5.6 CARLSBAD SITE

The following section discusses the environmental impacts associated with the No Action Alternative and the MPF Alternative at the Carlsbad Site. 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.

5.6.1 Land Use and Visual Resources

5.6.1.1 Land Use

The proposed concept for the 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, 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, HVAC Exhaust Stacks, Waste Staging/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), stack 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.

The MPF reference location for the Carlsbad Site is in the southern half of Section 21 of Township 22 South and Range 31 East, within the Off Limits Area, just east of the DOE Exclusive Use Area (see Figure 4.6.1.1–2). There are approximately 130 ha (321 ac) available for development in this location. As previously stated, the primary land usage in this area is grazing.

It should be noted that the reference location is one preliminary potential location to place the MPF. There may actually be more than one potential location for MPF placement at the Carlsbad Site. In a more site-specific EIS, the actual location would be chosen and analyzed.

It may also be noted that land outside of the WIPP site boundary at the Carlsbad Site may have potential for MPF placement. However, the NNSA notes that future land withdrawal action by

Congress would be required in order to proceed with the construction of a MPF at the Carlsbad Site either on land within the WIPP site boundary or on land in the vicinity that is outside of the existing WIPP site boundary. Additionally, the existing rights to the land outside of the WIPP site boundary, several of which are held by private interests, would need to be considered. It should be noted that the reference location is one preliminary potential location to place the MPF. There may actually be more than one potential location for MPF placement at the Carlsbad Site. In a more site-specific EIS, the actual location would be chosen and analyzed.

It may also be noted that land outside of the WIPP site boundary at the Carlsbad site may have potential for MPF placement. However, the NNSA notes that future land withdrawal action by Congress will be required to proceed with the construction of a MPF at the Carlsbad Site either on land within the WIPP site boundary or on land in the vicinity that is outside of the existing WIPP site boundary. Additionally, the existing rights to the land outside of the WIPP site boundary, several of which are held by private interests, would need to be considered.

No Action Alternative

Under the No Action Alternative, no new buildings or facilities would be built and current operations would not change. The reference location would continue to be used for grazing. There would be no impact on land use at the WIPP 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 land required for the proposed MPF construction would represent approximately 1.4-1.7 percent of WIPP's total land area of 41 km^2 (16 mi^2), a relatively small proportion.

Although there would be a change in land use, the proposed MPF is compatible with current land use plans for this area. No impacts to WIPP land use plans or policies are expected.

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 1.1-1.3 percent of WIPP's total land area of 41 km^2 (16 mi^2), a relatively small proportion.

Although there would be a change in land use, the proposed MPF is compatible with current land use plans for this area. No impacts to the Carlsbad Site land use plans or policies are expected.

Sensitivity Analysis

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

5.6.1.2 Visual Resources

No Action Alternative

Under the No Action Alternative, there would be no impact on visual resources at the Carlsbad Site 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 the reference location due to the presence of construction equipment, new buildings in various stages of construction, and possibly increased dust. These changes would be temporary and visible by the general public only from southern and western viewpoints beyond site boundaries. Thus, impacts on visual resources during construction would be similar to those observed during the construction of previously developed areas of the site.

Operations Impacts

The MPF, which would include one- and two-story buildings, storage tanks, and two HVAC exhaust stacks, would change the appearance of the reference location. However, this change would be consistent with the currently developed areas of the WIPP site. New construction would not change the current Class IV BLM Visual Resource Management rating of the WIPP site.

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.

5.6.2 Site Infrastructure

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

5.6.2.1 No Action Alternative

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

5.6.2.2 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 5.6.2.2–1. Existing infrastructure at the Carlsbad Site would be adequate to support annual construction requirements for the proposed plant sizes for the projected 6-year construction period. Infrastructure requirements for construction would have a minor impact on current site infrastructure.

Operations Impacts

The estimated annual site infrastructure requirements for the pit production capacities of 125, 250, or 450 ppy are presented in Table 5.6.2.2–2.

The existing power grid is capable of supplying sufficient electrical power to operate the MPF. Two new transformers also would be needed to upgrade the existing system to provide redundant electrical power to the MPF.

Currently, the Carlsbad Site does not use natural gas or coal which are necessary for the production of steam for heating. Natural gas supplies to meet MPF requirements for steam are readily available near the Carlsbad Site, even though natural gas is not currently used onsite. Impacts to liquid fuel and process gases would be negligible.

Sensitivity Analysis

Since the Carlsbad Site does not have sufficient electrical power capacity to support 450 ppy, surge use of two-shift operations could not be accommodated at the Carlsbad Site. Therefore, additional electrical capacity would need to be provided. Natural gas or coal capacity would have to be adequate to support surge operations. Impacts to liquid fuel and process gases are expected to be negligible.

Table 5.6.2.2–1. Annual Site Infrastructure Requirements for Construction of MPF at the Carlsbad Site

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	**175,200**	**20**	**Not limited[a]**	**0**	**Not limited[a]**
Available site capacity	**155,441**	**16.2**	**Not limited**	**0**	**Not limited**
No Action Alternative					
Total site requirement	19,759	3.8	113,600	0	Not limited
Percent of site capacity	11%	19%	Not limited	0	Not limited
MPF Alternative					
125 ppy					
Total site requirement	20,700	6.8	1,600,000	0	Not limited
Percent of site capacity	12%	34%	Not limited	0	Not limited
Change from No Action	1,000	3	1,520,000	0	2,200
Percent of available capacity	0.6%	19%	Not limited	0	Not limited
Peak requirement	NA	NA	2,600,000	0	4,000
250 ppy					
Total site requirement	20,900	7.3	1,800,000	0	Not limited
Percent of site capacity	12%	37%	Not limited	0	Not limited
Change from No Action	1,125	3.5	1,700,000	0	2,500
Percent of available capacity	0.7%	22%	Not limited	0	Not limited
Peak requirement	NA	NA	2,900,000	0	4,200
450 ppy					
Total site requirement	21,000	7.8	2,280,000	0	Not limited
Percent of site capacity	12%	39%	Not limited	0	Not limited
Change from No Action	1,333	4	2,170,000	0	3,200
Percent of available capacity	0.9%	25%	Not limited	0	Not limited
Peak requirement	NA	NA	3,700,000	0	5,700

[a] Not limited due to offsite procurement.
NA = Not Applicable
Source: MPF Data 2003.

Table 5.6.2.2–2. Annual Site Infrastructure Requirements for Facility Operations Under MPF at the Carlsbad Site

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	**175,200**	**20**	**Not limited[c]**	**0**	**Not limited[c]**	**Not limited[c]**
Available site capacity	**155,441**	**16.2**	**Not limited**	**0**	**Not limited**	**Not limited**
No Action Alternative						
Total site requirement	19,759	3.8	113,600	0	Not limited	Not limited
Percent of site capacity	11%	19%	Not limited	0	Not limited	Not limited
MPF Alternative						
125 ppy[a,b]						
Total site requirement	99,000	24.3	373,000	4,400,000	Not limited	Not limited
Percent of site capacity	57%	122%	Not limited	NA	Not limited	Not limited
Change from No Action	79,800	20.5	260,000	4,400,000[d]	224,000	4,200
Percent of available capacity	51%	127%	Not limited	NA	Not limited	Not limited
250 ppy[a,b]						
Total site requirement	133,000	27.3	471,000	4,990,000	Not limited	Not limited
Percent of site capacity	76%	137%	Not limited	NA	Not limited	Not limited
Change from No Action	114,000	23.5	360,000	4,990,000[d]	245,000	7,300
Percent of available capacity	73%	145%	Not limited	NA	Not limited	Not limited
450 ppy[a,b]						
Total site requirement	195,000	40.3	697,000	7,730,000	Not limited	Not limited
Percent of site capacity	112%	202%	Not limited	NA	Not limited	Not limited
Change from No Action	176,000	36.5	580,000	7,730,000[d]	303,000	11,800
Percent of available capacity	113%	225%	Not limited	NA	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] Natural gas requirement for the generation of steam. Steam is used for heating.

NA = Not Applicable.

Source: MPF Data 2003.

5.6.3 Air Quality and Noise

5.6.3.1 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 PSD increment analysis is not required.

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 WIPP 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 oxide, PM_{10}, total suspended particulates, and carbon monoxide. The calculation of emissions from construction equipment was based on emission factors provided in the EPA document AP-42, "Compilation of Air Pollutant Emission Factors" (EPA 1995). For highway vehicles (worker commuting vehicles and delivery vehicle) 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/ha (1.20 tons/ac) 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 NAAQS beyond the existing WIPP site boundary at the Carlsbad Site. Therefore, air quality impacts resulting from construction would be small.

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 5.6.9, 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) include carbon monoxide, nitrogen dioxide, PM_{10}, sulfur dioxide, 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. These emissions would be incremental to the Carlsbad Site baseline. If the Carlsbad Site 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 the Carlsbad Site 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 Carlsbad 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 5.6.3.1–1. 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 nitrogen dioxide under the 450 ppy scenario, but ambient concentrations 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 5.6.3.1–1. Criteria Pollutant Concentrations at the Existing WIPP Site Boundary for the Carlsbad Site for the MPF—Operations

Pollutant	Averaging Period	Most Stringent Standard or guideline [a] (µg/m^3)	Maximum Incremental Concentration (µg/m^3)			
			Baseline [b]	MPF		
				125 ppy	250 ppy	450 ppy
Carbon monoxide	8-hour	7,800	NA	4.5	6.2	10
	1-hour	11,700	NA	6.4	8.8	14
Nitrogen dioxide	Annual	73.7	NA	2.3	3.2	5.2
	24-hour	147	NA	11.1	16	26
Sulfur dioxide	Annual	41	NA	0.16	0.22	0.35
	24-hour	205	NA	0.79	1.1	1.8
	3-hour	1,030	NA	1.8	2.4	4.0
PM_{10}	Annual	50	NA	0.063	0.085	0.14
	24-hour	150	NA	0.31	0.43	0.70
Total Suspended Particulates	Annual	60	NA	0.17	0.23	0.38
	24-hour	150	NA	0.84	1.2	1.9

[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. Aiken County ambient concentrations are listed.
NA = not available.
Source: MPF Data 2003, 20 NMAC 2.3.

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 5.6.9, Human Health and Safety.

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 are bounded by the 450 ppy plant releases (see Table 5.6.3.1–1). A review of the maximum incremental concentrations in Table 5.6.3.1–1 indicates that if the maximum incremental concentration of each criteria pollutant for the 450 ppy facility were conservatively doubled for surge capacity, concentrations would still not approach the most stringent standards or guideline concentrations.

5.6.3.2 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 5.6.9, 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 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 5.6.3.2–1). While radionuclide emissions at WIPP would noticeably increase under each of the three capacity scenarios, the total amount released would be small. 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 5.6.3.2–1. Annual Radiological Air Emissions for the MPF at the Carlsbad Site—Operations

Isotope	Annual Emissions (Ci/yr)			
	Baseline[a,b]	125 ppy	250 ppy	450 ppy
Americium-241	5.05×10^{-19}	2.08×10^{-7}	3.81×10^{-7}	7.61×10^{-7}
Plutonium-239	NA	7.72×10^{-6}	1.19×10^{-5}	2.05×10^{-5}
Plutonium-240	NA	2.01×10^{-6}	3.10×10^{-6}	$5.6.35 \times 10^{-6}$
Plutonium-241	NA	1.48×10^{-4}	2.28×10^{-4}	3.94×10^{-4}
Total Plutonium	**1.04×10^{-18}**	**1.58×10^{-4}**	**2.43×10^{-4}**	**4.20×10^{-4}**
Uranium-234	8.00×10^{-17}	4.19×10^{-9}	5.58×10^{-9}	8.38×10^{-9}
Uranium-235	4.57×10^{-18}	1.32×10^{-10}	1.76×10^{-10}	2.64×10^{-10}
Uranium-236	NA	2.13×10^{-11}	2.84×10^{-11}	4.26×10^{-11}
Uranium-238	7.84×10^{-17}	1.18×10^{-12}	1.58×10^{-12}	2.36×10^{-12}
Total Uranium	**1.63×10^{-16}**	**4.34×10^{-9}**	**5.79×10^{-9}**	**8.69×10^{-9}**
Total	**1.64×10^{-16}**	**1.58×10^{-4}**	**2.43×10^{-4}**	**4.21×10^{-4}**

[a] The No Action Alternative is represented by the baseline.
[b] Onsite emissions only.
NA = not available.
Source: WSRC 2002f.

DOE estimated the radiation doses to the offsite MEI and the offsite population surrounding the Carlsbad Site. As shown in Table 5.6.3.2–2, 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 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 5.6.9, Human Health and Safety.

Table 5.6.3.2–2. Annual Doses Due to Radiological Air Emissions from MPF Operations at the Carlsbad Site

Receptor	125 ppy	250 ppy	450 ppy
Maximally Exposed Offsite Individual[a] (mrem/yr)	2.3×10^{-8}	3.6×10^{-8}	6.5×10^{-8}
Population within 80 km (50 mi) (person-rem per year)	4.2×10^{-8}	6.8×10^{-8}	1.2×10^{-7}

[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 5.6.3.2–1). A review of the annual radiological emissions in Table 5.6.3.2–1 indicates that if the emissions for the 450 ppy facility were conservatively doubled for surge capacity, concentrations would remain very low. The additional dose represented by these emissions would be well below regulatory limits.

5.6.3.3 Noise

No Action Alternative

Construction Impacts

Under the No Action Alternative, continuing operations at the Carlsbad Site 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 4.6.3.5 would continue. These noise-generating activities are included in the Carlsbad Site baseline and are not expected to change under the No Action Alternative.

Modern Pit Facility Alternative

Construction Impacts

Construction of new buildings 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 would not include loud impulsive sources such as blasting. Although noise levels in construction areas could be as high as 110 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 (4.6 km [2.8 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.

Construction 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.

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. 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 4.6 km [2.8 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. Workers on second shift would be exposed to the same level of noise as workers on the first shift. 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.

5.6.4 Water Resources

Environmental impacts associated with the proposed alternatives at the Carlsbad Site could affect groundwater resources. No impacts to surface water are expected. At the Carlsbad Site, groundwater resources would be used to meet all construction and operations water requirements. Table 5.6.4–1 summarizes existing groundwater resources at the Carlsbad Site, the total site-wide water resource requirements for each alternative, and the potential changes to water resources at the Carlsbad Site resulting from the proposed alternatives.

Table 5.6.4–1. Potential Changes to Water Resources from the MPF at the Carlsbad Site

Affected Resource Indicator	No Action[a]	MPF 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
Total site water operation requirement (million L/yr)	25.96	36.7	37.8	42.3
Percent change from No Action water use (25.96 million L/yr)	NA	41.2%	45.5%	62.8%
Water Quality				
Wastewater discharge into sewage lagoon and treatment facility	0.082	1.12	1.23	1.59
Percent change from No Action Alternative wastewater discharge	NA	1,265%	1,400%	1,839%
Operations – *Water Availability and Use*				
Water source	Ground	Ground	Ground	Ground
Total site-wide water operation requirement (million L/yr)	25.96	303.4	355.5	530.3
Percent change from No Action water use (13,249 million L/yr)	NA	1,068.6%	1,269.3%	1,942.6%
Water Quality				
Wastewater discharge into sewage lagoon and treatment facility (million L/yr)	0.082	45.08	61.98	81.88
Percent change from No Action Alternative wastewater discharge (0.082 million L/yr)	NA	54,878.0%	75,487.8%	99,756.1%
Floodplain				
Actions in 100-year floodplain	NA	None	None	None
Actions in 500-year floodplain	NA	None	None	None

All discharges to natural drainages require NPDES permits.
[a] Source: DOE 1997b.
Source: MPF Data 2003.

5.6.4.1 Surface Water

No Action Alternative

Under this alternative, additional impacts on surface water resources are anticipated at the Carlsbad Site 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 the Carlsbad Site, as groundwater is the source of water at the Carlsbad Site. 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, onsite discharge of sanitary wastewater would be minimized.

During construction, an estimated total of 37.48 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 ppy, 250 ppy, 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 waste generated during construction would be from sanitary wastewater, with the remaining amount attributed to concrete construction activities. A NPDES permit for stormwater involving construction activities needs to be obtained to handle water runoff from construction at WIPP.

The potential for stormwater runoff from construction areas to impact downstream surface water quality is small. 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. The Carlsbad Site would comply with Federal and state regulations to prevent, control, and handle potential spills from construction activities. However, the reference location at the Carlsbad Site 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 the Carlsbad Site does not lie within the 100-year floodplain and the site is protected from flooding by the diversion of water away from the site by a system of peripheral interceptor diversions. Therefore, no impacts on the 100-year floodplain are anticipated. No information on the 500-year floodplain is available.

Operations Impacts

No impacts on surface water resources are expected as a result of operations at the Carlsbad Site. No surface water would be used to support facility activities, and there would be no discharge of sanitary or industrial effluent to surface waters. Sanitary wastewater would be generated as a

result of 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 (11.9 million gal), 61.9 million L (16.4 million gal), and 81.8 million L (21.6 million gal) of sanitary wastewater would be generated for the 125 ppy, 250 ppy, and 450 ppy facilities, respectively. These quantities would represent 54,878 percent, 75,488 percent, and 99,756 percent increases, respectively, in sanitary wastewater discharges. WIPP's current discharge plan would require modification and approval concerning the increase in wastewater discharges. Sanitary wastewater would be treated, monitored, and discharged into the existing WIPP sewage lagoon at the Carlsbad Site, as required under the discharge plan. The lagoon would require modifications to handle additional volume. No industrial or other regulated discharges to surface waters are anticipated.

The MPF would not generate any radioactive water emissions. However, there is a potential for generating radioactive contaminated water from the operation 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 converted to a solid and disposed of in accordance with DOE procedures. The water emissions that are sampled, analyzed, and determined to be contaminated can be converted to a solid by processing through the MPF liquid process waste facilities for the plutonium purification process.

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.

5.6.4.2 Groundwater

No Action Alternative

Under this alternative, additional impacts on groundwater availability or quality are anticipated at the Carlsbad Site 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 construction personnel would greatly reduce water use over that normally required during construction. In addition, the 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 ppy, 250 ppy, 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 (2.8 million gal), 11.8 million L (3.1 million gal), and 16.3 million L (4.3 million gal) would be needed for the 125, 250, and 450 ppy facilities, respectively. The total site water requirement including these quantities would be within WIPP's maximum water allotment of 75.7 million L (20 million gal). It is anticipated that this water would be derived from WIPP's groundwater distribution system 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 to be released to the surface or subsurface and to ensure that waste materials are properly disposed. In general, no impact on groundwater availability or quality is anticipated.

Operations Impacts

Activities at the Carlsbad Site under the MPF would use groundwater primarily to meet the potable and sanitary needs of facility personnel, as well as for miscellaneous building mechanical uses. A summary of water needs for the MPF by category and total is listed in Table 5.6.4.2–1. The percent change in water consumption for the No Action Alternative ranges from 1,068.6-1,942.6 percent. The current contract between the city of Carlsbad and DOE allows WIPP to obtain up to 75.7 million L/yr (20 million gal/yr) of groundwater. As shown in the table, any of the three production levels would exceed this amount. Because the city of Carlsbad owns rights to a total of 8.6 billion L (2.3 billion gal) of groundwater in the wellfield that currently supplies WIPP (and an additional 12.6 billion L (3.3 billion gal) in an undeveloped wellfield nearby), it appears that sufficient capacity may exist for the increased consumption for the MPF. However, DOE would need to negotiate with the city of Carlsbad to increase its water use over the currently agreed upon amount.

Table 5.6.4.2–1. Summary of Water Consumption During Operations at the Carlsbad Site (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	303.4	355.5	530.3
Percent Change from No Action Alternative	1,068.6%	1,269.3%	1,942.6%

Source: MPF Data 2003.

No sanitary or industrial effluent would be discharged to the subsurface. Therefore, 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 the cooling tower water makeup for bacteria and corrosion control. Table 5.6.4.2–2 summarizes the chemicals added. Use of these types of chemicals is standard and no adverse impacts would be expected.

Table 5.6.4.2–2. 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 is already a 20-fold increase in water use at the site. However, as mentioned above, the city of Carlsbad owns rights to a total of 8.6 billion L (2.3 billion gal) of groundwater in the wellfield that currently supplies WIPP. This total amount of water available to the city is approximately 16 million times the amount of water required for the 450 ppy single shift. DOE would need to negotiate with the city of Carlsbad to supply the required capacity for the 450 ppy double-shift alternative.

5.6.5 Geology and Soils

5.6.5.1 No Action Alternative

Under the No Action Alternative, no additional impacts on geology and soils are anticipated at the Carlsbad Site due the MPF. 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 WIPP facilities at the Carlsbad Site are summarized in Section 4.4.5 and further detailed in the *Waste Isolation Pilot Plant Disposal Phase Final Supplement Environmental Impact Statement* (DOE 1997b).

5.6.5.2 Modern Pit Facility Alternative

Construction Impacts

The construction of the MPF is expected to disturb land adjacent to existing WIPP facilities at the Carlsbad Site. 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 acreage requirement 9 m (30 ft) from the surrounding roads and the borders of the construction area and Concrete Batch Plant.

Aggregate and other geologic resources (e.g., sand) would be required to support construction activities at the Carlsbad Site, but these resources are abundant in the surrounding area. 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 fossils 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 buried media in accordance with appropriate requirements and agreements. 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 4.5.5, faults located in the vicinity of the Carlsbad Site have little potential for earthquakes. Ground shaking affecting primarily the integrity of inadequately designed or nonreinforced structures might occur, but shaking capable of damaging or slightly damaging properly or specially designed or upgraded facilities is not expected.

Operations Impacts

The operation of the 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.

5.6.6 Biological Resources

5.6.6.1 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 Carlsbad Site 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

The area identified for construction of the MPF consists primarily of shrubs and grasses as the most prominent components of the local flora. The blend of plant communities with shin oak/dune habitat that somewhat dominates the grassland affords a composition of factors that

results in the diverse wildlife population of the Los Medaños. Wildlife are characterized by a wide variety of amphibians, reptiles, mammals, and birds.

Depending upon the MPF capacity, approximately 62-74 ha (152-182 ac) of primarily grass and shrub habitat would be cleared or modified during MPF construction. During site-clearing activities, highly mobile wildlife species or wildlife species with large home ranges (such as deer and birds) would be able to relocate to adjacent undeveloped 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. Species relocation may result in additional pressure to lands already at or near carrying capacity. The impacts could include overgrazing (in the case of herbivores), stress, and over-wintering mortality. For less mobile species (reptiles, amphibians, 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 grass and shrub plant communities and wildlife habitat. The acreage modified or lost would range from 44-56 ha (110-138 ac) depending upon pit production capacity.

In addition to the areas to be disturbed, there would be a decrease in the quality of habitat immediately adjacent to the proposed development due to increased noise level, traffic, lights, and other human activity, both pre- and post-construction. The adjacent habitat also would experience a loss of quality from the reduction in size, segmentation of the habitat, and restriction on mobility for some species (Kelly and Rotenberry 1993).

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 affects to plant and animal communities (terrestrial resources) in the surrounding environment.

Sensitivity Analysis

There would be minimal impacts to terrestrial resources during the two-shift operations. 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.

5.6.6.2 Wetlands

Under all alternatives, there would be no impacts to wetlands because no wetlands are present within the Carlsbad Site.

5.6.6.3 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 of the Carlsbad Site and WIPP 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 proposed MPF location. Thus, there would be no direct impacts to aquatic resources. Indirect effects to aquatic resources, primarily a few small intermittent creeks or puddles created after spring or summer rains that are used by amphibians within the Carlsbad Site 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 are 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 existing built environments and the quantity would represent a very minor contribution to the watershed.

Sensitivity Analysis

There would be no impacts to aquatic resources during the two-shift operations.

5.6.6.4 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. None of the species presented in Table 4.6.6.4–1 that identifies Federal- and state-listed species and other special-interest species in the region are known to be present at WIPP.

Construction Impacts

Depending upon the MPF capacity, approximately 62-74 ha (152-182 ac) of grass and shrub vegetation and habitat would be cleared or modified during MPF construction. Should the Carlsbad Site be selected for construction and operation 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 USFWS, the potential impacts to special-interest species. Acreage temporarily modified from construction would be lost as potential habitat, foraging areas, or hunting habitat for special-interest avian, mammalian, and reptile 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 habitat, foraging areas, or as a prey base for species of special-interest would range from 44-56 ha (110-138 ac). 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 would minimize the potential 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 surge production.

5.6.7 Cultural and Paleontological Resources

5.6.7.1 Cultural Resources

No Action Alternative

Under the No Action Alternative, there would be no new facility and 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 this alternative, a block of land would be disturbed during construction of the MPF. The size of the disturbed area would vary by the output of the facility, and would include the plant 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).

The reference location at the Carlsbad Site is within the central 10 km^2 (4 mi^2) of the site that was previously surveyed for cultural resources in the late 1970s. Archaeological sites were recorded throughout this area at that time. Due to the movement of dune fields in this area, it is likely that there are resources within or near the reference location that were not recorded during the 1970s survey. In addition, resources that were recorded in the 1970s survey may now seem to have disappeared, when they are merely covered with sand. Because of the changing dune fields, the presence of resources that would be impacted during construction of MPF at the reference location or any other location at the Carlsbad Site is currently unknown. However, results of unrelated surveys throughout the region indicate that this general area likely contains a medium to high density of resources, relative to the other DOE sites under consideration. The fact that the reference location and many other locations in and around the Land Withdrawal Area have not been disturbed by construction increases the likelihood of resources being located within the area that could be disturbed by MPF construction. Thus, there is a high probability that resources could be impacted during MPF construction at the reference location or any other undisturbed locations at the Carlsbad Site. Although the number of resources that would be impacted is unknown, the probability for resource impacts would increase with an increase in the number of acres disturbed.

Because the exact location of the MPF at the Carlsbad Site is not yet determined, cultural resources arising from infrastructure construction (such as water, sewer, gas, electricity, access roads) are not analyzed in this EIS. Should the Carlsbad Site be selected, it would be analyzed in a site-specific tiered-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 the MPF. Methods for identification could include field survey, 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 *WIPP Land Management Plan* (DOE 2002a). 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 not impact on cultural resources.

5.6.7.2 Paleontological Resources

No Action Alternative

Under the No Action Alternative, there would be no new facility and 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

Because of the location of Pleistocene-aged lakes, springs, and seeps near the Carlsbad Site, it is likely that paleontological resources are located on the WIPP site. There has been only one recorded discovery of fossilized remains at WIPP, found 1 km (0.6 mi) away from the reference location. Thus, there is a possibility that paleontological resources would be impacted due to construction of the MPF or the associated infrastructure at the reference location. This is also true for any other area at or near the Carlsbad Site. The probability for impacts to paleontological resources would increase with an increase in the number of acres disturbed.

Paleontological resources would be included in the scope of any cultural resource inventories conducted prior to the beginning of construction. If previously unknown paleontological resources are discovered during construction, activities in the area of the discovery would stop and the discovery would be treated appropriately, as determined by DOE.

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.

5.6.8 Socioeconomics

5.6.8.1 Regional Economy Characteristics

No Action Alternative

Under the No Action Alternative, there would be no change in the workforce currently at the Carlsbad Site. Therefore, there would be no impacts to ROI employment, income, labor force, population, housing, or community services in the area.

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 280 indirect jobs would be created, for a total of approximately 1,050 jobs. This represents approximately 2 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 660 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 1.3 percent as a result of the new jobs created. Based on the ROI average earnings of $27,600 for the construction industry, direct income would increase by $21.3 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $27.8 million ($21.3 million direct and $6.5 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 300 indirect jobs would be created, for a total of 1,150 jobs. This represents approximately 2.4 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 740 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 1.4 percent as a result of the new jobs created. Based on the ROI average earnings of $27,600 for the construction industry, direct income would increase by $23.5 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $30.7 million ($23.5 million direct and $7.2 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 390 indirect jobs would be created, for a total of approximately 1,490 jobs. This represents approximately 3 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 990 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 1.8 percent as a result of the new jobs created. Based on the ROI average earnings of $27,600 for the construction industry, direct income would increase by $30.4 million at peak construction. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $39.7 million ($30.4 million direct and $9.3 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 240 indirect jobs would be created, for a total of approximately 1,230 jobs. This represents approximately 2.5 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 720 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 1.9 percent as a result of the new jobs created. Based on the ROI average earnings of $32,500 for the government services industry, direct income would increase by $32.1 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $42.2 million ($32.1 million direct and $10.1 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 330 indirect jobs would

be created, for a total of approximately 1,690 jobs. This represents approximately 3.5 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 1,090 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 2.6 percent as a result of the new jobs created. Based on the ROI average earnings of $32,500 for the government services industry, direct income would increase by $44.1 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $57.9 million ($44.1 million direct and $13.8 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 430 indirect jobs would be created, for a total of 2,230 jobs. This represents approximately 4.5 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 1,530 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 3.5 percent as a result of the new jobs created. Based on the ROI average earnings of $32,500 for the government services industry, direct income would increase by $58.4 million annually. This would also generate additional indirect income in supporting industries. The total impact to the ROI income would be approximately $76.7 million ($58.4 million direct and $18.3 million indirect).

Sensitivity Analysis

If the facility were 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.

5.6.8.2 Population and Housing

No Action Alternative

Under the No Action Alternative, there would be no change in the workforce currently at the Carlsbad Site. Therefore, there would be no impacts to the ROI population or housing market.

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 1,700 new residents would be expected in the ROI, including workers and their families. This is a 1.6 percent increase 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 a 1.8 percent increase 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 2,600 new residents would be expected in the ROI, including workers and their families. This is a 2.4 percent increase 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 1,900 new residents would be expected in the ROI, including workers and their families. This is a 1.7 percent increase 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 2,800 new residents would be expected in the ROI, including workers and their families. This is a 2.6 percent increase 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 3,900 new residents would be expected in the ROI, including workers and their families. This is a 3.7 percent increase 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 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.

5.6.8.3 Community Services

No Action Alternative

Under the No Action Alternative, there would be no change in the workforce currently at the Carlsbad Site. Therefore, there would be no impacts to the ROI population or community services in the area.

Modern Pit Facility Alternative

Construction Impacts

Facility–125, 250, or 450 ppy. The increase in population could put an increased demand on local community services. Additional teachers, doctors, police, and fire protection may be required. However, the population is not expected to increase more than 2.4 percent. Comparable levels of service would likely be maintained without significant increases.

Operations Impacts

Facility–125, 250, or 450 ppy. The increase in population could put an increased demand on local community services. Additional teachers, doctors, police, and fire protection may be required. However, the population is not expected to increase more than 3.7 percent. Comparable levels of service would likely be maintained without significant increases.

Sensitivity Analysis

If the facility were operated on a two-shift system, additional employees would be required for the second shift. There would be additional impacts to the ROI population and additional stress on the local community services because most of these workers would come from outside the ROI.

5.6.9 Human Health and Safety

5.6.9.1 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. There would be no change in the Carlsbad Site operations.

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 WIPP would continue at the same rates described in Section 4.6.9. The associated impacts on the general public living within 80 km (50 mi) of WIPP and the offsite MEI would continue at the levels shown in Table 4.6.9.1–2. As shown in that table, the expected annual radiation dose to the offsite MEI would be much smaller than the limit of 10 mrem/yr by both EPA (40 CFR 61) and DOE (DOE Order 5400.5) for airborne releases of radioactivity. The fatal cancer risk to the offsite MEI due to radiological releases from WIPP operations is estimated to be 2.5×10^{-12}.

Under this alternative, the radiation dose received by WIPP workers would continue at the rates described in Section 4.6.9. These worker radiation doses at WIPP are presented for the year 2001 in Table 4.6.9.1–3. The number of projected fatal cancers among WIPP workers from normal operations in 2001 is 4.4×10^{-4}.

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, 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 of MPF operations. Public radiation doses would likely occur from airborne releases only (Section 5.6.3). Table 5.6.9.1–1 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 less than or equal to 3.3×10^{-14} per year (i.e., about 1 chance in 31 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 6.2×10^{-11} per year (i.e., about 1 chance in 16 billion per year of a LCF).

Table 5.6.9.1–1. Annual Radiological Impacts on the Public from MPF Operations at the Carlsbad Site for All Three Pit Production Rates

Receptor	125 ppy	250 ppy	450 ppy
Population within 80 km			
Collective dose (person-rem)	4.2×10^{-8}	6.8×10^{-8}	1.2×10^{-7}
Percent of natural background radiation[a]	0.00000000012%	0.00000000020%	0.00000000035%
LCFs[b]	2.1×10^{-11}	3.4×10^{-11}	6.2×10^{-11}
Offsite MEI[c]			
Dose (mrem)	2.3×10^{-8}	3.6×10^{-8}	6.5×10^{-8}
Percent of regulatory dose limit	0.000000230%	0.000000360%	0.000000650%
Percent of natural background radiation[a]	0.00000000780%	0.0000000122%	0.0000000220%
Cancer fatality risk[b]	1.2×10^{-14}	1.8×10^{-14}	3.3×10^{-14}

[a] The average annual dose from background radiation at the Carlsbad Site is 295 mrem (see Section 4.3.9); the 117,796 people living within 80 km (50 mi) of the Carlsbad Site in the year 2043 would receive an annual dose of 34,750 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, 3,990 m (13,091 ft) northwest from the MPF. An actual residence may not currently be present at this location.

Impacts to MPF Workers. Estimates of annual radiological doses to workers involved with MPF facility 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 5.6.9.1–2. 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 (or 1 chance in 8 or 5, respectively, that the worker population would experience a fatal cancer per year of operations).

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 the Carlsbad Site would be approximately double.

Table 5.6.9.1–2. Annual Radiological Impacts on MPF Workers at the Carlsbad Site 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.

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.

5.6.9.2 Nonradiological Impacts

This section considers illness, injury, and fatality rates associated with construction and operation of MPF on the Carlsbad Site 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 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 the Carlsbad Site.

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 for 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 5.6.9.2–1.

Table 5.6.9.2–1. Injury, Illness, and Fatality Estimates for Construction of the MPF at the Carlsbad Site

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. 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 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 were estimated for facility populations estimated for each of the operating capacities. These values are shown below in Table 5.6.9.2–2.

Table 5.6.9.2–2. Injury, Illness, and Fatality Annual Estimates for Normal Operations of the MPF at the Carlsbad Site

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 the 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 WIPP illness and injury rates for facility associated activities. No chemical-related health impacts would be associated with this increase in operations.

5.6.10 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 the Carlsbad Site. Additional details supporting the information presented here are provided in Appendix C.

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.

5.6.10.1 No Action Alternative

Under the No Action Alternative, all current activities would continue at existing levels. Potential accident scenarios for the No Action Alternative are addressed in existing documentation included by reference (DOE 1996c).

5.6.10.2 Modern Pit Facility Alternative

Radiological Impacts

DOE estimated radiological impacts to three receptors: (1) the offsite MEI at the WIPP boundary; (2) the offsite population within 80 km (50 mi) of WIPP; and (3) a non-involved worker 1,000 m (3,281 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 5.6.10.2–1 through 5.6.10.2–3 show 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 tables are calculated by the MACCS computer code based on accident data. The 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 5.6.10.2–4 through 5.6.10.2–6 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 at the MPF. 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 5.6.10.2–1. MPF Alternative Radiological Accident Frequency and Consequences at the Carlsbad Site 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}	50.3	0.05	3,000	1.5	331	0.27
Fire in a Single Building						
1×10^{-4}	26.5	0.027	1,380	0.69	206	0.17
Explosion in a Feed Casting Furnace						
1×10^{-2}	31.1	0.031	1,620	0.81	241	0.19
Nuclear Criticality						
1×10^{-2}	9.9×10^{-5}	5.0×10^{-8}	0.0046	2.3×10^{-6}	0.00076	3.0×10^{-7}
Fire-induced Release in the CRT Storage Room						
1×10^{-2}	2.1	0.001	108	0.054	16.1	0.0064
Radioactive Material Spill						
1×10^{-2}	0.62	0.00031	32.3	0.016	4.83	0.0019

CRT = Cargo Restraint Transporter.
[a] Based on a year-2043 population of 117,796 persons residing within 80 km (50 mi) of the Carlsbad Site.
[b] Increased likelihood of a LCF.
[c] Increased number of LCFs.

Table 5.6.10.2–2. MPF Alternative Radiological Accident Frequency and Consequences at the Carlsbad Site 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}	51.8	0.052	3,090	1.55	341	0.27
Fire in a Single Building						
1×10^{-4}	27.5	0.028	1,430	0.72	214	0.17
Explosion in a Feed Casting Furnace						
1×10^{-2}	31.1	0.031	1,620	0.81	241	0.19
Nuclear Criticality						
1×10^{-2}	9.9×10^{-5}	5.0×10^{-8}	0.0046	2.3×10^{-6}	0.00076	3.0×10^{-7}
Fire-induced Release in the CRT Storage Room						
1×10^{-2}	2.1	0.001	108	0.054	16.1	0.0064
Radioactive Material Spill						
1×10^{-2}	0.62	0.00031	32.3	0.016	4.83	0.0019

[a] Based on a year-2043 population of 117,796 persons residing within 80 km (50 mi) of the Carlsbad Site.
[b] Increased likelihood of a LCF.
[c] Increased number of LCFs.

Table 5.6.10.2–3. MPF Alternative Radiological Accident Frequency and Consequences at the Carlsbad Site 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}	99.8	0.1	5,950	2.98	657	0.53
Fire in a Single Building						
1×10^{-4}	53.3	0.053	2,770	1.39	414	0.33
Explosion in a Feed Casting Furnace						
1×10^{-2}	31.1	0.031	1,620	0.81	241	0.19
Nuclear Criticality						
1×10^{-2}	9.9×10^{-5}	5.0×10^{-8}	0.0046	2.3×10^{-6}	0.00076	3.0×10^{-7}
Fire-induced release in the CRT Storage Room						
1×10^{-2}	4.14	0.0021	216	0.11	322	0.026
Radioactive Material Spill						
1×10^{-2}	0.62	0.0031	32.3	0.016	4.83	0.0019

[a] Based on a year-2043 population of 117,796 persons residing within 80 km (50 mi) of the Carlsbad Site.
[b] Increased likelihood of a LCF.
[c] Increased number of LCFs.

The accident with the highest risk to the offsite population (see Tables 5.6.10.2–4 through 5.6.10.2–6) is the explosion in a glovebox 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 0.0081 per year (i.e., about 1 chance in 120 per year of a LCF in the total population) for all three

production cases. The highest risk of a LCF to an offsite MEI located 3,222 m (10,571 ft) north-northwest from the accident would be 0.00031 per year (i.e., about 1 chance in 3,200 per year of a LCF) for all three production cases. The highest risk of a LCF to a non-involved worker located 1,000 m (3,281 ft) from the accident would be 0.0019 per year (i.e., about 1 chance in 525 per year of a LCF) for all three production cases.

Table 5.6.10.2–4. Annual Cancer Risks Due to MPF Accidents at the Carlsbad Site for 125 ppy

Accident	Offsite MEI[a]	Offsite Population[b,c]	Non-involved Worker[a]
Beyond Evaluation Basis Earthquake with Fire	5.0×10^{-7}	1.5×10^{-5}	2.7×10^{-5}
Fire in a Single Building	2.7×10^{-6}	6.9×10^{-5}	1.7×10^{-5}
Explosion in a Feed Casting Furnace	0.00031	0.0081	0.0019
Nuclear Criticality	5.0×10^{-10}	2.3×10^{-8}	3.0×10^{-9}
Fire-induced Release in the CRT Storage Room	1.0×10^{-5}	0.00054	6.4×10^{-5}
Radioactive Spill Material	3.1×10^{-6}	0.00016	1.9×10^{-5}

[a] Increased likelihood of a LCF.
[b] Increased number of LCFs.
[c] Based on a year-2043 population of 117,796 persons residing within 80 km (50 mi) of the Carlsbad Site.

Table 5.6.10.2–5. Annual Cancer Risks Due to MPF Accidents at the Carlsbad Site for 250 ppy

Accident	Offsite MEI[a]	Offsite Population[b,c]	Non-involved Worker[a]
Beyond Evaluation Basis Earthquake with Fire	5.2×10^{-7}	1.6×10^{-5}	2.7×10^{-6}
Fire in a Single Building	2.8×10^{-6}	7.2×10^{-5}	1.7×10^{-5}
Explosion in a Feed Casting Furnace	0.00031	0.0081	0.0019
Nuclear Criticality	5.0×10^{-10}	2.3×10^{-8}	3.0×10^{-8}
Fire-induced Release in the CRT Storage Room	1.0×10^{-5}	0.00054	6.4×10^{-5}
Radioactive Spill Material	3.1×10^{-6}	0.00016	1.9×10^{-5}

[a] Increased likelihood of a LCF.
[b] Increased number of LCFs.
[c] Based on a year-2043 population of 117,796 persons residing within 80 km (50 mi) of the Carlsbad Site.

Table 5.6.10.2–6. Annual Cancer Risks Due to MPF Accidents at the Carlsbad Site for 450 ppy

Accident	Offsite MEI[a]	Offsite Population[b,c]	Non-involved Worker[a]
Beyond Evaluation Basis Earthquake with Fire	1.0×10^{-6}	3.0×10^{-5}	5.3×10^{-6}
Fire in a Single Building	5.3×10^{-6}	0.00014	3.3×10^{-5}
Explosion in a Feed Casting Furnace	0.00031	0.0081	0.0019
Nuclear Criticality	5.0×10^{-10}	2.3×10^{-8}	3.0×10^{-9}
Fire-induced Release in the CRT Storage Room	2.1×10^{-5}	0.0011	0.00026
Radioactive Spill Material	3.1×10^{-6}	0.00016	1.9×10^{-5}

[a] Increased likelihood of a LCF.
[b] Increased number of LCFs.
[c] Based on a year-2043 population of 117,796 persons residing within 80 km (50 mi) of the Carlsbad Site.

Hazardous Chemicals Impacts

DOE estimated the impacts of the potential release of the most hazardous chemicals used at the MPF. 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. Tables 5.6.10.2–7 through 5.6.10.2–9 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 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 point 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. The distance to the nearest site boundary is 2.3 km (1.4 mi). None of the chemicals released in an accident would exceed ERPG-2 limits offsite.

Table 5.6.10.2–7. MPF Alternative Chemical Accident Frequency and Consequences at the Carlsbad Site 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 2.3 km (ppm)	
Nitric acid	10,500	6	1.0	6.18	1.57	10^{-4}
Hydrofluoric acid	550	20	0.81	12.7	2.49	10^{-4}
Formic acid	1,500	10	0.28	0.97	0.24	10^{-4}

[a] Site boundary is at a distance of 2.3 km (1.4 mi) east.

Table 5.6.10.2–8. MPF Alternative Chemical Accident Frequency and Consequences at the Carlsbad Site 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)	At Site Boundary 2.3 km (ppm)	
Nitric acid	21,000	6	1.5	11.9	3.04	10^{-4}
Hydrofluoric acid	1,100	20	1.1	24.9	4.86	10^{-4}
Formic acid	3,000	10	0.39	1.88	0.47	10^{-4}

[a] Site boundary is at a distance of 2.3 km (1.4 mi) east.

Table 5.6.10.2–9. MPF Alternative Chemical Accident Frequency and Consequences at the Carlsbad Site 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 2.3 km (ppm)	
Nitric acid	40,000	6	2.3	21.9	5.64	10^{-4}
Hydrofluoric acid	2,000	20	1.5	43.7	8.71	10^{-4}
Formic acid	5,500	10	0.54	3.36	0.85	10^{-4}

[a] Site boundary is at a distance of 2.3 km (1.4 mi) east.

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 988-1,797 (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.

5.6.11 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.

For the Carlsbad Site, this 80-km (50-mi) area includes portions of Chaves, Eddy, and Lea Counties in New Mexico, and Loving, Culberson, and Winkler Counties in Texas. Table 5.6.11–1 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 5.6.11–1 shows the minority populations located with an 80-km (50-mi) radius of the site. Figure 5.6.11–2 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 5.6.11–1 and 5.6.11–2 show the distribution of these populations throughout the area around the site.

Table 5.6.11–1. Racial, Ethnic, and Socioeconomic Composition Surrounding the Carlsbad Site

Population Group	Population	Percent of Total
Hispanic or Latino	83,889	43.7
Black or African American	4,481	2.3
American Indian and Alaska Native	1,214	0.6
Asian	765	0.4
Native Hawaiian and Other Pacific Islander	44	0.0
Other Race	128	0.1
Two or More Races	1,889	1.0
White	99,493	51.8
Total	**191,903**	**100**

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 WIPP is 48.1 percent, more than that in the United States but less than the entire 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 WIPP, 20.6 percent of the population lives below the poverty level.

As shown in Section 5.6.9, 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.

5.6.12 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.

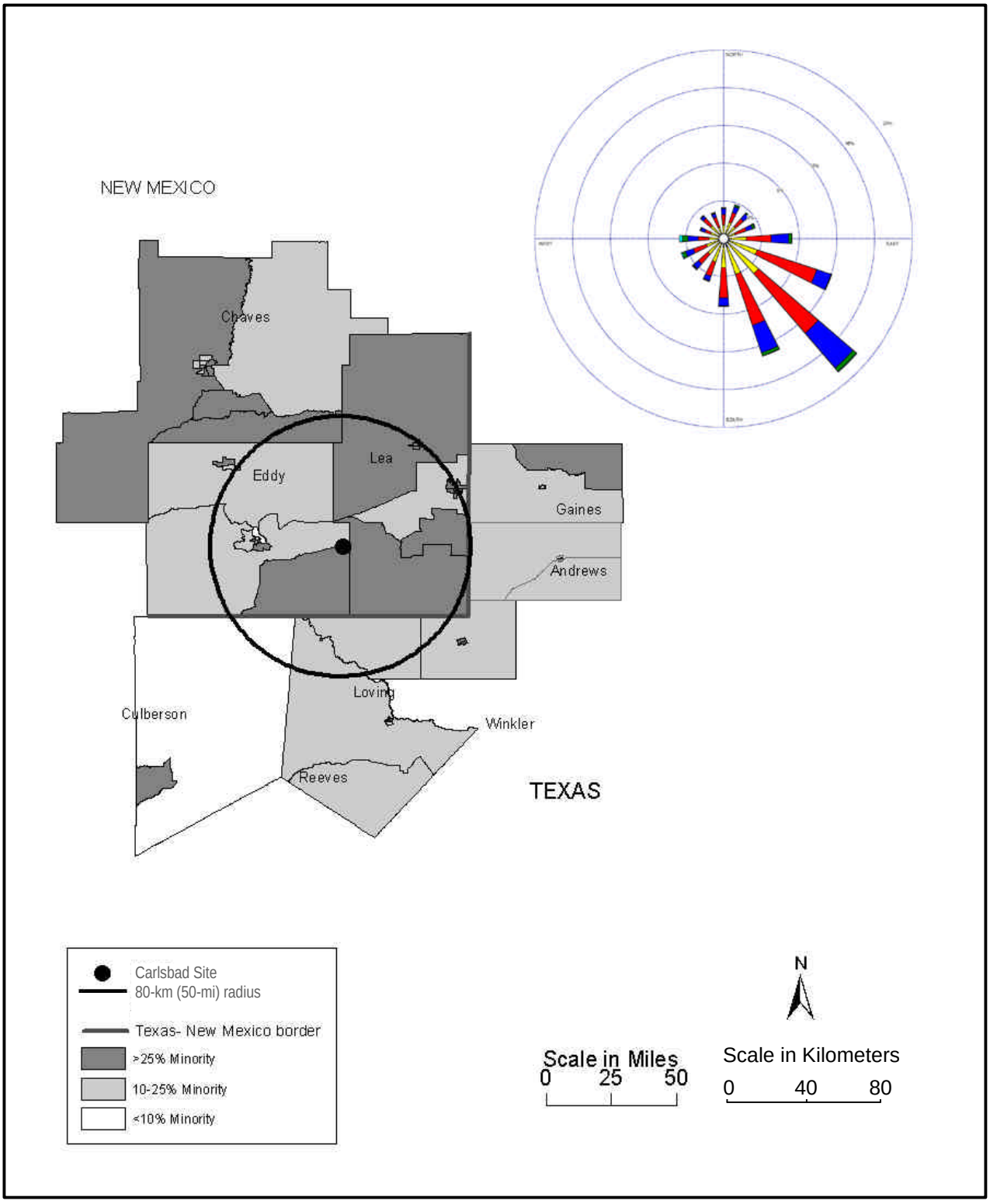

Figure 5.6.11–1. Distribution of the Minority Population Surrounding the Carlsbad Site

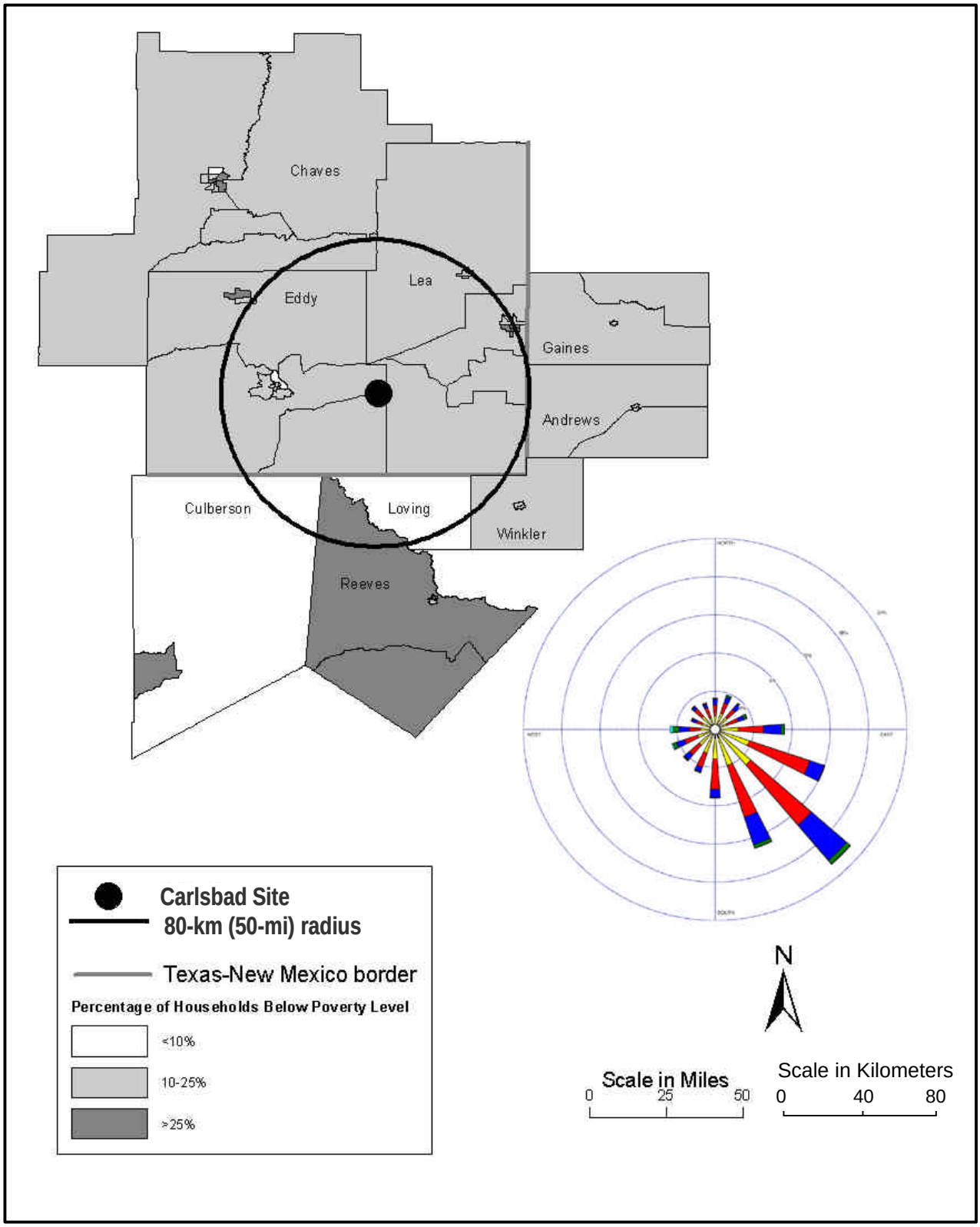

Figure 5.6.11–2. Distribution of the Low-Income Population Surrounding the Carlsbad Site

This EIS is primarily concerned with determining a candidate DOE site for 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 presents DOE's methodology in analyzing the selected analytical endpoints and provides some detail on the calculations, including the more important analytical parameters.

5.6.12.1 No Action Alternative

Under the No Action Alternative, transportation of TRU waste between LANL and the Carlsbad Site would have impacts that are assigned to LANL. See Section 5.2.12.1.

5.6.12.2 Modern Pit Facility Alternative

Construction Impacts

Construction of a new facility at the Carlsbad Site would result in increased traffic due to commuting construction workers and deliveries of construction materials and equipment. Although this traffic increase would tend to increase congestion on local roads, the increase would be small compared to the average daily traffic levels reported in Section 4.6.10 and would be temporary.

Operations Impacts

Radiological transportation under the MPF Alternative for the Carlsbad Site would include transport of pits from Pantex (near Amarillo, Texas) to the Carlsbad Site, recycle of enriched uranium parts to and from Y-12 (Oak Ridge, Tennessee), return of pits, and enriched uranium parts to Pantex, and shipment of LLW to NTS (Nye County, Nevada). TRU waste would be disposed of at WIPP. DOE's analysis includes options for processing 125, 250, and 450 ppy. Table 5.6.12.2–1 presents the number of shipments for the MPF Alternative. Tables 5.6.12.2–2 and 5.6.12.2–3 present incident-free impacts from this transportation. Tables 5.6.12.2–4 and 5.6.12.2–5 present the accident impacts.

Table 5.6.12.2–1. Numbers of Shipments per Year at the Carlsbad Site for the MPF

Transported Materials	125 ppy	250 ppy	450 ppy
Pits	14	28	50
EU Parts	10	20	36
LLW	136	217	331
Total	**160**	**265**	**417**

Table 5.6.12.2–2. Annual Incident-Free Transportation Impacts to Workers at the Carlsbad Site 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	0.057	2.3×10^{-5}	0.11	4.6×10^{-5}	0.20	8.2×10^{-5}
EU parts	0.16	6.2×10^{-5}	0.31	1.2×10^{-4}	0.56	2.2×10^{-4}
LLW	3.5	1.4×10^{-3}	5.5	2.2×10^{-3}	8.4	3.4×10^{-3}
Total	**3.7**	**1.5×10^{-3}**	**6.0**	**2.4×10^{-3}**	**9.2**	**3.7×10^{-3}**

Table 5.6.12.2–3. Annual Incident-Free Transportation Impacts to the General Public at the Carlsbad Site 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	0.072	3.6×10^{-5}	0.14	7.2×10^{-5}	0.26	1.3×10^{-4}
EU parts	0.24	1.2×10^{-4}	0.47	2.4×10^{-4}	0.85	4.3×10^{-4}
LLW	2.3	1.2×10^{-3}	3.7	1.9×10^{-3}	5.7	2.8×10^{-3}
Total	**2.6**	**1.3×10^{-3}**	**4.3**	**2.2×10^{-3}**	**6.8**	**3.4×10^{-3}**

Table 5.6.12.2–4. Annual Transportation Accident Radiological Impacts at the Carlsbad Site 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	6.1×10^{-8}	3.1×10^{-11}	1.2×10^{-11}	6.1×10^{-11}	2.2×10^{-7}	1.1×10^{-10}
EU parts	2.3×10^{-10}	1.2×10^{-13}	4.7×10^{-10}	2.3×10^{-13}	8.4×10^{-10}	4.2×10^{-13}
LLW	4.3×10^{-4}	2.2×10^{-7}	6.9×10^{-4}	3.5×10^{-7}	1.1×10^{-3}	5.3×10^{-7}
Total	**4.3×10^{-4}**	**2.2×10^{-7}**	**6.9×10^{-4}**	**3.5×10^{-7}**	**1.1×10^{-3}**	**5.3×10^{-7}**

The addition of 988-1,797 new employees under the three capacity options would represent an increase in the Carlsbad Site employment ranging from 95-170 percent, with a corresponding increase in commuting traffic. Although this employment increase is large, the increase in congestion on local roads would be small compared to the average daily traffic levels reported in Section 4.6.10, and the highway capacities are sufficient to absorb the increase.

Table 5.6.12.2–5. Annual NonRadiological Fatalities from Transportation Accidents at the Carlsbad Site 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	2.3×10^{-3}	1.5×10^{-4}	4.5×10^{-3}	2.9×10^{-4}	8.1×10^{-3}	5.2×10^{-4}
EU parts	8.8×10^{-3}	4.8×10^{-4}	0.018	9.5×10^{-4}	0.032	1.7×10^{-3}
TRU waste	0.030	2.3×10^{-3}	0.05	3.7×10^{-3}	0.073	5.6×10^{-3}
Total	**0.041**	**2.9 ´ 10^{-3}**	**0.070**	**4.9 ´ 10^{-3}**	**0.11**	**7.8 ´ 10^{-3}**

Sensitivity Analysis

Should DOE elect to operate a new 450 ppy facility at the Carlsbad Site in two shifts, the impacts would increase. The incident-free doses for the 450 ppy facility reported in Tables 5.6.12.2–2 and 5.6.12.2–3 would increase by approximately the factor 1.8 because the number of shipments would increase. The accident values in Table 5.6.12.3–4 would also increase by a factor of 1.8 because of 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.

5.6.13 Waste Management

This section considers the burden that waste generation associated with construction and operation of the MPF places on the WIPP waste treatment, storage, and disposal infrastructure. Impacts are evaluated based on routine waste generation, excluding wastes generated from environmental restoration or D&D activities. Impacts associated with transportation of radioactive waste from the Carlsbad Site to offsite disposal facilities are provided in Section 5.6.12.

5.6.13.1 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 Carlsbad Site waste management activities described in Section 4.6.11.

5.6.13.2 Modern Pit Facility Alternative

Construction Impacts

Construction of the MPF would generate solid and liquid sanitary waste and liquid hazardous waste. Table 5.6.13.2–1 summarizes the total volume of waste generated over the 6 years of construction activity for the three proposed MPF operating capacities.

Table 5.6.13.2–1. 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.

The Carlsbad Site currently manages small quantities of site-generated waste. It has limited waste management infrastructure other than TRU waste management capabilities associated with repository operations.

Nonhazardous wastes may be disposed of in the onsite construction debris landfill in Section 6 or at an offsite landfill. Although construction of the MPF would result in a two- to three-fold increase in the annual routine sanitary waste generation relative to current the Carlsbad Site operations, the disposal facilities are expected to have adequate capacity to handle the projected amount of waste during MPF construction.

MPF construction activities would increase the annual routine hazardous waste generation by less than 3 percent over current WIPP operations. Hazardous wastes would be managed in satellite accumulation areas or the less-than-90-day storage area (Section 474) pending shipment offsite for treatment and disposal at a commercial facility. Commercial treatment is readily available and currently used to treat WIPP hazardous wastes.

The projected sanitary wastewater volumes for the three proposed MPF operating capacities are 17,100, 18,800, and 24,700 L/day (4,500, 5,000, and 6,500 gal/day). The daily discharge limit for the WIPP sewage treatment facility includes 87,064 L (23,000 gal) of domestic wastewater. Even at the lowest proposed pit manufacturing capacity, the combination of MPF operations and repository operations could exceed the capacity of the existing sewage treatment facility. Treatment of the MPF wastewater would require an expansion of the existing sewage treatment facility or construction of a new facility to service the MPF workforce.

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 wash out activities. The facility would be located on approximately 4 ha (10 ac) 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 5.6.13.2–2 summarizes the estimated waste generation rates for the three proposed MPF operating capacities.

Table 5.6.13.2–2. 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.

Because the Carlsbad Site currently manages only small quantities of site-generated waste, MPF operations would require a substantial increase in the waste management infrastructure at the Carlsbad Site.

Except for site-derived waste, Carlsbad Site operations do not generate TRU waste. Although there is considerable knowledge of TRU waste management requirements, there are no provisions for managing newly-generated (i.e., non-site-derived waste) at this time. 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 TRU 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). The capability to load waste drums into TRUPACT-II shipping containers and load the TRUPACT-II containers onto trucks would not be required under this alternative. Waste drums could be transferred directly to the WIPP Waste Handling Building at the Carlsbad Site.

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 but may be reduced somewhat by eliminating the TRUPACT-II loading requirements. Section 6.5 discusses the availability of the WIPP or another facility 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. Site-derived LLW is packaged and disposed in the underground Hazardous Waste Disposal Units (HWDUs) comprising the repository. Under

current regulatory constraints, it is unlikely that LLW not associated with repository operations would be accepted in the HWDUs. For purposes of analysis, DOE assumed the LLW from MPF operations would be shipped offsite for disposal. If the Carlsbad Site were selected as the host site for the MPF, the tiered site-specific EIS would evaluate the reasonableness of establishing an on-site LLW disposal facility.

Section 5.6.12 describes the impacts for LLW transportation from the Carlsbad Site to NTS. At this time, there is no infrastructure at the Carlsbad Site to support storage of LLW until it can be shipped offsite for disposal.

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 volumes from MPF operations represent about 7.4-15 percent of the annual routine waste volumes currently managed at WIPP. Commercial treatment is readily available and currently used to treat Carlsbad Site hazardous wastes.

The Carlsbad Site does not routinely generate mixed LLW. Any site-derived mixed LLW is packaged for disposal in the HWDUs. Under current regulatory constraints, it is unlikely that mixed LLW not associated with repository operations would be accepted in the HWDUs. The mixed LLW from MPF operations would be transferred to an offsite DOE or commercial treatment or disposal facility. At this time, there is no infrastructure at the WIPP site to support storage of mixed LLW until it can be shipped offsite for disposal.

Nonhazardous waste from MPF operations includes sanitary solid waste and wastewater. Solid wastes may be disposed in the onsite construction debris landfill in Section 6. The remainder would be transferred to an offsite landfill. MPF operations would increase the annual routine waste generation by a factor of 9.5-12 relative to current Carlsbad Site operations. This increase would accelerate DOE's consumption of the available capacity of these disposal facilities.

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). The daily discharge limit for the WIPP sewage treatment facility includes 87,064 L (23,000 gal) of domestic wastewater. Even at the lowest proposed pit manufacturing capacity, MPF operations would exceed the capacity of the existing sewage treatment facility. Treatment of the MPF wastewater would require an expansion of the existing sewage treatment facility or construction of a new facility to service the MPF workforce.

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).