.2–4, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 millirems per year (mrem/yr) set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The maximum estimated dose to the offsite population residing within an 80-km (50-mi) radius would also be very low. The impacts on the public and on a hypothetical noninvolved worker in the vicinity of the processing facilities resulting from radiological air emissions are presented in Section 5.2.9, Human Health and Safety.

Table 5.2.3.2–4. Annual Doses Due to Radiological Air Emissions from Operations Under the TA-55 Upgrade Alternative

Receptor	Dose
Offsite MEI[a] (mrem/yr)	3.0×10^{-9}
Population within 80 km (person-rem per year)	2.5×10^{-8}

[a] The offsite MEI is assumed to reside at the site boundary.

5.2.3.3 Noise

No Action Alternative

Construction Impacts

Under the No Action Alternative, continuing operations at LANL would not involve any new construction. Thus, there would be no impacts from construction noise on wildlife or the public.

Operations Impacts

The noise-generating activities described in Section 4.2.3.4 would continue. These noise-generating activities are included in the LANL baseline and are not expected to change under the No Action Alternative.

Modern Pit Facility Alternative

Construction Impacts

Construction of new buildings at TA-55 would involve the movement of workers and construction equipment and would result in some temporary increase in noise levels near the area. Noise sources associated with construction at TA-55 would not include loud impulsive sources such as blasting. Although noise levels in construction areas could be as high as 110 A-weighted decibels (dBA), these high local noise levels would not extend far beyond the boundaries of the construction site. Table 5.2.3.3–1 shows the attenuation of construction noise over relatively short distances. At 122 m (400 ft) from the construction sites, construction noises would range from approximately 55-85 dBA. The *Environmental Impact Data Book* (Golden et al. 1980) suggests that noise levels higher than 80-85 dBA are sufficient to startle or frighten birds and small mammals. Thus, there would be little potential for disturbing wildlife outside a 122-m (400-ft) radius of the construction site. Given the distance to the site boundary (1.9 km [1.2 mi]) there would be no change in noise impacts on the public as a result of construction activities, except for a small increase in traffic noise levels from construction employees and material shipments. Impacts would be similar for each of the three plant capacities analyzed (e.g., 125, 250, and 450 ppy) for the MPF.

Table 5.2.3.3–1. Peak and Attenuated Noise Levels Expected from Operation of Construction Equipment

Source	Noise level (dBA)				
	Peak	Distance from source			
		15 m	30 m	61 m	122 m
Heavy trucks	95	84-89	78-83	72-77	66-71
Dump trucks	108	88	82	76	70
Concrete mixer	105	85	79	73	67
Jackhammer	108	88	82	76	70
Scraper	93	80-89	74-82	68-77	60-71
Dozer	107	87-102	81-96	75-90	69-84
Generator	96	76	70	64	58
Crane	104	75-88	69-82	63-76	55-70
Loader	104	73-86	67-80	61-74	55-68
Grader	108	88-91	82-85	76-79	70-73
Dragline	105	85	79	73	67
Pile driver	105	95	89	83	77
Fork lift	100	95	89	83	77

Source: Golden et al. 1980.

Construction workers could be exposed to noise levels higher than the acceptable limits specified by the Occupational Safety and Health Administration (OSHA) in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

Operations Impacts

The location of these facilities relative to the site boundary and sensitive receptors was examined to evaluate the potential for onsite and offsite noise impacts. Noise impacts from pit manufacturing operations at the new buildings would be expected to be similar to those from existing operations at TA-55. There would be an increase in equipment noise (e.g., heating and cooling systems, generators, vents, motors, material-handling equipment) from pit manufacturing activities. However, given the distance to the site boundary (about 1.9 km [1.2 mi]), noise emissions from equipment would not likely disturb the public. These noise sources would be far enough away from offsite areas that their contribution to offsite noise levels would be small. Some noise sources (e.g., public address systems and testing of radiation and fire alarms) could have onsite impacts, such as the disturbance of wildlife. But these noise sources would be intermittent and would not be expected to disturb wildlife outside of facility boundaries. Traffic noise associated with the operation of these facilities would occur onsite and along offsite local and regional transportation routes used to bring materials and workers to the site. Noise from traffic associated with the operation of these facilities would likely produce less than a 1-dBA increase in traffic noise levels along roads used to access the site, and thus would not result in any increased annoyance to the public. Impacts would be similar for each of the three plant capacities analyzed (e.g., 125, 250, and 450 ppy) for the MPF.

Operations workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

Sensitivity Analysis

If any of the three facilities operated at surge capacity, a second shift would be added. However, because of the distance of the facilities to the site boundary, noise from second-shift operations would not be noticeable offsite. Second-shift worker traffic would slightly increase noise levels on local roads. However, most material deliveries would likely occur during normal business hours, so there would be no increase in noise from truck traffic during the second shift. Impacts would be similar for each of the three plant capacities analyzed. Second-shift workers would be exposed to the same level of noise as first-shift workers. DOE would implement the same hearing protection programs for the second shift as used for the first. The second shift would not affect worker hearing.

TA-55 Upgrade Alternative

Construction Impacts

Construction of new facilities and modifications to PF-4 would involve the movement of workers and construction equipment and would result in some temporary increase in noise levels near the area. As discussed above, there would be little potential for disturbing wildlife outside a 122-m (400-ft) radius of the construction sites. Given the distance to the site boundary (about 1.9 km [1.2 mi]) there would be no change in noise impacts on the public as a result of construction activities at TA-55. The glovebox decontamination/handling facility construction site in TA-54 is located adjacent to Native American lands and approximately 2.1 km (1.3 mi) from the nearest residential community of White Rock. A small increase in noise levels may be observed at the site boundary, but there would be no change in noise impacts at the nearest residential area as a result of construction activities at TA-54. A small increase in traffic noise levels from construction employees and material shipments would be expected, but the noise level would likely increase by less than 1 dBA and would not result in any increased annoyance to the public.

Operations Impacts

Noise impacts from operations under the TA-55 Upgrade Alternative are expected to be similar to those from existing operations at TA-54 and TA-55. There may be a small increase in equipment noise (e.g., heating and cooling systems, generators, vents, motors, and material-handling equipment) due to the increased output from pit manufacturing activities. However, the small increase in noise emissions is not expected to disturb wildlife or the public. Traffic noise associated with operation of these facilities would occur onsite and along offsite local and regional transportation routes used to bring materials and workers to the site. Noise from traffic associated with additional employment at these facilities would likely produce less than a 1-dBA increase in traffic noise levels along roads used to access the site, and thus would not result in any increased annoyance to the public.

Operations workers could be exposed to noise levels higher than the acceptable limits specified by OSHA in its noise regulations (29 CFR 1926.52). However, DOE has implemented appropriate hearing protection programs to minimize noise impacts on workers. These include the use of administrative controls, engineering controls, and personal hearing protection equipment.

5.2.4 Water Resources

Environmental impacts associated with the proposed alternatives at LANL could affect groundwater resources. No impacts to surface water are expected. At LANL, groundwater resources would be used to meet all construction and operations water requirements. Table 5.2.4–1 summarizes existing surface water and groundwater resources at LANL, the total LANL site-wide water resource requirements for each alternative, and the potential changes to water resources at LANL resulting from the proposed alternatives.

Table 5.2.4–1. Potential Changes to Water Resources from the MPF at LANL

Affected Resource Indicator	No Action[a]	MPF Alternative			TA-55 Upgrade Alternative
		125 ppy Single-Shift Operation	250 ppy Single-Shift Operation	450 ppy Single-Shift Operation	
Construction – *Water Availability and Use*					
Water source	Ground	Ground	Ground	Ground	Ground
Total site-wide water construction requirement (million L/yr)	1,710	1,720.7	1,721.8	1,726.3	1,710.005
Percent change from No Action water use (1,710 million L/yr)	NA	0.6%	0.7%	1.0%	0.00031%
Water Quality					
Wastewater discharge into NPDES permitted outfalls	693	695	695	696	696
Percent change from No Action wastewater discharge	NA	0.29%	0.29%	0.43%	0.43%
Operations – *Water Availability and Use*					
Water source	Ground	Ground	Ground	Ground	Ground
Total site-wide water operations requirement (million L/yr)	1,710	1,987.4	2,039.5	2,214.5	1,740.2
Percent change from No Action water use	NA	16.2%	19.3%	29.5%	1.8%
Water Quality					
Wastewater discharge into NPDES permitted outfalls (million L/yr)	693	738.0	754.9	774.8	705.3

Table 5.2.4–1. Potential Changes to Water Resources from the MPF at LANL *(continued)*

Affected Resource Indicator	No Action[a]	MPF Alternative			TA-55 Upgrade Alternative
		125 ppy Single-Shift Operation	250 ppy Single-Shift Operation	450 ppy Single-Shift Operation	
Water Quality (continued)					
Percent change from No Action wastewater discharge (693 million L/yr)	NA	6.5%	8.9%	11.8%	1.8%
Floodplain					
Actions in 100-year floodplain	NA	None	None	None	None
Actions in 500-year floodplain	NA	None	None	None	None

All discharges to natural drainages require National Pollutant Discharge Elimination System (NPDES) permits.
NA = not applicable.
million L/yr = million liters per year.
[a] Source: DOE 2002k.
Source: MPF Data 2003.

5.2.4.1 Surface Water

No Action Alternative

No additional impacts on surface water resources are anticipated at LANL under the No Action Alternative beyond the effects of existing and projected activities. The environment and operations (current and planned) described in Chapter 4 (Affected Environment) would continue.

Modern Pit Facility Alternative

Construction Impacts

Surface water would not be used to support the construction of the MPF at LANL as groundwater is the source of water at LANL. Therefore, there would be no impact to surface water availability from construction. Sanitary wastewater would be generated by construction personnel. As plans include use of portable toilets, no onsite discharge of sanitary wastewater would be minimized.

During construction, an estimated total of 37.5 million L (9.9 million gal), 41.26 million L (10.9 million gal), and 54.13 million L (14.3 million gal) of liquid wastes would be generated for the 125, 250, and 450 ppy facilities, respectively. It is expected that construction should take approximately 6 years. Assuming an equal generation of liquid waste over that timeframe, it is estimated that approximately 6.25 million L/yr (1.65 million gal/yr), 6.88 million L/yr (1.82 million gal/yr), and 9.02 million L/yr (2.38 million gal/yr) of liquid waste would be generated for the 125, 250, and 450 ppy facilities, respectively. It is estimated that one-third of the liquid wastes generated during construction would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. Water runoff from construction would be handled according to LANL's National Pollutant Discharge Elimination System (NPDES) permit for stormwater involving construction activities.

Stormwater runoff from construction areas could potentially impact downstream surface water quality, although any effects on runoff quality would likely be localized around immediate points of disturbance or construction laydown areas. However, appropriate soil erosion and sediment control measures (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport, as well as potential water quality impacts. LANL would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the MPF reference location is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

The MPF reference location at LANL is not within the 100- or 500-year floodplains. Therefore, no impacts to floodplains are anticipated. New and existing DOE facilities are subject to numerous safety analyses, including threats posed by Natural Phenomena Hazards such as earthquakes, high winds/tornadoes, and flooding. Once the exact location of the MPF is determined, detailed flood hazard analyses would be performed.

Operations Impacts

No impacts on surface water resources are expected as a result of MPF operations at LANL. No surface water would be used to support facility activities and there would be no direct discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a result of facility operations stemming from staff use of lavatory, shower, and breakroom facilities and from miscellaneous potable and sanitary uses. It is estimated that 45.0 million L/yr (11.9 million gal/yr), 61.9 million L/yr (16.4 million gal/yr), and 81.8 million L/yr (21.6 million gal/yr) of sanitary wastewater would be generated for the 125, 250, and 450 ppy facilities, respectively. These quantities would represent 6.5 percent, 8.9 percent, and 11.8 percent increases in sanitary wastewater discharges, respectively. LANL's current NPDES permit would require modification and approval concerning the increase in wastewater discharges. The sanitary wastewater would be treated, monitored, and discharged through NPDES outfall 135.

The MPF would not generate any radioactive liquid waste. However, there is a potential for generating radioactive contaminated water from the operations and maintenance of safety showers in contaminated areas, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of fire sprinkler systems located in contaminated areas. Wastewater that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be treated and disposed of in accordance with DOE procedures.

Sensitivity Analysis

For a 450 ppy facility working a double shift, more wastewater would be generated by the increased number of workers. The sanitary wastewater treatment system would require appropriate modifications to handle the increase in flow.

TA-55 Upgrade Alternative

Construction Impacts

Surface water would not be used to support the construction of the TA-55 Upgrade Alternative, as groundwater is the source of drinking water at LANL. Therefore, there would be no impact to surface water availability from construction. During construction, sanitary liquid waste would be generated. As plans include use of portable toilets, no onsite discharge of sanitary wastewater would be minimized.

During construction, an estimated total of 18.5 million L (4.9 million gal) of liquid wastes would be generated for the TA-55 Upgrade Alternative. Liquid wastes generated during construction would mostly be from sanitary wastewater that would be disposed of using the existing wastewater system.

Stormwater runoff from construction areas could potentially impact downstream surface water quality, although any effects on runoff quality would likely be localized around immediate points of disturbance or construction laydown areas. However, appropriate soil erosion and sediment control measure (e.g., sediment fences, stacked haybales, mulching disturbed areas, etc.) would be employed during construction to minimize suspended sediment and material transport and potential water quality impacts. LANL would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, TA-55 is not located near any surface water; therefore, no impacts to surface water from potential construction-related spills would be expected.

TA-55 is not located within the 100- or 500-year floodplains. Therefore, no impacts to floodplains are anticipated.

Operations Impacts

No impacts on surface water resources are expected as a result of TA-55 Upgrade Alternative operations at LANL. No surface water would be used to support facility activities and there would be no direct discharge of sanitary or industrial effluent to surface waters from TA-55; sanitary wastewater would be discharged to LANL's existing system. Sanitary wastewater would be generated as a result of facility operations stemming from staff use of lavatory, shower, and breakroom facilities and from miscellaneous potable and sanitary uses. It is estimated that 12.3 million L (3.25 million gal) of sanitary wastewater would be generated for the 80 ppy. This quantity would represent a 1.8 percent increase in sanitary wastewater discharge. LANL's current NPDES permit would require modification and approval concerning the increase in wastewater discharge. The sanitary wastewater would be treated, monitored, and discharged into dry arroyos according to NPDES requirements.

The TA-55 Upgrade Alternative would not generate any radioactive liquid waste. However, there is a potential for generating radioactive contaminated water from the operation and maintenance of safety showers, the operation of decontamination stations, the mopping of floors in contaminated areas, and the testing of sprinkler systems located in contaminated areas. Wastewater produced that has the potential for being radioactively contaminated would be collected, sampled, and analyzed prior to discharge. Radioactive wastewater would be treated and disposed of in accordance with DOE procedures.

5.2.4.2 Groundwater

No Action Alternative

Under the No Action Alternative, additional impacts on groundwater availability or quality are anticipated at LANL beyond the effects of existing and projected activities. The environment and operations (current and planned) described in Chapter 4 (Affected Environment) would continue.

Modern Pit Facility Alternative

Construction Impacts

Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. The proposed use of portable toilets by the construction personnel would greatly reduce water use over that normally required during construction. In addition, water required for concrete mixing would likely be procured offsite. As a result, it is estimated that construction activities would require a total of approximately 71.92 million L (19 million gal), 79.49 million L (21 million gal), and 109.79 million L (29 million gal) of groundwater for the 125, 250, and 450 ppy capacity facilities, respectively. It is expected that construction should take approximately 6 years. Assuming an equal usage over that timeframe, it is estimated that approximately 10.7 million L/yr (2.83 million gal/yr), 11.8 million L/yr (3.12 million gal/yr), and 16.3 million L/yr (4.31 million gal/yr) would be needed for the 125, 250, and 450 ppy facilities, respectively. The total site water requirement including these quantities would be within LANL's current maximum water allotment. It is currently anticipated that this water would be derived from LANL groundwater supply sources via a temporary service connection or trucked to the point of use, especially during the early stages of construction.

There would be no onsite discharge of wastewater to the surface or subsurface, and appropriate spill prevention controls and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Operations Impacts

Groundwater would continue to be used at LANL primarily to meet the potable and sanitary needs of facility personnel and for cooling tower water makeup. A summary of water needs for the MPF by category and total is listed in Table 5.2.4.2–1. The percent change in water consumption for the No Action Alternative ranges from 4.8-8.8 percent. LANL has a maximum water allotment of 2.05 billion L/yr (541.6 million gal/yr) and the maximum additional quantity of water needed for MPF represents 93 percent of the maximum water allotment. The maximum water requirement for site operations with the 125 ppy MPF Alternative does not exceed the maximum water allotment at LANL. Site water requirements for the 250 ppy and 450 ppy facilities exceed LANL's maximum water allotment. However, under the current lease agreement, LANL may purchase water in excess of the 30 percent allotment if available as discussed in Section 4.2.4.2.

Table 5.2.4.2–1. Summary of Water Consumption During MPF Operations at LANL (million L)

	125 ppy	250 ppy	450 ppy
Domestic Water	44.9	61.7	81.6
Cooling Tower Makeup	232.5	267.8	422.7
Total	**277.4**	**329.5**	**504.3**
Total needed for site operation	1,987.4	2,039.5	2,214.5
Percent Change from No Action Alternative	16.2%	19.3%	29.5%

Source: MPF Data 2003.

No sanitary or industrial effluent would be discharged to the surface or subsurface. Thus, no operational impacts on groundwater quality would be expected.

Routine chemical additives would be added to the domestic water to control bacteria and pH, as well as to cooling tower water makeup for bacteria and corrosion control. Table 5.2.4.2–2 summarizes the chemicals added. Use of these types of chemicals is standard and no adverse impacts would be expected.

Table 5.2.4.2–2. Summary of Chemical Additives to Domestic Water and Cooling Tower Water Makeup (kg)

Chemical	125 ppy	250 ppy	450 ppy
Water Chemicals			
Sodium hypochlorite	90	124	164
Sodium hydroxide	58	80	106
Polyphosphate	180	247	327
Cooling Tower Makeup			
Betz Slimicide	120	130	210
Betz 25K series (corrosion inhibitor)	7,000	8,000	12,700

Source: MPF Data 2003.

Sensitivity Analysis

The double shift for 450 ppy would cause a significant increase in water use over the 450 ppy single shift, which would already exceed LANL's maximum water allotment. Therefore, DOE would need to purchase additional water.

TA-55 Upgrade Alternative

Construction Impacts

Water would be required during construction for such uses as dust control and soil compaction, washing and flushing activities, and meeting the potable and sanitary needs of construction employees. The proposed use of portable toilets by the construction personnel would greatly reduce water use over that normally required during construction. In addition, water required for concrete mixing would likely be procured offsite. As a result, it is estimated that construction activities would require a total of 21,000 L (5,548 gal) for construction of an 80 ppy facility. It is expected that construction would take approximately 4 years. Assuming an equal usage over that timeframe, it is estimated that approximately 5,250 L/yr (1,387 gal/yr) would be needed. The annual requirement for the TA-55 Upgrade Alternative represents a very small fraction of the total site water requirement and would be within LANL's current maximum water allotment. It is anticipated that this water would be derived from LANL groundwater supply sources.

There would be no onsite discharge of wastewater to the subsurface and appropriate spill prevention controls, and countermeasure plans would be employed to minimize the chance of petroleum, oils, lubricants, and other materials used during construction being released to the subsurface and to ensure that waste materials are properly disposed. Overall, no impact on groundwater availability or quality is anticipated.

Operations Impacts

Groundwater would continue to be used at LANL primarily to meet the potable and sanitary needs of facility personnel. During operations, 30.2 million L/yr (8 million gal/yr) of domestic water would be required, and the total annual site operation groundwater requirement is 1,740.2 million L (459.7 million gal), which includes TA-55 Upgrade Alternative. The percent change in water consumption from the No Action Alternative is 1.8 percent. LANL has a maximum water allotment of 2.05 billion L/yr (541.6 million gal/yr) and the overall water requirement including the 80 ppy TA-55 Upgrade Alternative represents 85 percent of the maximum water allotment.

5.2.5 Geology and Soils

5.2.5.1 No Action Alternative

Under the No Action Alternative, no additional impacts on geology and soils are anticipated at LANL. The environmental impacts and operations (current and planned) described in Chapter 4 would continue. Hazards from large-scale geologic conditions, such as earthquakes, and from other site geologic conditions with the potential to affect existing LANL facilities are summarized in Section 4.2.5 and further detailed in the *Site-Wide Environmental Impact Statement for the Continued Operation of the Los Alamos National Laboratory* (DOE 1999a).

5.2.5.2 Modern Pit Facility Alternative

Construction Impacts

The construction of the MPF is expected to disturb land adjacent to existing facilities at TA-55. Table 5.2.5.2–1 shows the amount of disturbance for the three different plant sizes. The major differences in the three facility layouts are in the sizes of the detention basin, Construction Laydown Area, and the roads and parking. The area of disturbance was calculated by extending the MPF area 9 m (30 ft) from the surrounding roads and the borders of the construction area and Concrete Batch Plant.

Table 5.2.5.2–1. Area Required for the MPF by Capacity Size

Facility Size	Disturbed Area (ha)
125 ppy	61.6
250 ppy	63.3
450 ppy	73.9

Source: MPF Data 2003.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at TA-55, but these resources are abundant in Los Alamos County. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small; the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's environmental restoration program and in accordance with LANL's Hazardous Waste Facility Permit. Construction of the MPF would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

As discussed in Section 4.2.5, faults located in the vicinity of TA-55 have the potential for earthquakes. While the risk for a large earthquake exists in association with the Pajarito Fault, the smaller potential earthquakes on the closer faults would result in the same or greater ground motion at the MPF site. Ground shaking affecting primarily the integrity of inadequately designed or nonreinforced structures, but not damaging or slightly damaging properly or specially designed or upgraded facilities (Modified Mercalli Intensity VII to VIII), could be associated with the largest postulated earthquakes along these faults.

Operations Impacts

The operations of MPF at any of the three capacities would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1 which requires that nuclear and nonnuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

Sensitivity Analysis

Utilizing the 450 ppy facility for two-shift operations, would not impact geologic or soil resources. A second shift of workers would use the same parking lot as the first shift. No increase in the size of the parking lot is foreseen.

5.2.5.3 TA-55 Upgrade Alternative

Construction Impacts

Under the TA-55 Upgrade Alternative, new facilities within TA-55 would have to be constructed to provide additional office space, change space, and cold laboratory space. Additionally, a small glovebox decontamination/handling facility designed to prepare decommissioned gloveboxes for shipment to WIPP would be required and constructed in TA-54. The construction associated with the new facilities and upgrade of existing TA-55 facilities is expected to disturb land adjacent to existing facilities at the TA-55 and TA-54 sites. The construction would result in 2.5 ha (6.2 ac) of land disturbed by the construction.

Aggregate and other geologic resources (e.g., sand) would be required to support the construction activities, but these resources are abundant in Los Alamos County. In addition to new facility construction and upgrades, excavation to remove and replace some existing utility systems would also be conducted. The land area to be disturbed is relatively small, and the impact on geologic and soil resources would be relatively minor. The potential exists for contaminated soils and possibly other media to be encountered during excavation and other site activities. Prior to commencing ground disturbance, DOE would survey potentially affected areas to determine the extent and nature of any contaminated media and required remediation in accordance with the procedures established under the site's environmental restoration program and in accordance with LANL's Hazardous Waste Facility Permit. Construction of the TA-55 Upgrade would require a stormwater permit that would address erosion control measures to minimize the impacts of erosion.

As discussed in Section 4.2.5, faults located in the vicinity of LANL have the potential for earthquakes. While the risk for the largest earthquake exists in associated with the Pajarito Fault, the smaller potential earthquakes on the closer faults would result in the same or greater ground motion at the TA-55 Upgrade site. Ground shaking affecting primarily the integrity of inadequately designed or nonreinforced structures, but not damaging or slightly damaging properly or specially designed or upgraded facilities (Modified Mercalli Intensity VII to VIII) could be associated with the largest postulated earthquakes along these faults.

Operations Impacts

The operation of the TA-55 Upgrade Alternative would not be expected to result in impacts on geologic and soil resources. New, upgraded, and modified facilities would be evaluated, designed, and constructed in accordance with DOE Order 420.1, which requires that nuclear and nonnuclear facilities be designed, constructed, and operated so that workers, the public, and the environment are protected from the adverse impacts of natural phenomena hazards, including earthquakes.

5.2.6 Biological Resources

5.2.6.1 Terrestrial Resources

No Action Alternative

Under the No Action Alternative, impacts on terrestrial resources would not occur since no new facilities would be built and no new operations would be conducted. The Chapter 4 description of the existing LANL environment and operations would continue to be an accurate portrayal of the site conditions and current and planned activities not connected with the MPF.

Modern Pit Facility Alternative

Construction Impacts

Construction would take place within the TA-55 built environment. Wildlife and vegetation present are characteristic of species adapted to built environments with open settings, i.e., nonforested. Vegetation is comprised primarily of grasses, weeds, and plants used for landscaping. Wildlife is common to the region and primarily small mammals, lizards, and birds. Depending upon the MPF capacity, approximately 62-74 ha (152-182 ac) of low value vegetation and habitat would be affected during MPF construction. During site clearing activities, highly mobile wildlife species such as some small mammals and birds would be able to relocate to adjacent less developed areas. However, successful relocation may not occur due to competition for resources to support the increased population and the carrying capacity limitations of areas outside the proposed development. For less mobile species (reptiles and small mammals), direct mortality could occur during the actual construction event or ultimately result from habitat alteration. Acreage used for the development also would be lost as potential hunting habitat for raptors and other predators.

Operations Impacts

Impacts to terrestrial resources are very similar regardless of the level of pit production operations (potential pit production capacities of 125, 250, and 450 ppy including surge capacities). The major difference is the size of the modification or loss of low value plant communities and wildlife habitat. The acreage modified or lost would range from 44-56 ha (110-138 ac) depending upon pit production capacity. It is important to note that the impacts would be within a previously and substantially developed location. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, MPF operations would minimize the potential for any adverse effects to plant and animal communities (terrestrial resources) surrounding TA-55.

Sensitivity Analysis

There would be minimal impacts to terrestrial resources during the two-shift operations for the 450 ppy. Wildlife road strikes (vehicle and wildlife collisions) may increase during morning and evening shift changes due to more vehicle traffic coupled with decreased visibility and higher wildlife activity.

TA-55 Upgrade Alternative

Construction/Operations Impacts

Construction impacts associated with the upgrade of TA-55 and TA-54 facilities would have minimal effect to terrestrial resources. Existing facilities would be modified to accommodate operational requirements. These improvements would occur with minimal expansion of facilities. Construction would take place within the TA-55 and TA-54 built environments. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect terrestrial resources. Within implementation and adherence to administrative procedures, along with facility design and engineering controls, operations at the modified facilities are not expected to adversely affect plant and wildlife communities adjacent to TA-55.

5.2.6.2 Wetlands

No Action Alternative

Under the No Action Alternative, there would be no impacts to wetlands because no new facilities would be built and no new operations would be conducted. The Chapter 4 description of the existing environment and operations would continue to be an accurate portrayal of the site conditions and current and planned activities not connected with the MPF.

Modern Pit Facility Alternative

Construction Impacts

There would be no direct impacts to wetlands as there are no wetlands within the area proposed for the construction of the MPF or any of the associated construction staging and laydown areas. Implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan would avoid the indirect degradation of any adjacent wetland areas.

Operations Impacts

There are no adverse impacts predicted to any adjacent wetland area from implementation of any of the MPF production capacities. There would be no direct untreated effluent discharges to the environment. With implementation and adherence to administrative procedures, along with facility design and engineering controls, MPF operations are not expected to adversely affect wetlands downstream of the TA-55 watershed.

Sensitivity Analysis

There would be no impacts to wetlands during the two-shift operations for the surge production of 450 ppy.

TA-55 Upgrade Alternative

Construction/Operations Impacts

There are no wetlands present within the immediate area of the proposed facility upgrades. During operations there would be no direct untreated effluent discharges to the environment. Within implementation and adherence to administrative procedures, along with facility design and engineering controls, operations at the new and modified facilities would avoid adversely affecting any wetlands downstream of the TA-55 and TA-54 watersheds.

5.2.6.3 Aquatic Resources

No Action Alternative

Under the No Action Alternative, impacts on aquatic resources would not occur since no new facilities would be built and no new operations would be conducted. The Chapter 4 description of the existing environment and LANL operations would continue to be an accurate portrayal of the site conditions and current and planned activities not connected with the MPF.

Modern Pit Facility Alternative

Construction Impacts

There are no perennial or seasonal aquatic habitats within the TA-55 location proposed for the MPF. Thus there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources downstream and within the TA-55 watershed would be avoided by implementation of standard construction practices to minimize site runoff and erosion along with implementation of a stormwater pollution prevention plan.

Operations Impacts

There would be no direct discharge of untreated operational effluent from MPF operations. Stormwater runoff from new facilities, roadways, parking lots, and other impervious areas is not predicted to result in any indirect adverse impacts on area aquatic resources. The quality of runoff waters would be similar to runoff from other LANL built environments and the quantity would represent a minor downstream contribution into the TA-55 watershed.

Sensitivity Analysis

There would be no impacts to aquatic resources during the two-shift operations for the surge production of 450 ppy.

TA-55 Upgrade Alternative

Construction/Operations Impacts

Construction impacts associated with the upgrade of TA-55 and TA-54 facilities would have little, if any, effect on aquatic resources. Existing facilities would be modified to accommodate operational requirements. These improvements would occur with minimal expansion of facilities. During MPF operations there would be no direct discharge of untreated operational effluent into the environment. Operations at the modified facilities are not predicted to adversely affect aquatic communities adjacent to TA-55 and TA-54 with implementation and adherence to administrative procedures along with facility design and engineering controls.

5.2.6.4 Threatened and Endangered Species

No Action Alternative

Under the No Action Alternative, impacts to threatened and endangered species and other special interest species would not occur since no new facilities would be built and no new operations would be conducted. The Chapter 4 description of the existing environment and operations would continue to be an accurate portrayal of the site conditions and current and planned activities not associated with the MPF.

Modern Pit Facility Alternative

Section 7 of the *Endangered Species Act* requires all Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. Agencies must assess potential impacts and determine if proposed projects may affect federally listed or proposed-for-listing species. No species identified in Table 4.2.6.4–1, a list of Federal- and state-threatened and endangered species and other species of special interest that occur or may occur at LANL, are known to be present within the proposed site location. However, TA-55 does contain core and buffer Areas of Environmental Interest for the Mexican spotted owl (*strix occidentalis lucida*), a federally listed threatened species, and other special interest avian species may use the habitat for foraging and hunting. The proposed MPF would have minimal affect on the core and buffer area for the Mexican spotted owl as it is proposed for construction in an existing highly developed environment.

Construction Impacts

Construction would take place within the TA-55 built environment. Depending upon the MPF pit production capacity, approximately 62-74 ha (152-182 ac) of low value vegetation and habitat would be affected during MPF construction. During site clearing activities, no special interest species would be killed or dislocated as no special interest species are known to inhabit the area. However, should LANL be selected for construction and operations of the MPF, then the DOE, prior to any habitat modifying activities, would conduct site-specific surveys at the appropriate time and assess, in concert with the U.S. Fish and Wildlife Service (USFWS), the potential impacts to special interest species. Acreage temporarily modified from construction would be lost as potential foraging areas or hunting habitat for special interest avian species until the area revegetates. Revegetation would probably occur within a 1-3 year timeframe depending upon site maintenance and climate conditions.

Operations Impacts

Depending upon pit production capacity, acreage permanently modified or lost as foraging or prey base habitat for species of special interest would range from 44-56 ha (110-138 ac). It is important to note that the impacts would be to highly developed areas. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely affect special interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, MPF operations result in a prediction of no adverse impacts to any individual within a special interest species population.

Sensitivity Analysis

There would be no impacts to threatened and endangered species during the two-shift operations for the surge production of 450 ppy.

TA-55 Upgrade Alternative

Construction/Operations Impacts

Construction impacts associated with the upgrade of TA-55 and TA-54 facilities would have little, if any, effect on special interest species. Existing facilities would be modified to accommodate operational requirements. These improvements would occur with minimal expansion of facilities. There would be no direct untreated effluent discharges to the environment and air emissions would be controlled to levels that would not be expected to adversely effect special interest species. With implementation and adherence to administrative procedures, along with facility design and engineering controls for pit production, operations within TA-55 and TA-54 would minimize the potential of adverse impacts to any individual within a special interest species population.

5.2.7 Cultural and Paleontological Resources

5.2.7.1 Cultural Resources

No Action Alternative

Under the No Action Alternative, there would be no new facility or upgrade of existing facilities. Operations would remain at current and planned levels. Since there would be no construction activities and operations would remain unchanged, there would be no impact to prehistoric, historic, or Native American cultural resources. The cultural resource environment would remain as described in Chapter 4 (Affected Environment).

Modern Pit Facility Alternative

Construction Impacts

Under the MPF Alternative, a block of land would be disturbed during construction of the new facility. The size of the disturbed area would vary by the output of the facility, and would include LANL buildings and structures (inside the PIDAS fence), security fencing and perimeter roads, support buildings and parking, a detention basin, a Concrete Batch Plant, a Construction Laydown Area, and a 9-m (30-ft) wide buffer zone surrounding the facility. For purposes of analyzing impacts to cultural resources, the three sizes of disturbed areas would be 62 ha (152 ac) (125 ppy), 63 ha (156 ac) (250 ppy), and 74 ha (182 ac) (450 ppy).

Almost half of TA-55 has been disturbed through development of other facilities. All of TA-55 has been inventoried for cultural resources; the results are discussed in Section 4.2.7. Due to the high density of cultural resources at LANL, relative to other DOE sites under consideration, there is a high probability that resources would be impacted during MPF construction anywhere on the LANL site, including TA-55. The number of resources that would be disturbed is unknown, but would likely increase as the number of acres disturbed increases.

Because the exact location of the MPF at LANL is not yet determined, cultural resources arising from infrastructure construction (such as water, sewer, gas, electricity, access roads) are not analyzed here. They will be analyzed in the site-specific EIS. However, like the facility itself, the greater the number of acres disturbed, the greater the possibility for impacts to cultural resources.

Prior to any ground-disturbing activity, DOE would identify and evaluate any cultural resources that could potentially be impacted by the construction of MPF. Methods for identification could include field surveys, shovel tests, archival research, and consultation with interested Native American tribes. DOE would determine the possibility for impacts to the resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. Identification, evaluation, determination of impact, and implementation of measures would be conducted in consultation with the New Mexico State Historic Preservation Officer (SHPO) and in accordance with the *LANL Cultural Resource Overview and Data Inventory 1995* (LANL 1995b). If previously unknown cultural resources, such as subsurface resources, are discovered during construction, activities in the area of the discovery would stop and the discovery would be evaluated and treated appropriately, as determined by DOE in consultation with the New Mexico SHPO.

Operations Impacts

Operation of the MPF at any of the three capacity levels would have no impact on cultural resources.

Sensitivity Analysis

Utilization of the 450 ppy facility for two-shift operations would have no impact on cultural resources.

TA-55 Upgrade Alternative

Construction Impacts

This alternative includes internal modifications to the PF-4 in TA-55, construction of office space, change space, and a cold laboratory in TA-55, and construction of a glovebox decontamination/handling facility in TA-54. The total acreage that would be disturbed by these activities is 2.5 ha (6 ac).

Internal modification of the PF-4 would have no impact on cultural resources, as any construction staging areas or laydown areas would be located in areas that were previously disturbed during the original construction of the facility. All of TA-55 and most of TA-54 have been inventoried for cultural resources. Due to the high density of cultural resources at LANL, relative to the other DOE sites under consideration, there is a moderate probability that resources would be impacted during support facility construction. Because the probability for resource disturbance increases with the number of acres disturbed, and the acreage that would be disturbed for support facility construction is much smaller than the acreage that would be disturbed for the MPF, there is a much smaller likelihood for resource disturbance under the TA-55 Upgrade Alternative. Because the locations of the support facilities have not been decided, impacts to cultural resources arising from infrastructure construction (such as water, sewer, gas, electricity, access roads) are not analyzed here. They will be analyzed in the site-specific, tiered EIS. Like the facilities themselves, the greater the number of acres disturbed, the greater the possibility for impacts to cultural resources.

Prior to any ground-disturbing activity, DOE would identify and evaluate any cultural resources that could potentially be impacted by the construction of the support facilities. Methods for identification could include field surveys, shovel tests, archival research, and consultation with interested Native American tribes. DOE would determine the possibility for impacts to the resources and implement appropriate measures to avoid, reduce, or mitigate the impacts. Identification, evaluation, determination of impact, and implementation of measures would be conducted in consultation with the New Mexico SHPO and in accordance with the *LANL Cultural Resource Overview and Data Inventory 1995* (LANL 1995b). If previously unknown cultural resources, such as subsurface resources, are discovered during construction, activities in the area of the discovery would stop and the discovery would be evaluated and treated appropriately, as determined by the DOE in consultation with the New Mexico SHPO.

Operations Impacts

Operation of the PF-4 would have no impact on cultural resources.

5.2.7.2 Paleontological Resources

No Action Alternative

Under the No Action Alternative, there would be no new facility or upgrade of existing facilities. Operations would remain at current and planned levels. Since there would be no construction activities and operations would remain unchanged, there would be no impact to paleontological resources. The paleontological resource environment would remain as described in Chapter 4 (Affected Environment).

Modern Pit Facility Alternative

Construction Impacts

Only one paleontological resource has been reported within the LANL boundaries, and such resources are unlikely to be found due to the volcanic formations that comprise the area. Therefore, no paleontological resources would be impacted due to construction of any of the three capacity sizes of the MPF or associated infrastructure anywhere on LANL.

Operations Impacts

Operation of the MPF at any of the three capacity levels would have no impact on paleontological resources.

Sensitivity Analysis

Utilization of the 450 ppy facility for two-shift operations would have no impact on paleontological resources.

TA-55 Upgrade Alternative

Construction Impacts

No paleontological resources have been reported within the LANL boundaries, and none are likely to be found due to the volcanic formations that comprise the area. Therefore, no paleontological resources would be impacted due to modification of the PF-4, construction of the PF-4 support facilities in TA-55 and TA-54, or construction of associated infrastructure.

Operations Impacts

Operation of the PF-4 would have no impact on paleontological resources.

5.2.8 Socioeconomics

5.2.8.1 Regional Economy Characteristics

No Action Alternative

Under the No Action Alternative, there would be no change in the workforce currently at LANL. Therefore, there would be no impacts to the region of influence (ROI) employment, income, and labor force.

Modern Pit Facility Alternative

Construction Impacts

Facility–125 ppy. Construction of the facility to produce 125 ppy would require a total of 2,650 man-years of labor. During peak construction, 770 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 480 indirect jobs would be created, for a total of 1,250 jobs. This represents less than 1.5 percent of the total ROI labor force.

Due to the low unemployment rate in the ROI and the fact that the construction industry only employs approximately 6 percent of the ROI labor force, it is estimated that the majority of the direct jobs would be filled by workers migrating into the ROI, at least temporarily during the construction period. Approximately 640 construction workers from outside the ROI would be required to fill these positions. The current ROI labor force would be sufficient to fill the indirect jobs.

ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $30,900 for the construction industry, direct income would increase by $23.8 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $36.3 million ($23.8 million direct and $12.5 million indirect).

Facility–250 ppy. Construction of the facility to produce 250 ppy would require a total of 2,950 man-years of labor. During peak construction, 850 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 530 indirect jobs would be created, for a total of 1,390 jobs. This represents less than 1.5 percent of the ROI labor force.

Due to the low unemployment rate in the ROI and the fact that the construction industry only employs approximately 6 percent of the ROI labor force, it is estimated that the majority of the direct jobs would be filled by workers migrating into the ROI, at least temporarily during the construction period. Approximately 720 construction workers from outside the ROI would be required to fill these positions. The current ROI labor force would be sufficient to fill the indirect jobs.

ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $30,900 for the construction industry, direct income would increase by $26.3 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $40.1 million ($26.3 million direct and $13.8 million indirect).

Facility–450 ppy. Construction of the facility to produce 450 ppy would require a total of 3,800 man-years of labor. During peak construction, 1,100 workers would be employed at the site. In addition to the direct jobs created by the construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 690 indirect jobs would be created, for a total of 1,790 jobs. This represents less than 1.9 percent of the ROI labor force.

Due to the low unemployment rate in the ROI and the fact that the construction industry only employs approximately 6 percent of the ROI labor force, it is estimated that the majority of the direct jobs would be filled by workers migrating into the ROI, at least temporarily during the construction period. Approximately 970 construction workers from outside the ROI would be required to fill these positions. The current ROI labor force would be sufficient to fill the indirect jobs.

ROI income would increase approximately 1 percent as a result of the new jobs created. Based on the ROI average earnings of $30,900 for the construction industry, direct income would increase by $34 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $51.9 million ($34.0 million direct and $17.9 million indirect).

Operations Impacts

Facility–125 ppy. Operation of the facility to produce 125 ppy would require 988 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 280 indirect jobs would be created, for a total of approximately 1,270 jobs. This represents approximately 1.3 percent of the ROI labor force.

Due to the low unemployment rate in the ROI, it is estimated that some of the direct jobs would be filled by workers migrating into the ROI. Approximately 430 workers from outside the ROI would be required to fill these positions. The current ROI labor force would be sufficient to fill the indirect jobs.

ROI income would increase approximately 1.2 percent as a result of the new jobs created. Based on the ROI average earnings of $47,200 for the government services industry, direct income would increase by $46.6 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $63.4 million ($46.6 million direct and $16.8 million indirect).

Facility–250 ppy. Operation of the facility to produce 250 ppy would require 1,358 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 390 indirect jobs would be created, for a total of approximately 1,750 jobs. This represents approximately 1.8 percent of the total ROI labor force.

Due to the low unemployment rate in the ROI, it is estimated that some of the direct jobs would be filled by workers migrating into the ROI. Approximately 800 workers from outside the ROI would be required to fill these positions. The current ROI labor force would be sufficient to fill the indirect jobs.

ROI income would increase 1.7 percent as a result of the new jobs created. Based on the ROI average earnings of $47,200 for the government services industry, direct income would increase by $64.1 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $87.2 million ($64.1 million direct and $23.1 million indirect).

Facility–450 ppy. Operation of the facility to produce 450 ppy would require 1,797 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 510 indirect jobs would be created, for a total of approximately 2,310 jobs. This represents approximately 3 percent of the total ROI labor force.

Due to the low unemployment rate in the ROI, it is estimated that some of the direct jobs would be filled by workers migrating into the ROI. Approximately 1,250 workers from outside the ROI would be required to fill these positions. The current ROI labor force would be sufficient to fill the indirect jobs.

ROI income would increase approximately 2.2 percent as a result of the new jobs created. Based on the ROI average earnings of $47,200 for the government services industry, direct income would increase by $84.8 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $115.3 million ($84.8 million direct and $30.5 million indirect).

Sensitivity Analysis

If the facility were to be operated on a two-shift system, additional employees would be required for the second shift. This would lead to additional increases in ROI employment and income.

TA-55 Upgrade Alternative

Construction Impacts

Construction of TA-55 would require a total of 430 man-years of labor. During peak construction, 190 workers would be employed at the site. In addition to the direct jobs created by construction of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 120 indirect jobs would be created, for a total of approximately 310 jobs. This represents less than 0.5 percent of the ROI labor force.

Due to the low unemployment rate in the ROI and the fact that the construction industry only employs approximately 6 percent of the ROI labor force, it is estimated that some direct jobs would be filled by workers migrating into the ROI, at least temporarily during the construction period. Approximately 60 construction workers from outside the ROI would be required to fill these positions. The current ROI labor force would be sufficient to fill the indirect jobs.

ROI income would increase less than 0.5 percent as a result of the new jobs created. Based on the ROI average earnings of $30,900 for the construction industry, direct income would increase by $5.9 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $9.0 million ($5.9 million direct and $3.1 million indirect).

Operations Impacts

Operations of TA-55 would require 680 workers. In addition to the direct jobs created by the operation of the facility, additional jobs would be created in other supporting industries. It is estimated that approximately 200 indirect jobs would be created, for a total of approximately 880 jobs. This represents less than 1 percent of the ROI labor force.

Due to the low unemployment rate in the ROI, it is estimated that some of the direct jobs would be filled by workers migrating into the ROI. Approximately 130 workers from outside the ROI would be required to fill these positions. The current ROI labor force would be sufficient to fill the indirect jobs.

ROI income would increase less than 1 percent as a result of the new jobs created. Based on the ROI average earnings of $47,200 for the government services industry, direct income would increase by $32.0 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $43.6 million ($32.0 million direct and $11.6 million indirect).

5.2.8.2 Population and Housing

No Action Alternative

Under the No Action Alternative, there would be no change in the workforce currently at LANL. Therefore, there would be no impacts to the ROI population and housing.

Modern Pit Facility Alternative

Construction Impacts

Facility–125 ppy. The influx of new workers would increase the ROI population and create new housing demand. A total of approximately 1,600 new residents would be expected in the ROI, including workers and their families. This is an increase of approximately 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population.

Facility–250 ppy. The influx of new workers would increase the ROI population and create new housing demand. A total of 1,900 new residents would be expected in the ROI, including workers and their families. This is an increase of approximately 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population.

Facility–450 ppy. The influx of new workers would increase the ROI population and create new housing demand. A total of 2,500 new residents would be expected in the ROI, including workers and their families. This is an increase of approximately 1.3 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population.

Operations Impacts

Facility–125 ppy. The influx of new workers would increase the ROI population and create new housing demand. A total of 1,100 new residents would be expected in the ROI, including workers and their families. This is an increase of less than 1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population.

Facility–250 ppy. The influx of new workers would increase the ROI population and create new housing demand. A total of 2,100 new residents would be expected in the ROI, including workers and their families. This is an increase of approximately 1.1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population.

Facility–450 ppy. The influx of new workers would increase the ROI population and create new housing demand. A total of 3,200 new residents would be expected in the ROI, including workers and their families. This is an increase of approximately 1.7 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population.

Sensitivity Analysis

If the facility were to be operated on a two-shift system, additional employees would be required for the second shift. This would lead to additional increases in ROI employment and income. There would be additional impacts to the ROI population and additional stress on the local housing market because most of these workers would come from outside the ROI.

TA-55 Upgrade Alternative

Construction Impacts

The influx of new workers would increase the ROI population and create new housing demand. A total of approximately 150 new residents would be expected in the ROI, including workers and their families. This is an increase of 0.1 percent over the current population. The current housing market would likely be sufficient to absorb this increase in the ROI population.

Operations Impacts

The influx of new workers would increase the ROI population and create new housing demand. A total of approximately 335 new residents would be expected in the ROI, including workers and their families. This is an increase of approximately 0.2 percent over the current population. The current housing market would likely be sufficient to absorb this increase in ROI population.

5.2.8.3 Community Services

No Action Alternative

Under the No Action Alternative, there would be no change in the workforce currently at LANL. Therefore, there would be no impacts to the ROI community services.

Modern Pit Facility Alternative

Construction Impacts

Facility–125, 250, or 450 ppy. The small increase in the ROI population would not put increased demand on ROI community services. Comparable levels of service could be maintained with current staffing levels.

Operations Impacts

Facility–125, 250, or 450 ppy. The small increase in the ROI population would not put increased demand on ROI community services. Comparable levels of service could be maintained with current staffing levels.

TA-55 Upgrade Alternative

Construction Impacts

The small increase in the ROI population would not put increased demand on ROI community services. Comparable levels of service could be maintained with current staffing levels.

Operations Impacts

The small increase in the ROI population would not put increased demand on ROI community services. Comparable levels of service could be maintained with current staffing levels.

5.2.9 Human Health and Safety

Radiological Health Effects Risk Factors Used in this EIS

Health impacts of radiation exposure, whether from external or internal sources, are generally identified as "somatic" (i.e., affecting the exposed individual) or "genetic" (i.e., affecting descendants of the exposed individual). Radiation is more likely to produce somatic effects (i.e., induced cancers) than genetic effects. Except for leukemia, which can have an induction period (time between exposure to carcinogen and cancer diagnosis) of as little as 2-7 years, most cancers have an induction period of more than 20 years. Because of the delayed effect, the cancers are referred to as "latent" cancers.

For a uniform irradiation of the body, the incidence of cancer varies among organs and tissues; the thyroid gland and skin demonstrate a greater sensitivity than other organs. Such cancers, however, also produce comparatively low mortality rates because they are relatively amenable to medical treatment. Because fatal cancer is the most probable serious effect of environmental and occupational radiation exposure, estimates of cancer fatalities, rather than cancer incidents, are presented in this EIS.

The number of latent cancer fatalities (LCFs) is estimated using risk factors determined by the International Commission on Radiological Protection. A risk factor is the probability that an individual would incur a LCF during his or her lifetime if the individual receives a unit of radiation dose (1 rem). The risk factor for workers would be 0.0004 (LCFs per rem) and 0.0005 (LCFs per rem) for individuals among the general public. The risk factor for the public would be slightly higher because the public includes infants and children, who are more sensitive to radiation than adults.

Examples:

- The LCF risk for an individual (nonworker) receiving a dose of 0.1 rem would be 0.00005 (0.1 rem × 0.0005 LCFs per rem). This risk can also be expressed as 0.005 percent chance or 1 chance in 20,000.
- The same concept is used to calculate the LCF risk from exposing a group of individuals to radiation. The LCF risk for individuals in a group of 100,000, each receiving a dose of 0.1 rem, would be 0.00005, as indicated above. This individual risk, multiplied by the number of individuals in the group, expresses the number of LCFs that could occur among the individuals in the group. In this example, the number would be 5 LCFs (100,000 × 0.00005). A number of LCFs less than 1 means that the radiation exposure is not sufficient to cause a single LCF among the members of the group. In this case, the risk is expressed as a probability that a single LCF would occur among the members of the group. For example, 0.05 LCFs can be stated as "there is 1 chance in 20 (1/0.05) that 1 LCF would occur among the members of the group."

The EIS provides estimates of probability of a LCF occurring for the involved and non-involved workers, the offsite MEI, and the general population. These categories are defined as follows:

Involved worker—An individual worker participating in the operation of the facilities.

Non-involved worker—An individual worker at the site other than the involved worker.

Maximally exposed offsite individual (offsite MEI)—A hypothetical member of the public residing at the site boundary who could receive the maximum dose of radiation.

Population—Members of the public residing within an 80-km (50-mi) radius of the facility.

5.2.9.1 Radiological Impacts

No Action Alternative

Under the No Action Alternative, DOE would continue to use the plutonium pit manufacturing capability of PF-4 located in TA-55 at LANL.

Construction Impacts

Under the No Action Alternative, there would be no radiological impacts on members of the public or workers because this alternative would not involve any construction.

Operations Impacts

Under this alternative, the radiological releases to the environment from LANL would continue at the same rates described in Section 4.2.9. The associated impacts on the general public living within 80 km (50 mi) of LANL and the offsite MEI would continue at the levels shown in Table 4.2.9.1–2. As shown in that table, the expected annual radiation dose to the maximally exposed offsite individual would be much smaller than the limit of 10 mrem/yr set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The fatal cancer risk to the maximally exposed offsite member of the public due to radiological releases from LANL operations is estimated to be 9.5×10^{-7}, while 8×10^{-4} excess fatal cancers are projected in the population living within 80 km (50 mi) of LANL from normal LANL operations.

Under this alternative, the radiation dose received by LANL workers would continue at the rates described in Section 4.2.9. These worker radiation doses at LANL in the year 2000 are presented in Table 4.2.9.1–3. The number of projected fatal cancers among LANL workers from normal operations in 2000 is 0.098.

Modern Pit Facility Alternative

Construction Impacts

No radiological risks would be incurred by members of the public from construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site. However, these workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as is reasonably achievable.

Operations Impacts

Impacts to the Public. DOE expects minimal public health impacts from the radiological consequences of MPF operations. Public radiation doses would likely occur from airborne releases only (Section 5.2.3). Table 5.2.9.1–1 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental latent cancer fatalities (LCFs). To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

Table 5.2.9.1–1. Annual Radiological Impacts on the Public from MPF Operations at LANL for All Three Pit Production Rates

Receptor	125 ppy	250 ppy	450 ppy
Population within 80 km			
Collective dose (person-rem)	3.4×10^{-7}	5.5×10^{-7}	1.0×10^{-6}
Percent of natural background radiation[a]	0.00000000016%	0.00000000026%	0.00000000047%
LCFs[b]	1.7×10^{-10}	2.8×10^{-10}	5.0×10^{-10}
Offsite MEI[c]			
Dose (mrem)	4.1×10^{-8}	6.6×10^{-8}	1.2×10^{-7}
Percent of regulatory dose limit	0.00000041%	0.00000066%	0.0000012%
Percent of natural background radiation[a]	0.000000011%	0.000000018%	0.000000033%
Cancer fatality risk[b]	2.1×10^{-14}	3.3×10^{-14}	6.0×10^{-14}

[a] The average annual dose from background radiation at LANL is 360 mrem (see Section 4.2.9); the 586,335 people living within 80 km (50 mi) of LANL in the year 2043 would receive an annual dose of 211,081 person-rem from the background radiation.
[b] Based on a cancer risk estimate of 0.0005 LCFs per person-rem.
[c] The offsite MEI is assumed to reside at the site boundary, 2,000 m (6,562 ft) north-northeast from the MPF an actual residence may not currently be present at this location.

As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem/yr set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a LCF to this individual from operations would be less than or equal to 6.0×10^{-14} per year (i.e., about 1 chance in 17 trillion per year of a LCF). The projected number of fatal cancers to the population within 80 km (50 mi) would be less than or equal to 5.0×10^{-10} per year (i.e., about 1 chance in 2 billion per year of a LCF).

Impacts to MPF Workers. Estimates of annual radiological doses to workers involved with MPF operations are independent of geographical location. These dose estimates are solely a function of:

The number of radiological workers, as determined in the development of the MPF staffing estimate for each throughput alternative. The current estimates were developed by application of a factor to the total workers for each workgroup based on operating experience in plutonium facilities. Approximately 60 percent of total operating staff are estimated to be radiological workers.

- The working dose rate at the glovebox surface for each unit operation or workstation. These dose rates were calculated based on the maximum mass (plutonium, americium) and form (metal, oxide) of material being handled. Standard “weapons grade” isotopic distribution, and americium content of 0.5 percent were assumed.

- The amount of time spent by direct operators/first line supervisors in the radiation area. This was determined from a time-motion estimate of direct “hands-in-gloves” labor required to perform each individual operation and the number of parts processed per year for a given pit production rate. Efficiency scaling factors were applied for various operations. For Foundry and Machining operations, this was assumed to be 50 percent; for Assembly and Post-Assembly & Testing, efficiencies were 90 percent.

As indicated above, the collective annual dose (mrem/yr) received by individual direct operators is calculated based on the number of operators required for the various production rates, the time spent in the radiation area, and the associated dose rates for each operation. The collective exposures for support group workers were added to these numbers and were calculated using empirical data that implies that exposure for these workers can be estimated as a percentage of direct operator exposure (e.g., Analytical Laboratory Technician ~25 percent of direct operator exposure). The average individual dose is calculated as the collective exposure divided by the estimated number of radiological workers for each throughput alternative.

The estimates of annual radiological doses to workers under each of the three pit production rates are provided in Table 5.2.9.1–2. As shown in the table, the annual doses to individual workers for all levels of production would be well below the DOE limit of 5,000 mrem (10 CFR 835.202) and the DOE-recommended Control Level of 1,000 mrem (10 CFR 835.1002). The projected number of fatal cancers in the workforce from annual operations involving 125 ppy would be 0.064 (or 1 chance in 16 that the worker population would experience a fatal cancer per year of operations). For annual pit production rates of 250 and 450, the projected number of fatal cancers would be 0.12 and 0.22, respectively (1 chance in 8 or 5, respectively, that the worker population would experience a fatal cancer per year of operations).

Table 5.2.9.1–2. Annual Radiological Impacts on MPF Workers at LANL from Operations for All Three Pit Production Rates

Production Rate	125 ppy	250 ppy	450 ppy
Number of Radiological Workers	**550**	**800**	**1,100**
Individual Workers[a]			
Average individual dose, mrem/yr	290	390	510
Average worker cancer fatality risk[b]	1.2×10^{-4}	1.6×10^{-4}	2.0×10^{-4}
Worker Population			
Collective dose (person-rem)	160	310	560
Cancer fatality risk[b]	0.064	0.12	0.22

[a] The regulatory dose limit for an individual worker is 5,000 mrem/yr (10 CFR 835). However, the maximum annual dose to a worker would be kept below the DOE Control Level of 1,000 mrem/yr, as established in 10 CFR 835.1002. Further, DOE recommends that facilities adopt a more limiting 500-mrem/yr Administrative Control Level (DOE 1999e). To reduce doses to levels that are as low as is reasonably achievable, an effective dose reduction plan would be enforced.
[b] Based on a cancer risk estimator of 0.0004 LCFs per person-rem.

Sensitivity Analysis

DOE could operate the MPF using a double shift to increase the plutonium pit manufacturing capability. Double-shift operation of the MPF under any of the three capacities would approximately double the quantities of radioactive emissions from the MPF presented for single-shift operation at each capacity. Thus, the calculated radiation dose and LCFs to the offsite MEI and the population living within 80 km (50 mi) of LANL would approximately double.

Similarly, double-shift operation of the MPF under any of the three capacities would approximately double the radiation dose to MPF workers presented for single-shift operation at each capacity. Thus, the calculated adverse health impacts to MPF workers would be approximately double.

TA-55 Upgrade Alternative

Construction Impacts

No radiological risks would be incurred by members of the public from construction activities. Construction workers could be at a small radiological risk. They could receive doses above natural background radiation levels from exposure to radiation from other past or present activities at the site, including that associated with residual contamination at the facilities being upgraded. However, these workers would be protected through appropriate training, monitoring, and management controls. Their exposures would be limited to ensure that doses were kept as low as reasonably achievable.

Operations Impacts

Impacts to the Public. DOE expects minimal public health impacts from the radiological consequences for an upgraded TA-55 pit production facility operation. Public radiation doses would likely occur from airborne releases only (Section 5.2.3). The airborne releases from a production rate of 80 ppy are estimated to be 1.1×10^{-5} Ci/yr. This can be compared to a MPF producing 125 ppy and releasing an estimated total of 1.5×10^{-4} Ci/yr of airborne radioactive materials, most of it plutonium-241. Thus, the incremental impacts to the public from an upgraded TA-55 facility would be approximately 14 times lower than from a MPF operating at 125 ppy. Table 5.2.9.1–3 lists incremental radiation doses estimated for the public (offsite MEI and collective population dose) and corresponding incremental LCFs. To put the doses into perspective, comparisons with natural background radiation levels are included in the table.

As shown in the table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem/yr set by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The risk of a LCF to this individual from operations would be 1.5×10^{-15} per year (i.e., about 1 chance in 670 trillion per year of a LCF). The projected number of fatal cancers to the population within 80 km (50 mi) would be 1.2×10^{-11} per year (i.e., about 1 chance in 81 billion per year of a LCF).

Table 5.2.9.1–3. Annual Radiological Impacts on the Public from the TA-55 Upgrade Alternative

Receptor	80 ppy
Population within 80 km	
Collective dose (person-rem)	2.5×10^{-8}
Percent of natural background radiation[a]	0.000000000012%
LCFs[b]	1.2×10^{-11}
Offsite MEI[c]	
Dose (mrem)	3.0×10^{-9}
Percent of regulatory dose limit	0.000000030%
Percent of natural background radiation[a]	0.00000000084%
Cancer fatality risk[b]	1.5×10^{-15}

[a] The average annual dose from background radiation at LANL is 360 mrem (see Section 4.2.9); the 586,335 people living within 80 km (50 mi) of LANL in the year 2043 would receive an annual dose of 211,081 person-rem from the background radiation.
[b] Based on a cancer risk estimate of 0.0005 LCFs per person-rem.
[c] The offsite MEI is assumed to reside at the site boundary, 2,000 m (6,562 ft) north-northeast from the MPF. An actual residence may not currently be present at this location.

Impacts to MPF Workers. The estimates of annual radiological doses to workers at the upgraded TA-55 pit production facility are provided in Table 5.2.9.1–4. The data for the surge operation of 80 ppy were obtained from the SSM PEIS (DOE 1996c). The dose presented for the involved workforce is only that incremental dose received from pit production. As shown in the table, the annual doses to individual workers for all levels of production would be well below the DOE limit of 5,000 mrem (10 CFR 835.202) and the DOE-recommended Control Level of 1,000 mrem (10 CFR 835.1002). For a production rate of 80 ppy, the projected number of fatal cancers would be 0.062 (1 chance in 16 that the worker population would experience a fatal cancer per year of operations).

Table 5.2.9.1–4. Annual Radiological Impacts on Workers at TA-55 Upgrade Facility from Operations

Production Rate	80 ppy
Number of Radiological Workers	**406**
Individual Workers[a]	
Average individual dose, mrem/year	380
Average worker cancer fatality risk[b]	1.5×10^{-4}
Worker Population	
Collective dose (person-rem)	154
Cancer fatality risk[b]	0.062

[a] The regulatory dose limit for an individual worker is 5,000 mrem/yr (10 CFR 835). However, the maximum annual dose to a worker would be kept below the DOE Control Level of 1,000 mrem/yr, as established in 10 CFR 835.1002. Further, DOE recommends that facilities adopt a more limiting 500-mrem/yr Administrative Control Level (DOE 1999e). To reduce doses to levels that are as low as reasonably achievable, an effective dose reduction plan would be enforced.
[b] Based on a cancer risk estimator of 0.0004 LCFs per person-rem.

5.2.9.2 Nonradiological Impacts

This section considers illness, injury, and fatality rates associated with the construction and operation of the MPF on the LANL workforce. Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from the Bureau of Labor Statistics (BLS), U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including Integrated Safety Management (ISM) and the Voluntary Protection Program (VPP). Additionally, the small number of fatal accidents reported in the Computerized Accident/Incident Reporting System (CAIRS) makes associated calculated fatality rates statistically invalid.

No Action Alternative

Under the No Action Alternative, DOE would continue to use the plutonium pit manufacturing capability of PF-4 located in TA-55 at LANL. There would be no change in injury, illness, and fatality trends currently observed at LANL. There would be no hazardous chemical impacts on members of the public or workers because no construction would be involved and no increase in chemical inventories would be required.

Modern Pit Facility Alternative

Construction Impacts

The potential risk of occupational injuries and fatalities to workers constructing the MPF would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data from 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities were estimated for both the peak workforce loading and for the duration of construction activities including site preparation (6¾ years). These values are shown below in Table 5.2.9.2–1.

Table 5.2.9.2–1. Injury, Illness, and Fatality Estimates for Construction of the MPF at LANL

Injury, Illness, and Fatality Categories	MPF Operating Capacity		
	125 ppy	250 ppy	450 ppy
Peak Annual Employment	770	850	1,100
Total Recordable Cases	66	73	95
Total Lost Workday Cases	32	35	46
Total Fatalities	0.16	0.17	0.023
Project Duration (6¾ years)			
Total Recordable Cases	228	254	328
Total Lost Workday Cases	110	122	157
Total Fatalities	0.54	0.60	0.78

Source: MPF Data 2003, BLS 2002b.

No chemicals have been identified that would be a risk to members of the public from construction activities associated with any of the MPF operating capacities. Construction workers would be protected from hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals. Integrated Safety Management System (ISMS) programs to construction activities would also decrease the potential for worker exposures by providing hazards identification and control measures for construction activities (WSRC 2002c).

Operations Impacts

During normal (accident-free) operations, total facility staffing would range from approximately 988-1,797, depending on the operating capacity of the selected MPF. The potential risk of occupational injuries and fatalities to workers operating the MPF would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases, and Fatalities for facility populations were estimated for each of the operating capacities. These values are shown below in Table 5.2.9.2–2.

Table 5.2.9.2–2. Injury, Illness, and Fatality Annual Estimates for Normal Operations of the MPF at LANL

Injury, Illness, and Fatality Categories	MPF Operating Capacity		
	125 ppy	250 ppy	450 ppy
Total Recordable Cases	43	59	78
Total Lost Workday Cases	22	30	40
Total Fatalities	0.04	0.05	0.07

Source: MPF Data 2003, BLS 2002b.

No chemical-related health impacts are associated with normal (accident-free) operations of the MPF at the three identified operating capacities. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection is augmented by facility safety programs such as ISMS, work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness (WSRC 2002c).

Sensitivity Analysis

DOE could operate the MPF using a double shift to increase the plutonium pit manufacturing capability. Double-shift operation of the 450 ppy facility would approximately double the impacts to the LANL illness and injury rates for facility-associated activities. No chemical-related health impacts would be associated with this increase in operations.

TA–55 Upgrade Alternative

This section considers illness, injury, and fatality rates associated with construction and operation of the upgraded TA-55 pit production facility on the LANL workforce. Nonradiological impacts to workers were evaluated using occupational injury, illness, and fatality rates obtained from BLS, U.S. Department of Labor data. DOE values are historically lower than BLS values owing to the increased focus on safety fostered by complex-wide programs, including ISM and the VPP. Additionally, the small number of fatal accidents reported in the CAIRS system makes associated calculated fatality rates statistically invalid.

Construction Impacts

The potential risk of occupational injuries and fatalities to workers constructing the TA-55 Upgrade would be expected to be bounded by injury and fatality rates for general industrial construction. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases and Fatalities were estimated for the peak workforce loading, estimated to be 190 workers (MPF Data 2003), and for the project duration. For the duration of construction activities, (4 years, including site preparation), the number of worker years is estimated to be 430 (MPF Data 2003). These values are shown in Table 5.2.9.2–3.

Table 5.2.9.2–3. Injury, Illness, and Fatality Estimates for Construction of the TA-55 Upgrade Alternative

Injury, Illness, and Fatality Categories	80 ppy
Peak Annual Employment	190
Total Recordable Cases	16
Total Lost Workday Cases	8
Total Fatalities	0.039
Project Duration (4 years)	
Total Recordable Cases	37
Total Lost Workday Cases	18
Total Fatalities	0.09

Source: MPF Data 2003, BLS 2002b.

No chemicals have been identified that would be a risk to members of the public from construction activities associated with the TA-55 Upgrade. Construction workers would be protected from hazardous chemicals by adherence to OSHA and EPA occupational standards that limit concentrations of potentially hazardous chemicals. Implementation of ISMS programs to construction activities would also decrease the potential for worker exposures by providing hazards identification and control measures for construction activities (WSRC 2002c).

Operations Impacts

During normal (accident-free) operations, total facility staffing would be approximately 680 workers. The potential risk of occupational injuries and fatalities to workers operating the upgraded TA-55 pit production facility would be expected to be bounded by injury and fatality rates for general chemical manufacturing. Using BLS data for 1997-2001, Total Recordable Cases, Lost Workday Cases and Fatalities were estimated for the facility population. These values are shown below in Table 5.2.9.2–4.

Table 5.2.9.2–4. Injury, Illness, and Fatality Annual Estimates for Normal Operations of the TA-55 Upgrade Alternative

Injury, Illness, and Fatality Categories	80 ppy
Total Recordable Cases	29
Total Lost Workday Cases	15
Total Fatalities	0.025

Source: MPF Data 2003, BLS 2002b.

No chemical-related health impacts are associated with normal (accident-free) operations of the upgraded TA-55 pit production facility. Initial screens for the hazard analysis did not result in the identification of any controls necessary to protect the public or workers from direct chemical exposures. Facility design features that minimize the worker exposures during facility operations act as defense-in-depth controls. In addition to these controls, worker protection would be augmented by facility safety programs such as ISMS, work planning, chemical hygiene, industrial hygiene personnel monitoring, and emergency preparedness (WSRC 2002c).

5.2.10 Facility Accidents

This section presents the potential impacts on workers (both involved and non-involved) and the public due to potential accidents associated with operation of the MPF at LANL. Additional details supporting the information presented here are provided in Appendix C, Human Health Effects from Facility Accidents.

An accident is a sequence of one or more unplanned events with potential outcomes that endanger the health and safety of workers and the public. An accident can involve a combined release of energy and hazardous materials (radiological or chemical) that might cause prompt or latent health effects. The sequence usually begins with an initiating event, such as a human error, equipment failure, or earthquake, followed by a succession of other events that could be dependent or independent of the initial event, which dictate the accident's progression and the extent of materials released. Initiating events fall into three categories:

- *Internal initiators* normally originate in and around the facility, but are always a result of facility operations. Examples include equipment or structural failures and human errors.

- *External initiators* are independent of facility operations and normally originate from outside the facility. Some external initiators affect the ability of the facility to maintain its confinement of hazardous materials because of potential structural damage. Examples include aircraft crashes, vehicle crashes, nearby explosions, and toxic chemical releases at nearby facilities that affect worker performance.

- *Natural phenomena initiators* are natural occurrences that are independent of facility operations and occurrences at nearby facilities or operations. Examples include earthquakes, high winds, floods, lightning, and snow. Although natural phenomena initiators are independent of external facilities, their occurrence can involve those facilities and compound the progression of the accident.

If an accident were to occur involving the release of radioactive or chemical materials, workers, members of the public, and the environment would be at risk. Workers in the facility where the accident occurs would be particularly vulnerable to the effects of the accident because of their location. The offsite public would also be at risk of exposure to the extent that meteorological conditions exist for the atmospheric dispersion of released hazardous materials. Using approved computer models, DOE predicted the dispersion of released hazardous materials and their effects. However, prediction of latent potential health effects becomes increasingly difficult to quantify for facility workers as the distance between the accident location and the worker decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be injured or killed by physical effects of the accident.

Emergency Preparedness

Each DOE site has established an emergency management program. This program has been developed and maintained to ensure adequate response for most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with emergency planning, preparedness, and response.

5.2.10.1 No Action Alternative

Under the No Action Alternative, plutonium pit fabrication capabilities would be maintained at existing levels. Potential accident scenarios for the No Action Alternative are addressed in existing documentation included by reference (DOE 1996c, DOE 1999a, LANL 1995a).

5.2.10.2 Modern Pit Facility Alternative

Radiological Impacts

DOE estimated radiological impacts to three receptors: (1) the offsite MEI at the LANL boundary; (2) the offsite population within 80 km (50 mi) of LANL; and (3) a non-involved worker 1,000 m (328 ft) from the accident location. DOE did not evaluate total dose to non-involved workers because of the uncertain nature of worker locations at the time of the accident.

Tables 5.2.10.2–1 through 5.2.10.2–3 show the frequencies and consequences of the postulated set of accidents for the public (maximally exposed offsite individual and the general population living within 80 km [50 mi] of the facility) and a hypothetical non-involved worker for the three pit production rates. The dose shown in the tables are calculated by the MACCS computer code based on accident data. The latent cancer fatality (LCF) values are calculated using a dose-to-LCF conversion factor. For the MEI and the population the conversion factor is 0.0005 LCFs per rem or person-rem respectively. For workers, the dose-to-risk conversion factor is 0.0004 LCFs per rem. If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.001 and 0.0008 respectively. Tables 5.2.10.2–4 through 5.2.10.2–6 show the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *Topical Report - Supporting Documentation for the Accident Impacts Presented in the Modern Pit Facility Environmental Impact Statement* (Tetra Tech 2003). The selection process, screening criteria used, and conservative estimates of material at risk and source term (see Appendix C) ensure that the accidents chosen for evaluation in this EIS bound the impacts of all reasonably foreseeable accidents that could occur under an alternative. Thus, in the event that any other accident that was not evaluated in this EIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.2.10.2–1. MPF Alternative Radiological Accident Frequency and Consequences at LANL for 125 ppy

Frequency (per year)	Offsite MEI		Offsite Population[a]		Non-involved Worker	
	Dose (rem)	LCFs[b]	Dose (person-rem)	LCFs[c]	Dose (rem)	LCFs[b]
Beyond Evaluation Basis Earthquake with Fire						
1×10^{-5}	41.4	0.041	36,300	18.2	244	0.2
Fire in a Single Building						
1×10^{-4}	32.7	0.033	21,400	10.7	301	0.24
Explosion in a Feed Casting Furnace						
1×10^{-2}	38.3	0.038	25,100	12.5	353	0.28
Nuclear Criticality						
1×10^{-2}	0.00012	5.8×10^{-8}	0.11	5.3×10^{-5}	0.0012	4.7×10^{-7}
Fire-induced Release in the CRT Storage Room						
1×10^{-2}	2.4	0.0012	1,670	0.84	23.5	0.019
Radioactive Material Spill						
1×10^{-2}	0.77	0.00036	502	0.25	7.1	0.0028

CRT = Cargo Restraint Transporter.
[a] Based on a year-2043 population of 586,335 persons residing within 80 km (50 mi) of LANL.
[b] Increased likelihood of a LCF.
[c] Increased number of LCFs.

Table 5.2.10.2–2. MPF Alternative Radiological Accident Frequency and Consequences at LANL for 250 ppy

Frequency (per year)	Offsite MEI		Offsite Population[a]		Non-involved Worker	
	Dose (rem)	LCFs[b]	Dose (person-rem)	LCFs[c]	Dose (rem)	LCFs[b]
Beyond Evaluation Basis Earthquake with Fire						
1×10^{-5}	42.6	0.043	37,400	18.7	251	0.2
Fire in a Single Building						
1×10^{-4}	33.9	0.034	22,200	11.1	312	0.25
Explosion in a Feed Casting Furnace						
1×10^{-2}	38.3	0.038	25,100	12.5	353	0.28
Nuclear Criticality						
1×10^{-2}	0.00012	5.8×10^{-8}	0.11	5.3×10^{-5}	0.0012	4.7×10^{-7}
Fire-induced Release in the CRT Storage Room						
1×10^{-2}	2.4	0.0012	1,670	0.84	23.5	0.019
Radioactive Material Spill						
1×10^{-2}	0.77	0.00036	502	0.25	7.1	0.0028

[a] Based on a year-2043 population of 586,335 persons residing within 80 km (50 mi) of LANL.
[b] Increased likelihood of a LCF.
[c] Increased number of LCFs.

Table 5.2.10.2–3. MPF Alternative Radiological Alternative Accident Frequency and Consequences at LANL for 450 ppy

Frequency (per year)	Offsite MEI		Offsite Population[a]		Non-involved Worker	
	Dose (rem)	LCFs[b]	Dose (person-rem)	LCFs[c]	Dose (rem)	LCFs[b]
Beyond Evaluation Basis Earthquake with Fire						
1×10^{-5}	82.1	0.082	72,000	36	484	0.39
Fire in a Single Building						
1×10^{-4}	65.7	0.066	43,000	21.5	605	0.48
Explosion in a Feed Casting Furnace						
1×10^{-2}	38.3	0.038	25,100	12.5	353	0.28
Nuclear criticality						
1×10^{-2}	0.00012	5.8×10^{-8}	0.11	5.3×10^{-5}	0.0012	4.7×10^{-7}
Fire-induced Release in the CRT Storage Room						
1×10^{-2}	5.1	0.0024	3,340	1.67	47	0.038
Radioactive Material Spill						
1×10^{-2}	0.77	0.00036	502	0.025	7.1	0.0028

[a] Based on a year-2043 population of 586,335 persons residing within 80 km (50 mi) of LANL.
[b] Increased likelihood of a LCF.
[c] Increased number of LCFs .

The results of the accident analysis indicate potential consequences that exceed the DOE exposure guidelines of 25 rem for a member of the public at the nearest site boundary. The analyses in these cases for NEPA purposes are based on unmitigated releases of radioactive material to select a site for the MPF. Following the ROD and selection of a site, additional NEPA action would be taken that would identify specific mitigating features that would be incorporated in the MPF design to ensure compliance with DOE exposure guidelines. These could include procedural and equipment safety features, HEPA filtration systems, and other design features that would protect radioactive materials from accident conditions and contain any material that might be released. Upon completion of MPF NEPA actions, DOE would prepare safety analysis documentation such as a safety analysis report to further ensure that DOE exposure guidelines would not be exceeded. The results of the safety analysis report are reflected in facility and equipment design and defines an operating envelope and procedures to ensure public and worker safety. Once specific mitigation measures are incorporated into the MPF design and operating procedures, the potential consequences will not exceed the DOE exposure guidelines of 25 rem for a member of the public at the nearest site boundary for any of the site alternatives.

The accident with the highest risk to the offsite population (see Tables 5.2.10.2-4 through 5.2.10.2-6) is the explosion in a feed casting furnace for the 125 ppy, 250 ppy, and 450 ppy production cases. The increased number of LCFs in the offsite population would be 0.125 per year (i.e., about 1 chance in 8 per year of a LCF in the total population) for all three production cases. The highest risk of a LCF to an offsite MEI individual located at a distance of 1,750 m (5,742 ft) in the north-northeast direction from the accident would be 0.00038 per year (i.e., about 1 chance in 2,630 per year of a LCF) for all three production cases. The highest risk of a LCF to a non-involved worker located at a distance of 1,000 m (3,281 ft) from the accident would be 0.0028 per year (i.e., about 1 chance in 360 per year of a LCF) for all three production cases.

Table 5.2.10.2–4. Annual Cancer Risks Due to MPF Accidents at LANL for 125 ppy

Accident	Offsite MEI[a]	Offsite Population[b,c]	Non-involved Worker[a]
Beyond Evaluation Basis Earthquake with Fire	4.1×10^{-7}	0.00018	2.0×10^{-6}
Fire in a Single Building	3.3×10^{-6}	0.0011	2.4×10^{-5}
Explosion in a Feed Casting Furnace	0.00038	0.125	0.0028
Nuclear criticality	5.8×10^{-10}	5.3×10^{-7}	4.7×10^{-9}
Fire-induced Release in the CRT Storage Room	1.2×10^{-5}	0.0084	0.00019
Radioactive Spill Material	3.6×10^{-6}	0.0025	2.8×10^{-5}

[a] Increased likelihood of a LCF.
[b] Increased number of LCFs.
[c] Based on a year-2043 population of 586,335 persons residing within 80 km (50 mi) of LANL.

Table 5.2.10.2–5. Annual Cancer Risks Due to MPF Accidents at LANL for 250 ppy

Accident	Offsite MEI[a]	Offsite Population[b,c]	Non-involved Worker[a]
Beyond Evaluation Basis Earthquake with Fire	4.3×10^{-7}	0.00019	2.0×10^{-6}
Fire in a Single Building	3.4×10^{-6}	0.0011	2.5×10^{-5}
Explosion in a Feed Casting Furnace	0.00038	0.125	0.0028
Nuclear Criticality	5.8×10^{-10}	5.3×10^{-7}	4.7×10^{-9}
Fire-induced Release in the CRT Storage Room	1.2×10^{-5}	0.0084	0.00019
Radioactive Spill Material	3.6×10^{-6}	0.0025	2.8×10^{-5}

[a] Increased likelihood of a LCF.
[b] Increased number of LCFs.
[c] Based on a year-2043 population of 586,335 persons residing within 80 km (50 mi) of LANL.

Table 5.2.10.2–6. Annual Cancer Risks Due to MPF Accidents at LANL for 450 ppy

Accident	Offsite MEI[a]	Offsite Population[b,c]	Non-involved Worker[a]
Beyond Evaluation Basis Earthquake with Fire	8.2×10^{-7}	0.00036	3.9×10^{-6}
Fire in a Single Building	6.6×10^{-6}	0.0022	4.8×10^{-5}
Explosion in a Feed Casting Furnace	0.00038	0.125	0.0028
Nuclear Criticality	5.8×10^{-10}	5.3×10^{-7}	4.7×10^{-9}
Fire-induced Release in the CRT Storage Room	2.4×10^{-5}	0.017	0.00038
Radioactive Spill Material	3.6×10^{-6}	0.0025	2.8×10^{-5}

[a] Increased likelihood of a LCF.
[b] Increased number of LCFs.
[c] Based on a year-2043 population of 586,335 persons residing within 80 km (50 mi) of LANL.

Hazardous Chemicals Impacts

DOE estimated the impacts of the potential release of the most hazardous chemicals selected from the many chemicals used at MPF. A chemical's vapor pressure, acceptable concentration Emergency Response Planning Guideline (ERPG)-2, and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool about one inch in depth in the area around the point of release. Additional information on the evaporation and dispersion of each chemical is provided in Appendix C. Tables 5.2.10.2–7 through 5.2.10.2–9 provide information on each chemical and the frequency and consequences of an accidental release. The source term shown represents the amount of the chemical that is accidentally released. The American

Industrial Hygiene Association defines the ERPG-2 as the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action. The distances from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 concentration increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would be expected to increase.

This distance to the site boundary is about 1.75 km (1.1 mi). Except for nitric acid for the 450 ppy case, any release would not be expected to exceed ERPG-2 limits offsite. For the nitric acid 450 ppy case, the ERPG-2 limit is 6 ppm and the concentration at the site boundary is estimated to be 7.29 ppm.

Table 5.2.10.2–7. MPF Alternative Chemical Accident Frequency and Consequences at LANL for 125 ppy

Chemical Released	Quantity Released (kg)	ERPG-2 [a]		Concentration [a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary 1.75 km (ppm)	
Nitric acid	10,500	6	0.68	3.16	1.28	10^{-4}
Hydrofluoric acid	550	20	0.61	6.98	2.43	10^{-4}
Formic acid	1,500	10	0.19	0.51	0.202	10^{-4}

[a] Site boundary is at a distance of 1.75 km (1.1 mi) north.

Table 5.2.10.2–8. MPF Alternative Chemical Accident Frequency and Consequences at LANL for 250 ppy

Chemical Released	Quantity Released (kg)	ERPG-2 [a]		Concentration [a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	Site Boundary at 1.75 km (ppm)	
Nitric acid	21,000	6	1.4	11.4	3.31	10^{-4}
Hydrofluoric acid	1,100	20	0.83	13.4	4.02	10^{-4}
Formic acid	3,000	10	0.26	0.975	0.34	10^{-4}

[a] Site boundary is at a distance of 1.75 km (1.1 mi) north.

Table 5.2.10.2–9. MPF Alternative Chemical Accident Frequency and Consequences at LANL for 450 ppy

Chemical Released	Quantity Released (kg)	ERPG-2 [a]		Concentration [a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary 1.75 km (ppm)	
Nitric acid	40,000	6	1.9	20.3	7.29	10^{-4}
Hydrofluoric acid	2,000	20	1.1	23.7	8.42	10^{-4}
Formic acid	5,500	10	0.36	1.73	0.694	10^{-4}

[a] Site boundary is at a distance of 1.75 km (1.1 mi) north.

Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the receptor decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident.

The number of workers that would be at the MPF during operations would range from 988 (125 ppy) to 1,797 (450 ppy) (including security guards). Each process facility within the MPF would have attached safe haven structures designed in accordance with a number of life safety, fire protection, and safeguards and security requirements. These structures are required for personnel protection during various accident scenarios and are made of reinforced concrete similar in design to the process building wall construction. They would be designed to accommodate 120 percent of the building occupancy for a number of hours and would require their own independent ventilation systems (WSRC 2002b).

The facility ventilation system would control dispersal of any airborne radiological debris from the accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk of injury.

5.2.10.3 TA-55 Upgrade Alternative

This section presents the potential impacts on workers (both involved and non-involved) and the public due to potential accidents associated with operations under the TA-55 Upgrade Alternative. Additional details supporting the information presented here are provided in Appendix C.

Radiological Impacts

DOE estimated the radiological impacts to three receptors: (1) the offsite MEI; (2) the offsite population within 80 km (50 mi) of LANL; and (3) a non-involved worker 1,000 m (3,281 ft) from the accident location. DOE did not evaluate total dose to the non-involved workers because of the uncertain nature of their location at the time of the accident.

Table 5.2.10.3–1 shows the frequencies and consequences of the postulated set of accidents for the public (offsite MEI and the general population living within 80 km [50 mi] of the facility) and a hypothetical non-involved worker for the three pit production rates. The dose shown in the table is calculated by the MACCS computer code based on accident data. The latent cancer fatality (LCF) values are calculated using a dose-to-LCF conversion factor. For the MEI and the population the conversion factor is 0.0005 LCFs per rem or person-rem respectively. For workers, the dose-to-risk conversion factor is 0.0004 LCFs per rem. If the dose to an MEI or worker exceeds 20 rem, the dose-to-risk conversion factor is doubled to 0.001 and 0.0008 respectively. Table 5.2.10.3–2 shows the accident risks, obtained by multiplying the consequences by the likelihood (frequency per year) that an accident would occur. The accidents listed in these tables were selected from a wide spectrum of accidents described in the *Topical*

Report – Supporting Documentation for the Accident Impacts Presented in the Modern Pit Facility Environmental Impact Statement (Tetra Tech 2003). The selection process and screening criteria used (see Appendix C) ensure that the accidents chosen for evaluation in this EIS bound the impacts of all reasonably foreseeable accidents that could occur under the TA-55 Upgrade Alternative. Thus, in the event that any other accident that was not evaluated in this EIS were to occur, its impacts on workers and the public would be expected to be within the range of the impacts evaluated.

Table 5.2.10.3–1. TA-55 Upgrade Alternative Radiological Accident Frequency and Consequences for 80 ppy

Frequency (per year)	Offsite MEI		Offsite Population[a]		Non-involved Worker	
	Dose (rem)	LCFs[b]	Dose (person-rem)	LCFs[c]	Dose (rem)	LCFs[b]
Beyond Evaluation Basis Earthquake with Fire						
1×10^{-5}	26.4	0.026	23,200	11.6	156	0.13
Fire in a Single Building						
1×10^{-4}	20.9	0.021	13,700	6.85	193	0.15
Explosion in a Feed Casting Furnace						
1×10^{-2}	38.3	0.038	25,100	12.5	353	0.28
Nuclear Criticality						
1×10^{-2}	0.00012	6×10^{-8}	0.011	5.3×10^{-5}	0.0012	4.7×10^{-7}
Fire-induced Release in the CRT Storage Room						
1×10^{-2}	1.6	0.0008	1,070	0.54	15.1	0.006
Radioactive Material Spill						
1×10^{-2}	0.77	0.00036	502	0.25	7.1	0.0028

[a] Based on a year-2043 population of 586,335 persons residing within 80 km (50 mi) of LANL.
[b] Increased likelihood of a LCF.
[c] Increased likelihood of LCFs.

Table 5.2.10.3–2. Annual Cancer Risks for the TA-55 Upgrade Alternative for 80 ppy

Accident	Offsite MEI	Offsite Population[b,c]	Non-involved Worker[a]
Beyond Evaluation Basis Earthquake with Fire	2.6×10^{-7}	0.00012	1.3×10^{-5}
Fire in a Single Building	2.1×10^{-7}	0.00069	1.5×10^{-5}
Explosion in a Feed Casting Furnace	0.00038	0.125	0.0028
Nuclear Criticality	6×10^{-10}	5.3×10^{-7}	4.7×10^{-9}
Fire-induced Release in the CRT Storage Room	8.0×10^{-6}	0.0054	6.0×10^{-5}
Radioactive Material Spill	3.6×10^{-6}	0.0025	2.8×10^{-5}

[a] Increased likelihood of a LCF.
[b] Increased likelihood of LCFs.
[c] Based on a year-2043 population of 586,335 persons residing within 80 km (50 mi) of LANL.

The accident with the highest risk to the offsite population (see Table 5.2.10.3–2) is the explosion in a feed casting furnace. The increased number of LCFs in the offsite population would be 0.125 per year (i.e., about 1 chance in 8 per year of a LCF in the total population). The highest risk of a LCF to an offsite MEI located at a distance of 1,750 m (5,742 ft) in the north-northeast direction from the accident would be 0.00038 per year (i.e., about 1 chance in 2,630 per year of a LCF). The highest risk of a LCF to a non-involved worker located at a distance of 1,000 m (3,287 ft) from the accident would be 0.0028 per year (i.e., about 1 chance in 360 per year of a LCF).

Hazardous Chemical Impacts

DOE estimated the impacts of the potential release of the most hazardous chemicals that would be used under the TA-55 Upgrade Alternative. A chemical's vapor pressure, acceptable concentration (ERPG-2), and quantity available for release are factors used to rank a chemical's hazard. The accident scenario postulates a major leak, such as a pipe rupture, and the released chemical forming a pool, about one inch in depth, in the area around the point of release. Additional information on the evaporation and dispersion of each chemical is provided in Appendix C. Table 5.2.10.3–3 provides information on each chemical and the frequency and consequences of an accidental release for the three production cases. The American Industrial Hygiene Association defines ERPG-2 as the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action. The distance from the release point to the point where the ERPG-2 concentration is reached in relation to the site boundary reflects the consequence of the chemical's release. As the distance to the ERPG-2 concentration increases, the potential number of persons onsite and offsite that may be exposed to concentrations in excess of ERPG-2 would also be expected to increase.

Table 5.2.10.3–3. TA-55 Upgrade Alternative Chemical Accident Frequency and Consequences for 80 ppy

Chemical Released	Quantity Released (kg)	ERPG-2 [a]		Concentration [a]		Frequency
		Limit (ppm)	Distance to Limit (km)	At 1,000 m (ppm)	At Site Boundary 1.75 km (ppm)	
Nitric acid	3,420	6	0.37	1.08	0.44	10^{-4}
Hydrofluoric acid	340	20	0.5	4.44	1.54	10^{-4}
Hydrochloric acid	384	20	1.6	47.1	16.6	10^{-4}

[a] Site boundary is at a distance of 1.75 km (1.1 mi) north.

The distance to the site boundary is about 1.9 km (1.2 mi). Except for hydrochloric acid, a chemical release would not be expected to exceed the ERPG-2 limits offsite. For hydrochloric acid, the concentration at the site boundary would be 45.7 ppm, exceeding the 20 ppm ERPG-2 limit.

Concentrations at the location of a non-involved worker at a distance of 1,000 m (3,281 ft) from a hydrochloric acid release point would also exceed ERPG-2 limits.

Involved Worker Impacts

For all of the accidents, there is a potential for injury or death to involved workers in the vicinity of the accident. Prediction of potential health effects becomes increasingly difficult to quantify as the distance between the accident location and the receptor decreases. This is because the individual worker exposure cannot be adequately defined with respect to the presence of shielding and other protective features. The worker also may be acutely injured or killed by physical effects of the accident.

For the TA-55 Upgrade Alternative, the number of workers required for operations is estimated to be 630 (including security guards). Each process facility within the upgraded facility would have attached safe haven structures designed in accordance with a number of life safety, fire protection, and safeguards and security requirements. These structures are required for personnel protection during various accident scenarios and are made of reinforced concrete similar in design to the process building wall construction. They would be designed to accommodate 120 percent of the building occupancy for a number of hours and would require their own independent ventilation systems.

The facility ventilation system would control dispersal of any airborne radiological debris from an accident. Following initiation of accident/site emergency alarms, workers would evacuate the area in accordance with site emergency operating procedures and would not be vulnerable to additional radiological or chemical risk or injury.

5.2.11 Environmental Justice

Under Executive Order 12898, DOE is responsible for identifying and addressing disproportionately high and adverse impacts on minority or low-income populations. Minority persons are those who identify themselves as being Black or African American; American Indian or Alaska Native; Asian; Native Hawaiian and other Pacific Islander; or another non-White race; or persons of Hispanic or Latino ethnicity. Persons whose incomes are below the Federal poverty threshold are designated low-income.

At LANL, the 80-km (50-mi) radius includes portions of Rio Arriba, Taos, Los Alamos, Mora, Sandoval, Santa Fe, San Miguel, Bernalillo, and Torrance Counties in New Mexico. Table 5.2.11–1 provides the racial and ethnic composition of these counties based on the 2000 Census, as well as the number of people below the poverty level. Figure 5.2.11–1 shows the minority populations located within an 80-km (50-mi) radius of the site. Figure 5.2.11–2 shows the low-income populations located within the same 80-km (50-mi) radius. This study area corresponds to the region of potential radiological impacts. Figures 5.2.11–1 and 5.2.11–2 show the distribution of these populations throughout the area around the site.

Table 5.2.11–1. Racial, Ethnic, and Socioeconomic Composition Surrounding LANL

Population Group	Population	Percent of Total
Hispanic or Latino	406,956	44.3
Black or African American	16,459	1.8
American Indian and Alaska Native	44,696	4.9
Asian	13,246	1.4
Native Hawaiian and Other Pacific Islander	624	0.1
Other Race	1,570	0.2
Two or More Races	14,031	1.5
White	420,025	45.8
Total	**917,607**	**100**

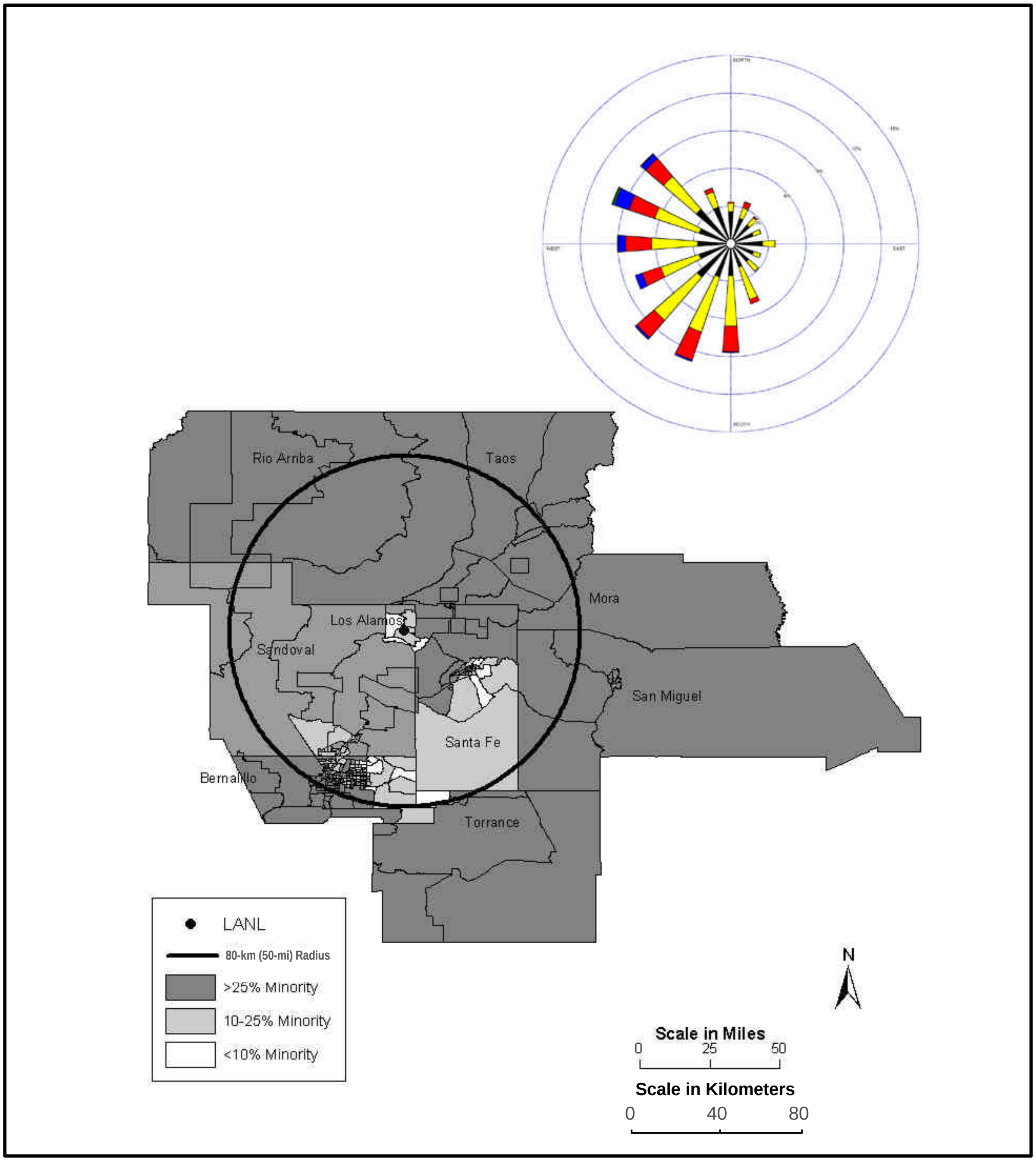

Figure 5.2.11–1. Distribution of the Minority Population Surrounding LANL

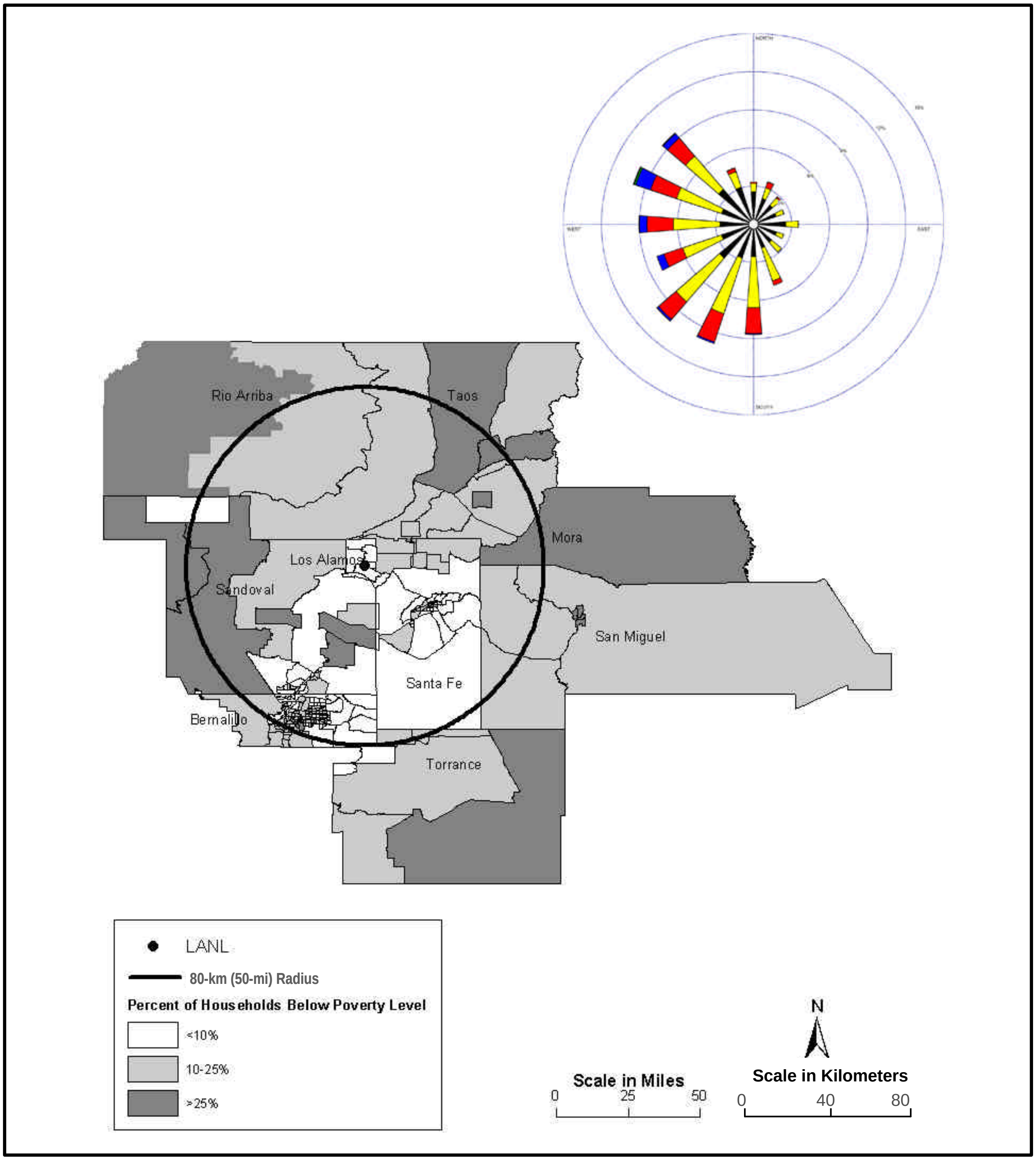

Figure 5.2.11–2. Distribution of the Low-Income Population Surrounding LANL

In 2002, minority populations comprised 30.9 percent of the U.S. population and 50.5 percent of the New Mexico population. The percentage of minority populations in the area surrounding LANL is 54.2 percent, more than that in the United States and the State of New Mexico.

Low-income populations comprised 12.4 percent of the U.S. population, based on 1999 income, and 18.4 percent of the New Mexico population. Within the counties surrounding LANL, 14.1 percent of the population lives below the poverty level.

As shown in Section 5.2.9, Human Health and Safety, there are no large adverse impacts to any populations. Therefore, there would be no disproportionately high and adverse impacts to minority or low-income populations.

5.2.12 Transportation

Impacts to the human environment from transportation can result from two sources: operation of the vehicle and the presence of the cargo. Vehicle-related impacts could include increased emissions, traffic congestion, noise, and traffic accidents. Cargo-related impacts could include incident-free radiation dose to those on and near the highway and radiation dose or chemical exposure from the cargo when the containers are breached following an accident.

This EIS is primarily concerned with determining a candidate DOE site for the MPF. A second EIS would be prepared once a DOE site is identified for more detailed analysis. Accordingly, this EIS focuses on a limited suite of analyses that will most specifically aid decisionmakers in distinguishing transportation impacts among the five DOE sites under consideration. NNSA has selected for quantitative analysis incident-free radiation dose to workers and the public, accident radiation dose-risk (which includes the probability of the accident occurring) to all individuals affected by the accident, and traffic accident fatalities. In addition, the analysis presents a qualitative discussion on traffic impacts near the DOE facility under both construction and operations. Traffic impacts would result from commuting workers and construction deliveries. Other potential analytical endpoints are roughly proportional to the analyzed endpoints and would yield similar relative distinction among the five DOE sites.

Appendix D, Radiological Transportation Analysis Methodology, presents NNSA's methodology in analyzing the selected analytical endpoints and provides some detail on the calculations, including the more important input parameters.

5.2.12.1 No Action Alternative

Construction Impacts

Under the No Action Alternative, there would be no construction at LANL.

Operations Impacts

Radiological transportation under the No Action Alternative for LANL would include transport of pits from Pantex (near Amarillo, Texas) to LANL, recycle of enriched uranium parts to and from the Y-12 National Security Complex (Oak Ridge, Tennessee), return of re-assembled pits to Pantex, and shipment of TRU waste to WIPP (near Carlsbad, New Mexico). Low-level waste (LLW) would be disposed of onsite at LANL. The number of pits processed per year would be limited to approximately 20. Table 5.2.12.1–1 presents the number of shipments under the No Action Alternative. Tables 5.2.12.1–2 and 5.2.12.1–3 present the incident-free impacts from this transportation. Tables 5.2.12.1–4 and 5.2.12.1–5 present the accident impacts.

Table 5.2.12.1–1. Number of Shipments per Year—No Action Alterative

Transported Materials	Number of Shipments
Pits	4
EU parts	4
TRU waste	20
Total	**28**

EU = enriched uranium.

Table 5.2.12.1–2. Annual Incident-Free Transportation Impacts to Workers—No Action Alternative

Transported Materials	Collective Dose (person-rem)	LCFs
Pits	0.017	6.6×10^{-6}
EU parts	0.064	2.6×10^{-5}
TRU waste	0.15	5.9×10^{-5}
Total	**0.23**	**9.1×10^{-5}**

Table 5.2.12.1–3. Annual Incident-Free Transportation Impacts to the General Public—No Action Alternative

Transported Materials	Collective Dose (person-rem)	LCFs
Pits	0.021	1.1×10^{-5}
EU parts	0.088	4.4×10^{-5}
TRU waste	0.25	1.3×10^{-4}
Total	**0.36**	**1.8×10^{-4}**

Table 5.2.12.1–4. Annual Transportation Accident Radiological Impacts—No Action Alternative

Transported Materials	Collective Dose (person-rem)	LCFs
Pits	2.5×10^{-8}	1.2×10^{-11}
EU parts	8.8×10^{-11}	4.4×10^{-14}
TRU waste	4.6×10^{-5}	2.3×10^{-8}
Total	**4.6×10^{-5}**	**2.3×10^{-8}**

Table 5.2.12.1–5. Annual Nonradiological Fatalities from Transportation Accidents—No Action Alternative

Transported Materials	Number of Accidents	Number of Fatalities
Pits	6.2×10^{-4}	3.8×10^{-5}
HEU parts	2.2×10^{-3}	1.6×10^{-4}
TRU Waste	1.3×10^{-3}	1.3×10^{-4}
Total	**4.1 ´ 10^{-3}**	**3.3 ´ 10^{-4}**

Because there would be no change from the baseline in operations employment under the No Action Alternative, there would be no change in traffic in the vicinity of LANL.

5.2.12.2 Modern Pit Facility Alternative

Construction Impacts

Construction of the MPF Alternative at LANL would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.2.10 and would be temporary.

Operations Impacts

Radiological transportation under the MPF Alternative for LANL would include transport of pits from Pantex to LANL, recycle of enriched uranium parts to and from the Y-12 National Security Complex, return of pits and enriched uranium parts to Pantex, and shipment of TRU waste to WIPP. LLW would be disposed of at LANL. NNSA's analysis includes options for 125, 250, and 450 ppy. Table 5.2.12.2–1 presents the number of shipments under the MPF Alternative. Tables 5.2.12.2–2 and 5.2.12.2–3 present the incident-free impacts from this transportation. Tables 5.2.12.2–4 and 5.2.12.2–5 present the accident impacts.

Table 5.2.12.2–1. Number of Shipments per Year at LANL for the MPF

Transported Materials	125 ppy	250 ppy	450 ppy
Pits	14	28	50
EU parts	10	20	36
TRU waste	74	93	142
Total	**98**	**141**	**228**

Table 5.2.12.2–2. Annual Incident-Free Transportation Impacts to Workers at LANL for the MPF

Transported Materials	125 ppy		250 ppy		450 ppy	
	Collective Dose (person-rem)	LCFs	Collective Dose (person-rem)	LCFs	Collective Dose (person-rem)	LCFs
Pits	0.058	2.3×10^{-5}	0.12	4.6×10^{-5}	0.21	8.3×10^{-5}
EU parts	0.16	6.4×10^{-5}	0.32	1.3×10^{-5}	0.58	2.3×10^{-4}
TRU waste	0.54	2.2×10^{-4}	0.68	2.7×10^{-4}	1.0	4.2×10^{-4}
Total	**0.76**	**3.0×10^{-4}**	**1.1**	**4.5×10^{-4}**	**1.8**	**7.3×10^{-4}**

Table 5.2.12.2–3. Annual Incident-Free Transportation Impacts to the General Public at LANL for the MPF

Transported Materials	125 ppy		250 ppy		450 ppy	
	Collective Dose (person-rem)	LCFs	Collective Dose (person-rem)	LCFs	Collective Dose (person-rem)	LCFs
Pits	0.075	3.7×10^{-5}	0.15	7.5×10^{-5}	0.27	1.3×10^{-4}
EU parts	0.22	1.1×10^{-4}	0.44	2.2×10^{-4}	0.79	3.9×10^{-4}
TRU waste	0.94	4.7×10^{-4}	1.2	5.9×10^{-4}	1.8	9.0×10^{-4}
Total	**1.2**	**6.2×10^{-4}**	**1.8**	**8.8×10^{-4}**	**2.9**	**1.4×10^{-3}**

Table 5.2.12.2–4. Annual Transportation Accident Radiological Impacts at LANL for the MPF

Transported Materials	125 ppy		250 ppy		450 ppy	
	Dose Risk (person-rem)	LCFs	Dose Risk (person-rem)	LCFs	Dose Risk (person-rem)	LCFs
Pits	8.7×10^{-8}	4.4×10^{-11}	1.7×10^{-7}	8.7×10^{-11}	3.1×10^{-7}	1.6×10^{-10}
EU parts	2.2×10^{-11}	1.1×10^{-13}	4.4×10^{-10}	2.2×10^{-13}	8.0×10^{-10}	4.0×10^{-13}
TRU waste	1.7×10^{-4}	8.5×10^{-8}	2.1×10^{-4}	1.1×10^{-7}	3.3×10^{-4}	1.6×10^{-7}
Total	**1.7×10^{-4}**	**8.6×10^{-8}**	**2.2×10^{-4}**	**1.1×10^{-7}**	**3.3×10^{-4}**	**1.6×10^{-7}**

Table 5.2.12.2–5. Annual Nonradiological Fatalities from Transportation Accidents for the MPF

Transported Materials	125 ppy		250 ppy		450 ppy	
	Number of Accidents	Number of Fatalities	Number of Accidents	Number of Fatalities	Number of Accidents	Number of Fatalities
Pits	2.2×10^{-3}	1.3×10^{-4}	4.3×10^{-3}	2.7×10^{-4}	7.7×10^{-3}	4.8×10^{-4}
EU parts	5.5×10^{-3}	3.9×10^{-4}	0.011	7.8×10^{-4}	0.020	1.4×10^{-3}
TRU waste	4.8×10^{-3}	4.9×10^{-4}	6.0×10^{-3}	6.1×10^{-4}	9.2×10^{-3}	9.4×10^{-4}
Total	**0.012**	**1.0×10^{-3}**	**0.021**	**1.7×10^{-3}**	**0.037**	**2.8×10^{-3}**

The addition of 988-1,797 new employees under the three capacity options would represent an increase in LANL employment ranging from 9.3-17 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.2.10.

Sensitivity Analysis

Should NNSA elect to operate a new 450 ppy facility at LANL in two shifts, the impacts would increase. The incident-free doses for the 450 ppy facility reported in Tables 5.2.12.2–1 and 5.2.12.2–2 would increase by a factor of approximately 1.8 because of the numbers of shipments would increase. The accident values in Table 5.2.12.2–3 would also increase by a factor of 1.8 because of the increased probability of the accident; however, the consequences of an accident, should one occur, would not change. The duration of traffic congestion during shift change would increase.

5.2.12.3 TA-55 Upgrade Alternative

Construction Impacts

Upgrading TA-55 at LANL would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to exacerbate congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.2.10 and would be temporary.

Operations Impacts

Radiological transportation under the TA-55 Upgrade Alternative for LANL would include transport of pits from Pantex to LANL, recycle of enriched uranium parts to and from the Y-12 National Security Complex, return of pits and enriched uranium parts to Pantex, and shipment of TRU waste to WIPP. LLW would be disposed of at LANL. NNSA estimates that approximately 80 ppy could be processed at the upgraded facility. Table 5.2.12.3–1 presents the number of shipments for the TA-55 Upgrade Alternative. Tables 5.2.12.3–2 and 5.2.12.3–3 present the incident-free impacts from this transportation. Tables 5.2.12.3–4 and 5.2.12.3–5 present the accident impacts.

Table 5.2.12.3–1. Number of Shipments per Year—TA-55 Upgrade Alternative

Transported Materials	Number of Shipments
Pits	10
EU parts	6
TRU waste	55
Total	**71**

Table 5.2.12.3–2. Annual Incident-Free Transportation Impacts to Workers—TA-55 Upgrade Alternative

Transported Materials	Collective Dose (person-rem)	LCFs
Pits	0.041	1.7×10^{-5}
EU parts	0.097	3.9×10^{-5}
TRU waste	0.40	1.6×10^{-4}
Total	**0.54**	**2.2 ´ 10^{-4}**

Table 5.2.12.3–3. Annual Incident-Free Transportation Impacts to the General Public—TA-55 Upgrade Alternative

Transported Materials	Collective Dose (person-rem)	LCFs
Pits	0.53	2.7×10^{-5}
EU parts	0.13	6.6×10^{-5}
TRU waste	0.70	3.5×10^{-4}
Total	**0.88**	**4.4 ´ 10^{-4}**

Table 5.2.12.3–4. Annual Transportation Accident Radiological Impacts—TA-55 Upgrade Alternative

Transported Materials	Collective Dose (person-rem)	LCFs
Pits	6.2×10^{-8}	3.1×10^{-11}
EU parts	1.3×10^{-10}	6.6×10^{-14}
TRU waste	1.3×10^{-4}	6.4×10^{-8}
Total	**1.3 ´ 10^{-4}**	**6.4 ´ 10^{-8}**

Table 5.2.12.3–5. Annual Nonradiological Fatalities from Transportation Accidents—TA-55 Upgrade Alternative

Transported Materials	Number of Accidents	Number of Fatalities
Pits	1.5×10^{-3}	9.6×10^{-5}
HEU parts	3.3×10^{-3}	2.3×10^{-4}
TRU Waste	3.6×10^{-3}	3.6×10^{-4}
Total	**8.4 ´ 10^{-3}**	**6.9 ´ 10^{-4}**

The addition of 680 new employees would represent an increase in LANL employment of 6.4 percent, with a corresponding increase in commuting traffic. Although this traffic increase would tend to exacerbate congestion on local roads, the increase is small compared to the overall average daily traffic level reported in Section 4.2.10 and less than that for the MPF Alternative.

5.2.13 Waste Management

This section considers the burden that waste generation associated with the construction and operation of the MPF places on the LANL waste treatment, storage, and disposal infrastructure. Impacts are evaluated based on routine waste generation, excluding wastes generated from environmental restoration or decontamination and decommissioning (D&D) activities. Impacts associated with transportation of radioactive waste from LANL to offsite disposal facilities are provided in Section 5.2.12.

5.2.13.1 No Action Alternative

Under the No Action Alternative, DOE would continue to use the plutonium pit manufacturing capability of PF-4 located in TA-55 at LANL. There would be no change to the current and planned LANL waste management activities described in Section 4.2.11.

5.2.13.2 Modern Pit Facility Alternative

Construction Impacts

Construction of the MPF would generate solid and liquid sanitary waste and liquid hazardous waste. Table 5.2.13.2–1 summarizes the total volume of waste generated over the 6 years of construction activity for the three proposed MPF operating capacities.

Table 5.2.13.2–1. Total Waste Generation From Construction of the MPF (m^3)

Waste type	MPF Operating Capacity		
	125 ppy	250 ppy	450 ppy
Hazardous waste	4.9	5.1	5.9
Sanitary waste	7,110	7,870	11,200
Sanitary wastewater	37,500	41,300	54,100

Source: MPF Data 2003.

MPF construction activities would increase LANL's routine waste generation by as much as 83 percent. However, LANL is capable of meeting applicable waste acceptance criteria, and offsite disposal capacities are much greater than LANL's projected waste volumes.

Solid nonhazardous wastes are currently disposed of in the Los Alamos County Landfill, which is located onsite. In 2004, that facility will be replaced by a new offsite regional solid waste disposal facility. Sanitary waste generated during MPF construction would increase LANL's routine waste generation by 53-83 percent, depending on the operating capacity. The waste would be disposed of at the offsite facility, which would be expected to have adequate capacity to handle the projected waste volume.

Hazardous wastes would be sent offsite for treatment and disposal at a commercial facility. The waste generated from MPF construction activities represents an increase of about 1 percent in the routine annual hazardous waste generated at LANL. Commercial treatment is readily available and currently used to treat LANL hazardous wastes.

Sanitary wastewater generated during MPF construction would be managed using portable toilet systems or put into the LANL sanitary sewer system. The anticipated volume of sanitary wastes (17,100-24,700 L/day [4,500-6,500 gal/day]) represents about 1 percent of the design capacity of the Sanitary Wastewater Systems (SWS) Plant at TA-46 and would have minimal impact.

A detention pond would be constructed to manage stormwater runoff from the entire MPF site including the Construction Laydown Area and Concrete Batch Plant. The basin would be sized to limit stormwater discharge from the developed site to no greater than the pre-existing conditions, with a basin area of approximately 0.4 ha (1 ac) per 16 ha (40 ac) of developed land.

A Concrete Batch Plant would operate at the MPF site during the construction phase. The Concrete Batch Plant would include a basin to manage wastewater from equipment washout activities. The facility would be located on approximately 4 ha (10 ac) and adjacent to the PIDAS area. The Concrete Batch Plant would be disassembled and the area would be restored once MPF construction is completed.

Operations Impacts

Normal operation of the MPF would generate TRU waste, LLW, mixed LLW, hazardous waste, and sanitary waste. Table 5.2.13.2–2 summarizes the estimated waste generation rates for the three proposed MPF operating capacities.

Table 5.2.13.2–2. MPF Operations Annual Waste Generation (m^3)

Waste type	MPF Operating Capacity		
	125 ppy	250 ppy	450 ppy
TRU waste	590	740	1,130
LLW	2,070	3,300	5,030
Mixed LLW—solid	1.5	2.0	3.5
Mixed LLW—liquid	0.2	0.4	0.7
Hazardous waste—solid	2.5	3.0	5.0
Hazardous waste—liquid	0.3	0.4	0.6
Sanitary waste	5,500	5,800	6,900
Sanitary wastewater	45,000	61,900	81,800

Source: MPF Data 2003.

The projected TRU waste volumes for the three proposed MPF operating capacities represent an increase of 620, 780, and 1,200 percent, respectively, in the annual routine TRU waste generation at LANL. TRU waste generated from plutonium pit manufacturing includes gloves, filters, and other operations/maintenance waste from the MPF gloveboxes. Americium process waste would be solidified and packaged as TRU waste. About 36 percent of the TRU waste would be mixed waste. The waste would be transferred from the MPF process buildings to the Waste Staging/TRU Packaging Building, which would be located outside of the PIDAS. The Waste Staging/TRU Packaging Building would include a staging area with capacity for approximately 1,200 TRU waste drums (about 250 m^3 [8,829 ft^3] of TRU waste). A drum loading area equipped with overhead bridge cranes would load the waste drums into Transuranic Package Transporter (TRUPACT-II) shipping containers and load the TRUPACT-II containers onto trucks for transport to WIPP. The size of the Waste Staging/TRU Packaging Building (approximately 1,950 m^2 [20,990 ft^2]) is not expected to vary with the MPF operating capacity. Section 6.5 discusses the availability of WIPP for disposal of TRU waste resulting from MPF operations.

LLW from MPF operations would include job control waste, failed equipment, and other general operations/maintenance waste. Any liquid LLW resulting from MPF operations would be solidified prior to leaving the facility. LLW volumes for the three proposed MPF operating capacities would increase the annual routine LLW generation at LANL by 400, 600, and 900 percent, respectively. The LLW would be transferred to TA-54, Area G, for onsite disposal. As described in Section 4.2.11.1, DOE has decided to expand LLW disposal capacity into Zones 4 and 6 at Area G. Additional sites within Area G are expected to provide 50-100 years of disposal capacity for LANL-generated LLW. The projected LLW volume for disposal at Area G is about 320,000 m^3 (11,300,800 ft^3) (DOE 2000h). The remaining Area G (1,255,000 m^3 [44,113,250 ft^3]) could readily accommodate the projected LLW volumes (104,000 – 251,000 m^3 [3,672,760 – 8,864,000 ft^3]) from MPF operations.

MPF operations would generate small amounts of hazardous waste and mixed LLW. These wastes include lead acid batteries, lubricating oils/fluids, rags, and sorbents. The projected hazardous waste volume from MPF operations represents 3-6 percent of the annual volume routinely managed by LANL. Commercial treatment is readily available and currently used to treat LANL hazardous wastes.

LANL's routine mixed LLW generation is very small (about 5 m^3/yr [176 ft^3/yr]). MPF operations would increase the annual routine mixed LLW generation by 29-71 percent over current LANL operations. This waste would be managed in accordance with the LANL Site Treatment Plan. The mixed LLW would be transferred to TA-54, where it would be shipped to commercial or DOE treatment and disposal facilities. LANL is capable of meeting applicable waste acceptance criteria, and offsite disposal capacities are much greater than the projected MPF waste volumes.

Nonhazardous waste from MPF operations includes sanitary solid waste and wastewater. Sanitary waste would be disposed offsite at the regional solid waste disposal facility. Although sanitary waste volumes would increase by 250-310 percent relative to current LANL routine operations, the offsite facility would be expected to have adequate capacity to handle the projected amount of waste.

Sanitary wastewater would be transferred to the SWS Plant at TA-46. The projected sanitary wastewater volumes for the three proposed MPF operating capacities are 123,000, 170,000, and 224,000 L/day (32,600, 44,800, and 59,200 gal/day), respectively. In 2000, the SWS Plant processed a maximum of about 950,000 L/day (250,000 gal/day) relative to its design capacity of 2.3 million L/day (600,000 gal/day) (DOE 2002k). There would be adequate capacity for the SWS Plant to manage the sanitary wastewater from MPF operations.

MPF operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the operation and maintenance of safety showers in contamination areas, the operation of decontamination stations, the mopping of floors in contamination areas, and the testing of fire sprinkler systems located in contamination areas. Wastewaters that could potentially be contaminated would be collected, sampled, and analyzed prior to discharge. Any contaminated wastewater would be solidified by processing through the liquid process waste facilities for the plutonium purification process (MPF Data 2003).

Sensitivity Analysis

DOE could operate the MPF using a double shift to increase the plutonium pit manufacturing capability. Double-shift operation of the 450 ppy facility would approximately double the impacts to the LANL waste management infrastructure from those described above for single-shift operation. Although this would substantially increase the LANL routine waste generation, the volumes resulting from double-shift operation are not expected to exceed the available capacities of the waste management facilities. See Section 6.5 for a discussion of the availability of WIPP for disposal of TRU waste resulting from MPF operations.

5.2.13.3 TA-55 Upgrade Alternative

Under this alternative, DOE would upgrade the plutonium pit manufacturing capability of PF-4 located in TA-55 at LANL. Waste management activities under this alternative would be similar to those described for the Pit Fabrication and Reuse Facility in Section A.3.3 of the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (DOE 1996c).

Modifications to PF-4 would include a major upgrade of the residue recovery/metal feed area. Many of the gloveboxes in this part of the facility would be replaced. There would also be significant glovebox decontamination/decommissioning/disposal operations as new process development and certification operations are moved into other areas of PF-4. When the upgrades are completed, the Pit Fabrication and Reuse Facility at PF-4 would have the capability of producing 80 ppy.

DOE would construct a small glovebox decontamination/handling facility at TA-54 that is specifically designed to prepare the decommissioned gloveboxes from PF-4 for disposal at WIPP. Wastes associated with the replacement of approximately 140 gloveboxes over a 10-year period are addressed as part of the operations phase for this alternative.

Construction Impacts

Construction activities would generate solid and liquid sanitary waste and liquid hazardous waste. Table 5.2.13.3–1 summarizes the total volume of waste generated over the 4 years of construction activity.

Table 5.2.13.3–1. Total Waste Generation from TA-55 Upgrades (m^3)

Waste type	Volume
Hazardous waste	3
Sanitary waste	7,500
Sanitary wastewater[a]	6,000

[a] Assumes 14 m^3 per worker year
Source: MPF Data 2003.

Construction activities would increase LANL's routine waste generation by as much as 85 percent. However, LANL is capable of meeting applicable waste acceptance criteria, and offsite disposal capacities are much greater than LANL's projected waste volumes.

Sanitary waste generated during construction would increase LANL's routine waste generation by 85 percent. As described above, the waste would be disposed of at the offsite regional solid waste disposal facility, which would be expected to have adequate capacity to handle the projected waste volume.

Hazardous waste generated from construction activities represents an increase of about 1 percent in the routine annual hazardous waste generated at LANL. The waste would be sent offsite for treatment and disposal at a commercial facility. Such treatment is readily available and currently used to treat LANL hazardous wastes.

Sanitary wastewater generated during construction would be managed using portable toilet systems or put into the LANL sanitary sewer system. The anticipated volume of sanitary wastes 4,164 L/day (1,100 gal/day) represents less than 1 percent of the design capacity of the SWS Plant and would have minimal impact.

Operations Impacts

Normal operation of the upgraded TA-55 facility would generate TRU waste, LLW, mixed LLW, hazardous waste, sanitary waste, and sanitary wastewater. Table 5.2.13.3–2 summarizes the estimated waste generation rates for the production of 80 ppy.

Table 5.2.13.3–2. Operations Annual Waste Generation Under the TA-55 Upgrade Alternative (m^3)

Waste type	80 ppy Operating Capacity
TRU waste - solid[a]	440
TRU waste - liquid	5
LLW - solid	1,430
LLW - liquid	15
Mixed LLW	53
Hazardous waste - solid	203
Hazardous waste - liquid	2
Sanitary waste	552
Sanitary wastewater	12,300

[a] Includes 56 m^3 per year over a 10-year period to replace gloveboxes in PF-4.
Source: MPF Data 2003.

The projected TRU waste volume for PF-4 operations represents an increase of 470 percent in the annual routine TRU waste generation at LANL. This TRU waste includes gloves, filters, and other operations/maintenance waste from the PF-4 gloveboxes. Americium process waste would be solidified and packaged as TRU waste. A small amount (2 m^3 [71 ft^3]) of the annual TRU waste volume is expected to be mixed waste. The solid TRU waste would be transferred from PF-4 to TA-54 for storage pending shipment offsite for disposal. Liquid TRU waste would be processed through the Radioactive Liquid Waste Treatment Facility (RLWTF) in TA-50. Section 6.5 discusses the availability of WIPP for disposal of TRU waste resulting from PF-4 operations.

LLW from pit manufacturing operations would include job control waste, failed equipment, and other general operations/maintenance waste. The projected LLW volumes would increase the annual routine LLW generation at LANL by 280 percent. Any liquid LLW would be transferred to the RLWTF. The solid LLW would be transferred to TA-54, Area G, for onsite disposal. As described in Section 4.2.11.1, Area G is expected to provide 50-100 years of disposal capacity for LANL-generated LLW and could readily accommodate the projected LLW volumes from PF-4 operations.

Pit manufacturing operations would generate hazardous waste and mixed LLW. These wastes include lead acid batteries, lubricating oils/fluids, rags, and sorbents.

The projected hazardous waste volume from pit manufacturing operations would increase the annual volume routinely managed by LANL by 210 percent. Although this would substantially increase the hazardous waste volume routinely managed at LANL, commercial treatment is readily available.

Pit manufacturing would increase the annual routine mixed LLW generation at LANL by a factor of 9.0 over current LANL operations. This waste would be managed in accordance with the LANL Site Treatment Plan. The mixed LLW would be transferred to TA-54, where it would be shipped to commercial or DOE treatment and disposal facilities. LANL is capable of meeting applicable waste acceptance criteria, and offsite disposal capacities are greater than the projected waste volumes.

Nonhazardous waste from MPF operations includes sanitary solid waste and wastewater. Sanitary waste would be disposed offsite at the regional solid waste disposal facility. The sanitary waste volumes would increase by 25 percent relative to current LANL routine operations. The offsite facility would be expected to have adequate capacity to handle the projected amount of waste.

Sanitary wastewater would be transferred to the SWS Plant at TA-46. The projected sanitary wastewater volume is 33,690 L/day (8,900 gal/day). This represents 1.5 percent of the design capacity 2.2 million L/day (600,000 gal/day) of the SWS. There would be adequate capacity for the SWS Plant to manage the sanitary wastewater from pit manufacturing operations.

MPF operations are not expected to generate radioactive wastewater. However, the potential does exist for generating radioactively contaminated water from the discharge of fire-sprinkler water inside the process areas. If that were to occur, the water would be contained and treated as process wastewater. Any contaminated wastewater would be processed by the RLWTF at TA-50.