3.0 Affected Environment

Section 3.0 describes the natural and human environment that could be affected by implementing the Proposed Action and the No Action Alternative. Based on the Proposed Action description, environmental resources that may potentially be affected as a result of implementing the Proposed Action have been considered. Environmental issues were identified and either addressed in this section or not, based on the "Sliding Scale Approach" discussed earlier in this EA (Section 1.4). Table 2 identifies the subsection where potential environmental issues are discussed or notes why they are not addressed in this document.

Table 2. Potential Environmental Issues Applicable to this EA

Environmental Category	Applicability	Subsection
Environmental Restoration and Waste Management	Yes	3.2
Water Resources (Surface and Ground)	Yes	3.3
Climatology and Air Quality	Yes	3.4
Geology	Yes	3.5
Human Health	Yes	3.6
Transportation and Utilities	Yes	3.7
Noise	Yes	3.8
Environmental Justice	Yes	3.9
Socioeconomic	Yes	3.10
Land Use	No. None of the Proposed Action corrective measure options would change the land use at TA-54 to a designation other than Waste Management.	N/A
Floodplains and Wetlands	No. The Proposed Action would not be located in a floodplain or wetland.	N/A
Cultural Resources	No. Field surveys and onsite inspection by trained archaeologists reveal that there are no cultural resources within the vicinity of MDA H.	N/A
Visual Resources	No. All corrective measure options involve only local construction in an existing industrial area. Interim storage of about 50,000 yd^3 (38,000 m^3) of overburden would result in a temporary mound of soil and tuff about 60 ft (18 m) high within TA-54. This overburden would be returned to the MDA H work site to be used as backfill.	N/A
Biological Resources	No. The Proposed Action would be located within previously disturbed and developed land or adjacent to disturbed areas within an industrialized area of LANL. The Proposed Action site is adequately distant from potential habitat for sensitive wildlife and plants.	N/A

3.1 Regional Setting

The Proposed Action would be located within the area of Los Alamos County that includes LANL. LANL comprises a large portion of Los Alamos County and extends into Santa Fe County. LANL is situated on the Pajarito Plateau along the eastern flank of the Jemez Mountains and consists of 49 technical areas. The Pajarito Plateau slopes downward towards the Rio Grande along the eastern edge of LANL and contains several fingerlike mesa tops separated by relatively narrow and deep canyons.

Commercial and residential development in Los Alamos County is confined primarily to several mesa tops lying north of the core LANL development, in the case of the Los Alamos town site, or southeast, in the case of the community of White Rock. The lands surrounding Los Alamos County are largely undeveloped wooded areas that are administered by the U.S. Department of Agriculture, Santa Fe National Forest; the U.S. Department of the Interior, National Park Service, Bandelier National Monument; the U.S. Department of the Interior, Bureau of Land Management; and San Ildefonso Pueblo.

3.2 Environmental Restoration and Waste Management

DOE and UC staff at LANL are jointly responsible for implementing the environmental restoration activities at LANL, which is a permitted RCRA hazardous waste facility. Environmental Restoration at LANL is governed primarily by the corrective action process prescribed in RCRA, but is also subject to other applicable laws, regulations, DOE orders, and LANL policies. The NMED administers RCRA in New Mexico. DOE, NNSA, through the Los Alamos Site Office, oversees site characterization and waste cleanup and remediation activities at LANL PRSs.

PRSs include SWMUs[26] and areas of concern,[27] collectively. PRSs at LANL include septic tanks and lines, chemical storage areas, wastewater outfalls (the area below a pipe that drains wastewater), landfills, firing ranges and their impact areas, surface spills, and electric transformers. PRSs are found on mesa tops, on canyon walls, and in canyon bottoms. The main pathways by which released contaminants can migrate are infiltration into alluvial aquifers, airborne dispersion of dust or particulate matter (PM), and migration from surface runoff. The environmental contaminants at LANL include VOCs, semivolatile organic compounds, polychlorinated biphenyls, pesticides, heavy metals, radionuclides, petroleum products, and HE. The 1999 LANL SWEIS (DOE 1999a) contains additional information on LANL contaminants. The Proposed Action would involve MDA H, which is designated as SWMU 54-004 within TA-54.

UC staff at LANL generate solid waste from construction, demolition, and facility operations. These wastes are managed and disposed of at appropriate solid waste facilities. Both LANL and Los Alamos County currently use the same solid waste landfill located within LANL boundaries on DOE-administered land. The Los Alamos County Landfill receives about 50,000 tons of solid waste per year (45,500 metric tons per year), with LANL contributing about 10,500 tons per year (9,555 metric tons per year), or about 21 percent of the total. When the current Los Alamos County Landfill closes, currently estimated to occur in 2007, it would be capped and monitored. NNSA and UC staff at LANL are currently investigating future waste management options for LANL solid waste.

[26] A SWMU is defined in the HSWA Module VIII of LANL's Hazardous Waste Facility Permit as "any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at or around a facility at which solid wastes have been routinely and systematically released."

[27] Areas of concern are PRSs that may warrant investigation or remediation, but do not meet the definition of a SWMU.

Building-debris storage yards on Sigma Mesa, the Los Alamos County Landfill, or other approved material management areas at LANL are currently used to store concrete rubble, asphalt, and clean soil for future re-use at LANL or for recycling offsite. Management of all waste at LANL is carried out in accordance with applicable laws, regulations, and DOE orders. LLW, including DU, is disposed of at TA-54, Area G. HE debris material is burned at TA-16. Hazardous waste regulated under RCRA is transported to Area G at LANL for proper management. Hazardous wastes and mixed wastes may be treated onsite or offsite but must be disposed of offsite since LANL has no permitted onsite disposal facilities for these waste types. The offsite disposal locations are located across the U.S. and are audited for regulatory compliance before being used for LANL hazardous or mixed waste disposals.

Waste shipped offsite from LANL for disposal must meet stringent DOT shipping requirements and TSD-specific waste acceptance criteria and permit conditions before transportation occurs. Most nonradioactive, hazardous wastes can be disposed of at a number of permitted hazardous waste disposal facilities. Some hazardous wastes may be radioactively contaminated; these are referred to as mixed waste. This waste type can only be disposed of away from LANL at offsite locations that are licensed to manage mixed radioactive or hazardous waste up to an authorized limit. Several TSD facilities are appropriate for one or more categories of waste generated by LANL operations and the LANL environmental restoration activities. These disposal facilities currently include DOE's NTS and commercial firms located in Washington or Utah.

The Secretarial Memorandum on release of materials from DOE facilities (Richardson 2000) states that recyclable metals must remain within the DOE system and cannot be sent to commercial metal recyclers. Nonhazardous, nonradioactive metals may be recycled through the LANL-operated recycling facility when its acceptance criteria are met.

The following metals are suitable for recycling within the DOE system by metal melting even if they are radioactively contaminated: stainless steel, carbon steel, iron, galvanized metal, nickel alloys, chromium alloys, and ferrous alloys. This process is also suitable for small quantities of copper, aluminum, brass, and bronze. The following metals are suitable for recycling within the DOE system following decontamination: lead, stainless steel, carbon steel, iron, copper, aluminum, nickel, chromium, galvanized metal, and brass.

3.3 Water Resources (Surface and Ground)

Surface water at LANL occurs primarily as short-lived or intermittent reaches of streams. Perennial springs on the flanks of the Jemez Mountains supply base flow into the upper reaches of some canyons, but the volume is insufficient to maintain surface flows across LANL. Runoff from heavy thunderstorms or heavy snowmelt can reach the Rio Grande. Effluents from sanitary sewage, industrial water treatment plants, and cooling tower blow-down enter some canyons at rates sufficient to maintain surface flows for varying distances (DOE 1999a). Surface waters at LANL are monitored by LANL and the NMED. Planned releases from industrial and sanitary wastewater facilities within LANL boundaries are permitted under NPDES stormwater permits. Construction, maintenance, or other intrusive activities conducted within water courses are carried out under the *Clean Water Act* Sections 401 and 404 as implemented by the NMED for the State of New Mexico and the Army Corps of Engineers, respectively. The application of BMPs to mitigate impacts from stormwater runoff is required under LANL's NPDES Multi-sector General Permit for stormwater discharges.

The nature and extent of groundwater within the LANL region have not been fully characterized. Current data indicate that groundwater occurs near the surface in the canyon bottom alluvium, perched at deeper (intermediate) levels below the alluvium, and at still deeper levels in the regional aquifer (LANL 1995a). Alluvial groundwater has been identified primarily through monitoring wells drilled around LANL (DOE 1999a). Within LANL boundaries, continually saturated alluvial groundwater occurs in Mortandad, Los Alamos, Pueblo, Sandia, and Pajarito Canyons. The depth to perched groundwater varies from about 90 ft (27 m) in the middle of Pueblo Canyon to about 450 ft (135 m) below the ground surface in lower Sandia Canyon (LANL 1993). Based on data from wells and boreholes in and around TA-54, perched groundwater is not known to exist beneath the immediate MDA H area. The regional aquifer is separated from the alluvial groundwater by 350 to 620 ft (105 to 186 m) of unsaturated volcanic tuff and sediments (LANL 1995b). At MDA H, the estimated depth to the regional aquifer is 1,040 ft (312 m) (LANL 2001c). Recharge of the regional aquifer is not fully understood nor characterized but is not expected to be strongly interconnected across its extent. Groundwater within the LANL area is monitored to provide indications of the potential for human and environmental exposure from contaminants (DOE 1999a). Groundwater protection and monitoring requirements are included in DOE Order 450.1, Environmental Protection Program.

There have been subsurface releases of VOC vapors and tritium in the form of water vapor from MDA H. Transport of tritium through the subsurface would be expected to be in the form of water vapor associated with residual moisture within the tuff. The thickness of the unsaturated rock between the tritium source in the disposal shafts and the regional aquifer is 1,040 ft (312 m). The current measured moisture content of the Bandelier tuff is less than 5 percent (LANL 2001d). Under this existing moisture content, water within the unsaturated rock on Mesita del Buey would not be expected to recharge into the regional aquifer for thousands of years, if at all. Evidence supporting this statement includes natural tracer studies, pore-water chemical analyses, moisture-measurement analyses, and groundwater flow calculations (LANL 1997a).

Analytical results from the RFI (LANL 2001a) were used to assess the present-day impacts to ecological and human receptors. The present-day risk assessment concluded that existing soil contamination does not exceed applicable EPA and NMED risk thresholds. The tritium inventory in the disposal shafts has already been reduced by diffusion and by radioactive decay. Tritium has a short half-life of about 12.3 years. Since it was disposed of, the tritium inventory in the shafts has been reduced by a factor of 2 every 12.3 years and will continue to diffuse at a slower and slower rate.

Data and analysis of LANL surface and groundwater samples indicate that LANL operations and activities have affected the surface water within LANL boundaries and some of the alluvial perched groundwater zones in the LANL region as well. Details on the surface and groundwater quality can be found in the annual LANL Environmental Surveillance and Compliance Report (LANL 2002b).

The average precipitation rate for the area near MDA H is 14 in. (35.6 cm) per year (LANL 1990b). Most of this precipitation is lost to runoff and ET, resulting in a heterogeneous infiltration pattern that is controlled by the mesa and canyon setting of the site. Infiltration is thought to be seasonal with most occurring during spring snowmelt and, to a lesser extent, during the summer thunderstorm season (LANL 1997b).

Measured rock saturations and chloride data indicate low net percolation rates (0 to 0.2 in. [0 to 0.5 cm] per year) within the mesa (LANL 2001e, 1996). Cañada del Buey is dry with a percolation rate similar to the mesa top, while Pajarito Canyon is wetter than Mesita del Buey and Cañada del Buey with an estimated percolation rate of 0.4 to 12 in. (1 to 30 cm) per year. The small drainages surrounding the site are also expected to have percolation rates similar to the mesa top because they have small catchment areas and also are quite steep in some areas. The coupling of the fractured units separated by the high-permeability surge bed with the mesa's topographic relief is thought to enhance air circulation and consequently evaporative drying within the mesa interior. Matrix flow is expected to dominate in the unsaturated tuff units at the site. Because wastes were mostly disposed of at MDA H in large metal pieces, major contaminant transport through the unsaturated tuff units from fluid fracture flow is unlikely.

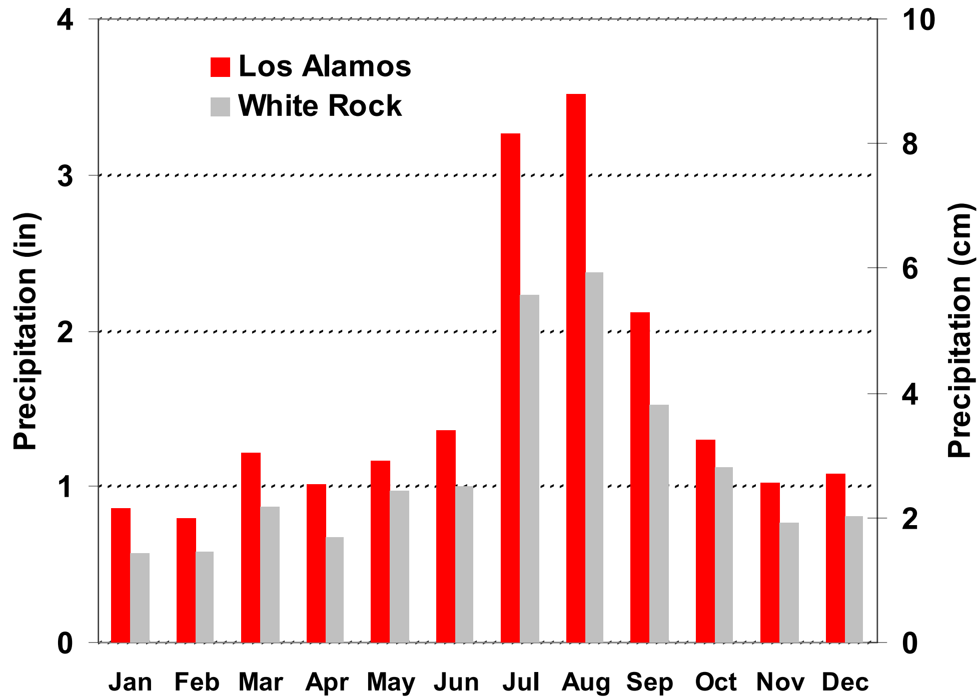
3.4 Climatology and Air Quality

Los Alamos County has a semiarid, temperate mountain climate. Annual precipitation averages 18.7 in. (46.8 cm) per year; 36 percent to 40 percent of which occurs during the summer "monsoon" season of July and August (Figure 13). However, the annual total precipitation fluctuates considerably from year to year; the standard deviation of these fluctuations is 4.8 in. (12 cm). The lowest recorded annual precipitation is 6.8 in. (17.0 cm), and the highest is 30.3 in. (75.8 cm). The maximum precipitation recorded for a 24-hour period is 3.5 in. (8.8 cm). The maximum 15-min precipitation in the record is 0.9 in. (2.25 cm). Monthly average values for relative humidity vary little during the year. Relative humidity ranges from a low of 39 percent in June to a high of 56 percent in December, averaging 51 percent over the entire year. Fog in Los Alamos is very rare, occurring less than five times per year on average.

Summers are generally sunny with moderately warm days (maximum temperatures usually below 90 degrees Fahrenheit [°F] [32 degrees Celsius (°C)] and cool nights (temperatures in the 50s°F [10s°C]). Summer thunderstorms generally occur during the afternoon or early evening. These thunderstorms are usually short, intense events that can cause significant surface water runoff. Lightning is very frequent in Los Alamos. In an average year, Los Alamos experiences 61 thunderstorm days, about twice the national average. (A thunderstorm day is defined as a day on which thunder is heard or a thunderstorm occurs.) Only in the southeastern part of the country is this frequency exceeded. In addition to lightning, hail often accompanies these summertime convective storms. Hailstones of 0.25 in. (0.6 cm) are common, but stones of 1 in. (2.50 cm) have been reported. Hail has caused significant damage to property and vegetation, and localized accumulations of 3 in. (7.6 cm) have been observed (LANL 1992a).

Winter temperatures typically range from 15 to 25°F (-9 to -4°C) during the night and warm to 30 to 50°F (-1 to 10°C) during the day. Occasionally, temperatures drop to below 0°F (-18°C) (Figure 13). Winter snow accumulation averages 51 to 59 in. (127.5 to 147.5 cm) per year. Freezing rain is rare.

Surface winds average 5.5 miles per hour (mph) (8.85 kilometers per hour [kph]) at Los Alamos. Wind speeds are strongest from March through June (averaging 8.8 mph [14.2 kph]) and weakest in December and January. Sustained winds exceeding 25 mph (40.3 kph) are common during the spring. The strongest winds are generally southwesterly through northwesterly and occur in the afternoon and evening. The complex surface terrain in the area contributes to wind



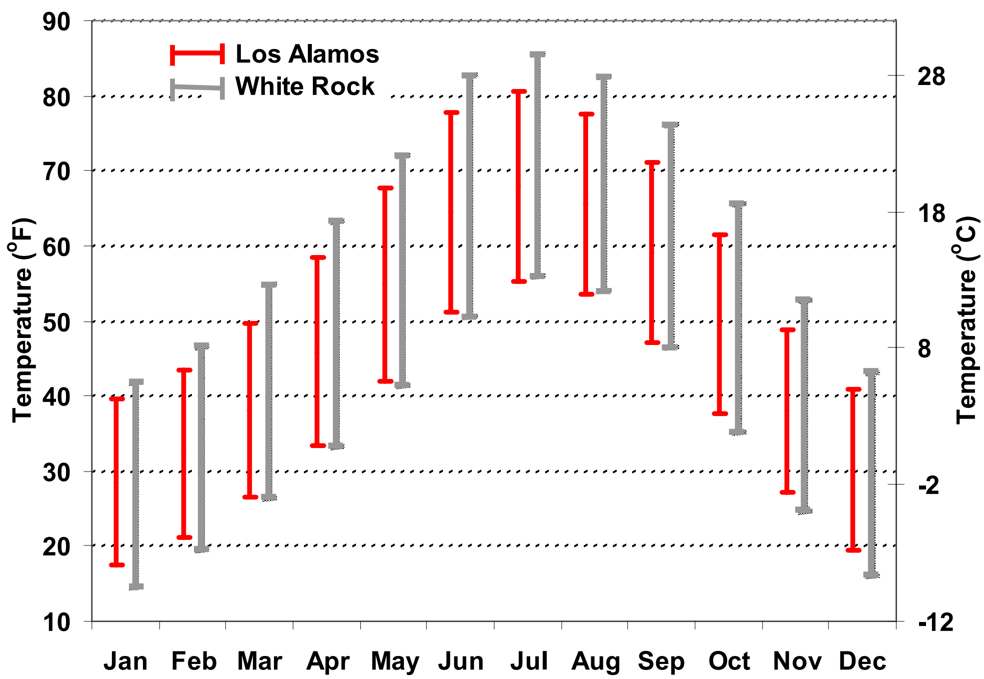


Figure 13. Mean monthly precipitation and air temperature in Los Alamos and White Rock (LANL 1990b).

conditions that vary with location and time of day. No tornadoes have been reported but strong "dust devils" (up to 75 mph) and spring wind gusts (up to 60 mph) do occur (LANL 1992a).

Average annual precipitation at a weather station within Area G on Mesita del Buey in TA-54 is about 14 in. (35.6 cm); about 40 percent of this occurs as brief, intense thunderstorms during July and August. Snowfall is greatest from December through March; heavy snowfall is infrequent during other months. Surface water runoff can occur during summer thunderstorms, frontal storms, and snowmelt periods, but the majority of runoff and resultant erosion probably occurs during the summer thunderstorm period. The canyon-mesa topography at TA-54 affects wind speed and direction in a dramatic way, as indicated by measurements taken at meteorological stations on Mesita del Buey and within Cañada del Buey and Pajarito Canyon. Comparisons of average annual wind roses from the mesa-top and canyon meteorological towers reveal the channeling effect of the mesa-canyon topography. Mesa-top winds flow predominantly south to southwest during the day. Canyon winds are strongly channeled; they flow predominantly up canyon (north-northwest) during the day and down canyon (south-southeast) and across the mesa (east) at night.

Plants adapted to this environment are very efficient in their ability to extract moisture that infiltrates into the ground, and transpiration rates (removal of water from the near-surface via root uptake and redistribution to the atmosphere through plant leaves and stems) are high. For example, at TA-54, measured average transpiration equaled the measured annual average precipitation (14 in.) over a 10-year period (LANL 1995a).

Low precipitation and high ET rates minimize the quantity of water that percolates through the vadose zone across the Pajarito Plateau, especially on mesa tops, including Mesita del Buey. The mesa geometry also enhances exposure of the subsurface to evaporative processes such as high solar radiation, strong winds, and engineered air circulation.

The *Clean Air Act* (CAA) (40 CFR 50) establishes air quality standards to protect public health and the environment from the harmful effects of air pollution. The CAA requires establishment of national standards of performance for new stationary sources of emissions, limitations for any new or modified structure that emits or may emit an air pollutant, and standards for emission of hazardous air pollutants (HAPs). In addition, the CAA requires that specific emission increases be evaluated to prevent a significant deterioration in air quality.

The EPA is the regulating authority for the CAA. However, EPA has granted the NMED primacy for regulating air quality under an approved State Implementation Plan (SIP)[28]. In New Mexico, all of the CAA regulations, with the exception of the National Emission Standards for Hazardous Air Pollutants (NESHAP) for radionuclides (40 CFR 61), certain provisions relating to Stratospheric Ozone Protection (40 CFR 82), and the Risk Management Program (40 CFR 68) have been adopted by the State as part of the SIP, and are regulated under the *New Mexico Air Quality Control Act*.

The New Mexico Environmental Improvement Board, as provided by the *New Mexico Air Quality Control Act*, has promulgated a series of air quality control regulations in the NMAC.

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[28] The purpose of the SIP is to ensure that Federal emission standards are being implemented and the NAAQS are being achieved.

These regulations are administered by NMED. Under the Federal CAA and the SIP, LANL is subject to Federal air quality regulations, including those that are not part of the SIP, and all work is performed at LANL in accordance with Federal, State, DOE, LANL, and local regulations, as required. In addition to the existing Federal programs, the 1990 amendments to the CAA mandate new program requirements that include control technology for HAPs, engineered monitoring, prevention of accidental releases, and chlorofluorocarbon replacement.

Los Alamos County is in attainment with all State ambient air[29] quality standards and NAAQS. Air quality is a measure of the amount and distribution of potentially harmful pollutants in ambient air. Air surveillance at Los Alamos includes monitoring emissions to determine the air quality effects of LANL operations. LANL staff calculates annual actual LANL emissions of regulated air pollutants and reports the results annually to the NMED. The ambient air quality in and around LANL meets all State, EPA, and DOE standards for protecting the public and workers (LANL 2001c).

LANL is adjacent to Bandelier National Monument, which is a Federal Class I area designated under the CAA. Prevailing winds generally are from the south and west, but the topography of the Pajarito Plateau causes daily, seasonal, and localized changes in wind speeds and direction.

Mobile sources, such as automobiles and construction vehicles, are additional sources of air emissions; however, mobile sources are not regulated by NMED. Diesel emissions from conveyance vehicles are not regulated as stationary sources of emissions. Mechanical equipment including bulldozers, excavators, backhoes, cranes, tamper compactors, trenchers, and drill rigs are exempt from permitting under Title 20 of the NMAC Part 2.72, *Construction Permits*. This type of exemption does not require notification to NMED.

Both EPA and NMED regulate nonradioactive air emissions. NMED does not regulate dust from excavation or construction, but LANL workers take appropriate steps during construction activities to control fugitive dust and particulate emissions using, for example, best achievable control measures of water sprays or soil tackifiers. Excavation and construction activities are not considered stationary sources of regulated air pollutants under the New Mexico air quality requirements; these activities are not subject to permitting under 20 NMAC, Parts 2.70 and 2.72. Annual dust emissions from daily windblown dust are generally higher than short-term construction-related dust emissions.

3.5 Geology

The Jemez Mountains volcanic field (JMVF) is located in northern New Mexico at the intersection of the western margin of the Rio Grande Rift and the Jemez Lineament (Figure 14) (Gardner et al. 1986, Heiken et al. 1996). The Jemez Lineament is a northeast-southwest-trending alignment of young volcanic fields ranging from the Springerville volcanic field in east-central Arizona to the Raton volcanic field of northeastern New Mexico (Heiken et al. 1996). The JMVF is the largest volcanic center along this lineament (LANL 1992b). Volcanism in the

[29] Ambient air is defined in 40 CFR 50.1 as "that portion of the atmosphere external to buildings, to which the public has access." It is defined in the NMAC Title 20, chapter 2, part 72, as "the outdoor atmosphere, but does not include the area entirely within the boundaries of the industrial or manufacturing property within which the air contaminants are or may be emitted and public access is restricted within such boundaries."

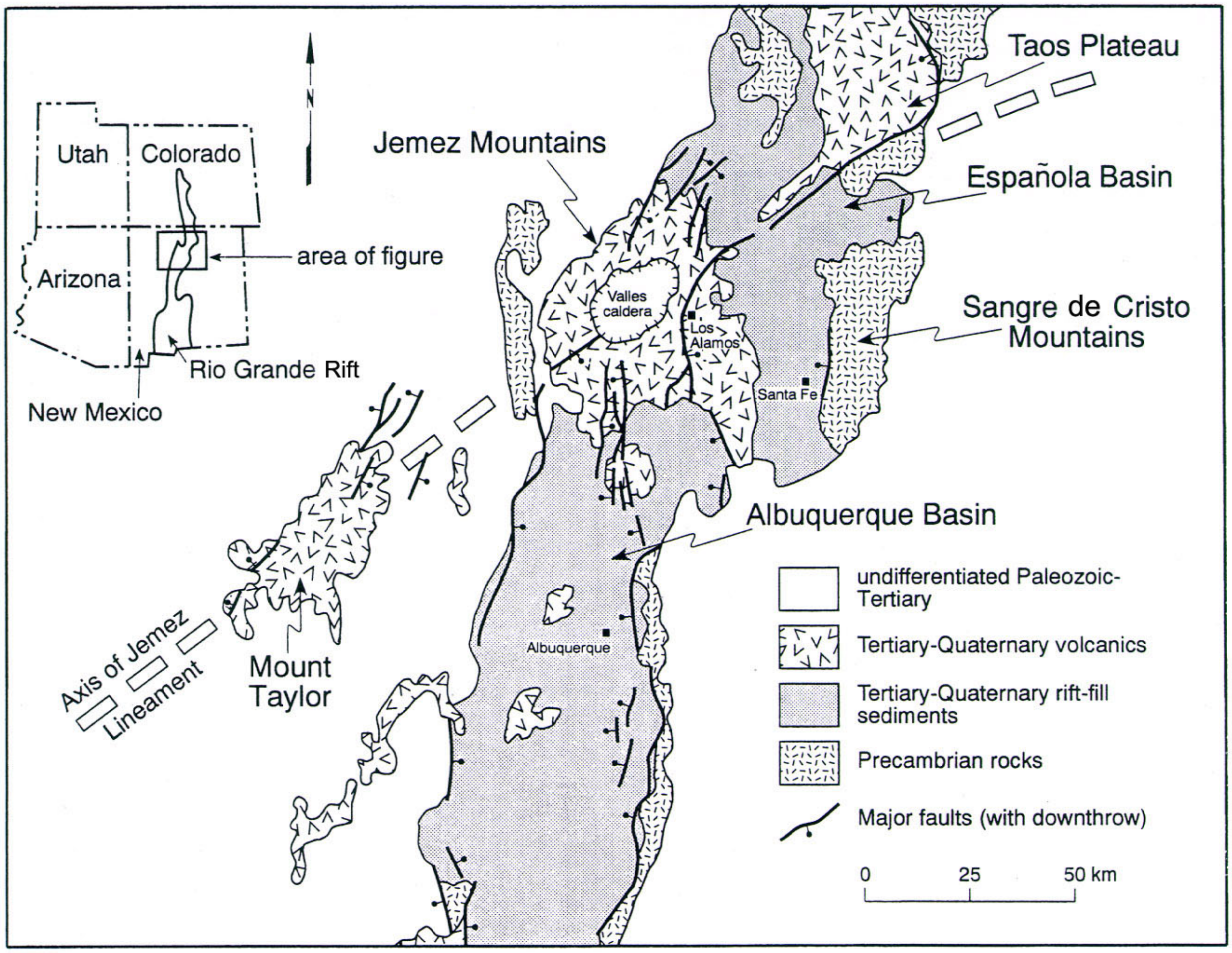

Figure 14. Generalized geologic map of the Rio Grande Rift in northern New Mexico (Self and Sykes 1996).

JMVF spans a roughly 16-million-year period beginning with the eruptions of numerous basaltic lava flows. Various other eruptions of basaltic, rhyolitic, and intermediate composition lavas and ash flows occurred sporadically during the next 15 million years with volcanic activity culminating in the eruption of the rhyolitic Bandelier Tuff at 1.79 and 1.23 million years ago (Self and Sykes 1996). All of LANL property is within the JMVF and is sited along the western edge of the Rio Grande Rift. Most of the bedrock on LANL property is composed of the salmon-colored Bandelier Tuff (Figure 15).

The geologic structure of the LANL area is dominated by the north-trending Pajarito Fault system. The Pajarito Fault system forms the western structural boundary of the Rio Grande Rift, along the western edge of the Española Basin, and the eastern edge of the JMVF. The Pajarito Fault system consists of three major fault zones (Pajarito, Guaje Mountain, and Rendija Canyon) and numerous secondary faults with vertical displacements ranging from 80 to 400 ft (24 to 120 m). Estimates of the timing of the most recent surface rupturing paleoearthquakes along this fault range from 3,000 to 24,000 years ago (LANL 2001f, 1999a). Results of seismic hazards studies (LANL 2001f, 1999a, Wong et al. 1995) indicate the Pajarito Fault system represents the

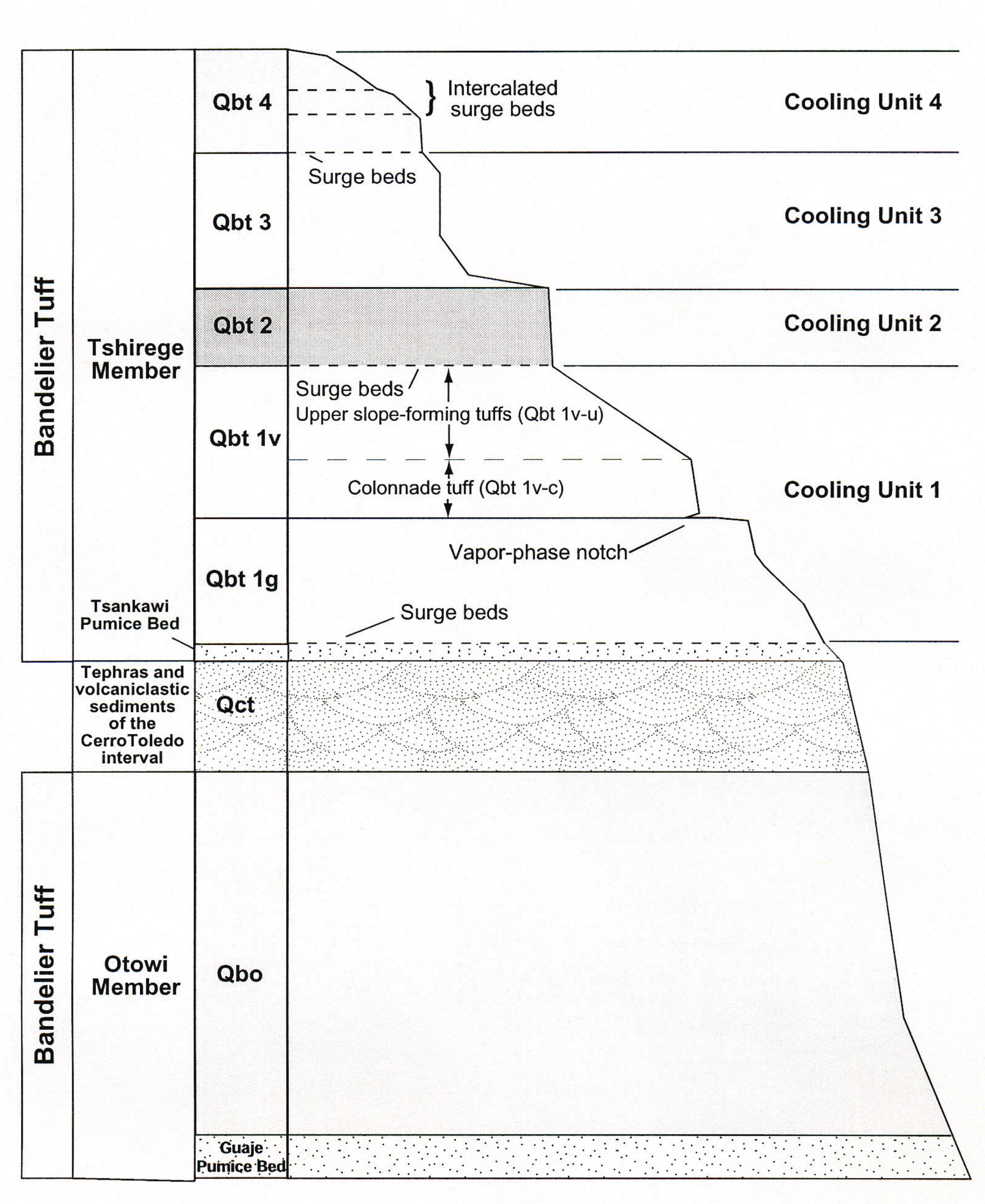

Figure 15. Stratigraphy of the Bandelier Tuff (LANL 1995a).

greatest potential seismic risk to LANL, with an estimated maximum earthquake magnitude of about 7 on the Richter Scale. Although large uncertainties exist, an earthquake with a Richter magnitude of 6 is estimated to occur once every 4,000 years; an earthquake of magnitude 7 is estimated to occur once every 100,000 years (DOE 1999a).

TA-54 has been constructed within the upper member of the Bandelier Tuff known as the Tshirege Member. The Tshirege Member erupted 1.23 million years ago during the Quaternary Period. It consists of four "cooling units" of varying thickness (see Figure 14). Each "cooling unit" represents a separate, but closely spaced in time, eruption(s) of ash that came to rest and then cooled as a unit and lithified into rock. The contact between units 1v and 2 is marked by discontinuous surge beds which have been utilized as marker beds in detailed geologic mapping of the area (LANL 1998b). The Tshirege Member of the Bandelier Tuff is characterized by numerous fractures (cracks related to cooling and contraction of the ash) and variable degrees of welding. Welding is a term that indicates the hardness of tuff. Poorly welded tuffs are very friable and weather easily. Strongly or densely welded tuffs are very hard, dense volcanic rocks that resist weathering and usually form cliffs. Unit 2 is exposed at the surface of some areas of TA-54 and is a variably welded cliff-former. The lower part of this unit is gradational into the underlying unit 1v. The amount of welding of the units generally increases upwards from non-welded at the base of unit 1g, to densely welded at the top of unit 2 (see Figure 14). In general, the rock is less dense and more friable at the base of Pajarito Canyon and becomes more dense about halfway up the Pajarito Canyon wall near TA-54.

The stratigraphy beneath MDA H is based on RFI boreholes located near MDA H and geologic information from regional well R-20 located about 0.5 mi (0.8 km) southeast of MDA H in Pajarito Canyon. The most important geologic characteristics of the rock layers beneath MDA H are those that affect the hydrology (or movement of water) beneath the site by effectively minimizing the rate of percolation of infiltrating moisture. These characteristics include a) porosity between about 45 percent and 50 percent, which under unsaturated conditions creates a capillary suction that holds liquid water; and b) discontinuous open fractures in the more welded units, which under unsaturated conditions enhance the evaporation of moisture from deep within the subsurface (LANL 1997c).

There are 37 known faults within the TA-54 area from Area G to Area J (LANL 1998b). These are minor secondary faults with 2 to 26 in. (5 to 65 cm) of displacement. The general absence of larger-scale offsets or inflections along the contact between units 2 and 1v within this area indicates these faults are not associated with major fault zones. These faults are not concentrated in discrete zones and may represent widespread distributed secondary faulting associated with earthquakes that occurred along the main trace of the Pajarito Fault. There is, however, a 500- to 833-ft- (150- to 250-m-) wide zone of greater magnitude faulting present roughly 0.6 mi (1 km) east of TA-54 with faults displaying offset of 5 to 11.7 ft (1.5 to 3.5 m) (LANL 1998b). The significance of this fault zone is not currently understood.

A seismic hazard evaluation was conducted at several sites around LANL to estimate ground motion from possible earthquakes (tectonics) (Wong et al. 1995). The evaluation led to the following conclusion: within 100 years, an earthquake with a magnitude of 6 or greater is considered likely to occur in the Pajarito Fault system. While TA-54, including MDA H, was not included in the study, the geology at TA-54 is similar to two of the sites evaluated in the study (TA-18 and TA-46). Results of the study were applied in the safety analysis report for Area G, which includes LANL's radioactive waste disposal facility (LANL 1995c). An earthquake of this magnitude was determined not to pose a hazard in terms of waste buried below the surface at Area G. Therefore, it is postulated that an earthquake would not cause a surface rupture at MDA H because MDA H and Area G are on the same mesa within a mile of each other.

Rockfalls, landslides, and slope instability are triggered by any process that might destabilize supporting rocks. These are geo-hazards that could affect the Proposed Action and the No Action alternative. The natural fracturing (cooling cracks) mentioned above provide pathways for water, increasing the likelihood of freeze-thaw cycles or excessive rainfalls contributing to rockfalls at the mesa edge and to the intrusion of water into the disposal shafts. Preferential erosion of less welded portions of the tuffs could undermine the overlying, more densely welded layers (see Figure 14) resulting in rockfalls or landslides. Construction activity (creating roads or constructing buildings) could also contribute to slope instability. A study on potential mesa-edge stability at Pajarito Mesa (LANL 1995d) indicates that north-facing rims of canyons typically display large-scale mass movement features in a zone of about 100 to 200 ft (30 to 60 m) wide. In contrast, cliff failure on south rims is characterized by infrequent failure of narrow fracture-bounded tuff blocks. Because MDA H is located on the south-facing rim of Mesita del Buey, it is unlikely to experience cliff failure. The frequency of failure on the Pajarito Plateau is unknown but seismic shaking may provide a triggering mechanism. Since all of the mesas of the Pajarito Plateau are composed of the same geologic units (Bandelier Tuff), the conclusions of the study of Pajarito Mesa are directly applicable to other mesas at LANL.

3.6 Human Health

This section considers the health of LANL site remediation workers and project staff working at MDA H. These two categories of receptors are evaluated in this EA because each category of worker is either involved in routine site inspections, remediation, or waste transportation activities at LANL. Wastes from LANL are transported to either onsite or offsite disposal sites and members of the public could also be affected by these transportation activities.

The health of LANL workers is routinely monitored depending upon the type of work performed. Health monitoring programs for LANL workers consider a wide range of potential concerns including exposures to radioactive materials, hazardous chemicals, and routine workplace hazards. In addition, LANL workers involved in hazardous operations are protected by engineering controls and required to wear appropriate PPE. Training is also required to identify and avoid or correct potential hazards typically found in the work environment and to respond to emergencies. All work performed at LANL is subject to the Integrated Safety Management System. This is a five-step process that defines a systematic approach to actions taken before, during, and after work is performed. Because of the various health monitoring programs, the requirements for PPE, and routine health and safety training, LANL workers are generally considered to be a healthy workforce with a below average incidence of work-related injuries and illnesses.

LANL employees monitor environmental media for contaminants that could affect members of the public. This information is reported to regulatory agencies, such as the NMED, and to the public through various permits and reporting mechanisms and it is used to assess the effects of routine operations at LANL on the public. More information about environmental media monitoring and doses to the public is contained in the LANL Environmental Surveillance Report for 2002 (LANL 2004). The health of LANL workers and members of the public is also subject to various RCRA and OSHA requirements established to protect public health and safety during hazardous waste site remediation operations.

3.7 Transportation and Utilities

Regional and site transportation routes are the primary methods used to transport LANL-affiliated employees, commercial shipments, and also hazardous and radioactive material shipments. TA-54 is only accessed from Pajarito Road, which links State Road (SR) 4 and White Rock to LANL's TA-03. Pajarito Road carries about 8,000 vehicles on an average workday and is essentially a two-lane road with some wider sections to permit passing, acceleration, and deceleration at certain intersections. It is the primary conveyor of LANL commuter traffic from White Rock. Pajarito Road is open only to LANL traffic; a badge or proper documentation is required for access into LANL beyond the checkpoints. A segment of SR 4 from Rover Boulevard in White Rock to East Jemez Road traverses land belonging to the Pueblo of San Ildefonso (the San Ildefonso Sacred Area). The DOE and San Ildefonso Pueblo renegotiated a 30-year easement on this stretch of highway in 2000.

The Pajarito East utility corridor carries major utilities to TA-54. Utilities include water lines, sanitary sewer lines, natural gas distribution lines, electrical transmission and distribution lines, and communications lines.

3.8 Noise

Noise is defined as unwanted sound. Noise is categorized into two types: *continuous noise* and *impulsive* or *impact noise*. The intensity of sound is measured in decibel (dB) units and has been modified into an A-weighted frequency scale (dBA) for setting human auditory limits.

Noise measured at LANL is primarily from occupational exposures. Occupational exposures are compared against an established OSHA Threshold Limit Value (TLV) (LANL 1999b). The TLV is administratively defined as the sound level to which a worker may be exposed for a specific work period without probable adverse effects on hearing acuity. The TLV for continuous noise is 85 dBA for an 8-hour workday. The TLV for impulsive noise during an 8-hour workday is not fixed because the number of impulses allowed per day varies depending on the dBA of each impulse, however, no individual impulse should exceed 140 dBA. An action level (level of exposure to workplace noise below the TLV but the use of PPE is recommended) has been established for noise in the workplace at LANL. The OSHA action level for both continuous and impulsive noise is 82 dBA for an 8-hour workday (LANL 1999b).

Environmental noise levels at LANL are highly variable and dependent on the generator and proximity to other sources of noise. Sources of environmental noise at LANL consist of background sound, vehicular traffic, routine operations, and periodic HE testing. Measurements of environmental noise around LANL facilities and operations typically average below 80 dBA. The averages of measured values from limited ambient environmental sampling in Los Alamos County were found to be consistent with expected sound levels (55 dBA) for outdoors in residential areas (Canter 1996). Because of the relatively remote location of TA-54, the ambient noise levels at and in the vicinity of TA-54 are typical of the environmental noise values found around LANL.

3.9 Environmental Justice

Presidential Executive Order 12898 (EO 12898) requires that Federal agencies, including the DOE, consider environmental justice when complying with the NEPA. Disproportionate adverse health and socioeconomic effects of proposed actions on minority populations (all people of color, exclusive of white non-Hispanics) and low-income families (household incomes less than $15,000 per year) must be identified and addressed. Operations such as establishing or closing hazardous waste landfills are of particular concern when considering whether there are environmental justice issues, as are the associated transportation ramifications of leaving wastes in place or relocating them. Populations that are subject to environmental justice considerations are present within 50 mi (80 km) of LANL, but there are no concentrations of minority or low-income populations residing at LANL or in Los Alamos County or at the Pueblo of San Ildefonso Sacred Area.

About 54 percent of the population within a 50-mi (80-km) radius of LANL is of minority status; 24 percent of the households have annual incomes below $15,000. Los Alamos County, which would be most directly affected by the Proposed Action, has a higher median family income and a much lower percentage of minority residents than the three surrounding counties. Los Alamos County is about 18 percent minority and, according to the 2000 Census, has one of the highest median household incomes in New Mexico at $78,993.

Families living below the poverty level[30] in Los Alamos County accounted for just 1.9 percent of all families. This compares with a median household income of $34,133 in the State of New Mexico, where 14.5 percent of all families live below the poverty level; median household incomes of $42,207 in Santa Fe County where 9.4 percent of families live below the poverty level; and $29,429 in Rio Arriba County where 16.6 percent of families live below the poverty level (USCB 2000).

The Pueblo of San Ildefonso is adjacent to Los Alamos County and LANL and meets the environmental justice criteria for minority (Native American) populations; however, the median household income was $30,457 in 2000; 12.4 percent of the families at the Pueblo earned below the poverty level. The three other Accord Pueblos of Santa Clara, Cochiti, and Jemez have median household incomes of $30,946, $35,500, and $28,889, respectively, and 16.4 percent, 13.2 percent, and 27.2 percent, respectively, of the families live below the poverty level at these three Pueblos. Pojoaque Pueblo has a median household income of $34,256; 11.3 percent of families there live below the poverty level (USCB 2000).

[30] Poverty level: Following the Office of Management and Budget's Directive 14, the Census Bureau uses a set of money income thresholds that vary by family size and composition to detect who is poor. If the total income for a family falls below the relevant poverty threshold, then the family is classified as being "below the poverty level."

3.10 Socioeconomics

LANL and Los Alamos County operations have a notable and positive influence on the economy of north-central New Mexico. Specifically, in FY01 (the latest year for which such information is available) LANL had an operating budget that was 1.667 billion dollars and a total workforce of 13,570. Salaries and benefits accounted for 880 million dollars. This translated into a 3.8 billion dollar impact on the tri-county region that includes Los Alamos, Santa Fe, and Rio Arriba Counties. In effect, nearly one of every three jobs in the tri-county region was created or supported by LANL. FY01 procurements in northern New Mexico were 357 million dollars (LANL 2002b). About 80 percent of the jobs created indirectly by LANL in the region occurred in the trade, finance, insurance, real estate, and services sectors (DOE 1999a).

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