4.6 THE CARLSBAD SITE

The following sections describe the affected environment at the Carlsbad Site for land use, visual resources, site infrastructure, air quality and noise, water resources, geology and soils, biological resources, cultural and paleontological resources, and socioeconomics. In addition, radiation and hazardous chemical environment, transportation, and waste management are described.

4.6.1 Land Use and Visual Resources

4.6.1.1 Land Use

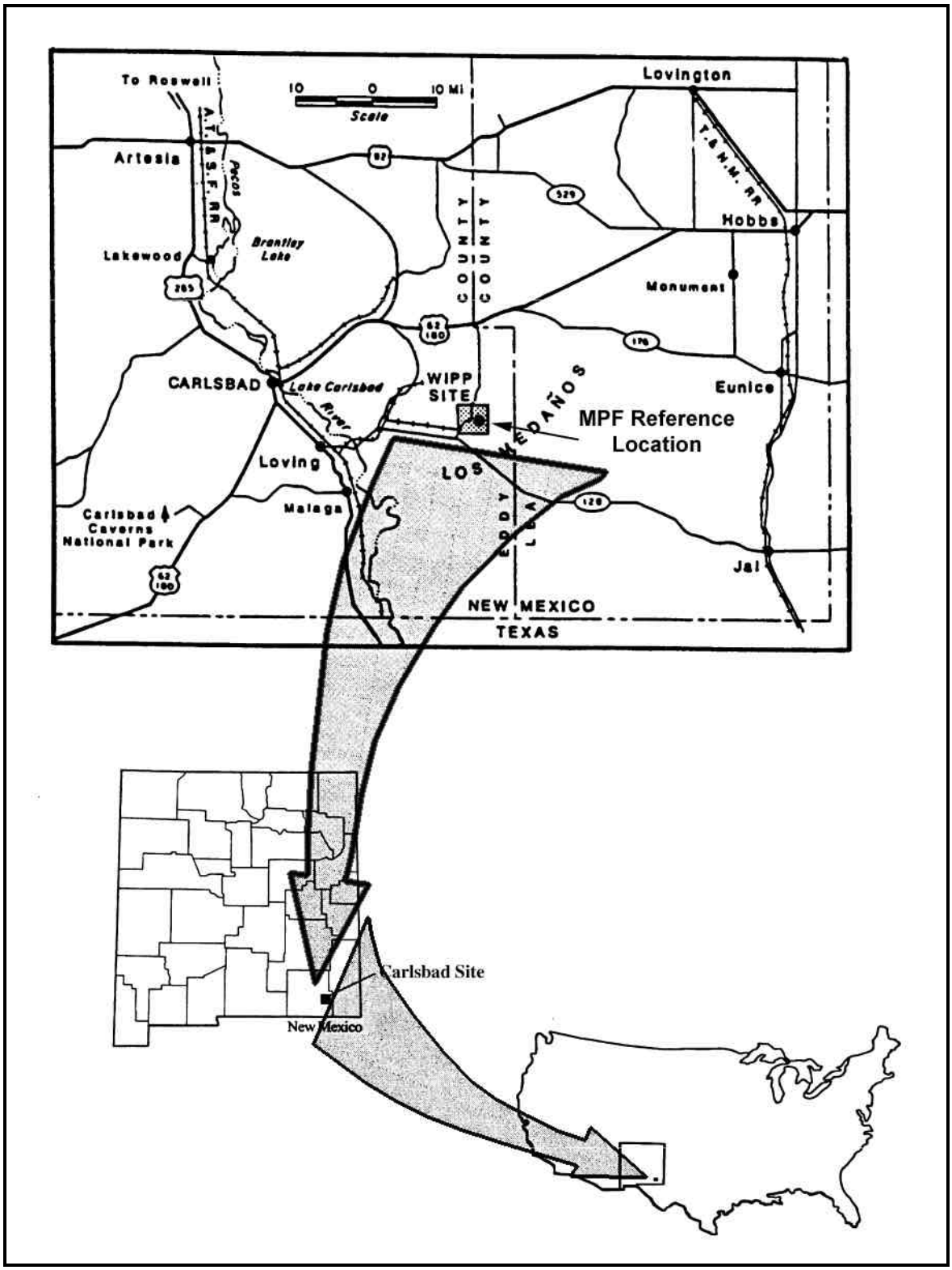
The Carlsbad Site is in Eddy County in southeastern New Mexico, 42 km (26 mi) east of Carlsbad, New Mexico (see Figure 4.6.1.1–1). Carlsbad Site and the surrounding land is a relatively flat, sparsely inhabited plateau with little surface water. The land for operation of the Waste Isolation Pilot Plant (WIPP) at Carlsbad was provided by the *WIPP Land Withdrawal Act* (Public Law 102-579, as amended by Public Law 104-201), which transferred the land from the U.S. Department of the Interior (DOI) to DOE and effectively withdrew the land from entry, sale, or disposition, appropriation under mining laws, and operation of the mineral and geothermal leasing laws. The Act also directed DOE to produce a management plan for grazing, hunting and trapping, wildlife habitat, the disposition of salt, and tailings and mining.

The Carlsbad Site includes WIPP, which is a square, 6.4 km (4 mi) on each side, comprising a total of 4,144 ha (10,240 ac). The WIPP Site is divided into four areas, with increasing levels of DOE control toward the center of the site. The innermost area is the Property Protection Area (see Figure 4.6.1.1–2), which is 14 ha (35 ac) surrounded by a chain link fence. Most of the WIPP facilities are within this area. These facilities include the Waste Handling Building where radioactive waste is received and prepared for underground disposal, four shafts to the underground area, a Support Building, an Exhaust Filter Building, and a water supply system.

Beyond the Property Protection Area is the Exclusive Use Area, which is 112 ha (277 ac) surrounded by barbed wire and fencing. Public access to the Exclusive Use Area is controlled by the WIPP security force. Within this area, DOE operates collection ponds for managing site runoff, some auxiliary buildings, and two-mined-rock (salt) piles. Just outside the barbed wire fence, but well within the WIPP property boundary is the Off-Limits Area. The Off-Limits Area is 575 ha (1,421 ac) that is unfenced to allow cattle grazing, but is posted for no trespassing.

However, this area contains sewage stabilization ponds that are fenced. The remaining land between the WIPP site boundary and the Off-Limits Area is 3,443 ha (8,507 ac) designated as multiple use. All the land in this area, as well as that in the Off-Limits Area, has been leased for grazing.

The reference location for the MPF 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. There are approximately 130 ha (321 ac) available for development in this location. As stated above, the primary land usage in this area is grazing.



Source: DOE 1997b.

Figure 4.6.1.1–1. Location of the Carlsbad Site

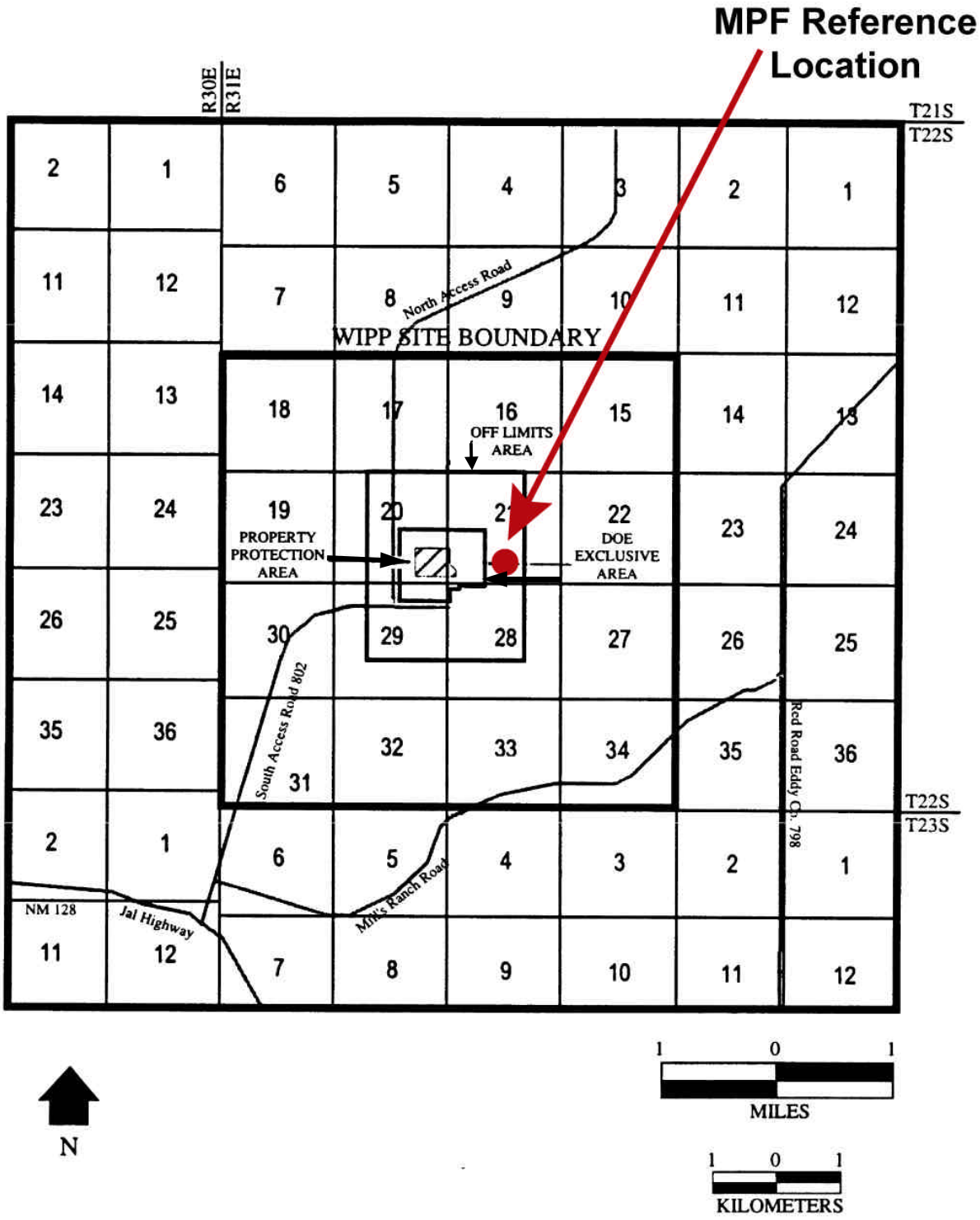


Figure 4.6.1.1–2. The Carlsbad Site

In accordance with the *WIPP Land Withdrawal Act*, DOE prepared a Land Management Plan (DOE 2002a). The Plan, prepared in cooperation with the State of New Mexico and the U.S. DOI's BLM, identifies resource values, promotes multiple-use management, and identifies long-term goals for the WIPP lands. It also provides opportunities for the public as well as local, state, and Federal agencies to participate in the land use planning process.

The land within 16 km (10 mi) of WIPP is predominantly owned by BLM, with interspersed parcels of state trust and privately owned lands, including two private ranches. It is used for grazing cattle, with lesser amounts used for oil and gas wells and potash mining. Recreation is another popular use of the land with hunting, camping, hiking, and bird watching being the major activities. In nearly all respects, surface land characteristics within a 16-km (10-mi) radius are similar to those on the WIPP site itself (see Section 4.6.1.2). The nearest community is Loving, New Mexico, 29 km (18 mi) west-southwest of WIPP with a population of approximately 1,300. The nearest major population center is Carlsbad.

4.6.1.2 Visual Resources

The Carlsbad Site is situated in the Los Medaños region of the Chihuahuan Desert. Los Medaños is located in an area of intergradation between the northern region of the Chihuahuan Desert and the Llano Estacado or Staked Plains (DOE 2002a). The region is characterized by aeolian and alluvial sedimentation on upland plains that form hummocks, dunes, sand ridges, and swales with the presence of Harvard Shin Oak as a prominent foliar factor (DOE 2002a). Additional foliage includes honey mesquite and an assortment of prairie grasses. Topographically, this high desert area contains few natural visual obstructions.

From viewpoints to the west, WIPP facilities and the site tailings pile are visible. From a northern viewpoint, a ridge obstructs the view of the Off-Limits Area and beyond. From the east, the same ridge obstructs the view of the innermost areas of the site and road access is restricted. From the southern viewpoint, the majority of the site is visible to the public. BLM has assigned a Class IV Visual Resource Management rating to the entire WIPP site (Lynn 2002b). For a description of the BLM classification system, see Table 4.2.1.2–1. Management activities within this class require major modifications of the existing character of the landscape.

4.6.2 Site Infrastructure

An extensive network of existing infrastructure provides services to WIPP activities and facilities as shown in Table 4.6.2–1. These services are discussed in detail in the following sections. Two categories of infrastructure—transportation access and utilities—are described below for the Carlsbad Site. Transportation access includes roads, railroads, and airports while utilities include electricity and fuel (e.g., natural gas, gasoline, and coal).

4.6.2.1 Transportation

The site can be reached from the north access road, which intersects U.S. 62/180, 21 km (13 mi) north of the Carlsbad Site and south access road which intersects NM 128 at a distance of 6.5 km (4 mi) southwest of the Carlsbad Site. There are approximately 5-8 km (3-5 mi) of unimproved (dirt) roads onsite. There is a DOE constructed rail spur to the site from the

Burlington Northern and Santa Fe Railroad at a distance of 10 km (6 mi) west of the site (DOE 1997b).

Table 4.6.2–1. Carlsbad Site Infrastructure Characteristics

Resource	Current Usage	Site Capacity
Transportation		
Roads (km)	24	NA
Railroads (km)	10	NA
Electricity		
Energy consumption (MWh/yr)	19,759	175,200
Peak load (MWe)	3.8	20
Fuel		
Natural gas (m^3/yr)	0	NA[a]
Liquid fuel (L/yr)	113,600	NA[b]
Coal (t/yr)	0	0

NA = not available.
[a] 12-inch natural gas line is about 1.6 km (1 mi) north of the site.
[b] Capacity – 2 pump fueling stations with 30,283 L (8,000 gal) of fuel storage.
Source: Johnson 2002a.

Portions of two Federal airways are within 8 km (5 mi) of the Carlsbad Site. The nearest commercial airport is in Cavern City, 45.1 km (28 mi) west of the Carlsbad Site near Carlsbad, New Mexico. Other airports in the area are Eunice (51.5 km [32 mi] east), Carlsbad Caverns (67.6 km [42 mi] southwest), Hobbs Airport (67.6 km [42 mi] northeast), Jal (64.4 km [40 mi] southeast), Lovington (80.5 km [50 mi] northeast), and Artesia (82.1 km [51 mi] northwest) (DOE 2002a).

4.6.2.2 Electrical Power

The Carlsbad Site is serviced by an overhead electrical transmission line that traverses the 4,146 ha (10,240 acre) site for 3.2 km (2 mi) to the north and an additional 3.2 km (2 mi) to the south (DOE 1996a). In 2001, annual site consumption of electricity was approximately 19,759 MWh (Johnson 2002a).

4.6.2.3 Fuel

There is currently no natural gas being used at the site; however, capacity is available from a 30-cm (12-in) natural gas line owned by El Paso Natural Gas, approximately 1.6 km (1 mi) north of the site. Approximately 113,600 L/yr (30,000 gal/yr) of liquid fuel is consumed at the site. Additional capacity is available from two pump fuel stations with 30,283 L (8,000 gal) of fuel storage. There is no coal consumption at the Carlsbad Site (Johnson 2002a).

4.6.3 Air Quality and Noise

4.6.3.1 Climate and Meteorology

The regional climate at the Carlsbad Site is semi-arid, with generally mild temperatures, low precipitation and humidity, and a high rate of evaporation. Temperatures are moderate throughout the year, although seasonal changes are distinct. The mean annual temperature in southeastern New Mexico is 17.2°C (63°F). In the winter (December through February), nighttime lows average near -5°C (23°F), and average maxima average near 10°C (50°F). The lowest recorded temperature at the nearest Class-A weather station in Roswell was -33.8°C (-29°F) in February 1905. In the summer (June through August), the daytime temperature exceeds 32.2°C (90°F) approximately 75 percent of the time. On June 27, 1994, the National Weather Service documented a measurement of 50°C (122°F) at WIPP as the record high temperature for New Mexico (DOE 2002a).

Precipitation is light and unevenly distributed throughout the year, averaging 33 cm (13 in) for the past 5 years. Winter is the season of least precipitation, averaging less than 1.5 cm (0.6 in) of rainfall per month. Snow averages about 13 cm (5 in) per year at the site and seldom remains on the ground for more than a day at a time because of the typically above-freezing temperatures in the afternoon. Approximately half the annual precipitation comes from frequent thunderstorms during June through September. Rains are usually brief but occasionally intense and can result in flash flooding in arroyos and along floodplains (DOE 2002a).

Prevailing winds are from the southeast approximately 13 percent of the time, and the dominant wind speed ranges from 8-11 km/hr (5-7 mph) with an occurrence of 38 percent. Wind speeds categorized as calm (less than 3 km/hr [2 mph]) occur about 4 percent of the time (DOE 2002h). These conditions are consistent with long-term averages for the region. High winds associated with thunderstorms are frequently a source of localized blowing dust. Dust storms covering an extensive area are rare, and those that reduce visibility to less than 1.6 km (1.1 mi) occur only with the strongest pressure gradients such as those associated with intense extratropical cyclones that occasionally form in the region during winter and early spring. Winds of 80-97 km/hr (50-60 mph) and higher may persist for several days if these pressure systems become stationary. Ten windstorms of 93 km/hr (58 mph) and greater were reported during 1955-1967 within the area in which the WIPP facility is located.

Tornadoes are common throughout the region. From 1955-1967, 15 tornadoes were reported in the WIPP site area covered by one degree of latitude and longitude. Tornado statistics indicate that the average frequency of a tornado striking WIPP is 8.1×10^{-4} times per year, or about once every 1,235 years (DOE 2002a).

4.6.3.2 Nonradiological Releases

WIPP operations can result in the release of nonradiological air pollutants that may affect the air quality of the surrounding area. WIPP is located within Pecos-Permian Basin Intrastate AQCR. The area encompassing WIPP and Eddy County is classified as an attainment area for all six criteria pollutants (i.e., carbon monoxide, nitrogen dioxide, lead, ozone, sulfur dioxide, and particulate matter) (40 CFR 81.332). In addition to the NAAQS established by EPA, the State of

New Mexico has established ambient air quality standards for carbon monoxide, sulfur dioxide, nitrogen dioxide, total suspended particulates, hydrogen sulfide, and total reduced sulfur. The PSD Class I areas nearest to WIPP are Carlsbad Caverns National Park, which is approximately 61 km (38 mi) southwest of WIPP, and Guadalupe Mountains National Park, which is approximately 100 km (62 mi) southwest of WIPP.

WIPP has completed inventories of potential pollutants and emissions in accordance with EPA and New Mexico Air Quality Control Regulations (NMAQCR). Based on these inventories, WIPP has no permitting or reporting requirements at this time except for those applying to two primary backup diesel generators. A NMAQCR operating permit was issued for the two diesel generators in 1993. The diesel generators are assumed to emit four pollutants (nitrogen dioxide, sulfur dioxide, carbon monoxide, and PM_{10}) and have strict limits on those emissions.

Based on the initial 1993 air emissions inventory, WIPP is not required to obtain Federal *Clean Air Act* permits. WIPP, in consultation with the NMED Air Quality Bureau, working in concert with data provided in the first air emissions inventory, was required to obtain a NMAQCR 702, Operating Permit (recodified in 1997 as 20.2.72 NMAC, "Construction Permits") for two primary backup diesel generators at the site. The only emission points where WIPP exceeds state threshold criteria requiring a permit are the backup diesel generators. WIPP completed all necessary requirements for emissions monitoring and sampling required by New Mexico Air Quality Permit 310-M-2. During 2001, backup diesel generators were operated for approximately 28 of the 480 hours allowed by the permit. There were no malfunctions or abnormal conditions of operation that would cause a violation of the permit. Proposed facility modifications are reviewed to determine if they caused new air emissions and require permit applications.

Prior to October 1994, ambient monitoring of sulfur dioxide, hydrogen sulfide, nitrogen dioxide, TSP, carbon monoxide, and VOCs was conducted at WIPP. The results of this monitoring program indicated that air quality in the area of WIPP usually met state and Federal standards. TSP standards were occasionally exceeded during periods of high wind and blowing sands, and the ambient air quality standard for sulfur dioxide had been infrequently exceeded. Because there is no regulatory requirement to conduct air quality monitoring at WIPP, the ambient air monitoring stations at WIPP have been decommissioned. TSP monitoring continues weekly at offsite locations. Estimated concentrations at maximally impacted points of unrestricted public access are summarized in Table 4.6.3.2–1.

The existing ambient air concentrations attributable to sources at WIPP are expected to represent a small percentage of the ambient air quality standards.

Table 4.6.3.2–1. WIPP Estimated Nonradiological Ambient Air Emissions

Pollutant	Averaging Period	Most Stringent Standard[a] (micrograms per m^3)	Estimated Ambient Concentration (micrograms per m^3)
Carbon monoxide	8-hour	8,900 [b]	110
	1-hour	13,400 [b]	410
Nitrogen dioxide	Annual	84 [b]	0.28
	24-hour	168 [b]	110
Sulfur dioxide	Annual	47 [b]	0.02
	24-hour	234 [b]	8.5
	3-hour	1,170 [c]	77
PM_{10}	Annual	50 [a]	0.67
	24-hour	150 [a]	85

[a] National Primary Ambient Air Quality Standard (40 CFR 50)
[b] New Mexico Ambient Air Quality Standard (Air Quality Criteria Regulation 201) corrected for altitude.
[c] National Secondary Ambient Air Quality Standard (40 CFR 50) corrected for altitude.
Source: DOE 1997b.

4.6.3.3 Radiological Releases

In the Carlsbad Site region, airborne radionuclides originate from natural sources (i.e., terrestrial and cosmic), worldwide fallout, and WIPP operations. DOE maintains a network of seven air sampling stations on and around WIPP to determine concentrations of radioactive particulates and aerosols in the air. DOE provides detailed summaries of radiological releases to the atmosphere from WIPP operations, along with resulting concentrations and doses, in a series of annual environmental data reports. Table 4.6.3.3–1 lists minimum, maximum, and average radionuclide concentrations obtained from composite air sampling locations surrounding WIPP. Since radioactive materials remain in the waste containers, there are no emissions of radionuclides to the ambient air from DOE facilities during normal WIPP waste handling, and the public is not subjected to radioactivity from the WIPP facility. The WIPP 2001 National Emissions Standards for Hazardous Air Pollutants (NESHAP) Report concluded that WIPP operated in compliance with the release standards of 40 CFR 191, Subpart A, and 40 CFR 61, Subpart H (WTRU 2002).

4.6.3.4 Noise

The Carlsbad Site is located in a sparsely populated area of southeastern New Mexico. The dominant use of the land within 16 km (10 mi) of the site is grazing, with lesser amounts used for oil and gas extraction and potash mining. BLM owns most of this land. Two ranches are located within 16 km (10 mi) of WIPP. The nearest prominent man-made features are the city of Loving (with a 1990 population of 1,243), which is 29 km (18 mi) west-southwest, and the city of Carlsbad (with a 1990 population of 24,896), which is 42 km (26 mi) west. The area of land that lies within the WIPP Site Boundary and committed to the WIPP facility is a square. Each side of the square is 6.4 km (4 mi), or 4,146 ha (10,240 ac) or 41.4 km^2 (16 mi^2). The main operations structures consist of the Waste Handling Building, the Support Building and the Exhaust Filter Building. Noise generated by topside operations is limited and potential public receptors are sufficiently removed from noise exposure as a result of the facility's geographical location, site boundary demarcation, and access control requirements (DOE 2002h).

Table 4.6.3.3–1. Minimum, Maximum, and Average Radionuclide Concentrations (Bq/m^3) in Air Filter Composites from Stations Surrounding the WIPP Site

Radionuclide		RN	2xTPU	MDC
Americium-241	Minimum	-4.26×10^{-8}	6.40×10^{-8}	3.81×10^{-8}
	Maximum	6.03×10^{-8}	6.11×10^{-8}	2.17×10^{-7}
	Average	1.87×10^{-8}	4.88×10^{-8}	8.58×10^{-8}
Plutonium-238	Minimum	-3.36×10^{-8}	6.73×10^{-8}	3.92×10^{-8}
	Maximum	2.07×10^{-7}	2.23×10^{-7}	3.05×10^{-7}
	Average	2.23×10^{-8}	9.37×10^{-8}	1.43×10^{-7}
Plutonium-239+240	Minimum	-2.96×10^{-8}	5.96×10^{-8}	3.52×10^{-8}
	Maximum	1.08×10^{-7}	1.34×10^{-7}	2.18×10^{-7}
	Average	1.62×10^{-8}	5.36×10^{-8}	7.84×10^{-8}
Uranium-234	Minimum	2.01×10^{-8}	4.48×10^{-7}	3.52×10^{-8}
	Maximum	4.59×10^{-8}	8.51×10^{-7}	1.29×10^{-7}
	Average	2.96×10^{-8}	1.66×10^{-8}	5.80×10^{-8}
Uranium-235	Minimum	0.00×10^{0}	0.00×10^{0}	4.44×10^{-8}
	Maximum	8.18×10^{-7}	9.29×10^{-8}	2.10×10^{-7}
	Average	1.69×10^{-7}	2.82×10^{-7}	7.74×10^{-8}
Uranium-238	Minimum	1.75×10^{-8}	4.18×10^{-7}	3.51×10^{-8}
	Maximum	4.81×10^{-8}	9.55×10^{-7}	1.82×10^{-7}
	Average	2.90×10^{-8}	1.63×10^{-8}	6.42×10^{-8}
Potassium-40	Minimum	-5.29×10^{-6}	2.37×10^{-4}	1.27×10^{-4}
	Maximum	6.44×10^{-3}	2.46×10^{-4}	8.84×10^{-4}
	Average	6.90×10^{-4}	3.11×10^{-3}	3.31×10^{-4}
Cobalt-60	Minimum	-1.32×10^{-5}	2.94×10^{-5}	1.98×10^{-5}
	Maximum	3.96×10^{-5}	4.00×10^{-5}	5.07×10^{-8}
	Average	6.32×10^{-6}	2.72×10^{-5}	2.89×10^{-5}
Strontium-90	Minimum	-7.47×10^{-6}	5.66×10^{-6}	6.99×10^{-6}
	Maximum	6.33×10^{-8}	4.40×10^{-6}	1.44×10^{-5}
	Average	2.01×10^{-7}	7.08×10^{-8}	8.77×10^{-8}
Cesium-137	Minimum	-3.81×10^{-5}	3.28×10^{-5}	1.69×10^{-5}
	Maximum	3.70×10^{-5}	3.70×10^{-5}	4.88×10^{-5}
	Average	-7.71×10^{-7}	3.35×10^{-5}	2.62×10^{-5}

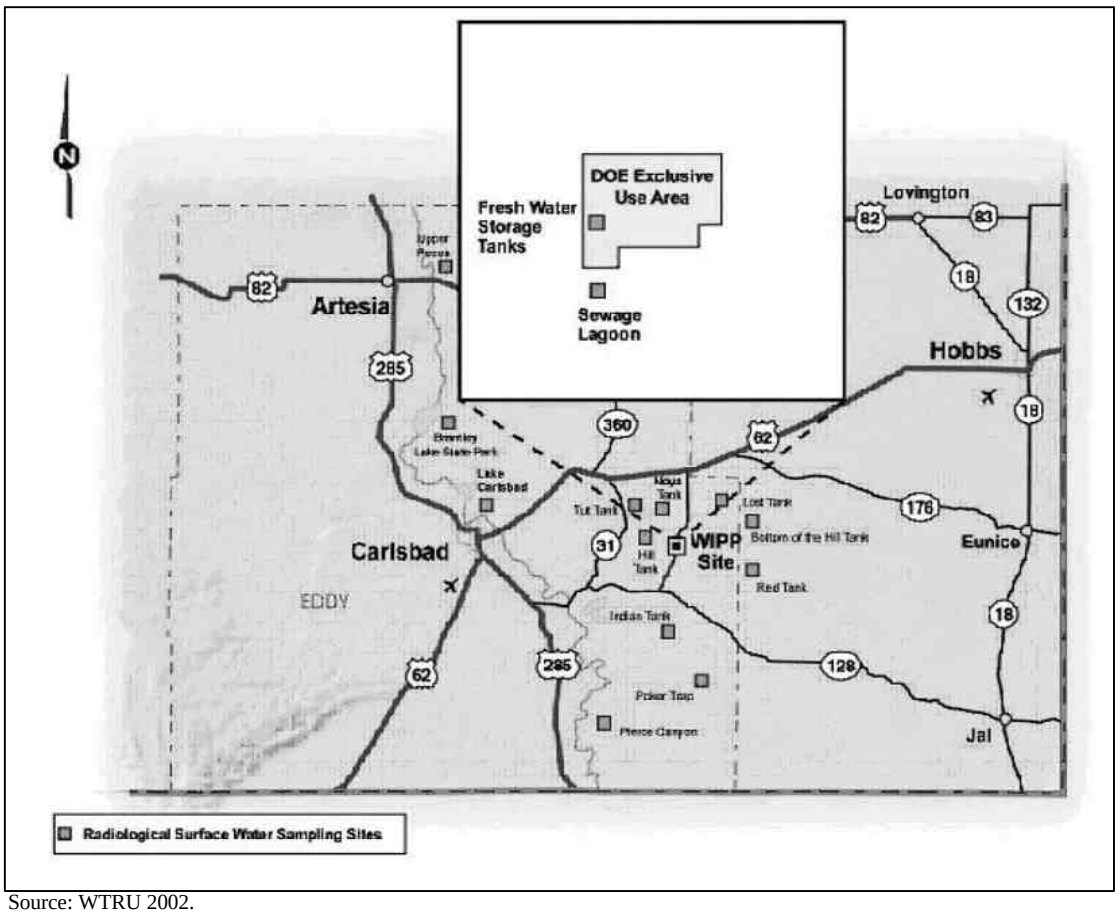
RN = Radionuclide concentration
TPU = Total Propagated Uncertainty (Standard Deviation, in the case of the mean)
MDC = Minimum Detectable Concentration
Source: DOE 1997b.

The ambient noise level in the WIPP area prior to construction was 26 to 28 dB. DOE requires its facilities to comply with OSHA standards as promulgated in 29 CFR 1910.95. Any WIPP noise sources with the potential to exceed these standards have been mitigated (for example, noise dampers have been installed in the underground air exhausts) and are now in compliance with 29 CFR 1910.95. The ambient noise level around WIPP has been estimated to be about 50 dB at a distance of 120 m (400 ft) from the Waste Handling Building due to normal operations. This qualitative estimate was determined to be accurate for *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (DOE 1997b) and remains accurate for the current WIPP operations. DOE requires its facilities to comply with OSHA standards as promulgated in 29 CFR 1910.95 for protection of workers (DOE 2001b).

4.6.4 Water Resources

4.6.4.1 Surface Water

The Carlsbad Site is located 19 km (12 mi) east of the Pecos River and within the Pecos River Basin, which represents about one-half of the drainage area of the Rio Grande Water Resources Region. The drainage area of the Pecos River at this location is 49,200 km^2 (19,000 mi^2). WIPP has a few small intermittent creeks, the only westward-flowing tributaries of the Pecos River within 32 km (20 mi) north or south of the site (Figure 4.6.4.1–1).



Source: WTRU 2002.

Figure 4.6.4.1–1. Surface Water at the Waste Isolation Pilot Plant

The Pecos River is the main surface water resource in the Carlsbad Site vicinity. Due to inflow from brine springs and slight exceedance of water quality levels of certain heavy metals, river water is not used for human consumption (DOE 1997b). Irrigation and livestock watering are the primary uses of the water from the Pecos River.

More than 90 percent of the mean annual precipitation at the site is lost by evapotranspiration. On an average monthly basis, evapotranspiration at the site greatly exceeds the available rainfall; however, intense local thunderstorms produce runoff and percolation. The maximum recorded flood on the Pecos River occurred on August 23, 1966, near Malaga, about 25 km (15 mi) from the Carlsbad Site. The maximum elevation of the flood was 90 m (300 ft) below the elevation of the WIPP surface facility.

WIPP does not lie within the 100-year floodplain. The general ground elevation in the vicinity of the surface facility is about 152 m (500 ft) above the riverbed and 122 m (400 ft) above the 100-year floodplain. No information on the 500-year floodplain is available. Protection from flooding is provided by the diversion of water away from WIPP by a system of peripheral interceptor diversions.

Surface Water Quality

Samples were collected once in 2001 from 10 sampling locations and analyzed for radionuclides (WTRU 2002). See Figure 4.6.4.1–1 for sampling locations. Isotopes of natural uranium were detected in surface water at every sampling location. Uranium-234 ranged from 1.12×10^{-2} picocuries per liter (pCi/L) to 5.89 pCi/L. The MCL for uranium-234 is 500 pCi/L. Uranium-235 was detected in 54 percent of the samples, with concentration ranging from 3.46×10^{-3} pCi/L to 1.76×10^{-1} pCi/L. The MCL for uranium-235 is 600 pCi/L. Results for uranium concentrations in 2001 samples were compared with the uranium concentrations in 2000 samples. There was no significant difference in the concentration of any uranium isotope between the years. The results for plutonium-238, plutonium-239+240 and americium-241 samples showed levels below the Minimum Detection Concentration in every sample. The results of selected radionuclides are summarized in Table 4.6.4.1–1.

4.6.4.2 Groundwater

The WIPP repository is situated in the thick, relatively impermeable Salado Formation salt beds 655 m (2,150 ft) below the ground surface. The hydrologic and mechanical properties of the salt beds surrounding WIPP are better understood than the regional hydrology. Generally, however, groundwater in the Rustler and Dewey Lake Formations and the units overlying them are essentially isolated from the hydrology of the Salado Formation.

The Rustler Formation includes the Culebra and Magenta Dolomites, two units containing water of low quality (brine to brackish) (DOE 1997b). The Culebra Dolomite, which is the first notable water-bearing unit above the Salado Formation, has been investigated for its potential to transport radionuclides released from the repository resulting from a borehole intrusion. Groundwater flow in the units overlying the Salado Formation has been assumed to occur primarily in the Culebra Dolomite, although it is recognized that regional flow in the Rustler Formation is three-dimensional and occurs to some degree in all Rustler units (DOE 1997a).

Flow in the Culebra is generally from north to south. The Dewey Lake Formation overlies the Rustler Formation and in some areas is relatively transmissive, particularly in the south-central and southwestern part of the WIPP site (DOE 1997b). The location of the water table is generally considered to be within the Dewey Lake Formation.

Table 4.6.4.1–1. Selected Radionuclide Concentration (pCi/L) in Surface Water Near WIPP

Location	Results	MCL or DCG	Result	MCL or DCG
	Cesium-137		**Cobalt-60**	
BRA	3.27	200	12.59	100
CBD	8.73	200	-0.27	100
FWT	-22.5	200	0.82	100
HIL	5.54	200	1.94	100
IDN	5.49	200	2.04	100
NOY	0.54	200	0.58	100
PCN	6.86	200	-3.97	100
SWL	-1.16	200	-3.97	100
TUT	-12.40	200	8.11	100
UPR	2.00	200	4.70	100
	Strontium-90		**Potassium-40**	
BRA	-0.51	1,000	198.90	15
CBD	0.080	1,000	115.94	15
FWT	0.31	1,000	129.99	15
HIL	0.62	1,000	105.94	15
IDN	0.497	1,000	-33.51	15
NOY	0.96	1,000	-77.57	15
PCN	0.38	1,000	2756.75	15
SWL	-0.72	1,000	591.89	15
TUT	0.13	1,000	152.97	15
UPR	-0.44	1,000	86.49	15
	Uranium-234		**Uranium-235**	
BRA	2.89	500	0.086	600
CBD	3.57	500	0.098	600
FWT	1.43	500	0.038	600
HIL	0.59	500	0.027	600
IDN	0.33	500	0.025	600
NOY	0.30	500	0.015	600
PCN	5.89	500	0.18	600
SWL	1.21	500	0.0052	600
TUT	0.26	500	0.014	600
UPR	2.20	500	0.097	600

Source: WTRU 2002.

Only a few locations of groundwater recharge and discharge to and from the Rustler Formation are known. The only documented areas of naturally occurring groundwater discharge within 24 km (15 mi) of WIPP are the Pecos River near Malaga Bend and, to a lesser extent, the saline lakes in Nash Draw, a shallow drainage course about 8 km (5 mi) wide (DOE 1997b). This local flow associated with Nash Draw is unrelated to groundwater flow at WIPP. The only documented area of groundwater recharge is also near Malaga Bend (DOE 1997b). This location is hydraulically downgradient from the repository, and recharge here has little relevance to flow near WIPP. Recent regional groundwater modeling has suggested that groundwater in the Culebra, Magenta, and Dewey Lake and Triassic units originates in areas that are north and northeast of WIPP (DOE 1997b).

Water service for WIPP is provided by a water line that originates 50 km (31 mi) north of the site. This water line provides all water required for operations of WIPP as well as untreated water to the city of Carlsbad (DOE 1996a). However, the city of Carlsbad owns rights to a total of 8.6 billion L/yr (2.3 billion gal/yr) 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. Water consumption in 2001 was approximately 25,963,000 L (6,858,646 gal). The current maximum water limit provided by the city of Carlsbad is at 75.7 million L/yr (20 million gal/yr) but WIPP has water capacity of approximately 2.4 billion L/yr (650 million gal/yr). Wells for this supply line are located near Maljamar, New Mexico, and tap the Ogallala Aquifer (Johnson 2002a).

Nonpotable water, used primarily for irrigation and livestock watering, comes from the Pecos River (DOE 1997b).

Groundwater Quality

Groundwater samples were collected twice in 2001 from seven different wells around the WIPP site. The water samples were collected from depths ranging from 180-270 m (600-900 ft) from six wells (WQSP-1 to WQSP-6), and from a depth of 69 m (225 ft) from WQSP-6A (WTRU 2002). Isotopes of naturally occurring uranium were detected in every well in 2001. The mean concentrations of Uranium-234 ranged from 6.84 pCi/L to 3.49×10^{1} pCi/L. Uranium-235 ranged from 1.59×10^{-1} pCi/L to 3.34×10^{-2} pCi/L. The concentrations of uranium isotopes in water samples collected from these wells were compared between 2000 and 2001. There was a significant difference in the concentration of uranium isotopes. The average concentration for both nuclides was approximately two times higher in 2001. This may be due to two different laboratories performing the analysis, employing two different methods in 2000 and 2001. The groundwater had a high total dissolved solids content, which caused the average chemical recovery of the samples to be less in 2001. The results of groundwater sampling are summarized in Table 4.6.4.2–1.

Table 4.6.4.2-1. Average Annual Radionuclide Concentration (pCi/L) in Groundwater from Wells at the WIPP Site

Location	Mean (pCi/L)		
	Americium-241	**Plutonium-238**	**Plutonium-239+240**
MCL or DCG	NS	40	30
WQSP-1	0.011	0.0079	0.0016
WQSP-2	0.00	0.0059	-0.15
WQSP-3	0.014	0.0059	0.00
WQSP-4	0.0081	0.0058	0.00039
WQSP-5	-0.0056	0.0029	0.0015
WQSP-6	-0.0056	0.0029	-0.0025
WQSP-6A	0.0057	0.0092	-0.0016
	Uranium-234	**Uranium-235**	**Uranium-238**
MCL or DCG	500	600	40
WQSP-1	3.49	0.90	5.70
WQSP-2	31.08	0.48	5.08
WQSP-3	7.32	0.16	1.12
WQSP-4	14.35	0.22	2.41
WQSP-5	15.54	0.22	2.25
WQSP-6	14.81	0.33	2.02
WQSP-6A	6.83	0.25	3.59
	Cesium-137	**Cobalt-60**	**Potassium-40**
MCL or DCG	200	100	15
WQSP-1	-0.31	0.90	5.70
WQSP-2	-6.81	14.11	424.32
WQSP-3	-0.13	2.95	140.54
WQSP-4	-3.43	1.68	694.60
WQSP-5	-2.32	0.99	2756.75
WQSP-6	-10.43	4.68	165.95
WQSP-6A	2.24	3.89	164.32
	Strontium-90	**Radium-226**	**Radium-228**
MCL or DCG	8	5*	5*
WQSP-1	-0.31	149.19	28.11
WQSP-2	-0.14	104.86	13.89
WQSP-3	-0.25	182.43	29.73
WQSP-4	1.60×10^{-2}	0.43	239.46
36.76	9.84×10^{-3}	0.27	73.24
10.35	0.045	24.05	4.59
WQSP-6A	0.33	10999.99	0.18

* Denotes combined Radium-226 and Radium-228 MCL standard
NS = No Standard.
pCi/L = picocuries/Liter.
Source: WTRU 2002.

4.6.5 Geology and Soils

4.6.5.1 Geology

The Carlsbad Site is located in southeastern New Mexico, in the northern portion of the Delaware Basin in the Pecos Valley Section of the Great Plains Physiographic Province. The Delaware Basin is a structural basin underlying present-day southeastern New Mexico and western Texas and containing a thick sequence of sandstones, shales, carbonates, and evaporites.

The terrain throughout the Great Plains Physiographic Province varies from plains and lowlands to rugged canyons. In the immediate vicinity of WIPP, numerous small mounds formed by wind-blown sand characterize the land surface. The representative site being evaluated for the MPF is located east of the WIPP project location (see Figure 4.6.1.1–2).

Geologic Conditions

This subsection describes the geologic conditions that could affect the stability of the ground and infrastructure at WIPP and includes potential volcanic activity, seismic activity (earthquakes), slope stability, surface subsidence, and soil liquefaction.

Volcanism

While there is a layer of volcanic ash that dates back to 600,000 years ago, volcanic activity is considered unlikely over the next 10,000 years (EPA 1996).

Seismic Activity

No surface displacement or faulting younger than early Permian (Wolfcampian) has been reported, indicating that tectonic movement since then, if any, has not been noteworthy. No mapped Quaternary (last 1.9 million years) or Holocene (last 10,000 years) faults exist closer to the site than the western escarpment of the Guadalupe Mountains, about 100 km (60 mi) west-southwest (DOE 1997b).

The strongest earthquake on record in the region occurred within 290 km (180 mi) of the WIPP site. The August 16, 1931, Valentine, Texas, earthquake had an estimated Richter magnitude of 6.4. The estimated ground shaking from this earthquake that would have been felt at WIPP is a Modified Mercalli Intensity V, which is defined to be shaking that is felt by nearly everyone, with some dishes breaking and shutters and pictures moving (see Table 4.2.5.1–2) (DOE 1997b).

Since 1990, at least two seismic events have occurred that were recorded at WIPP. The Richter magnitude 5.0 Rattlesnake Canyon Earthquake occurred approximately 100 km (60 mi) east-southeast of WIPP in January 1992. This event had no effect on any of the structures at WIPP. The most recent earthquake recorded at WIPP occurred April 14, 1995, at a distance of 32 km (20 mi) east-southeast of Alpine, Texas (approximately 240 km [150 mi] south of the site) with a Richter magnitude of 5.3 (DOE 1997b). These events had no effect on any structures at WIPP.

Slope Stability, Subsidence, and Soil Liquefaction

The site slopes gently from east to west, from an elevation of 1,088 m (3,570 ft) above sea level at its eastern boundary to 990 m (3,250 ft) above sea level along its western boundary. Landslides are not considered a threat in the area.

Subsidence (lowering of the ground surface) is known to occur in areas overlying layers of carbonates and evaporates. However, there is no field evidence of surface subsidence features at WIPP (63 FR 273.54).

4.6.5.2 Soils

The soils in the immediate vicinity of WIPP are made mostly of wind-blown sand and dust. The Mescalero caliche, a layer enriched in calcium carbonate material ranging in age from about 510,000 to about 410,000 years, is typically present beneath the surface layer of sand (DOE 1997b).

Soil Erosion

Intense local thunderstorms can produce significant localized runoff and associated localized erosion.

Mineral Resources

Resources such as oil, natural gas, and potash are in the region of WIPP. Mining and drilling activities other than those supporting the WIPP project are restricted within Section 16 area of the WIPP site (see Figure 4.6.1.1–2) (DOE 1997b).

4.6.6 Biological Resources

4.6.6.1 Terrestrial Resources

The Carlsbad Site is located in Eddy County, New Mexico, and encompasses approximately 41 km^2 (16 mi^2) within the remote Chihuahuan Desert of southeastern New Mexico. The site is 42 km (26 mi) east of Carlsbad, New Mexico. Geographically, the region is a relatively flat, sparsely inhabited plateau with little surface water (DOE 2002a). The *WIPP Land Withdrawal Act* was signed into law on October 30, 1992, transferring the land from DOI to DOE. With the exception of facilities within the boundaries of the posted 6 km^2 (2 mi^2) Off-Limits Area, the surface land uses remain largely unchanged from pre-1992 uses, and are managed in accordance with accepted practices for multiple land use (WTRU 2002). The WIPP withdrawal area includes portions of two grazing allotments administered by the DOI's BLM. DOE is responsible for range management decisions within the WIPP withdrawal area, including those affecting the two grazing allotments. However, as stipulated in the Memorandum of Understanding between DOE and DOI, BLM will provide for management of the grazing allotments within the WIPP withdrawal area in accordance with applicable grazing laws. DOE manages all habitat within the WIPP withdrawal area for ungulates, raptors, upland game, and any state- and/or federally-listed species of plants or animals occupying the WIPP withdrawal area (JPA 1997).

The Chihuahuan Desert has long been regarded for its extraordinary diversity of plant and animal communities. The location of WIPP, situated in the Los Medaños region of the Chihuahuan Desert, exemplifies this unusual array of biotic factors. The Los Medaños is located in an area of intergradation between the northern region of the Chihuahuan Desert and the Llano Estacado (Staked Plains). The region is characterized by aeolian (wind borne) and alluvial (water borne) sedimentation on upland plains that form hummocks, dunes, sand ridges, and swales with the presence of shinnery oak (or shin oak) (*Quercus havardii*) as a prominent woody species. Shrubs and grasses are the most prominent components of the local flora. Dominant trees include shinnery oak, honey mesquite (*Prosopis glandulosa*), and western soapberry (*Sapindus drummondii*). Much of the area is composed of combined dune and grassland habitats that include perennial grasses and shrubs. Although the abundance of shin oak has aided in the stabilization of the dunes, a number of them remain unstable and exhibit distinct signs of shifting. An additional predominant shrub is honey mesquite that has invaded what historically was a short-grass, shinnery oak-dominated landscape. As with many areas, the shinnery oak community has shifted from a dominant bluestem/grama *(Andropogon* spp.*/Bouteloua* spp.*)* grassland with varying amounts of shinnery oak, sand sage *(Artemisia filifolia)*, and yucca *(Yucca* spp.*)* to a composition dominated by dropseeds *(Sporobolus* spp.*)*, three-awns *(Aristida* spp.*)*, and gramas, with high densities of plains yucca *(Yucca glauca)*, annual forbs, and honey mesquite.

The subtle 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 in the vicinity of WIPP is characterized by a wide variety of insects, amphibians, reptiles, mammals, and birds. Wildlife populations are characterized by numerous species of arthropods, amphibians, reptiles, birds, and mammals.

Reptiles and amphibians are found in great numbers in southeastern New Mexico. Representative of the no fewer than 10 native amphibians are the tiger salamander (*Ambystoma tigrinum*), green toad (*Bufo debilis*), plain's spadefoot toad (*Spea bombifrons*), red-spotted toad (*Bufo punctatus*), and New Mexico spadefoot toad (*Spea muliplicata*). Their significance is seldom recognized until spring or summer rains, at which time they appear in extraordinary numbers. Reptiles comprise more conspicuous inhabitants due to the diurnal nature of numerous species. Characteristic of the approximately 35 distinct species of indigenous reptiles in the region include the ornate box turtles (*Terrapene ornata*), side-blotched lizards (*Uta stansburiana*), western whiptails (*Cnemidophorus tigris*), bullsnakes (*Pituophis melanoleucus*), prairie rattlesnakes (*Crotalus viridis*), and Texas horned lizards *(Phrynosoma cornutum*).

This portion of New Mexico supports an abundant and diverse population of mammals. As is common in desert biomes, black-tailed jackrabbits (*Lepus californicus)* and desert cottontails (*Sylvilagus audoboni*) are the most conspicuous mammals. Three species of ground squirrel (*Spermophilus* spp.) and numerous other rodents such as kangaroo rats (*Dipodomys* spp.) and cactus mice (*Peromyscus eremicus*) also occupy the area. Large piles of debris, which may consist of aluminum cans, cow dung, and other rubbish (sometimes to a height of nearly 1.5 m [5 ft]), clustered at the base of cactus or large mesquites characterize the houses (or "middens") of the Southern Plains woodrat (*Neotoma micropus*). Big-game species, such as desert mule deer (*Odocoileus hemionus*) and carnivores such as badgers (*Taxidea taxis*), coyotes (*Canis latrans*), gray foxes (*Urocyon cinereoargenteus*), and striped skunks (*Mephitis mephitis*) also frequent the

area. According to the BLM's Resource Management Plan, 15 percent of the wildlife species identified in the Resource Area utilize the Shin Oak habitat with 30 percent occupying areas consisting primarily of grass compositions with greater than 75 percent grasses.

Bird densities vary according to preferable food and habitat availability. The habitat heterogeneity of Los Medaños accounts for a wide assortment of bird species that inhabit the area either as seasonal transients or permanent residents. Scaled quail (*Callipepla squamata*), mourning doves (*Zenaida macroura*), loggerhead shrikes (*Lanius ludovicianus*), black-throated sparrows (*Amphispiza bilineata*), Chihuahuan ravens *(Corvus cryptoleucus*), and a unique desert subspecies of the northern bobwhite (*Colinus virginianus*) are but a few examples of the array of avian inhabitants. Due to a scarcity of surface waters in the immediate vicinity of WIPP, migrating or breeding waterfowl are not common. In addition, this area supports a particularly abundant and diverse population of raptors, or birds of prey. The density of large avian-predator nests has been documented as high as 16 nests per 10 km^2 (4 mi^2), one of the predominant raptor breeding populations in recorded scientific literature. Harris' hawks (*Parabuteo unicinctus*), Swainson's hawks (*Buteo swainsoni*), and great horned owls *(Bubo virginianus*) are species commonly found nesting in the area. Northern harriers (*Cicus cyaneus*), burrowing owls (*Athene cunicularia*), barn owls (*Tyto alba*), and American kestrels (*Falco sparverius*) are also found around the site.

Birds and mammals compose the upper levels of the food chain in the natural ecosystem around WIPP. These organisms may be affected by noise and human presence as well as by changes in habitat structure due to salt impacts. Population densities are monitored annually to define normal cycles of abundance and to detect major changes in populations or communities that may be due to activities at WIPP. It is the policy and practice of DOE to conduct effluent monitoring and environmental surveillance programs that are appropriate for determining adequate protection of the public and the environment during WIPP operations. The goal of the WIPP Environmental Monitoring Program is to determine if the local ecosystem has been impacted by WIPP activities and, if so, to evaluate the severity, geographic extent, and environmental significance of those impacts. The Environmental Monitoring Program monitors pathways by which WIPP-related radionuclides and other contaminants could reach the environment surrounding the WIPP site. The pathways measured include air, surface water, groundwater, sediments, soils, and biota (e.g., vegetation, game birds, and fish) (WTRU 2002). Site personnel manage several wildlife research projects and conduct a number of general wildlife management activities. Specific wildlife populations are monitored and researched in accordance with applicable laws, agreements, and regulations. Each activity is mandated and/or supported by state and Federal guidelines or by way of commitments created through interagency agreements and Memorandums of Understanding. Beginning in 1985, population density measurements of birds and small nocturnal mammals were performed annually to assess the effects of WIPP surface activities (e.g., construction, salt piles) on wildlife populations. Customary protocol involved comparative data analyses between two outlying or "control" plots and two experimental plots near WIPP operations. No consistent differences were found between the control and experimental plots. WIPP, and the region surrounding it, is widely recognized for its concentration and diversity of raptors. The area is home to several raptor species of special concern, including Harris' hawks, Swainson's hawks, burrowing owls, and barn owls, as well as other species. DOE, BLM, and other government agencies are keenly aware of the value and importance of protecting and monitoring raptor populations. To assist in this effort at WIPP,

BLM and DOE established a program in the early 1990s to monitor, protect, and educate site workers and the public about raptors on the WIPP site.

4.6.6.2 Wetlands

There are no jurisdictional wetlands present within the WIPP site that are regulated under Section 404 of the CWA.

4.6.6.3 Aquatic Resources

The Carlsbad Site is located east of the Pecos River. The Pecos River within this region drains an area of 49,200 km^2 (19,000 mi^2). WIPP has a few small intermittent creeks that are the only westward-flowing tributaries of the Pecos River within 32 km (20 mi) north or south of the site. Native amphibians are noticeable during puddle creation from the spring or summer rains. They may appear in extraordinary numbers after rainfall events. Perennial aquatic habitats near WIPP are limited to stock watering ponds and tanks, which may be frequented by yellow mud turtles (*Kinosternon flarescens*) and tiger salamanders. Similarly, various species of aquatic mollusks, inhabitants of local stock ponds and livestock drinking units, are observed on occasion.

4.6.6.4 Threatened and Endangered Species

In the first WIPP SEIS, DOE concluded that there was no critical habitat at the site for terrestrial species identified as endangered, threatened, or candidate species by either the USFWS or the New Mexico Department of Game and Fish (DOE 1997a). In 1996, DOE conducted a survey on the WIPP Land Withdrawal Area and associated lands to investigate the potential for impacts to rare, threatened, endangered, or sensitive plant or animal species as a result of the potential actions presented a second SEIS. The 1996 survey included an assessment of suitable habitats for these species. No state- or federally-listed species were found on the WIPP Land Withdrawal Area during the survey. The data reported in the survey, which support the conclusions of other studies, remain valid and indicate that permanent populations of these species are not established on WIPP lands. Currently, for Eddy County, the USFWS lists six federally endangered, six federally threatened, one proposed for listing, and five candidate species. The New Mexico Department of Game and Fish lists 10 endangered and 21 threatened animal species, while the New Mexico Energy, Minerals, and Natural Resources Department lists 6 endangered plant species for Eddy County. Neither the New Mexico Game and Fish's BISON-M (Biota Information System of New Mexico) database nor the New Mexico Council's database contains a record of occurrence at WIPP for any listed species found in Table 4.6.6.4–1. Ongoing wildlife research projects and general wildlife management programs are conducted by personnel at Westinghouse TRU Solutions, LLC, the management and operations contractor at WIPP, to ensure disturbance and encroachment on wildlife habitat are minimized. The protection of threatened and endangered species is taken into consideration when planning and administering projects on WIPP lands (DOE 2001b, DOE 2002a, and DOE 2002h).

Table 4.6.6.4–1. Listed Federal- and State-Threatened and Endangered Species and other Special Interest Species that Occur in Eddy County, New Mexico

Species	Federal Classification	State Classification	Occurrence in Eddy County/WIPP
Mammals			
Black-tailed Prairie Dog *Cynomys ludovicianus arizonensis*	Candidate	Sensitive taxa (informal)	Eddy County Occurrence No Record at WIPP
Least Shrew *Cryptotis parva*	Unlisted	Threatened	Eddy County Occurrence No Record at WIPP
Swift Fox Vulpes velox velox	Removed from Candidate listing October 30, 2001	Sensitive taxa (informal)	Eddy County Occurrence No Record at WIPP
Birds			
American Peregrine Falcon *Falco peregrinus anatum*	Delisted	Threatened	Eddy County Occurrence No Record at WIPP
Aplomado Falcon, *Falco femoralis septentrionalis*	Endangered	Endangered	Eddy County Occurrence No Record at WIPP
Baird's Sparrow *Ammodramus bairdii*	Unlisted	Threatened	Eddy County Occurrence No Record at WIPP
Bald eagle *Haliaeetus leucocephalus*	Threatened—Proposed for Delisting	Threatened	Eddy County Occurrence No Record at WIPP
Bell's Vireo *Vireo bellii*	Unlisted	Threatened	Eddy County Occurrence No Record at WIPP
Broad-billed Hummingbird *Cynanthus latirostris magicus*	Unlisted	Threatened	Eddy County Occurrence No Record at WIPP
Brown Pelican *Pelecanus occidentalis carolinensis*	Endangered	Endangered	Eddy County Occurrence No Record at WIPP
Common Ground-dove *Columbina passerina pallescens*	Unlisted	Endangered	Eddy County Occurrence No Record at WIPP
Gray Vireo *Vireo vicinior*	Unlisted	Threatened	Eddy County Occurrence No Record at WIPP
Interior Least Tern *Sterna antillarum athalassos*	Endangered	Endangered	Eddy County Occurrence No Record at WIPP
Lesser Prairie-chicken *Tympanuchus pallidicinctus*	Candidate	Sensitive taxa (informal)	Eddy County Occurrence No Record at WIPP
Mexican Spotted Owl *Strix occidentalis lucida*	Threatened	Sensitive taxa (informal)	Eddy County Occurrence No Record at WIPP

Table 4.6.6.4–1. Listed Federal- and State-Threatened and Endangered Species and other Special Interest Species that Occur in Eddy County, New Mexico (*continued*)

Species	Federal Classification	State Classification	Occurrence in Eddy County/WIPP
Birds *(continued)*			
Mountain Plover *Charadrius montanus*	Proposed Threatened	Sensitive taxa (informal)	Eddy County Occurrence No Record at WIPP
Neotropic Cormorant *Phalacrocorax brasilianus*	Unlisted	Threatened	Eddy County Occurrence No Record at WIPP
Piping Plover *Charadrius melodus circumcinctus*	Threatened	Endangered	Eddy County Occurrence No Record at WIPP
Southwest Willow Flycatcher *Empidonax traillii extimus*	Endangered	Endangered	Eddy County Occurrence No Record at WIPP
Varied Bunting *Passerina versicolor*	Unlisted	Threatened	Eddy County Occurrence No Record at WIPP
Reptiles			
Arid Land Ribbon Snake *Thamnophis proximus diabolicus*	Unlisted	Threatened	Eddy County Occurrence No Record at WIPP
Blotched Water Snake *Nerodia erythrogaster transversa*	Unlisted	Endangered	Eddy County Occurrence No Record at WIPP
Mottled Rock Rattlesnake *Crotalus lepidus lepidus*	Unlisted	Threatened	Eddy County Occurrence No Record at WIPP
Sand Dune Lizard *Sceloporus arenicolus*	Candidate	Threatened	Eddy County Occurrence No Record at WIPP
Western River Cooter *Pseudemys gorzugi*	Unlisted	Threatened	Eddy County Occurrence No Record at WIPP
Fish			
Bigscale Logperch *Percina macrolepida*	Unlisted	Threatened	Eddy County Occurrence Not present at WIPP
Blue Sucker *Cycleptus elongatus*	Unlisted	Endangered	Eddy County Occurrence Not present at WIPP
Gray Redhorse, *Moxostoma congestum*	Unlisted	Threatened	Eddy County Occurrence Not present at WIPP
Greenthroat Darter *Etheostoma lepidum*	Unlisted	Threatened	Eddy County Occurrence Not present at WIPP
Mexican Tetra *Astyanax mexicanus*	Unlisted	Threatened	Eddy County Occurrence Not present at WIPP

Table 4.6.6.4–1. Listed Federal- and State-Threatened and Endangered Species and other Special Interest Species that Occur in Eddy County, New Mexico (*continued*)

Species	Federal Classification	State Classification	Occurrence in Eddy County/WIPP
Fish *(continued)*			
Pecos Bluntnose Shiner *Notropis simus pecosensis*	Threatened	Threatened	Eddy County Occurrence Not present at WIPP
Pecos Gambusia *Gambusia nobilis*	Endangered	Endangered	Eddy County Occurrence Not present at WIPP
Pecos Pupfish *Cyprinodon pecosensis*	Unlisted	Threatened	Eddy County Occurrence Not present at WIPP
Molluscs			
Ovate Vertigo Snail *Vertigo ovata*	Unlisted	Threatened	Eddy County Occurrence No Record at WIPP
Pecos Pyrg Snail *Pyrgulopsis pecosensis*	Candidate	Threatened	Eddy County Occurrence No Record at WIPP
Texas Hornshell *Popenaias popeii*	Candidate	Endangered	Eddy County Occurrence No Record at WIPP
Plants			
Gypsum wild buckwheat *Eriogonum gypsophilum*	Threatened	Endangered	Eddy County Occurrence No Record at WIPP
Kuenzler's hedgehog cactus/Kuenzler's strawberry cactus/ pitayita *Echinocereus fendleri var. kuenzleri*	Unlisted	Endangered	Eddy County Occurrence No Record at WIPP
Lee's pincushion cactus *Escobaria sneedii var. leei*	Threatened	Endangered	Eddy County Occurrence No Record at WIPP
Mulee/needle mulee/beehive cactus/pineapple cactus/Scheer pincushion *Coryphantha scheeri var. scheeri*	Endangered	Endangered	Eddy County Occurrence No Record at WIPP
Shining coralroot/shining cock's comb *Hexalectris nitida*	Unlisted	Endangered	Eddy County Occurrence No Record at WIPP
Tharp's blue-star *Amsonia tharpii*	Unlisted	Endangered	Eddy County Occurrence No Record at WIPP

Sources: NMG&F 2002, NMRPTC 1999.

4.6.7 Cultural and Paleontological Resources

4.6.7.1 Cultural Resources

All undertakings at WIPP are conducted in compliance with relevant cultural resource Federal legislation, particularly Sections 110 and 106 of the NHPA, and DOE orders and policies that address cultural resource protection and management. Prior to passage of the *WIPP Land Withdrawal Act* in 1992, BLM managed the cultural resources in this area. Management responsibility was transferred from DOI to DOE in 1994 through a Memorandum of Understanding. Cultural resources are currently managed according to guidelines set forth in the WIPP Land Management Plan (DOE 2002a). DOE and the State of New Mexico signed a Joint Powers Agreement that includes provisions specifying how DOE will satisfy its obligations regarding cultural resources under NHPA. The ROI for cultural resources is the entire WIPP site.

Cultural resource investigations at WIPP started in 1976 and have continued to the present for any new undertakings at the site. Initially, the central 10 km^2 (4 mi^2) of the WIPP Land Withdrawal Area was surveyed, resulting in the identification of 33 sites and 64 isolated occurrences (DOE 1980). Over 25 separate investigations have been conducted at the site since then, resulting in approximately 37 percent of the Land Withdrawal Area 1,368 ha (3,380 ac) being inventoried (DOE 1997b, DOE 2002a). Fifty-nine archaeological sites and 91 isolated occurrences (single or few artifacts, or isolated features) comprise the total resources recorded in the Land Withdrawal Area (DOE 2002a). Based on site inventory data and assuming fairly even distribution of resources across the landscape, DOE estimates that the remaining unsurveyed acreage in WIPP may contain 99 sites and 153 isolated occurrences. The resources are almost exclusively prehistoric, with only one of the 59 sites having both prehistoric and historic components. There are no known Native American traditional cultural properties, sacred sites, or burials in the Land Withdrawal Area.

Management of cultural resources, particularly archaeological sites, in this part of New Mexico is difficult due to the geomorphology. Dune fields, which are common in the region within and surrounding WIPP, often move rapidly, covering and uncovering archaeological sites. A survey conducted in a previously surveyed location a few years later will record different sites. Thus, previously surveyed project areas often require resurveying for new undertakings.

The isolated occurrences at WIPP are not likely to yield information beyond that already documented, and thus are considered not eligible for inclusion in the NRHP. Many of the sites are considered eligible or potentially eligible for listing on the NRHP. All of the 33 sites recorded in the central 10 km^2 (4 mi^2) are considered eligible to the NRHP as a district (DOE 1980).

Cultural Resources on the Reference Location

The reference location at WIPP is located in the central 10 km^2 (4 mi^2) of the Land Withdrawal Area. This location was previously surveyed for archaeological sites in the late 1970s and archaeological sites were found throughout this area. In addition, because of the movement of dune fields, it is likely that resurvey of the area would discover previously unrecorded archaeological sites. Finally, this is a location that has not undergone construction disturbance,

therefore, it is likely that cultural resources are located at the reference location or in the area immediately surrounding it.

4.6.7.2 Paleontological Resources

Near the end of the Pleistocene, approximately 20,000-15,000 years ago, the region surrounding WIPP enjoyed a water table higher than today's. Although the specific location of WIPP remained dry on the surface, the higher water table was evidenced by nearby lakes, with springs and seeps present along the Oglala Caprock. The Mescalero sands and dunes which cover WIPP now were also present, and the general paleo-environment at this time was one of sagebrush and grasslands. The sources of water near WIPP contained fresh water snails and other mollusks, and were an attraction for Late Pleistocene vertebrates, including the giant ground sloth, camel, horse, bison, short-faced bear, and Columbian mammoth. Discoveries of fossils from these invertebrates and vertebrates in the region generally have been found in locations exhibiting Late Pleistocene lacustrine or spring/seep deposits (McGee 2002). However, because these water sources were located around WIPP, it is possible that some fossil deposits of vertebrates could be located on the WIPP site from animals migrating between water sources. The only recorded discovery of fossilized remains at WIPP is the metacarpal of a *Bison antiquus*, which was an isolated find with no other remains in the area. The bone was found in 1996 during trenching for electrical conduit in the Property Protection Area (Lynn 2002a).

4.6.8 Socioeconomics

Socioeconomic characteristics addressed at the Carlsbad Site include employment, income, population, housing, and community services. These characteristics are analyzed for a two-county ROI consisting of Eddy and Lea Counties in New Mexico, where the majority of site employees reside.

4.6.8.1 Employment and Income

The service sector employs the greatest number of workers in the ROI with more than 26 percent of the workforce. Other important sectors of employment include retail trade (17 percent); mining (15.5 percent); and government (13.6 percent) (BEA 2002).

The labor force in the ROI increased 7.8 percent from 1990 to 2001, an average of 0.7 percent each year. In comparison, the State of New Mexico labor force increased at a much greater rate, a total of 18.4 percent over the same time period. Total employment in the ROI increased at a faster pace than the labor force, a total of 9.5 percent. Unemployment fell from 5.6 percent in 1990 to 4.1 percent in 2001. In comparison, the state-wide average unemployment rate fell from 6.5 percent in 1990 to 4.8 percent in 2001 (BLS 2002a).

In 2000, per capita income in the ROI ranged from a high of $21,007 in Eddy County to a low of $20,229 in Lea County. The average per capita income in the ROI was approximately $20,600, compared to the New Mexico average of $21,931. Per capita income increased by almost 49 percent from 1990 to 2000, compared to a state-wide increase of 46.8 percent (BEA 2002).

4.6.8.2 Population and Housing

Between 1990 and 2000, the ROI population grew from 104,370 to 107,169, an increase of 2.7 percent. This was a much slower rate of growth than for New Mexico, which grew at a rate of 47 percent during the same time period. All of the population growth was in Eddy County, where the population increased by 6.3 percent. Lea County's population decreased by 0.5 percent (Census 2002).

In 2000, the total number of housing units in the ROI was 45,654 with 39,078 occupied. There were 28,692 owner-occupied housing units and 10,386 occupied rental units. In 2000, the homeowner vacancy rate in the ROI ranged from a high of 3.6 percent in Lea County to a low of 2.9 percent in Eddy County. The rental vacancy rate ranged from 18.7 percent in Lea County to 18.1 percent in Eddy County. The homeowner vacancy rates for the ROI are comparable to the New Mexico state average of 2.2 percent, but the ROI rental vacancy rate was much higher than the New Mexico state average rate of 11.6 percent. The number of housing units in the ROI is fairly evenly divided between the two counties with 49 percent in Eddy County and 51 percent in Lea County (Census 2002).

4.6.8.3 Community Services

There are a total of 8 school districts in the ROI with 66 schools serving over 22,000 students. The student-to-teacher ratio in these districts ranges from a high of 16.8 in the Carlsbad Municipal Schools in Eddy County to a low of 12.9 in Tatum Municipal Schools in Lea County. The average student-to-teacher ratio in the ROI is 16.0 (NCES 2002).

The ROI is served by four hospitals with a capacity of over 400 beds. The largest hospital in the ROI is Lea Regional Medical Center in Hobbs, New Mexico. The closest hospital to WIPP is the Guadalupe Medical Center in Carlsbad, New Mexico (AHA 1995). There are approximately 100 doctors in the ROI.

4.6.9 Radiation and Hazardous Chemical Environment

4.6.9.1 Radiation Exposure and Risk

An individual's radiation exposure in the vicinity of WIPP amounts to approximately 360 mrem/yr as shown in Table 4.6.9.1–1 and is comprised of natural background radiation from cosmic, terrestrial, and internal body sources; radiation from medical diagnostic and therapeutic practices; weapons test fallout; consumer and industrial products, and nuclear facilities. All radiation doses mentioned in this EIS are effective dose equivalents. Effective dose equivalents include the dose from internal deposition of radionuclides and the dose attributable to sources external to the body.

Table 4.6.9.1–1. Sources of Radiation Exposure to Individuals in the WIPP Vicinity Unrelated to WIPP Operations

Source	Radiation Dose (mrem/yr)
Natural Background Radiation	
Total external (cosmic and terrestrial)	55
Internal terrestrial and global cosmogenic	40[a]
Radon in homes (inhaled)	200[a]
Other Background Radiation[a]	
Diagnostic x rays and nuclear medicine	53
Weapons test fallout	less than 1
Air travel	1
Consumer and industrial products	10
Total	**360**

[a] An average for the United States.
Source: Derived from data in NCRP 1987.

Annual background radiation doses to individuals are expected to remain constant over time. The total dose to the population, in terms of person-rem, changes as the population size changes. Background radiation doses are unrelated to WIPP operations.

Releases of radionuclides to the environment from WIPP operations provide another source of radiation exposure to individuals in the vicinity of WIPP. Types and quantities of radionuclides released from WIPP operations in 2001 are listed in *WIPP 2001 Site Environmental Report* (WTRU 2002). The doses to the public resulting from these releases are presented in Table 4.6.9.1–2. The radionuclide emissions contributing the majority of the dose to the offsite MEI were americium-241, plutonium-238, plutonium-239, and plutonium-240. These doses fall within the radiological limits given in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, and are much lower than those from background radiation.

Table 4.6.9.1–2. Radiation Doses to the Public From Normal WIPP Operations in 2001 (Total Effective Dose Equivalent)

Members of the Public	Atmospheric Releases		Liquid Releases		Total	
	Standard[a]	Actual	Standard[a]	Actual	Standard[a]	Actual
Offsite MEI (millirem)	10	4.96×10^{-6}	4	0	100	4.96×10^{-6}
Population within 80 km person-rem)	None	NR	None	NR	None	NR

NR = Not Reported.
[a] The standards for individuals are given in DOE Order 5400.5. As discussed in that order, the 10-mrem/yr limit from airborne emissions is required by the *Clean Air Act* (40 CFR 61) and the 4-mrem/yr limit is required by the *Safe Drinking Water Act* (40 CFR 141). For this EIS, the 4-mrem/yr value is conservatively assumed to be the limit for the sum of doses from all liquid pathways. The total dose of 100 mrem/yr is the limit from all pathways combined. If the potential collective dose to the offsite population exceeds the 100 person-rem value, the contractor operating the facility would be required to notify DOE.
Source: WTRU 2002.

Using a risk estimator of one latent cancer death per 2,000 person-rem to the public (see Appendix B), the fatal cancer risk to the offsite MEI due to radiological releases from WIPP

operations are estimated to be 2.5×10^{-12}, or 2.5 cancer deaths in a population of 1 trillion. The estimated probability of this maximally exposed person dying of cancer at some point in the future from radiation exposure associated with one year of WIPP operations is less than one in 1 million (it takes several to many years from the time of radiation exposure for a cancer to potentially manifest itself).

WIPP workers receive the same dose as the general public from background radiation, but they also may receive an additional dose from working in facilities with nuclear materials. The average dose to the individual worker and the cumulative dose to all workers at WIPP from operations in 2001 are presented in Table 4.6.9.1–3. According to a risk estimator of one latent fatal cancer per 2,500 person-rem among workers (see Appendix B), the number of projected fatal cancers among WIPP workers from normal operations in 2001 is 4.4×10^{-4}. The risk estimator for workers is lower than the estimator for the public because of the absence from the workforce of the more radiosensitive infant and child age groups.

Table 4.6.9.1–3. Radiation Doses to Workers from Normal WIPP Operations in 2001 (Total Effective Dose Equivalent)

Occupational Personnel	Standard	Actual
Average radiation worker dose (millirem)	5,000[a]	2.9
Collective radiation worker dose[b] (person-rem)	None	1.103

[a] DOE's goal is to maintain radiological exposure as low as is reasonably achievable. Therefore, DOE has recommended an administrative control level of 500 mrem/yr (DOE 1999e); the site must make reasonable attempts to maintain individual worker doses below this level.
[b] There were 75 workers with measurable doses in 2001.
Source: Goff 2003.

4.6.9.2 Chemical Environment

The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (e.g., soil through direct contact or via the food pathway).

Workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. WIPP workers are also protected by adherence to OSHA and EPA occupational standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals.

Appropriate monitoring, which reflects the frequency and amounts of chemicals used in the operation processes, ensures that these standards are not exceeded. Additionally, DOE requirements ensure that conditions in the workplace are as free as possible from recognized hazards that cause or are likely to cause illness or physical harm.

Adverse health impacts to the public are minimized through administrative and design controls to decrease hazardous chemical releases to the environment and to achieve compliance with permit requirements. The effectiveness of these controls is verified through the use of monitoring information and inspection of mitigation measures. Health impacts to the public may occur during normal operations at WIPP via inhalation of air containing hazardous chemicals released

to the atmosphere by WIPP operations. Risks to public health from ingestion of contaminated drinking water or direct exposure are also potential pathways.

VOC monitoring underground at WIPP was implemented in 1997 as a requirement of the Hazardous Waste Facility Permit and is intended to demonstrate that regulated VOCs are not being emitted by the waste at concentrations in excess of concentrations of concern as prescribed in the permit. Nine target compounds, which contribute approximately 99 percent of the calculated human health risks from RCRA constituents, were chosen for monitoring. These target compounds are 1,1-dichloroethylene, methylene chloride, chloroform, 1,1,1-trichloroethane, carbon tetrachloride, 1,2-dichloroethane, toluene, chlorobenzene, and 1,1,2,2-tetrachloroethane.

Sampling for target compounds is done at two air monitoring stations. The stations are identified as VOC-A, located downstream from hazardous waste disposal unit Panel 1 in Drift E300, and VOC-B, located upstream from Panel 1. In 2001, VOC-B was located in Drift S1950. As waste is placed in new panels, VOC-B will be relocated to ensure that it samples underground air before it passes the waste panels. The location of VOC-A is not anticipated to change.

4.6.10 Traffic and Transportation

4.6.10.1 Regional Transportation Infrastructure

WIPP is located approximately 42 km (26 mi) east of Carlsbad, New Mexico (Figure 4.6.10.1–1). Major highways in the region include U.S. 285 that runs north and south through Carlsbad and U.S. 62/U.S. 180 that runs roughly east and west through Carlsbad. These highways are both four-lane highways. Access to WIPP from all locations of interest for this EIS is from the north on U.S. 285 to U.S. 62/U.S. 180. A 21-km (13-mi) access road connects WIPP to U.S. 62/U.S. 180. A 6-km (4-mi) long south access road connects the southern WIPP boundary with NM 128. All hazardous and radioactive shipments to and from WIPP use the north access road.

4.6.10.2 Local Traffic Conditions

Given the low population in Carlsbad, especially in the vicinity of WIPP, and the relatively low employment for WIPP, traffic in the region is light and free flowing except for short durations during shift change. Traffic data for roads in the vicinity of WIPP are provided in Table 4.6.10.2–1.

Table 4.6.10.2–1. Traffic Conditions on Principal Roads Near WIPP

Access Road	Annual Average Daily Traffic	Peak Hourly Traffic
North access road	310	NA
South access road	750	NA
U.S. 62/U.S. 180 between north access road and Carlsbad	3,300	570
NM 128 between south access road and intersection with NM 31	1,200	180
U.S. 62 just east of Carlsbad	18,900	1,100

Source: NMSH&TD 2002, Johnson 2002b.

Figure 4.6.10.1–1. Highways in the Region of the Carlsbad Site

4.6.11 Waste Management

This section describes the DOE waste generation baseline that will be used to gauge the relative impact of MPF construction and operations on the overall waste generation at the Carlsbad Site and on DOE's capability to manage such waste. WIPP manages LLW, mixed LLW, hazardous waste, and sanitary waste. Except for "derived waste" (discussed below), TRU waste and mixed TRU waste are not normally generated. Table 4.6.11–1 provides the routine waste generation rates at WIPP. Table 4.6.11–2 summarizes the waste management capabilities at WIPP.

Table 4.6.11–1. Annual Routine Waste Generation From WIPP Operations (m^3)

Waste Type	1996	1997	1998	1999	2000	2001
Transuranic	0	0	0	0	0	0
Low-level	0	0	0	0	0	0.40
Mixed	0	0	0	0	0	0.05
Hazardous[a]	2.00	84.0	80.0	30.4	15.8	14.2
Sanitary[b]	1,000	821	821	751	9.18	82.2

[a] Includes state-regulated waste. Hazardous waste reported in metric tons.
[b] From DOE 2002o (1996 data) and DOE's Central Internet Database (available at http://cid.em.doe.gov). Sanitary waste reported in metric tons.
Source: DOE 2002o.

Table 4.6.11–2. Waste Management Facilities at WIPP

Facility/ Description	Capacity	Status	Applicable Waste Types				
			LLW	Mixed LLW	TRU Waste	Hazardous Waste	Nonhazardous Waste
Storage Facility (m^3)							
Waste Handling Building Unit [a]	77				X		
Parking Area Unit	45				X		
Disposal Facility (m^3)							
10 underground HWDUs	54,000 [b]				X		

[a] Includes derived waste storage area. Derived waste from TRU waste operations is managed as TRU waste.
[b] Capacity authorized by current RCRA permit, which includes 3 of 10 panels planned for the WIPP facility. Under the *WIPP Land Withdrawal Act*, the repository capacity is limited to 175,600 m^3 (6,201,314 ft^3), including up to 7,080 m^3 (250,000 ft^3) of remote-handled (RH) TRU waste.
Source: NMED 2001.

WIPP is a geologic repository designed for the disposal of defense-generated TRU waste. Some of the TRU wastes disposed of at WIPP contain hazardous wastes as co-contaminants. During the Disposal Phase of the WIPP facility, which is expected to last 25 years, the total amount of waste received from offsite generators and any derived waste will be limited to 175,600 m^3 (6,201,314 ft^3) of TRU waste of which up to 7,080 m^3 (250,000 ft^3) may be remote-handled TRU mixed waste.

The WIPP repository has been divided into 10 discrete underground hazardous waste disposal units (HWDUs) or panels, which are being permitted under 40 CFR 264, Subpart X. The process design capacity for the miscellaneous unit is for the maximum amount of waste that may be received from offsite generators plus the maximum expected amount of derived wastes that

may be generated at the WIPP facility. During the 10-year period of the current RCRA permit (issued in October 1999), up to 52,110 m^3 (1,840,264 ft^3) of contact-handled waste and 1,954 m^3 (69,005 ft^3) of remote-handled waste could be emplaced in Panels 1 to 3. A fourth HWDU (Panel 4) and disposal area access drifts (designated as Panels 9 and 10) will be constructed, but will not receive waste for disposal, under the current RCRA permit.

WIPP operates two container storage units. One is inside the Waste Handling Building and consists of the contact-handled bay, conveyance loading room, waste hoist entry room, remote-handled bay, cask unloading room, hot cell, transfer cell, and facility cask loading room. This storage unit will be used for waste receipt, handling, and storage (including storage of derived waste) prior to emplacement in the underground repository. The capacity of this storage unit is 77 m^3 (2,719 ft^3). The second storage unit is the parking area outside the Waste Handling Building where the TRUPACT-II trailers and the road cask trailers will be parked awaiting waste handling operations. The capacity of this unit is 12 TRUPACT-IIs and three road casks or four rail casks with a combined volume of 45 m^3 (1,589 ft^3). The railroad side tracks are included in this area to accommodate rail shipments of remote-handled TRU mixed waste.

Wastes may be generated at the WIPP facility as a direct result of managing the TRU wastes received from the offsite generators. Such waste may be generated in either the Waste Handling Building or the underground. This waste is referred to as "derived waste." All such derived waste will be placed in the rooms in HWDUs along with the TRU waste for disposal. Non-mixed hazardous wastes generated at WIPP, through activities where contact with TRU mixed waste does not occur, are characterized, placed in containers, and accumulated until they are transported offsite for treatment and/or disposal at a permitted facility.

The WIPP operational philosophy is to introduce no new hazardous components into TRU mixed waste to avoid generating TRU mixed waste that is compositionally different than the TRU mixed waste shipped to the repository for disposal. Some additional TRU mixed wastes, such as personal protective equipment, swipes, and tools, may result from decontamination operations and off-normal events. Such waste will be assumed to be contaminated with the RCRA-regulated constituents in the TRU waste containers from which it was derived. Derived waste may be generated as a result of decontamination during the waste handling process. Derived waste is assumed to be acceptable for management at WIPP because any TRU waste shipped to the facility will have already been determined to be acceptable and no new constituents will be added. Derived waste will be packaged in standard Department of Transportation-approved Type A containers. Containers of derived waste will be moved to the underground HWDU using the same equipment used for handling TRU mixed waste.

4.6.11.1 Low-Level Radioactive Waste

The solid radioactive waste system provides for the collection and packaging of site-derived radioactive waste for the disposal in the underground HWDU. This waste is collected in standard Type A containers equipped with filter vents and managed as TRU waste. All site-derived waste is anticipated to be contact-handled, due to its low activity and the potential sources of site-derived solid waste in the WIPP facility.

In addition to the derived waste, a small amount of LLW is generated by the WIPP radiochemistry laboratory. This waste is stored at the laboratory and shipped offsite for treatment and disposal.

4.6.11.2 Mixed Low-Level Waste

WIPP site-derived waste could originate in both the surface and underground facilities. These wastes will be packaged for disposal in the underground HWDUs. Because derived wastes can contain only those materials present in the waste from which they were derived, no additional characterization of the derived waste is proposed for disposal purposes. Characterization of derived waste will primarily be based on process knowledge.

In addition to the derived waste, a small amount of mixed LLW is generated by the WIPP radiochemistry laboratory. This waste is stored at the laboratory and shipped offsite for treatment and disposal.

4.6.11.3 Transuranic and Alpha Waste

Except for site-derived waste, WIPP operations have not generated TRU wastes to date.

4.6.11.4 Hazardous Waste

WIPP hazardous wastes typically include absorbed liquids from spills and routine usage of maintenance products, including oils, coolants, and solvents. The waste is managed in satellite accumulation areas and a less-than-90-day storage area (Section 474) pending shipment to offsite treatment or disposal facilities (WTRU 2002).

Storage of these materials is administered by the Site Generated Nonradioactive Hazardous Waste Management Program, the Industrial Safety Program, and the WIPP Emergency Management Program. A Hazardous Waste/Material Storage Facility is provided for storage of various types of incoming and outgoing hazardous materials prior to shipment to a treatment, storage, and disposal facility (DOE 2002m).

4.6.11.5 Sanitary Waste

WIPP operates a construction debris landfill in Section 6. This landfill is restricted to the disposal of unused construction materials and construction debris (e.g., timbers, piping, uncontaminated excavation soil, concrete, packing materials, sheet metal, glass, and wood). Refuse and paper are disposed of at a local landfill or recycled off site, as appropriate for the waste.

4.6.11.6 Wastewater

Water used as a fire suppressant is the largest potential source of liquid radioactive waste at WIPP. Another source would be liquid used for decontamination. In an unlikely fire event, suspect liquids would be sampled and tested for radioactivity. If the liquid exceeds the uncontrolled release limit of DOE Order 5400.5, it would be made acceptable for disposal at WIPP. All nonfire water radioactive waste is collected in portable tanks or drums and handled in accordance with procedure in WP 05-WH1036, *Site-Derived Mixed Waste Handling* (DOE 2002a).

WIPP operates a sewage treatment facility to collect and treat sanitary wastewater and nonradioactive liquids from the repository's surface facility operations. Provisions also exist for the sewage treatment facility to receive nonhazardous effluents typically resulting from observation wells and the dewatering of mine shafts **(**DOE 2002h). The lagoon system is a zero discharge treatment facility consisting of two primary settling lagoons, two polishing lagoons, a chlorination system, and three evaporation basins. The sewage system was expanded in June 1993 to add two lined evaporation basins, doubling the system capacity.

WIPP has a NMED Discharge Permit for a wastewater lagoon facility. The daily discharge limit to the lagoon is 87,064 L/day (23,000 gal/day) of domestic wastewater, 7,571 L/day (2,000 gal/day) of miscellaneous nonhazardous water, and 30,283 L/day (8,000 gal/day) of miscellaneous nonhazardous brine and water. WIPP is preparing to amend its existing discharge permit to cover discharges from the active salt tailings pile. Currently, WIPP does not require NPDES permitting. There are no point source discharges to waters of the United States associated with the repository (DOE 2001b).

4.6.11.7 Pollution Prevention

The total waste (routine waste as well as environmental restoration and D&D waste) generated by WIPP was 96 m^3 (3,390 ft^3) in FY2001, accounting for 0.015 percent of DOE's overall waste generation. Implementing pollution prevention projects reduced the total amount of waste generated at WIPP in 2001 by approximately 169 m^3 (5,968 ft^3). Examples of WIPP pollution prevention projects completed in 2001 include the reduction of sanitary waste by 5 metric tons (5.5 tons) by recycling computer equipment through donations to local schools (DOE 2002g).

4.6.11.8 Waste Management PEIS Records of Decision

A discussion of DOE's hazardous waste, LLW, mixed LLW, and TRU waste decisions based on the Waste Management PEIS is provided in Section 4.2.11.8. The Waste Management PEIS RODs affecting WIPP are shown in Table 4.6.11.8–1.

Table 4.6.11.8–1. Waste Management PEIS Records of Decision Affecting WIPP

Waste Type	Preferred Action
TRU waste	DOE decided (with one exception) that each DOE site would prepare its own TRU waste for disposal and store it onsite until it could be shipped to WIPP for disposal. DOE amended its decision to establish the capability at WIPP to prepare for disposal up to 1,250 m^3 (44,143 ft^3) of contact-handled TRU waste out of about 7,000 m^3 (247,205 ft^3) expected to be received annually for disposal. In addition, DOE decided to increase the time that CH-TRU waste may be stored above ground at WIPP to one year and to increase the total aboveground storage capacity at WIPP by 25 percent, for a total of 152 m^3 (5,368 ft^3) (65 FR 82985).[a]
LLW	DOE has decided to treat WIPP's LLW onsite and to ship the waste to either the Hanford Site or NTS for disposal.[b]
Mixed LLW	DOE has decided to regionalize treatment of mixed LLW at the Hanford Site, INEEL, ORR, and SRS. DOE has decided to ship WIPP's mixed LLW to either the Hanford Site or NTS for disposal.[b]
Hazardous waste	DOE has decided to continue to use commercial facilities for treatment of WIPP's non-wastewater hazardous waste.[c]

[a] From the ROD for TRU waste (63 FR 3629) and the ROD for the WIPP Disposal Phase SEIS (63 FR 3624).
[b] From the ROD for LLW and mixed LLW (65 FR 10061).
[c] From the ROD for hazardous waste (63 FR 41810).