Revision 2, July 2004

NATIONAL ENRICHMENT FACILITY

ENVIRONMENTAL REPORT

3.5 ECOLOGICAL RESOURCES

This section describes the terrestrial and aquatic communities of the proposed National Enrichment Facility (NEF) site. This section is intended to provide a baseline characterization of the site's ecology prior to any disturbances associated with construction or operation of the NEF. Prior environmental disturbances (e.g., roads and pipeline right-of-ways) not associated with the facility and their impacts on the site ecology, are considered when describing the baseline condition.

A single major community has been identified at the NEF site. The plant and animal species associated with this major community are identified and their distributions are discussed. Those species that are considered important to the ecology of the site are described in detail.

Once the significant species were identified, their interrelationship with the environment was described. To the extent possible, these descriptions include discussions of the species' habitat requirements, life history, and population dynamics. Also, as part of the evaluation of important species at the site, pre-existing environmental conditions, that may have impacted the ecological integrity of the site and affected important species, are considered.

Unless otherwise indicated, the information provided in this section is based on surveys conducted by LES.

3.5.1 Maps

Figures 3.5-1, County Map Proposed Area of Critical Environmental Concern (ACEC) Lesser Prairie Chicken, and 3.5-2, NEF Site Vegetation Survey Transect Locations

3.5.2 General Ecological Conditions of the Site

Lea County is located in the Pecos Valley Section of the Great Plains Province, very near the boundary between the Pecos Valley Section to the west; and the Southern High Plains Section to the east and north. The boundary between the two sections is the Mescalero Escarpment, locally referred to as Mescalero Ridge. The escarpment is located approximately 6.2 to 9.3 km (10 to 15 mi) northwest of the proposed NEF site. Mescalero Ridge abruptly terminates Pecos Plains along the east. The ridge is a nearly vertical cliff with a relief of approximately 46 m (150 ft) in northwestern Lea County. In southeastern Lea County, the Ridge is partially covered by wind deposited sand and therefore is less prominent, typically exhibiting 9 to15 m (30 to 50 ft) of relief. Locally, the Southern High Plains Section is referred to as the Llano Estacado. The Llano Estacado is an isolated mesa that covers a large part of western Texas and eastern New Mexico. East of the Mescalero Ridge, on the Southern High Plains, the topography is relatively flat to gently undulating. Drainage on the Southern High Plains (Llano Estacado) is poor, with larger regional drainages along northwest to southeast lineaments. Where lineaments are absent, local drainage is via ephemeral streams into playa lakes.

The primary difference between the Pecos Valley and the Southern High Plains physiographic sections is the change in topography. The Llano Estacado is a large flat mesa which uniformly slopes to the southeast. In contrast, the Pecos Valley section is characterized by its very irregular erosional topographic expression, sloping westerly in its northern reaches and southerly in the southern reaches (NMBMMR, 1961).

The proposed NEF site is located on the Eunice Plain just northwest of Rattlesnake Ridge in Section 32, Township 21 South, Range 38 East. The Eunice Plain gently slopes towards Monument Draw, a north to south traversing arroyo. Monument Draw begins north of the city of Eunice following a southeasterly trend, and then turns southerly presumably diverted by the Red Bed Ridge. Refer to ER Section 3.3, Geology and Soils, for further discussion on the Red Bed Ridge.

Along Red Bed Ridge, approximately 1.6 km (1 mi) northeast of the site is Baker Spring. Baker Spring is an intermittent surface water feature that contains water seasonally (see ER Section 3.4.1.1, Major Surface and Subsurface Hydrological Systems).

The 220-ha (543-acre) NEF site slopes gently to the south southwest with a maximum relief of about 12 m (40 ft) The highest elevation is approximately 1,045 m (3,430 ft) msl in the northeast corner of the property. The lowest site elevation is approximately 1,033 m (3,390 ft) msl along the southwest corner of the site. No defined drainage features are evident on the subject property.

The NEF site is located in an extensive deep sand environment west of the Llano Estacado caprock and east of the Pecos River in southeastern New Mexico. The vegetation in this area is dominated by deep sand tolerant or deep sand adapted plant species. The area is a transitional zone between the short grass prairie of the Southern High Plains and the desert communities of the Chihuahuan Desert Scrub (Dick-Peddie, 1993). The site is located in one of the more unique sand scrub areas of New Mexico because of the dominance of the oak shinnery community.

The Plains Sand Scrub vegetation community at the NEF site has probably remained stable over the past 150 years since the introduction of domestic livestock grazing in the area by settlers from the eastern plains. By the mid-nineteenth century, there had already been a reduction of grasslands in the region by livestock herds associated with Spanish settlements along the Rio Grande River and Pecos River valleys. The site has not been impacted by farming or oil and gas development which is prevalent in the region.

The species composition of the wildlife community at the NEF site is a direct function of the type, quality, and quantity of habitat that exists at the site and in the surrounding area. Based on initial field surveys of wildlife at the site and with information on regional and local distribution of wildlife species and on species-specific habitat preferences, the wildlife species likely to occur at the NEF can be identified. The mammals, birds, amphibians and reptiles known or expected to occur on the NEF are discussed below.

Because the NEF site is in a transitional zone, wildlife species at the NEF site are typical of species that occur in grassland habitats and desert habitats. Mammalian species common to this area of southeastern New Mexico include mule deer (*Odocoileus hemionus*), pronghorn antelope (*Antilocapra americana*), desert cottontail (*Sylvilagus audubonii*), black-tailed jackrabbit (*Lepus californicus*), plains pocket gopher (*Geomys bursarius*), deer mouse (*Peromyscus maniculatus*), prairie vole (*Micortus ochrogaster*), kangaroo rat (*Dipodomys ordii*), coyote (*Canis latrans*), black-tailed prairie dog (*Cynomys ludovicianus*), collared peccary or javelina (*Dicotyles tajacus*), striped skunk (*Mephitis mephitis*), and gray fox (*Urocyon cinereoargentues*). Several species of bats that occur in the area include the Mexican free-tailed bat (*Tadarida mexicana*) and the pallid bat (*Antrozous pallidus*) (See Table 3.5-1, Mammals Potentially Using the NEF Site.)

Common game birds include the mourning dove (*Zinaida macroura*), bobwhite quail (*Colinus virginianus*), and scaled quail (*callipepla squamata*). Other birds common to the area include scissor-tailed flycatcher (*Tyrannus forficatus*), nighthawk (*Chordeiles minor*), roadrunner (*Geococcyx californianus*), and the turkey vulture (*Carthartes aura*). Raptors include red-tailed hawk (*Buteo jamaicensis*) and barn owl (*Tyto alba*). Reptiles include the western diamondback rattlesnake (*Crotalus atrox*), eastern fence lizard (*Sceloporus undulates*), western box turtle (*Terrapene ornate*), and the Great Plains Skink (*Eumeces obsoletus*) (Benyus, 1989). (See Table 3.5-2, Birds Potentially Using the NEF Site.)

The mammalian species potentially occurring on the site are listed in Table 3.5-1. A field survey to identify mammals at the NEF site was conducted in September 2003. Small mammal capture and release was not conducted during the field survey.

Table 3.5-1 also lists the general habitat requirements of each mammalian species potentially occurring at the site as well as qualitative estimates of its probable distribution and abundance at the site. These estimates are derived from knowledge of the species-specific habitat preferences and the current composition, structure, and extent of the vegetative communities at the site. Because the vegetative community at the site is in a stable, near climax, successional stage significant changes in habitat or mammalian species are not anticipated.

Table 3.5-2 (Benyus, 1989; Peterson, 1961; Brown, 1985), lists the bird species that may occur on the site along with their migratory and nesting status. All water fowl and water birds have been excluded from this list due to the lack of suitable water-related habitat on the NEF site. The 34 species listed were mostly, selectively chosen from the sources cited above as those likely to live in or visit the region. Of these, approximately 18 species are likely to be summer residents, many of which may nest on the site. These species are denoted with the letter "C" under the column "Resident" in Table 3.5-2. Approximately 15 of the species are probable winter residents of the site. A site-specific avian survey was not conducted on the site because of the time of the season (summer). Future site-specific avian surveys will be conducted at appropriate times of the coming years.

The amphibians and reptiles potentially occurring on the site are listed in Table 3.5-3, Amphibians/Reptiles Potentially Using the NEF Site. Table 3.5-3 also lists the general habitat requirements for each amphibian or reptile species potentially occurring at the site as well as estimates of each species' probable distribution at the site. Because the occurrence of amphibian species is closely related to water and the NEF site contains no permanent water, there are very few associated amphibian species. A site-specific herpetology survey was conducted in October 2003.

3.5.3 Description of Important Wildlife and Plant Species

Based on information from New Mexico Department of Game and Fish, the U.S. Fish and Wildlife Service, and the Bureau of Land Management-Carlsbad Field Office, the NEF site is located within the known range of three species of concern. The lesser prairie chicken (*Tympanuchus pallidicintus*) is currently on the federal candidate list for listing as a threatened species. The nearest known breeding area or "lek" is located approximately 6.4 km (4 mi) north of the NEF site. There have been no known sightings of the lesser prairie chicken on the site. Field surveys of the NEF site in September 2003 and April 2004, did not locate any lesser prairie chickens. The sand dune lizard (*Sceloporus arenicolus*) is currently listed as a threatened species on the New Mexico State Threatened and Endangered list. A survey of the

NEF site did not identify any sand dune lizard habitats. The black-tailed prairie dog (*Cynomys ludovicianus*) was listed as a candidate species under the Endangered Species Act by the U.S. Fish and Wildlife Service in 2000. No sightings or evidence of prairie dogs were found during a field survey of the NEF site.

The lesser prairie chicken, the sand dune lizard and the black-tailed prairie dog are discussed in detail based on their special status and potential proximity to the NEF site. Other species are selected based on their importance for recreation or commercial value. The other species listed in Table 3.5-1 through Table 3.5-3 are considered less important in terms of protected status, recreation or commercial value.

LESSER PRAIRIE CHICKEN

Habitat Requirements. The lesser prairie chicken requires relatively large areas of native prairie mixed shrub lands for cover, food, water and breeding. In the area of the NEF, the presence of a sand/shinnery oak habitat type meets the requirements for suitable habitat for the lesser prairie chicken. Mesquite shrubs provide needed protective cover from raptors and the short grass prairie vegetation meets the requirements for the breeding areas known as "booming grounds" or leks. Though the NEF site contains suitable lesser prairie chicken habitat, this type of habitat is not uncommon in the general area.

A nomination has been submitted (Stinnett, 2002) to the Bureau of Land Management (BLM) to designate two public land parcels within Lea County as an Area of Critical Environmental Concern (ACEC) for the lesser prairie chicken (*Tympanuchus pallidicinctur*). Refer to Figure 3.5-2, County Map Proposed Area of Critical Environmental Concern (ACEC) Lesser Prairie Chicken. The nearest nominated ACEC straddles Lea and Eddy Counties and is about 48 km (30 mi) northwest of the proposed NEF site. The other nominated ACEC, which is further north, borders the northwest corner of Lea County. Currently, the BLM is evaluating this nomination and expects to make a decision within the next several years.

A member of the grouse family, the adult lesser prairie chicken is 38-41 cm (15-16 in) tall, a smaller and paler version of the greater prairie chicken. The male has reddish colored air sacs on the neck that are inflated and deflated to create a "booming" sound during courtship. The lesser prairie chicken diet consists of insects and seeds of wild plants and grains such as sorghum, oats and wheat when available. During periods of below average precipitation, water distribution can be become a limiting factor for lesser prairie chicken habitat in southeastern New Mexico. The NEF site could provide suitable food sources for the lesser prairie chicken, though there are limited water sources on the site.

Life History. The lesser prairie chickens are considered to be an R-selected species, which means that natural selection operates on traits that increase fecundity, with density regulated primarily through mortality (survival) and dispersal. R-selected species tend to be short-lived and exhibit high fecundity and emigration rates.

In southeastern New Mexico, lesser prairie chicken begin breeding in the early spring and continue through May. They produce 12-14 eggs per clutch with the average incubation period from 23-26 days in a ground nest. Due to nest failure and mortality the number of young reaching maturity is relatively low. The brood remains with the mother for 6-8 weeks and then gradually disperse. A reorganization of old and young birds into fall flocks occurs, with a gradual movement to suitable winter cover.

Population Dynamics. The lesser prairie chicken are found in mixed-sex flocks during the late fall and winter, but by early spring the males return to their traditional display grounds, where they reestablish old territories or, in the case of young birds, try to acquire new ones. The older males tend to hold central territories, while the younger males establish peripheral ones. Territorial display consist of the “booming” behavior, where the male inflates the bare yellow to orange skin area (skin sacs) on the sides of his neck, erects the feathered pinnae above his head, drops his wings, stamps his feet and calls. Females visit the display grounds when ready for breeding, and after breeding move off the lek to begin nesting (Campbell, 1972; NMDGB, 1998).

MULE DEER

Habitat Requirements. Throughout much of its range, mule deer habitat consists of arid, open terrain with mid-height trees such as juniper or pinion pine. In southeastern New Mexico in the vicinity of the NEF site, habitat consists of mesquite/oak scrub and the desert grasslands of the Chihuahuan desert. The mule deer diet consists of forbs, browsing of mesquite/oak shrub and flowering stalks of yucca plants. The NEF contains suitable food vegetation for mule deer, but generally lacks sufficient hiding and escape cover. Higher quality habitat exists in the vicinity surrounding the NEF than exists on the site.

Water distribution during periods of below average precipitation can be a limiting factor in mule deer habitat, although, the mule deer is adapted to getting moisture from succulent plants such as various species of cactus. The lack of a consistent water source on the NEF site lessens the quality of the habitat. Space requirements for mule deer are larger than those of whitetail and are based on population densities, home range areas, and the carrying capacity of the habitat.

Life History. Mule deer are considered to be K-selected species, which means that natural selection operates on traits that influence survivorship and competitive ability at population densities near the carrying capacity of the environment (K), rather than selection on traits that favor rapid population growth at low population densities. K-selected species tend to be long-lived and exhibit low fecundity and emigration rates.

Mule deer reach sexual maturity at 18-20 months, with some females breeding as yearlings. However, young bucks may not be allowed to participate in breeding activity until they are 3 or 4 years old. The breeding season extends from November to February, but varies with locality and climatic conditions. Gestation is approximately 210 days with the fawning period extending over several weeks in June, July and August. Females typically have one fawn, but two are not uncommon in areas of good habitat. Fawns typically remain with the mother for a year, but are weaned within 60 to 75 days following birth (Davis, 1974).

Population Dynamics

Mule deer herd behavior consists of small groups of mature females and fawns in the summer joined by yearlings in late fall. Mature bucks are typically solitary or in small groups in summer and early fall, but become territorial during the late fall breeding season. During winter, following the breeding season, mule deer form herds that consist of both sexes and all age classes.

SCALED QUAIL

Habitat Requirements. The scaled, or blue, quail has a large distribution range throughout the western U.S. occupying a wide range of habitat types. In southeastern New Mexico in the general vicinity of the NEF site, scaled quail are associated with the desert grasslands and mixed grasslands. The sand-shinnery oak scrub vegetation community is not as valuable as habitat as the desert grasslands, but the mesquite and shinnery oak provide sources of food and cover that are important components of scaled quail habitat. This specie has the best survival rate where there is a combination of annual weeds, some shrubby or spiny ground cover, and available surface water. Scaled quail require a source of midday shade and loafing cover in the hot summer months, but the cover must not be so thick as to prevent escape by running (Johnsgard, 1975).

The NEF site has several components of scaled quail habitat including cover, food sources, and nesting cover. Surface water is a limiting factor at the site. Scaled quail eat a large variety of seeds of annual forbs, grasses, shrubs, and trees. They also eat insects depending of the availability. During winter months, mesquite seeds and broom snakeweed seeds are major components of their diet. Shinnery oak acorns appear to be a minor component (Peterson, 1961).

Life History. Scaled quail are considered to be an R-selected species, which means that natural selection operates on traits that increase fecundity, with density regulated primarily through mortality (survival) and dispersal. R-selected species tend to be short-lived and exhibit high fecundity and emigration rates.

In southeastern New Mexico, scaled quail form breeding pairs in the spring. In spite of a long potential nesting season, actual egg laying by females may be deferred until the start of the summer rainy season. Incubation requires 15 to 28 days with clutch sizing ranging form 11 to 15 eggs. It is not uncommon for the female to have a second clutch of eggs during the same year. There is a high rate of nest losses from various causes, and during years of extreme drought the birds may not attempt to nest.

Population Dynamics. It has been found that spring-summer rainfall is positively and significantly correlated with scaled quail population density in eastern New Mexico. During the summer nesting season, the males and females form pairs that are maintained until the young have hatched. During the rest of the year the scaled quail form coveys that range from 20 to 50 birds. The chicks join these coveys as they mature in the late summer and fall. Local climatic conditions, such as spring/summer precipitation and habitat manipulation such as moderate livestock grazing and creating early vegetative successional stages have significant impacts on the population distribution and density of scaled quail.

SAND DUNE LIZARD

Habitat Requirements. The sand dune lizard populations are mostly confined to shinnery oak-sand dune habitats of southeastern New Mexico and West Texas. This lizard occurs only in areas with open sand, but forages and takes refuge under shinnery oak and is seldom more than 1.2 to 1.8 m (4 to 6 ft) form the nearest plant. The sand dune lizard is restricted to areas where sand dune blow-outs, topographic relief, or shinnery oak occur (Sena, 1985). Dunes that have become completely stable by vegetation appear to be unsuitable habitat. The NEF site contains areas of sand dunes in the eastern central area of the site, southwestern quadrant, and a small area in the northwestern corner of the site. Surveys of the NEF site did not identify any sand dune lizard habitats.

The sand dune lizard diet consists primarily of insects such as ants, crickets, grasshoppers, beetles, spiders, ticks and other arthropods. Most feeding appears to take place with or immediately adjacent to patches of vegetation. It is likely that the NEF provides an adequate food source for the sand dune lizard.

Life History. The sand dune lizard breeds in spring/summer from April to June. Typically, the female lays 3-7 eggs and may have two clutches of eggs a year. The young are hatched from July to September. Eggs are deposited in underground burrows in sand or directly on the sand. The lizards reach sexual maturity within one year.

Population Dynamics. The sand dune lizard has a limited and often spotty distribution throughout its range in southeastern New Mexico (Fitzgerald, 1997). Estimated population densities are low, e.g., only 7.5 to 12 lizards/ha (3 to 4.9 lizards/acre) in good habitat east of Roswell, Chaves County New Mexico. One of the documented primary threats to lizard populations is habitat removal by chemical brush control program that eliminate shinnery oak on and around the shinnery oak-sand dune areas.

BLACK-TAILED PRAIRIE DOG

Habitat Requirements. Throughout much of its range, black-tailed prairie dog habitat consists of short grass plains, mid-grass prairies, and grass-shrub habitats. Historically, they were widespread and abundant east of the Rio Grande River and in the grasslands of southwestern New Mexico. Though they have expanded their range into oak shinnery and other grass-shrub habitats, they typically avoid areas with tall grass, heavy sagebrush, and other thick vegetation cover. Colonies of black-tailed prairie dogs have been reported in the Plains-Mesa Grasslands vegetation type of southeastern New Mexico. They are not dependent on free water, getting adequate water from plants and precipitation events in arid and semi-arid habitats.

Black-tailed prairie dogs depend on grass as their dominant food source, and usually establish colonies in short grass vegetation types that allow them to see and escape predators. The predominant vegetation type, plains-mesa sand scrub, on the NEF site is not optimal black-tailed prairie dog habitat because of the high density of shrubs.

Shrubs comprise 36% of the relative vegetative cover and are present on the site at density levels of 16,549 individuals per hectare (6700 individuals per acre). Tall grass and shrubs provide hiding cover for predators such as coyotes and badgers. Shrubs provide perching locations for raptors that also prey on prairie dogs.

There have been no sightings of black-tailed prairie dogs, active or inactive prairie dog mounds/burrows, or any other evidence, such as trimming of the various shrub species, or prairie dogs at the NEF site.

Life History. Black-tailed prairie dogs are large rodents weighing 0.5 to 1.4 kg (1 to 3 lb) and are 25 to 41 cm (10 to 16 in) long. They live in well-organized colonies or “towns” with family subgroups. Prairie dogs dig extensive, deep and permanent burrows with a dome-shaped mound at the entrance. Nest cavities are in the deeper parts of burrows for protection of the young and to mitigate temperature fluctuations. Black-tailed prairie dogs are diurnal, being active primarily during daylight hours. In southeastern New Mexico, they may remain active throughout the year, although they may remain below ground during adverse winter weather.

Historically, black-tailed prairie dog towns on the mixed grass plains ranged in size from a few individuals to several thousand. Currently, large concentrations are rare due to extensive poisoning and loss of habitat during the last century. Typically, in southeastern New Mexico, prairie dog towns range in size from 8 to 40 hectares (20 to 100 acres), though some towns are smaller than 8 hectares (20 acres) and are larger than 40 hectares (100 acres).

Population Dynamics. Black-tailed prairie dogs breed from January to March, with a 29-60 day gestation period. Young are live-born with litter size ranging from 3 to 5. Normally, there is one litter per year. At about six weeks of age, the young appear above ground and are able to walk, run, and eat green food. The family units remain intact for almost another month, but the ties are gradually broken and the family disperses. Sexual maturity is reached in the second year.

Formerly, the chief predators of black-tailed prairie dogs were black-footed ferrets, badgers, and raptors. Because of their competition with domestic livestock for grass, prairie dogs were extensively poisoned, trapped, and hunted during the late 19th century and throughout the 20th century. Consequently, the prairie dog numbers have been reduced by 98-99% of their former numbers across the West.

PLANT SPECIES

The vegetative community at the NEF site plays an important role in providing suitable habitat for wildlife at the site and in the area with habitat conditions fluctuating with the relative abundance of individual plant species. Certain plant species that are better adapted to soil and climatic conditions of a given area occur at higher frequencies and define the vegetation community. The vegetation community that occupies the NEF site is generally classified as Plains Sand Scrub. The dominant shrub species associated with the Plains Sand Scrub Community at the NEF site is Shinoak (*Quercus havardii*) with a lesser amount of Sand Sage (*Artemesia filifolia*). Significant amounts of the shrub species Honey Mesquite (*Prosopis glandulosa*) are also present. The dominant perennial grass species at the NEF site is Red Lovegrass (*Eragrostis oxylepis*). Significant amounts of Dropseed species (*Sporobolus Sp*.) are also present. Numerous other grass species are present in low densities. Table 3.5-4, Plant Cover, Frequency and Shrub Data lists plant species, percent cover, diversity and production.

Shrubs provide habitat and seeds for bird and small mammal species. Perennial grasses provide forage for large grazing mammals and seeds for small mammals. The dominant plant species listed in Table 3.5-4 are distributed uniformly across the site, such that no one area of the site contains that specie exclusively.

3.5.4 RTE Species Known or Potentially Occurring in the Project Area

Information on RTE species known or potentially occurring in the project area is provided below (Common Name, Scientific Name, New Mexico Status, Federal Status):

Lesser Prairie Chicken (Tympanchus pallidicinctus), Imperiled, Candidate

The lesser prairie chicken is discussed in detail in ER Section 3.5.3, Description of Important Wildlife and Plant Species. The closest known occurrence of this specie to the NEF site is a breeding ground or lek, located approximately 6.4 km (4 mi) north of the NEF site. Field surveys for the lesser prairie chicken that were conducted in September 2003 and April 2004, indicated the specie does not occur on the NEF site. No visual sightings or aural detections were made and there is little potential habitat in the survey area. In addition, high human disturbance and predator potential in the area make it unlikely that lesser prairie chickens will colonize the area. Based on these findings, no mitigation measures are planned to reduce the impacts on or to protect the lesser prairie chicken at the NEF site.

Sand Dune Lizard (Sceloporus arenicolus), Threatened, Candidate

The sand dune lizard is discussed in detail in ER Section 3.5.3. Field surveys for the sand dune lizard, conducted in October 2003 and June 2004, indicated that the specie does not occur on the NEF site. The field survey for the sand dune lizard, conducted in October 2003, concluded that the habitat of the NEF site is unsuitable for sand dune lizards for several primary reasons. The high frequency of mesquite and grassland associations on the site is associated with environmental conditions that do not support the specie. In addition, the frequency and extent of shinoak dunes and large blowouts on the site, which provide the habitat and microhabitats necessary for sand dune lizard survival are low and the shinnery dune habitats that exist on the site are isolated from occupied shinnery dunes. Lastly, the ecotonal characteristics of the site are in contrast to the primary habitat of sand dune lizards. The primary habitat of the specie is sand dunes dominated by shinoak, with scattered sand sage, yucca and grasses, and notable for an absence of mesquite. Considering that no sand dune lizards were detected during the 2003 survey and that there is little potential habitat in the survey area, no mitigation measures are planned at this time to reduce impacts on or protect the sand dune lizard at the NEF site.

Black-Tailed Prairie Dog (Cynomys ludovicianus), No State Listing, Candidate

The black-tailed prairie dog is discussed in detail in ER Section 3.5.3. No prairie dogs were observed and no evidence of past or present prairie dog activities was identified during a field survey of the NEF site conducted in September 2003. Based on the survey findings, no mitigation measures are planned to reduce the impacts on or to protect the black-tailed prairie dog at the NEF site.

Consultation with the New Mexico Department of Game and Fish, U.S. Fish and Wildlife Service, and the New Mexico State Forestry Department indicated that there are no threatened or endangered plant species on the NEF site.

3.5.5 Major Vegetation Characteristics

The general vegetation community type that the subject property is located in is classified as Plains Sand Scrub. The specific vegetation community of the subject property is characterized by the presence of significant amounts of the indicator species Shinoak (*Quercus havardii*), a low growing shrub. The community is further characterized by the presence of forbs, shrubs, and grasses that are adapted to the deep sand environment that occurs in parts of southeastern New Mexico.

Data from the NEF site was collected during field studies on September 6 through September 7, 2003. A total of 20 species were observed in cover transects. Species present in cover transects consisted of the following life forms: five forb species, 10 grass species, and five shrub species. See Figure 3.5-2 for location of the transects.

Total vegetative cover represents the percentage of ground that has vegetation above it, as opposed to bare ground or litter. The total vegetative cover for the NEF site was approximately 26.5% cover. Herbaceous plants covered approximately 16.7% of the total ground area and shrubs covered approximately 9.6% of the total ground area. The largest herbaceous contributor to vegetative cover was Eragrostis oxylepis (Red Lovegrass) with approximately 12.6% total cover, followed by *Sporobolus sp.* (Dropseed Species) with approximately 1.5% total cover. The next two largest contributors were *Aristida purpurea* (Purple Three Awn) with approximately 1.1% total cover and *Paspalum stramineum* (Sand Paspalum) with approximately 0.67% total cover.

Forbs comprised approximately 0.44% total cover. Forbs did not contribute significantly to cover transects.

Five shrub species occurred in the cover transects. Shrubs comprised approximately 9.6% of the total vegetative cover. *Prosopis glandulosa* (Honey Mesquite) and *Querqus havardii* (Shinoak) were the dominant shrub with approximately 3.7% and 3.2% of the total cover, respectively.

Relative cover is the fraction of total vegetative cover that is composed of a certain species or category of plants. Perennial grasses account for 63.1% of the relative cover and forbs accounted for 0.8% of the relative cover. Shrubs accounted for 36.1% of the relative cover. The estimated productivity of palatable grasses of the subject property was 237 kg/ha (211 lbs/acre).

Several factors should be taken into account when considering the production value. Production values are normally sampled after the growing season has concluded. Depending on the presence of precipitation, the growing season in southeastern New Mexico can continue beyond the time this survey was conducted. Also, the subject property has been moderately grazed. This is evident from the presence of cattle and grazed vegetation. Given these factors actual production may be higher. Subsequent LES surveys will determine if actual production values change over time.

Total shrub density for the subject property was 16,660 individuals/ha (6,748 individuals/ acre). Five shrub species were observed in density belt transects. *Querqus havardii* (Shinoak) was the most abundant with 14,040 individuals/ha (5,688 individuals/acre). *Yucca glauca* (Soapweed yucca) was the second most abundant shrub species with 1,497 individuals/ha (606 individuals/acre). The high density of shrubs per acre is due primarily to the presence of *Querqus havardii* (Shinoak). High densities of *Querqus havardii* are common in communities where it occurs. (See Table 3.5-5, Shrub Density.)

3.5.6 Habitat Importance

The importance of the habitat for most threatened, endangered, and other important species relative to the habitat of those species throughout their entire range is rather low. Most of these species have little or no suitable habitat on the NEF site and the habitats present on the site are not rare or uncommon in the local area or range wide for these species.

A field survey conducted in October, 2003, revealed that the NEF site does not support sand dune lizard habitat. The primary reasons that the NEF site is unsuitable habitat for the sand dune lizard are the high frequency of mesquite and grassland vegetation association, which are associated with environmental conditions that do not support sand dune lizards. Also, there is a low frequency and extent of shinnery oak dunes and large blowouts, which provide the habitat and micro-habitats necessary for sand dune lizard survival.

A field survey for the lesser prairie chicken and the black-tailed prairie dog was conducted in September 2003 that indicated these species do not occur on the NEF site. A subsequent survey performed for the lesser prairie chicken in April 2004, supports the initial findings. The NEF site could provide suitable food sources for the lesser prairie chicken, though there are limited water sources on the site. Due to the high density of shrubs, the NEF site is not optimal prairie dog habitat.

The potential for habitat contained within the NEF site to attract other species of interest has been evaluated and summarized below.

SWIFT FOX

The proposed NEF site contains habitat that has the potential to attract swift fox. The swift fox is known to inhabit Plains-Mesa Sand Scrub and Plains-Mesa Grasslands vegetation types that occur at or in the immediate vicinity of the NEF site. However, this small fox is more closely associated with grasslands. The swift fox preys primarily on rodents such as kangaroo rats and rabbits, and is closely associated with prairie dogs and other burrowing animals. Breeding habitat requires burrows in relative soft soils that the fox digs or alternatively, it may occupy existing burrows of other animals such as prairie dogs or badgers. Given the existing facilities in the immediate area of the NEF site and the low population density of the swift fox, 0.19 fox/km^2 (0.49 fox/mi^2) the NEF site is marginally attractive to the swift fox.

AMERICAN PEREGRINE FALCON

The proposed NEF site has no potential to attract breeding american peregrine falcons. In the Rocky Mountain States, peregrine falcons require cliffs for breeding, and there are no cliffs in the area. The species uses a variety of open habitats, potentially like those on the NEF site, for foraging, but the closest breeding sites make it unlikely that birds would travel to the area for foraging. Transient birds may use the area during migration but the species is unlikely to winter in the area.

ARCTIC PEREGRINE FALCON

The proposed NEF site has no potential to attract breeding arctic peregrine falcons. Arctic peregrine falcons are not known to breed in New Mexico. Transient birds may use the area during migration but they are unlikely to winter in the area.

BAIRD’S SPARROW

The proposed NEF site is outside of the breeding range of the baird’s sparrow and does not include typical breeding habitat. Baird’s sparrows may utilize the area during migration, but the species is not likely to winter in the area. In winter, baird’s sparrows prefer dense grassy habitats and are generally found to the south of the NEF site.

BELL’S VIREO

The proposed NEF site is unlikely to attract bell’s vireos. In New Mexico, the species generally uses dense riparian woodland habitats for breeding. Although dense mesquite thickets may be used by the species, they generally will use areas only near water. The dense mesquite stands on the NEF site are therefore unlikely to attract bell’s vireos. Transient birds may use the area during migration but they are very unlikely to winter in the area.

WESTERN BURROWING OWL

The proposed NEF site has the potential to attract burrowing owls. The site is within the range of burrowing owls and harbors habitats (open grass and shrub habitats with sparse cover) used by burrowing owls. The species requires burrows (natural or human-constructed) for nesting. If there are burrowing mammals such as prairie dogs or badgers in the area, then it is likely that the area may be attractive to burrowing owls. However, the lack of existing burrows at the NEF site reduces the potential impact on this species.

YELLOW-BILLED CUCKOO

The proposed NEF site has no potential to attract breeding yellow-billed cuckoos. Cuckoos require riparian woodlands and, in the southwest, are generally not found using other habitats. There are no areas on the NEF site that would qualify as riparian woodland suitable for breeding yellow-billed cuckoos. It is possible that a cuckoo might use the site during migration, but wintering here would be very unlikely.

3.5.7 Location of Important Travel Corridors

None of the important wildlife species selected for the NEF site are migratory in this part of their range, therefore, these species do not have established migratory travel corridors. However, three of the species, mule deer, lesser prairie chicken, and scaled quail, are highly mobile and utilize a network of diffuse travel corridors linking base habitat requirements (i.e., food, water, cover, etc.). These travel corridors may change from season-to-season as well as from year to year for each specie and can occur anywhere within the species home range.

Mule deer and scaled quail utilize and often thrive in altered habitats and can and do live in close proximity to man and human activities. For these two species, any travel corridors that would potentially be blocked by the proposed action would easily and quickly be replaced by an existing or new travel corridor linking base habitat requirements for these two species.

The NEF site does not provide optimal habitat for the lesser prairie chicken and has not been identified as an important travel corridor for this specie. Field surveys for the lesser prairie chicken that were conducted in September 2003 and April 2004 indicated the specie does not occur on the NEF site.

The sand dune lizard is not a highly mobile specie and is confined to small home ranges within the active sand dune-shinnery oak habitat type. Travel corridors are not important features of the lizard habitat. A field survey confirmed that the sand dune lizard is not present at the site. The primary reasons that the NEF site is unsuitable habitat for the sand dune lizard are the high frequency of mesquite and grassland vegetation association, which are associated with environmental conditions that do not support sand dune lizards. Also, there is a low frequency and extent of shinnery oak dunes and large blowouts, which provide the habitat and micro-habitats necessary for sand dune lizard survival and the shinnery dune habitats that do exist on the site are isolated from occupied shinnery oak dunes. Lastly, the ecotonal characteristics of the NEF site are in contrast to the primary habitat of sand dune lizards which is sand dunes dominated by shinoak and notable for an absence of mesquite.

The black-tailed prairie dog is not a highly mobile specie. Considering that prairie dogs dig extensive, deep and permanent burrows (i.e. they do not migrate) and are not dependent on free water, travel corridors are not important features of the prairie dog habitat. A field survey found no evidence of black-tailed prairie dogs at the NEF site.

3.5.8 Important Ecological Systems

The NEF site contains fair to poor quality wildlife habitat. The Plains Sand Scrub vegetative community has been impacted by past land use practices. The site has been grazed by domestic livestock for over a hundred years, has a New Mexico state highway along the southern boundary, a carbon dioxide (CO_2) pipeline right-of-way bisects the site, and a gravel access road runs north to south through the center of the site. The degraded habitat generally lacks adequate cover and water for large animal species, and the annual grazing by domestic livestock impacts ground nesting bird species.

Based on recent field studies and the published literature, there are no onsite important ecological systems that are especially vulnerable to change or that contain important species habitats such as breeding areas, nursery, feeding, resting, and wintering areas, or other areas of seasonally high concentrations of individuals of important species. The species selected as important for the site are all highly mobile species, with the exception of the sand dune lizard and the black-tailed prairie dog, and are not confined to the site nor dependent on habitats at the site. The Plains Sand Scrub vegetation type covers hundreds of thousands of acres in southeastern New Mexico and is not unique to the NEF site.

Critical habitat for the lesser prairie chicken is approximately 6.4 km (4 mi) north of the NEF site. There are no reported observations of lesser prairie chickens occupying the NEF site. Field surveys for the lesser prairie chicken that were conducted in September 2003 and April 2004, indicated the specie does not occur on the NEF site. Although the site does contain sand dune-oak shinnery communities, that could be potential sand dune lizard habitat, field surveys conducted in October 2003 and June 2004 revealed that the sand dune lizards are not present on the site. The field survey conducted in June 2004 identified the closest occupied sand dune lizard habitat as occurring approximately 4.8 km (3 mi) north of the NEF site. The high density of shrubs on the NEF site is not optimal prairie dog habitat. No prairie dogs were found onsite during the September 2003 survey.

3.5.9 Characterization of the Aquatic Environment

The NEF site contains no aquatic habitat. There is a shallow, domestic livestock watering area that contains a small amount of water for several days following a major precipitation event. This feature does not support aquatic life, and no rare, threatened and endangered species. There are no intermittent or perennial water bodies or jurisdictional wetlands on the site. There is no hydrological/chemical monitoring station onsite, and no data have been recorded in the past.

3.5.10 Location and Value of Commercial and Sport Fisheries

Due to the lack of aquatic habitat (no surface water), there are no commercial and/or sport fisheries located on the NEF site or in the local area. The closest fishery, the Pecos River and Lake McMillan located on the Pecos River near Carlsbad, New Mexico, is approximately 121 km (75 mi) west of the NEF site.

3.5.11 Key Aquatic Organism Indicators

Due to the lack of aquatic life known to exist on the NEF site, no key aquatic indicator organisms expected to gauge changes in the distribution and abundance of species populations that are particularly vulnerable to impacts from the proposed action can be identified.

3.5.12 Important Ecological Systems

There are no important aquatic ecological systems onsite or in the local area that are especially vulnerable to change or that contain important species habitats, such as breeding areas, nursery areas, feeding areas, wintering areas, or other areas of seasonably high concentrations of individuals of important species.

3.5.13 Significance of Aquatic Habitat

The NEF site contains no aquatic habitat; therefore, the relative regional significance of the aquatic habitat is low.

3.5.14 Description of Conditions Indicative of Stress

Pre-existing environmental stresses on the plant and animal communities at NEF consist of road and pipeline right-of-ways and domestic livestock grazing. The impact of pipeline installation and maintenance of the right-of-way has been mitigated by the colonization of the disturbed areas by local plant species. However, the access road through the middle of the site is maintained and used by gravel trucks on a regular basis. The disturbed areas immediately adjacent to the road are being invaded by lower successional stage species (i.e., weeds). This pattern is expected to continue as long as the road is maintained.

Historical and current domestic livestock grazing and fencing of the site constitute a pre-existing and continuing environmental stress. Heavily grazed native grasslands tend to exhibit changes in vegetation communities that move from mature, climax conditions to mid-successional stages with the invasion of woody species such as honey mesquite and sagebrush. The NEF site has large stands of mesquite indicative of long-term grazing pressure that has changed the vegetative community dominated by climax grasses to a sand scrub community and the resulting changes in wildlife habitat.

Another periodic environmental stress is changes in local climatic and precipitation patterns. The NEF site is located in an area of southeastern New Mexico that experiences shifts in precipitation amounts that can effect plant community diversity and production on a short-term seasonal basis and also on a long-term basis that may extend for several years. Below average precipitation that negatively impacts the plant community also directly alters wildlife habitat and may severely reduce wildlife populations.

Past and present livestock grazing, fencing and the maintenance of access roads and pipeline right-of-ways represent the primary pre-existing environmental stress on the wildlife community of the site.

The probable result of the past and current use of the NEF site is a shift from wildlife species associated with mature desert grassland to those associated with a grassland shrub community. Large herbivore species such as the pronghorn antelope (*Antilocapra Americana*) that require large, open prairie areas with few obstructions such as fences, have decreased. Other mammalian species that depend on open grasslands such as the black-tailed prairie dog (*Cynomys ludovicianus*) also are no longer present in the immediate area. Bird species that depend on the mature grasslands for habitat such as the lesser prairie chicken (*Tympanuchus pallidicinctus*) have decreased in the region and at the NEF site. Other species that thrive in a mid-successional plant community such as the black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), and mule deer (*Odocoileus hemionus*) probably have increased.

No other environmental stresses on the terrestrial wildlife community (e.g., disease, chemical pollutants) have been documented at the NEF site.

3.5.15 Description of Ecological Succession

Long-term ecological studies of the NEF site are not available for analysis of ecological succession at this specific location. The property is located in a Plains Sand Scrub vegetation community, which is a climax community that has been established in southeastern New Mexico for an extended period. The majority of the subject property is a mid-successional stage due primarily to historic and contemporary grazing of domestic livestock and climactic conditions.

Development of the property is limited to an access road for a neighboring property and faded two-track roads along the perimeter of the property are probably used for fence maintenance. These areas contain some colonizing plants that are common to disturbed ground. An example of a disturbed ground colonizing species in southeastern New Mexico is Broom Snakeweed (*Gutierrezia sarothrae*).

The NEF site has been grazed for an unknown period of time, although regional grazing by domestic livestock has occurred for 150 years. Cattle were present at the time of vegetation surveys conducted September 6 through September 7, 2003. Evidence of grazing was also apparent from reduced amounts of standing vegetation

Moderately high densities of Honey Mesquite (*Prosopis glandulosa*) seedlings were observed during the vegetation survey. Reduced grass canopy from historic and contemporary livestock grazing may be contributing to the colonization of *Prosopis glandulosa* due to reduced competition. *Prosopis glandulosa* is considered noxious on rangeland because of its ability to compete for soil moisture and its reproductive ability.

3.5.16 Description of Ecological Studies

A vegetation survey of the NEF site was conducted from September 6, 2003 through September 7, 2003. Several vegetation data collection methods were employed to obtain empirical information about the amount of vegetative cover, production of palatable grasses, and the density of trees and shrubs present at the subject property. (See Figure 3.5-2, NEF Site Vegetation Survey Transect Locations.)

For the vegetation survey, an inventory of vegetative cover, diversity and shrub density in the subject property was obtained through a series of 100-ft transects. Twenty transects were randomly located on a map of the property before the survey was conducted. The transects were then positioned on the ground.

Production of palatable grasses was determined through ocular estimation of randomly located square test plots as well as actual clipping and weighing of all palatable grass species within test plots.

Transect locations were determined randomly from a grid system overlay placed over the most current map showing areas to be sampled. A 100-ft tape, subdivided into 1.0-ft intervals, was then stretched between two points at the position found on the map. The sampler moved the line, and for each interval, recorded the plant species found and the distance it covered along that portion of the line intercept. Measurements of individual plants were read to the nearest inch. The sampler considered only those plants or seedlings touched by the line or lying under or over it. For floral canopies below eye level, the distance each species covered along the line at ground level was measured. For canopies above eye level, the distance covered by the downward projection of the foliage was measured. Multiple vegetation levels were included for cover measurements.

This survey method provides objective and accurate results. Bias is reduced since the survey results are based on actual measurements of the plants growing in randomly located and clearly defined sampling units. The survey method results are accurate in mixed plant communities and suited for measuring low vegetation. By direct measurement of small samples, the method allows estimates of known reliability to be obtained concerning the vegetation, its composition and ecological structure.

Initial field survey for mammals consisted of walking random linear transects parallel and immediately adjacent to the vegetation transects. Sightings of mammalian species were recorded and incorporated into the species tables. Trapping or capture and release surveys were not conducted during the September survey. Initial bird surveys were also conducted along withy the vegetation transects. Primary information for avian species that may occur at the site are referenced.

Many habitat studies have been conducted on the Plains Sand Scrub areas because of it's association with lesser prairie chicken habitat, however, studies specific to the NEF site are limited to the vegetation and wildlife studies by LES. Ecological information of the Plains Sand Scrub is contained in regional studies by:

- *Ahlborn, G. G., 1980. Brood-rearing habitat and fall-winter movements of lesser prairie chickens in Eastern New Mexico. Thesis, New Mexico State University, Las Cruces.*

  This study describes habitat types and vegetative communities selected for rearing young in southeastern New Mexico. Fall and winter movements are also described with observations of habitat types selected.

- *Candelaria, M. A., 1979. Movements and Habitat-use by lesser prairie chickens in Eastern New Mexico. Ecology, 19: 572-577.*

  This study focused on bird movements in association with various habitat types. Preferred habitats included the shinoak and to a lesser degree sand sagebrush.

- *Suminski, R. H., 1977. Habitat evaluation for lesser prairie chickens in Eastern Chavez County, New Mexico. Thesis, New Mexico State University, Las Cruces.*

  This study contains detailed vegetation analysis of bird habitat in an area of southeastern New Mexico with similar plant communities as those at the NEF site.

- *Weaver-Boos Consultants, Inc. 1998. Application for Permit, Lea County Landfill. Vols. 1-4. Submitted to the New Mexico Environment Department, Santa Fe, New Mexico*.

  The Lea County Landfill Permit Application contains wildlife (particularly T/E) information for the landfill site which is located less than a mile from the NEF site. A limited amount of vegetation information is also presented.

- *Wilson, D. L., 1982. Nesting of lesser prairie chickens in Roosevelt and Lea Counties, New Mexico. Thesis, New Mexico State University, Las Cruces.*

Vegetation communities and habitat types are described in this study of bird nesting behavior in areas of Lea County, New Mexico. Useful descriptions of the plant communities in the Plains Sand Scrub vegetation type are included.

3.5.17 Information on RTE Sightings

A population of lesser prairie chickens, a Federal Candidate species, has been sighted in an area approximately 6.4 km (4 mi) north of the NEF site. The sighting occurred during the Spring of 2002. A field survey for the lesser prairie chicken that was conducted in September 2003 indicated the specie does not occur on the NEF site.

Field surveys of the NEF site, conducted in October 2003 and June 2004, concluded that the sand dune lizard, a New Mexico State Threatened species, was not present on the site. The field survey conducted in June 2004 identified the closest sand dune lizard habitat as occurring approximately 4.8 km (3 mi) north of the NEF site.

No black-tailed prairie dogs, a Federal Candidate species, were sighted during the September 2003 field survey.

3.5.18 Agency Consultation

Consultation was initiated with all appropriate federal and state agencies and affected Native American Tribes. Refer to Appendix A, Consultation Documents, for a complete list of consultation documents.

3.5.19 RTE Effects by Other Federal Projects

The proposed NEF is not expected to negatively affect any rare, threatened and endangered species or their habitats. LES is not aware of other Federal and State projects within the region that are or could potentially affect the same threatened and endangered species or their habitats.

TABLES

Table 3.5-1 Mammals Potentially Using the NEF Site

Page 1 of 2

Common Name	Scientific Name	Preferred Habitat	Probable Occurrence at NEF Site
Mule Deer	*Odocoileus hemionus*	Desert shrubs, chaparral and rocky uplands	Probably occurs at site in limited numbers due to limited water resources
Pronghorn Antelope	*Antilocapra americana*	Sagebrush flats, plains and deserts	Probably occurs at site in limited numbers due to limited habitat
Desert Cottontail	*Sylvilagus audubonii*	Arid lowlands, brushy cover and valleys	Likely occurs at site in brushy areas and areas providing cover
Black-Tailed Jackrabbit	*Lepus californicus*	Grasslands and open areas	Likely occurs at site
Plains Pocket Gopher	*Geomys bursarius*	Deep soils of the plains	Probably occurs at site in limited numbers due to limited habitat
Deer Mouse	*Peromyscus maniculatus*	Grasslands, prairies, and mixed vegetation	Likely occurs at site
Prairie Vole	*Micortus ochrogaster*	Prairies	Unlikely to occur due to lack of suitable habitat
Ord's Kangaroo Rat	*Dipodomys ordii*	Hard desert soils	Likely occurs at site
Badger	*Taxidea taxus*	Dry open country	Unlikely due to human disturbance of the area
Coyote	*Canis latrans*	Open space, grasslands and brush country	Likely occurs at site
Black-Tailed Prairie Dog	*Cynomys ludovicianus*	Short grass prairie	Unlikely due to lack of optimal habitat
Collared Peccary	*Dicotyles tajacu*	Brushy, semi-desert, chaparral, mesquite and oaks	Likely occurs at site
Gray Fox	*Urocyon cinereoargentues*	Brush, chaparral and lowlands	Unlikely due to human disturbance of the area
Kit Fox	*Vulpes macrotis*	Deserts, dry foothills and plains	Unlikely due to human disturbance of the area
Swift Fox	*Vulpes velox*	Grasslands	Unlikely due to human disturbance of the area and low population density
Striped Skunk	*Mephitis mephitis*	All land habitats	Likely occurs at site
Desert Cottontail	*Sylvilagus audubonii*	Deserts, brush, chaparral and lowlands	Likely occurs at site

Table 3.5-1 Mammals Potentially Using the NEF Site
Page 2 of 2

Common Name	Scientific Name	Preferred Habitat	Probable Occurrence at NEF Site
Spotted Ground Squirrel	*Spermophilus spilosoma*	Brushy, semi-desert, chaparral, mesquite and oaks	Likely occurs at site
Rock Squirrel	*Spermophilus variegates*	Rocky outcrops, desert hill	Unlikely occurs at site due to lack of habitat
Raccoon	*Procyon lotor*	Brushy, semi-desert, chaparral and mesquite	Likely occurs at site
Porcupine	*Erethizon dorsatum*	Brush, chaparral and lowlands	Unlikely occurs at site due to lack of habitat
Spotted Bat	*Euderma maculatum*	Caves, mine tunnels and rocky habitat	Unlikely occurs at site due to lack of habitat
Mexican Free-Tailed Bat	*Tadarida mexicana*	Caves, mine tunnels and rocky habitat	Unlikely occurs at site due to lack of habitat
Western Mastiff Bat	*Eumops perotis*	Cracks, manmade structures and small holes	Unlikely occurs at site due to lack of habitat
Pallid Bat	*Antrozous pallidus*	Unlikely occurs at site due to lack of habitat	Unlikely occurs at site due to lack of habitat
Yellow-Faced Pocket Gopher	*Pappogeomys castanops*	Deep soils of the plains	Probably occurs at site in limited numbers due to limited habitat
Southern Plains Woodrat	*Neotoma micropus*	Grasslands, prairies, and mixed vegetation	Likely occurs at site
Cactus Mouse	*Peromyscus eremicus*	Grasslands, prairies, and mixed vegetation	Likely occurs at site
Mexican Ground Squirrel	*Spermophilus mexicanus*	Brush, chaparral and lowlands	Unlikely due to human disturbance of the area
White-Throated Woodrat	*Neotoma albigula*	Grasslands, prairies, and mixed vegetation	Likely occurs at site
Beaver	*Castro canadensis*	Prairies, desert water holes and creeks	Unlikely occurs at site due to lack of habitat

Table 3.5-2 Birds Potentially Using the NEF Site

Page 1 of 2

Common Name	***Scientific Name***	**Summer Breeder**	***Wintering***	***Resident***	***Migrant***
Mourning Dove	*Zenaida macroura*	C	C	C	
White-Winged Dove	*Zenaida asiatica*				
Bobwhite Quail	*Colinus virginianus*	C	C	C	
Gambel's Quail	*Lophortyx gambelii*		R	R	U
Scaled Quail	*Callipepla squamata*	C	C	C	
Scissor-Tailed Flycatcher	*Muscivora forficate*				C
Common Nighthawk	*Chordeiles minor*		C	C	
Roadrunner	*Geococcyx californianus*		C	C	
Turkey Vulture	*Cathartes aura*		C		U
Red-Tailed Hawk	*Buteo jamaicensis*		C	C	
Common Raven	*Corvus corax*		C	C	
Chichuahuan Raven	*Corvus cryptoleucus*		R		U
Loggershrike	*Lanius ludovicianus*				U
Northern Mockingbird	*Mimus polyglottos*			C	U
Crissal Thrasher	*Toxostoma dorsale*		C	C	
Green-Tailed Towhee	*Pipilo chlorurus*				U
Ash-Throated Flycatcher	*Myiarhus cinerascens*	R		C	
Vermilion Flycatcher	*Pyrocephalus rubinis*		C		C
American Kestrel	*Falco sparverius*			C	C
Swainson's Hawk	*Buteo swainsoni*			C	U
Harris' Hawk	*Parabuteo unicinctus*		R		U
Zone-Tailed Hawk	*Buteo albonotatus*		R		R
Black-Chinned Hummingbird	*Archilochus alexandri*			C	C
Sage Sparrow	*Amphispiza belli*	C	C	C	
House Finch	*Carpodacus mexicanus*	C	C	C	
Horned Lark	*Eremophilia alpestris*	U			C
Northern Cardinal	*Cardinalis cardinalis*	R			U

Table 3.5-2 Birds Potentially Using the NEF Site

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Common Name	***Scientific Name***	**Summer Breeder**	***Wintering***	***Resident***	***Migrant***
Long-Eared Owl	*Asio otus*		C	C	
Western Burrowing Owl	*Athene cunicularia hypugea*	U	U	U	C
Pyrrhuloxia	*Cardinalis sinuatus*	U			U
Scott's Oriole	*Icterus parisorum*	C	C	C	
Blue Grosbeak	*Guiraca caerulea*	C	C	C	
Varied Bunting	*Passerina versicolor*				U
Lesser Prairie Chicken	*Tympanuchus pallidicinctus*	R*	R*	R*	

R — Species Rarely Seen On-Site
U — Species Uncommonly Seen On-Site
C — Species Commonly Seen On-Site
* — Field surveys conducted at the site indicated the specie does not occur on the NEF site

Table 3.5-3 Amphibians/Reptiles Potentially Using the NEF Site

Page 1 of 2

Common Name	Scientific Name	Preferred Habitat	Probable Occurrence at NEF Site
New Mexico Spadefoot Toad	*Scapiopus multiplicatus*	Shallow watering holes and standing pools of water	Likely occurs at site
Plains Spadefoot Toad	*Scahiopus bombifrons*	Shallow to standing pools of water	Likely occurs at site
Couch's Spadefoot Toad	*Scaphiopus couchii*	Shallow to standing pools of water	Likely occurs at site
Woodhouse's Toad	*Bufo wood-housei*	Shallow watering holes and springs	Unlikely occurs at site due to lack of habitat
Green Toad	*Bufo debilis*	Shallow watering holes and springs	Unlikely occurs at site due to lack of habitat
Ornate Box Turtle	*Terrapene ornata*	Desert grasslands and short grass prairie	Likely occurs at site
Snapping Turtle	*Chelydra serpentina*	Tallgrass and mixed prairie	Unlikely occurs at site due to lack of habitat
Tiger Salamander	*Ambystoma tigrinum*	Tallgrass and mixed prairie	Likely occurs at site
Great Plains Skink	*Eumeces obsoletus*	Desert grasslands and short grass prairies	Unlikely occurs at site due to lack of habitat
Eastern Fence Lizard	*Sceloporus undulates*	Mixed grass prairie and desert grasslands	Likely occurs at site
Leopard Lizard	*Gambelia wislizenii*	Mixed grass prairie and desert grasslands	Likely occurs at site
Western Whiptail Lizard	*Cnemidophorus tigris*	Mixed grass prairie and desert grasslands	Likely occurs at site
Lesser Earless Lizard	*Holbrookia maculata*	Mixed grass prairie and desert grasslands	Likely occurs at site
Six-Lined Racerunner	*Cnemidophorus sexlineatus*	Mixed grass prairie and desert grasslands	Likely occurs at site
Collared Lizard	*Crotaphytus collaris*	Desert grasslands	Probably occurs at site in limited numbers due to limited habitat
Sand Dune Lizard	*Sceloporus arenicolus*	Sand dune-shinnery oak	Does not occur at site due to lack of habitat
Texas Horned Lizard	*Phyrynosoma cornutum*	Desert grasslands	Likely occurs at site
Plains Garter Snake	*Thamnophis radix*	Short grass prairie and desert grasslands	Probably occurs at site in limited numbers due to limited habitat
Checkered Garter Snake	*Thamnophis marcianus*	Desert grasslands	Likely occurs at site

Table 3.5-3 Amphibians/Reptiles Potentially Using the NEF Site

Common Name	Scientific Name	Preferred Habitat	Probable Occurrence at NEF Site
Pine-Gopher Snake	*Pituophis melanoleucus*	Short grass prairie and desert grasslands	Probably occurs at site in limited numbers due to limited habitat
Western Diamondback Rattlesnake	*Crotalus atrox*	Desert grasslands	Likely occurs at site
Western Rattlesnake	Crotalus viridis	Short grass prairie and desert grasslands	Likely occurs at site
Longnosed Snake	*Rhinocheilus lecontei*	Desert grasslands	Likely occurs at site
Ground Snake	*Sonora semiannulata*	Desert grasslands	Likely occurs at site
Coachwhip	*Masticophis flagellum*	Mixed grass prairie and desert grasslands	Likely occurs at site
Plains Blackhead Snake	*Tantilla nigriceps*	Short grass prairie and desert grasslands	Likely occurs at site

Table 3.5-4 Plant Cover, Frequency and Shrub Data

Page 1 of 2

Species	Mean % Cover	Relative Cover	Mean % Freq	Relative Freq
Forbs				
Aster sp. *Aster sp.*	0.155	0.006	0.600	0.008
Brassica Sp. Brassica Species	0.045	0.002	0.200	0.003
Croton texensis Croton	0.015	0.001	0.150	0.002
Eriogonum rotundilolium Roundleaf Buckwheat	0.09	0.003	0.450	0.006
unk forb unk forb	0.13	0.005	0.550	0.008
Sub-total	**0.435**	**0.016**	**1.950**	**0.027**
Grasses				
Aristida purpurea Purple Three Awn	1.05	0.039	3.600	0.050
Buchloe dactyloides Buffalo Grass	0.15	0.006	0.600	0.008
Bouteloua hirsuta Hairy Grama	0.135	0.005	0.550	0.008
Cenchrus incertus Puncture Vine	0.01	0.000	0.100	0.001
Eragrostis oxylepis Red Lovegrass	12.57	0.470	31.400	0.436
Paspalum stramineum Sand Paspalum	0.67	0.025	3.150	0.044
Scleropogon brevifolius Burro Grass	0.51	0.019	1.950	0.027
Setaria leucopila Plains Bristlegrass	0.125	0.005	0.550	0.008
Sporobolus giganteus Giant Dropseed	0.03	0.001	0.050	0.001

Table 3.5-4 Plant Cover, Frequency and Shrub Data
Page 2 of 2

Species	Mean % Cover	Relative Cover	Mean % Freq	Relative Freq
Sporobolus sp. Dropseed Species	1.475	0.055	5.450	0.076
sub-total	**16.725**	**0.626**	47.400	0.658

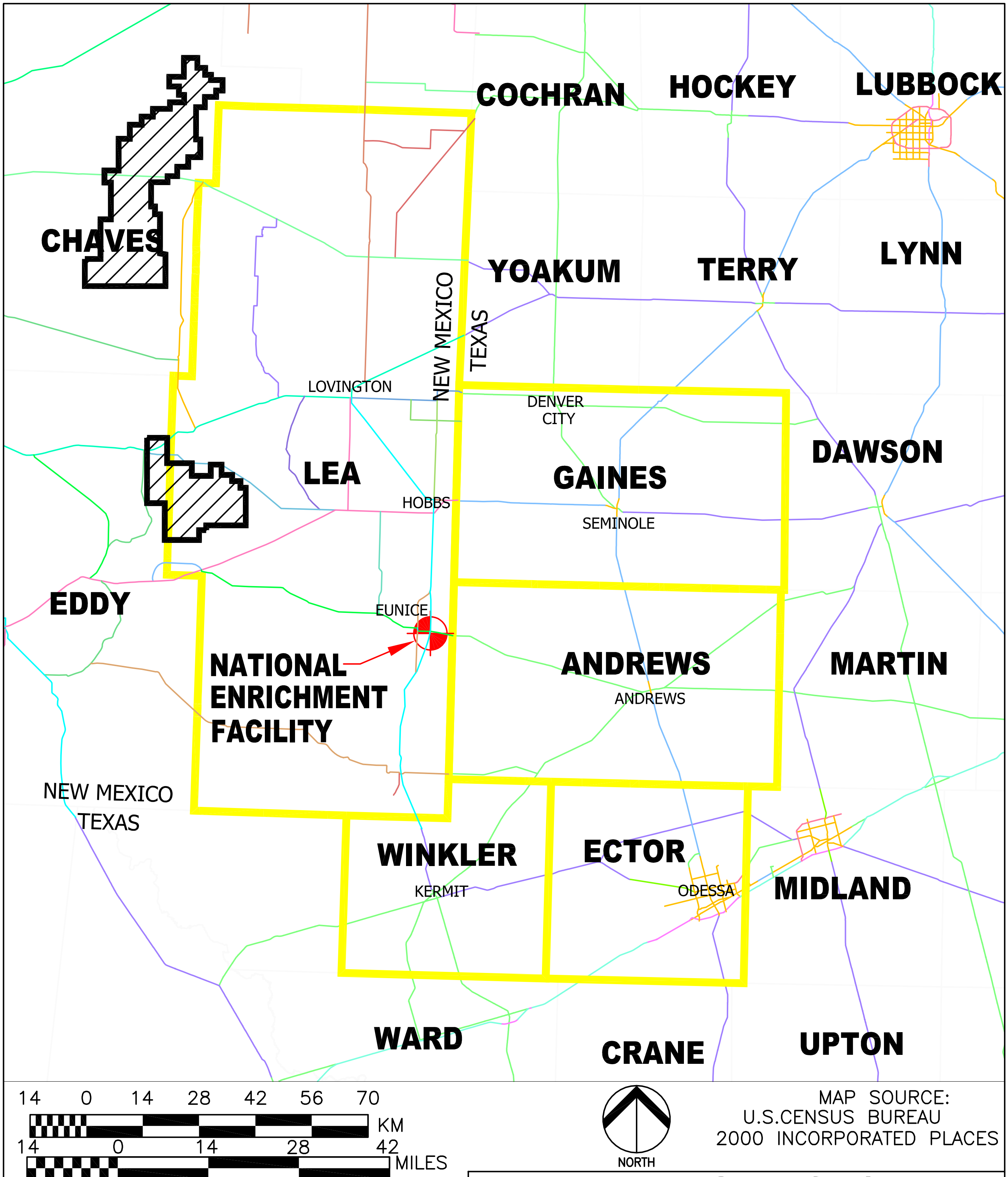
Shrubs				
Artemesia filifolia Sand Sage	0.77	0.029	2.050	0.028
Gutierrezia sarothrae Snakeweed	0.16	0.006	0.350	0.005
Prosopis glandulosa Honey Mesquite	3.69	0.138	5.600	0.078
Querqus havardii Shinoak	3.22	0.121	10.600	0.147
Yucca glauca Soapweed yucca	1.72	0.064	4.100	0.057
Sub-total	**9.56**	**0.358**	**22.700**	**0.315**
Total	**26.28**	**1.000**	**72.050**	**1.000**

Table 3.5-5 Shrub Density

Species	Mean Density per Transect	Individuals per Ha (per Acre)
Artemesia filifolia Sand Sage	4.7	842 (341)
Oppuntia polyacantha Plains Pricklypear	0.05	9.9 (4)
Prosopis glandulosa Honey Mesquite	1.5	2.69 (109)
Querqus havardii Shinoak	78.35	14,040 (5688)
Yucca glauca Soapweed yucca	8.35	1,497 (606)
Total	**92.95**	**16,660 (6,748)**

FIGURES

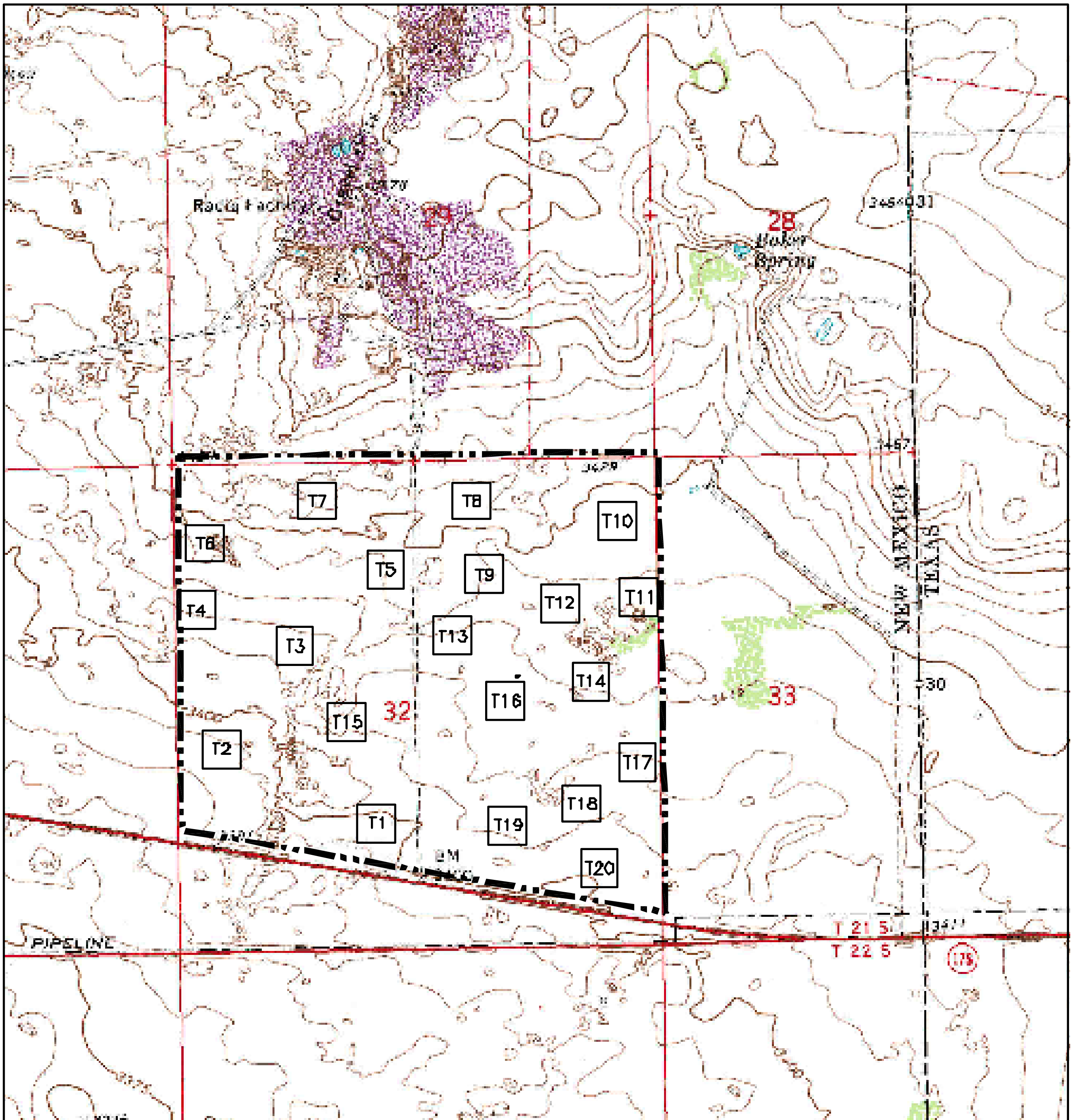
2



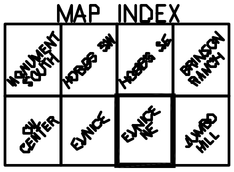
KEY:

APPROXIMATE LOCATION OF PROPOSED ACEC BOUNDARY

FIGURE 3.5-1
COUNTY MAP
PROPOSED AREA OF CRITICAL ENVIRONMENTAL CONCERN (ACEC)
LESSER PRAIRIE CHICKEN
ENVIRONMENTAL REPORT
REVISION 2 DATE: JULY 2004



USGS 7.5 MINUTE MAP INDEX



NORTH

300 0 300 600 900 METERS

1000 0 1000 2000 3000 FEET

MAP SOURCE:
USGS 7.5 MINUTE
EUNICE NE QUADRANGLE
TEX.-N. MEX. 1:24000
CONTOUR INTERVAL: 5 FEET

REFERENCE NUMBER
7.5Min Figures.dwg

FIGURE 3.5-2

NEF SITE VEGETATION SURVEY
TRANSECT LOCATIONS
ENVIRONMENTAL REPORT

REVISION 2 DATE: JULY 2004

2

3.6 METEOROLOGY, CLIMATOLOGY AND AIR QUALITY

In this section, data characterizing the meteorology (e.g., winds, precipitation, and temperature) for the proposed National Enrichment Facility (NEF) site are presented along with discussions on severe storms, ambient air quality, and the impact of local terrain features on site meteorology.

3.6.1 Onsite Meteorological Conditions

The meteorological conditions at the NEF have been evaluated and summarized in order to characterize the site climatology and to provide a basis for predicting the dispersion of gaseous effluents. No onsite meteorological data were available, however, Waste Control Specialists (WCS) have a meteorological monitoring station within approximately 1.6 km (1 mi) from the proposed NEF site.

Climate information from Hobbs, New Mexico, 32 km (20 mi) north of the site, obtained from the Western Regional Climate Center, was used. In addition, National Oceanic and Atmospheric Administration (NOAA) Local Climatological Data (LCD) recorded at Midland-Odessa Regional Airport, Texas, 103 km (64 mi) southeast of the site and at Roswell, New Mexico, 161 km (100 mi) northwest of the site were used. In the following summaries of meteorological data, the averages are based on:

- Hobbs station (WRCC, 2003) averages are based on a 30-year record (1971 to 2000) unless otherwise stated,
- Midland-Odessa station (NOAA, 2002a) averages are based on a 30-year record (1961 to 1990) unless otherwise stated,
- Roswell station (NOAA, 2002b) averages are based on a 30-year record (1961 to 1990) unless otherwise stated.

The meteorological tower in use at WCS is 10 m (32.8 ft) tall with ambient temperature measurements at 10 m and 2 m (32.8 ft and 6.6 ft) above ground level. Although there are wind speed and direction measurements, there are no data to determine atmospheric stability. WCS provided unvalidated hourly meteorological data from January 2000 through December 2001. These were the only full years of data available from WCS at the time of the analysis.

The WCS meteorological data were reviewed and analyzed for the specific purpose of determining the prevailing wind direction in the vicinity of the proposed NEF site. Use of the WCS data for this purpose is acceptable because it was consistent with the Midland-Odessa and Roswell data, although the WCS data was not from a first-order source. This analysis indicates that the prevailing wind direction in the vicinity of the NEF site is consistent with the prevailing wind directions at Midland-Odessa and Roswell. The WCS data, however, were not used for the purpose of characterizing atmospheric transport and diffusion processes at the NEF site because these data have not been fully verified by WCS. Instead, the Midland-Odessa data were used for this purpose. Use of the Hobbs, Midland-Odessa, and Roswell observations for a general description of the meteorological conditions at the NEF was deemed appropriate as they are all located within the same region and have similar climates. Use of the Midland-Odessa data for predicting the dispersion of gaseous effluents was deemed appropriate. It is the closest first-order National Weather Service (NWS) station to the NEF site and both Midland-Odessa and the NEF site have similar climates. In addition, wind direction frequency comparisons between Midland-Odessa and the closest source of meteorological measurements (WCS) to the NEF site show good agreement as reflected in Table 3.6-22, Wind Frequency Distribution, and Figure 3.6-12, Comparison of WCS and Midland-Odessa Wind Direction Data. There are five years of data from Midland-Odessa (five years of data is considered to be a minimum when using EPA air dispersion codes to perform air quality analyses), and the EPA had filled in all missing data values in the Midland-Odessa data set, as required for use with EPA air dispersion models. Midland-Odessa and Roswell data were compiled and certified by the National Climatic Data Center. Hobbs data were compiled and certified by the Western Regional Climate Center.

The information for Midland-Odessa and Roswell did not contain monthly and annual dewpoint temperature summaries, number of hours with precipitation, hourly rainfall rate distribution, description of local airflow patterns and characteristics, hourly averages of wind speed and direction, and estimated monthly mixing height data.

3.6.1.1 Regional Climate

The NEF site is located in the Southeast Plains of New Mexico close to the border with Texas. The climate is typical of a semi-arid region, with generally mild temperatures, low precipitation and humidity, and a high evaporation rate. Vegetation consists mainly of native grasses and some mesquite trees. During the winter, the weather is often dominated by a high pressure system located in the central part of the western United States and a low pressure system located in north-central Mexico. During the summer, the region is affected by a low pressure system normally located over Arizona.

3.6.1.2 Temperature

A summary of 30 years of temperature data (Table 3.6-1A, Hobbs, New Mexico, Temperature Data (1971-2000)) collected at the Hobbs, New Mexico, Cooperative Observer's Station shows a mean annual temperature of 16.8°C (62.2°F) with the mean monthly temperature ranging from 6.1°C (42.9°F) in January to 26.7°C (80.1°F) in July. The highest mean maximum temperature on record is 38.9°C (102.1°F) and the lowest mean minimum temperature is -5.1°C (22.8°F).

Mean monthly temperatures in Midland-Odessa (NOAA, 2002a) range from 5.8°C (42.5°F) in January to 27.8°C (82.0°F) in July. The lowest daily minimum temperature was -23.9°C (–11.0°F) in February 1985 and the highest daily maximum temperature was 46.7°C (116.0°F) in June 1994. The average relative humidity ranges approximately from 45% to 61%. Highest humidities occur mainly during the early morning hours (NOAA, 2002a). For the Midland-Odessa data, the daily and monthly mean values and extremes of temperature, and the monthly averages of mean relative humidity, are listed in Table 3.6-2, Midland-Odessa, Texas Temperature Data and Table 3.6-3, Midland-Odessa, Texas Relative Humidity Data, respectively. The temperature summaries are based on 30-year records.

Mean monthly temperatures in Roswell (NOAA, 2002b) range from 4.2°C (39.5°F) in January to 27.1°C (80.7°F) in July. The lowest daily minimum temperature was -22.8°C (–9.0°F) in January 1979 and the highest daily maximum temperature was 45.6°C (114.0°F) in June 1994. The average relative humidity of observations taken every 6 hours ranges approximately from 22% to 76%. Highest humidities occur mainly during the early morning hours (NOAA, 2002b). For the Roswell data, the daily and monthly mean values and extremes of temperature, and the monthly averages of mean relative humidity, are listed in Table 3.6-4, Roswell, New Mexico

Temperature Data and Table 3.6-5, Roswell, New Mexico Relative Humidity Data, respectively. These temperature summaries are based on 30-year records.

3.6.1.3 Precipitation

The normal annual total rainfall as measured in Hobbs is 46.1 cm (18.2 in). Precipitation amounts range from an average of 1.2 cm (0.5 in) in March to 8 cm (3.1 in) in September. Record maximum and minimum monthly totals are 35.1 cm (13.8 in) and zero. Table 3.6-1B, Hobbs, New Mexico, Precipitation Data (1971-2000) lists the monthly averages and extremes of precipitation for the Hobbs data. These precipitation summaries are based on 30-year records.

The normal annual total rainfall in Midland-Odessa is 37.6 cm (14.8 in). Precipitation amounts range from an average of 1.1 cm (0.4 in) in March to 5.9 cm (2.3 in) in September. Record maximum and minimum monthly totals are 24.6 cm (9.7 in) and zero, respectively. The highest 24-hr precipitation total was 15.2 cm (6.0 in) in July 1968 (NOAA, 2002a). Table 3.6-6, Midland-Odessa, Texas Precipitation Data lists the monthly averages and extremes of precipitation for the Midland-Odessa data. These precipitation summaries are based on 30-year records.

The normal annual rainfall total in Roswell, New Mexico, is 33.9 cm (13.3 in). Record maximum and minimum monthly totals are 17.5 cm (6.9 in) and zero, respectively (NOAA, 2002a, 2002b). The highest 24-hr precipitation total was 12.5 cm (4.91 in) in July 1981 (NOAA, 2002b). Table 3.6-7, Roswell, New Mexico Precipitation Data, lists the monthly averages and extremes of precipitation for the Roswell data. These precipitation summaries are based on 30-year records.

Snowfall in Midland-Odessa, Texas, averages 13.0 cm (5.1 in) per year. Maximum monthly snowfall/ice pellets of 24.9 cm (9.8 in) fell in December 1998. The maximum amount of snowfall/ice pellets to fall in 24 hours was 24.9 cm (9.8 in) in December 1998 (NOAA, 2002a). Table 3.6-8, Midland-Odessa, Texas Snowfall Data, lists the monthly averages and maximums of snowfall/ice pellets. These snowfall summaries are based on 30-year records.

Snowfall in Roswell, New Mexico, averages 30.2 cm (11.9 in) per year. Maximum monthly snowfall/ice pellets of 53.3 cm (21.0 in) fell in December 1997. The maximum amount of snowfall/ice pellets to fall in 24 hours was 41.9 cm (16.5 in) in February 1988 (NOAA, 2002b). Table 3.6-9, Roswell, New Mexico Snowfall Data, lists the monthly averages and maximums of snowfall/ice pellets. These snowfall summaries are based on 30-year records.

There was no snowfall information for Hobbs, New Mexico, presumably because snowfall events are extremely rare.

3.6.1.4 Wind

Monthly mean wind speeds and prevailing wind directions at Midland-Odessa are presented in Table 3.6-10, Midland-Odessa, Texas Wind Data. The annual mean wind speed was 4.9 m/sec (11.0 mi/hr) and the prevailing wind direction was 180 degrees with respect to true north. The maximum five-second wind speed was 3.13 m/s (70 mi/hr).

Monthly mean wind speeds and prevailing wind directions at Roswell are presented in Table 3.6-11, Roswell, New Mexico Wind Data. The annual mean wind speed was 3.7 m/sec (8.2 mi/hr) and the prevailing wind direction was wind from 160 degrees with respect to true north. The maximum five-second wind speed 27.7 m/s (62.0 mi/hr).

Five years of data (1987-1991) from the Midland-Odessa NWS were used to generate joint frequency distributions of wind speed and direction. This data summary, for all Pasquill stability classes (A-F) combined, is provided in Table 3.6-12, Midland-Odessa Five Year (1987-1991) Annual Joint Frequency Distribution for All Stability Classes Combined.

Cooperative station meteorological wind data are available for Hobbs, New Mexico, but the data were not included in this ER because the data was not from a first-order source. A first-order weather data source is one obtained from a major weather station staffed by the NWS personnel, whereas, a cooperative source is one that cooperates with NWS, but not supervised by NWS staff.

3.6.1.5 Atmospheric Stability

Five years of data (1987-1991) from the Midland-Odessa NWS were used to generate joint frequency distributions of wind speed and direction as a function of Pasquill stability class (A-F). Stability class was determined using the solar radiation/cloud cover method. These data are given in Tables 3.6-13 through 3.6-18. The most stable classes, E and F, occur 18.3% and 13.6% of the time, respectively. The least stable class, A, occurs 0.4% of the time. Important conditions for atmospheric dispersion, stable (Pasquill Class F) and low wind speeds 0.4 to 1.3 m/s (1.0 to 3.0 mi/hr), occur 2.2% of the time. The highest occurrences of Pasquill Class F and low wind speeds, 0.4 to 1.3 m/s (1.0 to 3.0 mi/hr), with respect to wind direction are 0.28% and 0.23% with south and south-southeast winds.

The same data set was used to generate wind rose plots, Figures 3.6-1 through 3.6-5. These figures show wind speed and direction frequency for each year. Figure 3.6-6, Midland, Texas 1987-1991 Wind Rose shows wind speed and direction for all years combined.

3.6.1.6 Storms

Thunderstorms occur during every month but are most common in the spring and summer months. Thunderstorms occur an average of 36.4 days/year in Midland-Odessa (based on a 54-year period of record as indicated in (NOAA, 2002a). The seasonal averages are: 11 days in spring (March through May); 17.4 days in summer (June through August); 6.7 days in fall (September through November); and 1.3 days in winter (December through February).

J. L. Marshall (Marshall, 1973) presented a methodology for estimating lightning strike frequencies which includes consideration of the attractive area of structures. His method consists of determining the number of lightning flashes to earth per year per square kilometer and then defining an area over which the structure can be expected to attract a lightning strike. Assuming that there are 4 flashes to earth per year per square kilometer (2.1 flashes to earth per year per square mile) in the vicinity of the NEF (conservatively estimated using Figure 3.6-7, Average Lightning Flash Density, which is taken from the National Weather Service (NWS, 2003). Marshall defines the total attractive area, A, of a structure with length L, width W, and height H, for lightning flashes with a current magnitude of 50 percent of all lightning flashes as:

$$A = LW + 4H (L + W) + 12.57 H^2$$

The following building complex dimensions, including the UBC Storage Pad, were used to estimate conservatively the attractive area of the NEF. The building complex dimensions are determined by taking the length (L) and width (W) of the ground rectangle that would encompass the entire disturbed area of the site, whereas the height (H) is the height of the tallest building in the complex.

L = 534 m (1,752 ft), W = 534 m (1,752 ft), H = 13 m (43 ft)

The total attractive area is therefore equal to 0.34 km^2 (0.13 mi^2). Consequently, the lightning strike frequency computed using Marshall's methodology is given as 1.36 flashes per year.

Tornadoes occur infrequently in the vicinity of the NEF. Only two tornadoes were reported in Lea County, New Mexico, (Grazulis, 1993) from 1880-1989. Across the state line, only one tornado was reported in Andrews County, Texas, (Grazulis, 1993) from 1880-1989.

Tornadoes are commonly classified by their intensities. The F-Scale classification of tornados is based on the appearance of the damage that the tornado causes. There are six classifications, F0 to F5, with an F0 tornado having winds of 64 to 116 km/hr (40 to 72 mi/hr) and an F5 tornado having winds of 420 to 512 km/hr (261-318 mi/hr) (AMS, 1996). The two tornadoes reported in Lea County were estimated to be F2 tornadoes (Grazulis, 1993).

Hurricanes, or tropical cyclones, are low-pressure weather systems that develop over the tropical oceans. These storms are classified during their life cycle according to their intensity:

- Tropical depression – wind speeds less than 63 km/hr (39 mi/hr)
- Tropical storm – wind speed between 63 and 118 km/hr (39 and 73 mi/hr)
- Hurricane – wind speeds greater than 118 km/hr (73 mi/hr)

Hurricanes are fueled by the relatively warm tropical ocean water and lose their intensity quickly once they make landfall. Since the NEF is sited about 805 km (500 mi) from the coast, it is most likely that any hurricane that tracked towards it would have dissipated to the tropical depression stage, that is, wind speeds less than 63 km/hr (39 mi/hr), before it reached the NEF.

3.6.1.7 Mixing Heights

Mixing height is defined as the height above the earth's surface through which relatively strong vertical mixing of the atmosphere occurs. Holzworth developed mean annual morning and afternoon mixing heights for the contiguous United States (EPA, 1972). This information is presented in Figure 3.6-8, Annual Average Morning Mixing Heights and Figure 3.6-9, Annual Average Afternoon Mixing Heights. From these figures, the mean annual morning and afternoon mixing heights for the NEF are approximately 450 m (1,476 ft) and 2,300 m (7,544 ft), respectively.

3.6.1.8 Sandstorms

Blowing sand or dust may occur occasionally in the area due to the combination of strong winds, sparse vegetation, and the semi-arid climate. High winds associated with thunderstorms are frequently a source of localized blowing dust. Dust storms that cover an extensive region are rare, and those that reduce visibility to less than 1.6 km (1 mi) occur only with the strongest pressure gradients such as those associated with intense extratropical cyclones which occasionally form in the area during winter and early spring (DOE, 2003d).

3.6.2 Existing Levels Of Air Pollution And Their Effects On Plant Operations

The United States Environmental Protection Agency (EPA) uses six criteria pollutants as indicators of air quality. Maximum concentrations, above which adverse effects on human health may occur, have been set. These concentrations are referred to as the National Ambient Air Quality Standards (NAAQS). Areas either meet the national primary or secondary air quality standards for the criteria pollutants (attainment) or do not meet the national primary or secondary air quality standards for the criteria pollutants (nonattainment). The criteria pollutants are ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead.

Ozone is a photochemical (formed in chemical reactions between volatile organic compounds and nitrogen oxides in the presence of sunlight) oxidant and the major component of smog. Exposure to ozone for several hours at low concentrations has been shown to significantly reduce lung function and induce respiratory inflammation in normal, healthy people during exercise. Other symptoms include chest pain, coughing, sneezing, and pulmonary congestion.

Carbon monoxide is an odorless, colorless, poisonous gas produced by incomplete burning of carbon in fuels. Exposure to carbon monoxide reduces the delivery of oxygen to the body's organs and tissues. Elevated levels can cause impairment of visual perception, manual dexterity, learning ability, and performance of complex tasks.

Nitrogen dioxide is a brownish, highly reactive gas that is present in all urban environments. It is an important precursor to both ozone and acid rain. Exposure to nitrogen dioxide can irritate the lungs, cause bronchitis and pneumonia, and lower resistance to respiratory infections.

Sulfur dioxide results largely from stationary sources such as coal and oil combustion, steel and paper mills, and refineries. It is a primary contributor to acid rain and contributes to visibility impairments in large parts of the country. Exposure to sulfur dioxide can affect breathing and may aggravate existing respiratory and cardiovascular disease.

Particulate matter, such as dust, dirt, soot, smoke, and liquid droplets, are emitted into the air by sources such as factories, power plants, cars, construction activity, fires, and natural windblown dust. Exposure to high concentrations of particulate matter can effect breathing, cause respiratory symptoms, aggravate existing respiratory and cardiovascular disease, alter the body's defense systems against foreign materials, damage lung tissue, and cause premature death.

Lead can be inhaled, ingested in food, water, soil, or dust. High exposure to lead can cause seizures, mental retardation, and/or behavioral disorders. Low exposure to lead can lead to central nervous system damage.

According to information from the EPA (EPA, 2003a), both Lea County, New Mexico, and Andrews County, Texas, are in attainment for all of the criteria pollutants (see Figure 3.6-10, EPA Criteria Pollutant Nonattainment Map). Air quality in the region is very good and should have no impact on plant operations. Normal operations at the NEF will result in emissions of the criteria pollutants from the boilers that power the heating system; these emissions are addressed in ER Section 4.6, Air Quality Impacts. Air emissions during site preparation and plant construction could include particulate matter and other pollutants; these potential emissions are also addressed in ER Section 4.6. Table 3.6-19, National Ambient Air Quality Standards lists the National Ambient Air Quality Standards (EPA, 2003b).

The closest monitoring station operated to the site by the Monitoring Section of the New Mexico Air Quality Bureau is about 32 km (20 mi) north of the site in Hobbs, New Mexico. This station monitors particulate matter, particles 2.5 µm or less in diameter. Summary readings from this monitor are presented in Table 3.6-20, Hobbs, New Mexico Particulate Matter Monitor Summary. No instances of the particulate matter National Ambient Air Quality Standards being exceeded have been measured by this monitoring station.

There are 54 sources of criteria pollutants in Lea County, New Mexico, and six sources in Andrews County, Texas, listed in the EPA AirData data base for emissions year 1999

(EPA, 2003b). Table 3.6-21, Existing Sources of Criteria Air Pollutants (1999), lists the AirData Monitor Summary Report. Readers are cautioned not to infer a qualitative ranking order of geographic areas based on AirData reports. Air pollution levels measured in the vicinity of a particular monitoring site may not be representative of the prevailing air quality of a county or urban area. Pollutants emitted from a particular source may have little impact on the immediate geographic area, and the amount of pollutants emitted does not indicate whether the source is complying with applicable regulations.

3.6.3 The Impact Of The Local Terrain And Bodies Of Water On Meteorological Conditions

Local terrain in the form of hills, valleys, and large water bodies can have a significant impact on meteorological conditions. The NEF site lies in a semi-arid region of the southwestern corner of the High Plains. The site is at approximately 1,037 m (3,400 ft) above mean sea level. The site is relatively flat, with elevations varying only about 15 m (50 ft). Figure 3.6-11, Topographic Map of Site shows the topography near the NEF site. Therefore, LES expects that there will be no impacts on meteorological conditions from local terrain and bodies of water onsite or nearby. For land use information, see ER Section 3.1, Land Use.

TABLES

Table 3.6-1A Hobbs, New Mexico, Temperature Data (1971-2000)

Month	Mean Monthly Temperature °C (°F)	Highest Mean Temperature °C (°F)	Lowest Mean Temperature °C (°F)	Highest Mean Maximum Temperature °C (°F)	Lowest Mean Minimum Temperature °C (°F)
January	6.1 (42.9)	8.8 (47.8)	2.6 (36.6)	18.2 (64.7)	-5.1 (22.8)
February	8.9 (48.0)	12.6 (54.6)	5.8 (42.5)	21.8 (71.3)	-1.9 (28.5)
March	12.7 (54.8)	16.4 (61.6)	9.3 (48.7)	26.2 (79.1)	1.1 (33.9)
April	17.0 (62.6)	19.9 (67.8)	13.9 (57)	28.8 (83.8)	5.3 (41.5)
May	21.6 (70.9)	25.5 (77.9)	19.2 (66.6)	34.7 (94.5)	10.3 (50.5)
June	25.5 (77.9)	29.3 (84.8)	23.2 (73.7)	38.6 (101.5)	15.3 (59.5)
July	26.7 (80.1)	30.0 (86.0)	23.8 (74.8)	38.9 (102.1)	17.1 (62.7)
August	25.7 (78.3)	27.8 (82.0)	22.7 (72.9)	35.8 (96.4)	16.2 (61.1)
September	22.4 (72.3)	25.3 (77.5)	18.9 (66)	33.7 (92.6)	12.3 (54.2)
October	17.3 (63.2)	19.2 (66.6)	13.8 (56.9)	29.1 (84.4)	5.4 (41.7)
November	10.7 (51.3)	13.6 (56.4)	7.2 (44.9)	23.1 (73.5)	-0.7 (30.8)
December	6.7 (44.0)	9.4 (48.9)	3.1 (37.6)	18.6 (65.4)	-5.1 (22.8)
Annual	16.8 (62.2)	30.0 (86.0)	2.6 (36.6)	38.9 (102.1)	-5.1 (22.8)

(WRCC, 2003)

Table 3.6-1B Hobbs, New Mexico, Precipitation Data (1971-2000)

Precip cm (in)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	1.3 (0.5)	1.7 (0.7)	1.2 (0.5)	2.0 (0.8)	6.6 (2.6)	5.2 (2.0)	6.1 (2.4)	6.4 (2.5)	8.0 (3.1)	3.7 (1.4)	2.2 (0.9)	1.8 (0.7)	46.1 (18.2)
Max	5.2 (2.0)	5.6 (2.2)	7.6 (3.0)	7.3 (2.9)	35.1 (13.8)	13.6 (5.4)	23.9 (9.4)	23 (9.1)	33 (13.0)	20.7 (8.2)	11 (4.3)	12.9 (5.1)	35.1 (13.8)
Min	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.6 (0.2)	0.3 (0.1)	0.2 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)

(WRCC, 2003)

Table 3.6-2 Midland-Odessa, Texas, Temperature Data

Month	Mean Monthly Temperature °C (°F)	Mean Daily Maximum Temperature °C (°F)	Mean Daily Minimum Temperature °C (°F)	Highest Daily Maximum Temperature °C (°F)	Lowest Daily Minimum Temperature °C (°F)
January	5.8 (42.5)	13.9 (57.0)	-1.2 (29.9)	28.9 (84.0)	-22.2 (-8.0)
February	8.4 (47.1)	16.8 (62.3)	1.1 (33.9)	32.2 (90.0)	-23.9 (-11.0)
March	13.2 (55.7)	21.0 (69.8)	4.7 (40.5)	35.0 (95.0)	-12.8 (9.0)
April	18.1 (64.6)	26.0 (78.8)	9.7 (49.5)	38.3 (101.0)	-6.7 (20.0)
May	22.7 (72.8)	30.4 (86.6)	15.1(59.1)	42.2 (108.0)	1.1 (34.0)
June	26.4 (79.6)	33.7 (93.0)	19.4 (67.0)	46.7 (116.0)	8.3 (47.0)
July	27.8 (82.0)	34.6 (94.5)	20.8 (69.4)	44.4 (112.0)	11.7 (53.0)
August	27.1 (80.8)	33.8 (93.3)	20.2 (68.3)	41.7 (107.0)	12.2 (54.0)
September	22.9 (73.7)	30.1 (86.5)	16.6 (61.9)	41.7 (107.0)	2.2 (36.0)
October	17.8 (64.0)	25.2 (77.7)	10.8 (51.5)	38.3 (101.0)	-4.4 (24.0)
November	11.4 (52.6)	18.8 (65.9)	3.9 (39.1)	32.2 (90.0)	-11.7 (11.0)
December	7.0 (44.6)	14.7 (58.8)	-0.1 (31.8)	29.4 (85.0)	-18.3 (-1.0)
Annual	17.4 (63.3)	25.0 (77.0)	10.1 (50.2)	46.7 (116.0)	-23.9 (-11.0)

Source: (NOAA, 2002a)

Table 3.6-3 Midland-Odessa, Texas, Relative Humidity Data

Relative Humidity (%)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	57	55	46	45	51	53	51	54	61	60	59	58	54
00 LST	63	62	54	52	60	61	57	60	69	70	68	65	62
06 LST	71	72	66	66	75	77	73	75	80	79	76	72	74
12 LST	46	44	36	34	38	42	42	43	50	46	45	45	43
18 LST	41	36	28	27	31	33	34	36	44	43	44	44	37

Time of Day, 24-Hour Clock
LST = Local Standard Time
Source: (NOAA, 2002a)

Table 3.6-4 Roswell, New Mexico, Temperature Data

Month	Mean Monthly Temperature °C (°F)	Mean Daily Maximum Temperature °C (°F)	Mean Daily Minimum Temperature °C (°F)	Highest Daily Maximum Temperature °C (°F)	Lowest Daily Minimum Temperature °C (°F)
January	4.2 (39.5)	12.5 (54.5)	-3.1 (26.4)	27.8 (82.0)	-22.8 (-9.0)
February	6.9 (44.5)	15.8 (60.4)	-0.7 (30.8)	29.4 (85.0)	-16.1 (3.0)
March	11.2 (52.1)	19.9 (67.8)	2.8 (37.1)	33.9 (93.0)	-12.8 (9.0)
April	16.1 (61.0)	24.7 (76.5)	7.6 (45.7)	37.2 (99.0)	-5.0 (23.0)
May	20.9 (69.7)	29.6 (85.3)	13.0 (55.4)	41.7 (107.0)	1.1 (34.0)
June	25.5 (77.9)	34.2 (93.5)	17.8 (64.1)	45.6 (114.0)	8.3 (47.0)
July	27.1 (80.7)	34.6 (94.2)	19.3 (66.8)	43.9 (111.0)	NA
August	25.8 (78.4)	33.4 (92.2)	19.3 (66.7)	41.7 (107.0)	12.2 (54.0)
September	22.6 (72.6)	29.8 (85.7)	15.3 (59.5)	39.4 (103.0)	4.4 (40.0)
October	16.8 (62.2)	24.6 (76.2)	8.6 (47.4)	37.2 (99.0)	-10.0 (14.0)
November	10.3 (50.6)	17.7 (63.8)	1.6 (34.9)	31.1 (88.0)	-15.6 (4.0)
December	4.9 (40.8)	13.0 (55.4)	-2.8 (27.0)	27.2 (81.0)	-22.2 (-8.0)
Annual	16.0 (60.8)	24.2 (75.5)	8.2 (46.8)	45.6 (114.0)	-22.8 (-9.0)

Source: (NOAA, 2002b)
NA: Not available

Table 3.6-5 Roswell, New Mexico, Relative Humidity Data

Relative Humidity (%)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	57	51	40	36	40	43	49	54	58	54	53	54	49
00 LST	71	66	56	53	59	64	68	74	76	70	66	66	66
06 LST	50	45	33	30	32	36	41	45	49	44	44	47	41
12 LST	40	34	24	22	24	27	32	37	41	36	38	40	33
18 LST	62	55	44	41	44	47	54	60	64	60	58	60	54

Time of Day, 24-Hour Clock
LST = Local Standard Time
Source: (NOAA, 2002b)

Table 3.6-6 Midland-Odessa, Texas, Precipitation Data
1961-1990

Precipitation cm (in)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Average	1.3 (0.53)	1.5 (0.58)	1.1 (0.42)	1.9 (0.73)	4.5 (1.79)	4.3 (1.71)	4.8 (1.89)	4.5 (1.77)	5.9 (2.31)	4.5 (1.77)	1.7 (0.65)	1.7 (0.65)	37.6 (14.8)
Maximum	9.3 (3.66)	6.5 (2.55)	7.3 (2.86)	7.2 (2.85)	19.4 (7.63)	10.0 (3.93)	21.6 (8.50)	11.3 (4.43)	24.6 (9.70)	18.9 (7.45)	5.9 (2.32)	8.4 (3.30)	24.6 (9.70)
Minimum	0.0 (0.00)	0.0 (0.00)	T T	0.0 (0.00)	0.1 (0.02)	0.03 (0.01)	T T	0.1 (0.05)	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)	T T	0.0 (0.00)
Maximum in 24 hours	2.9 (1.15)	3.4 (1.32)	5.6 (2.2)	4.1 (1.62)	12.1 (4.75)	7.8 (3.07)	15.2 (5.99)	6.1 (2.41)	11.1 (4.37)	9.1 (3.59)	5.5 (2.16)	2.3 (0.9)	15.2 (5.99)

T = trace amount
Source: (NOAA, 2002a)

Table 3.6-7 Roswell, New Mexico, Precipitation Data

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Precipitation cm (in)	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Average	1.0 (0.39)	1.0 (0.41)	0.9 (0.35)	1.5 (0.58)	3.3 (1.30)	4.1 (1.62)	5.1 (1.99)	5.9 (2.31)	5.0 (1.98)	3.3 (1.29)	1.3 (0.53)	1.5 (0.59)	33.9 (13.34)
Maximum	2.6 (1.03)	5.1 (2.02)	7.2 (2.84)	6.3 (2.48)	11.6 (4.57)	12.8 (5.02)	17.5 (6.88)	16.5 (6.48)	16.7 (6.58)	15.0 (5.91)	5.4 (2.11)	7.8 (3.07)	17.5 (6.88)
Minimum	0.1 (0.03)	0.0 (0.00)	0.0 (0.00)	0.0 (0.01)	T T	0.1 (0.02)	0.0 (0.01)	0.2 (0.07)	0.1 (0.05)	T T	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)
Maximum in 24 hours	1.7 (0.67)	3.6 (1.41)	5.6 (2.22)	5.7 (2.24)	4.5 (1.77)	7.7 (3.05)	12.5 (4.91)	10.0 (3.94)	6.9 (2.71)	9.9 (3.89)	3.4 (1.33)	2.8 (1.10)	12.5 (4.91)

T = trace amount

Source: (NOAA, 2002b)

Table 3.6-8 Midland-Odessa, Texas, Snowfall Data
1961-1990

Snowfall cm (in)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	5.6 (2.2)	1.8 (0.7)	0.5 (0.2)	0.3 (0.1)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.* (0.*)	1.3 (0.5)	3.6 (1.4)	13.0 (5.1)
Maximum	22.9 (9.0)	9.9 (3.9)	15.0 (5.9)	5.1 (2.0)	T T	T T	T T	T T	T T	1.5 (0.6)	20.3 (8.0)	24.9 (9.8)	24.9 (9.8)
Maximum in 24 hours	17.3 (6.8)	9.9 (3.9)	12.7 (5.0)	5.1 (2.0)	T T	T T	T T	T T	T T	1.5 (0.6)	15.2 (6.0)	24.9 (9.8)	24.9 (9.8)

0.* indicates the value is between 0.0 and 1.3 cm (0.0 and 0.5 in)
Source: (NOAA, 2002a)

Table 3.6-9 Roswell, New Mexico, Snowfall Data
1961-1990

Snowfall cm (in)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	7.9 (3.1)	6.6 (2.6)	2.3 (0.9)	1.0 (0.4)	0.* (0.*)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.8 (0.3)	3.3 (1.3)	8.4 (3.3)	30.2 (11.9)
Maximum	26.4 (10.4)	42.9 (16.9)	12.2 (4.8)	13.5 (5.3)	2.0 (0.8)	2.5 (1.0)	0.0 (0.0)	0.0 (0.0)	2.5 (1.0)	10.7 (4.2)	31.2 (12.3)	53.3 (21.0)	53.3 (21.0)
Maximum in 24 hours	18.5 (7.3)	41.9 (16.5)	12.2 (4.8)	10.2 (4.0)	5.1 (2.0)	2.5 (1.0)	0.0 (0.0)	0.0 (0.0)	2.5 (1.0)	7.9 (3.1)	16.0 (6.3)	24.6 (9.7)	41.9 (16.5)

0.* indicates the value is between 0.0 and 1.3 cm (0.0 and 0.5 in)
Source: (NOAA, 2002b)

Table 3.6-10 Midland-Odessa, Texas, Wind Data
1961-1990

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Mean Speed m/sec (mi/hr)	4.6 (10.4)	5.0 (11.2)	5.5 (12.4)	5.6 (12.6)	5.5 (12.4)	5.5 (12.2)	4.8 (10.7)	4.4 (9.9)	4.4 (9.9)	4.4 (9.9)	4.6 (10.3)	4.5 (10.1)	4.9 (11.0)
Prevailing Direction degrees from True North	180	180	180	180	180	160	160	160	160	180	180	180	180
Maximum 5-second speed m/sec (mi/hr)	22.8 (51.0)	23.2 (52.0)	24.1 (54.0)	26.4 (59.0)	24.6 (55.0)	21.9 (49.0)	26.4 (59.0)	28.6 (64.0)	31.3 (70.0)	20.6 (46.0)	20.1 (45.0)	21.9 (49.0)	31.3 (70.0)

Source: (NOAA, 2002a)

Table 3.6-11 Roswell, New Mexico, Wind Data
1961-1990

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Speed m/sec (mi/hr)	3.1 (6.9)	3.6 (8.1)	4.2 (9.5)	4.4 (9.8)	4.3 (9.6)	4.3 (9.6)	3.8 (8.5)	3.4 (7.7)	3.4 (7.6)	3.3 (7.3)	3.2 (7.2)	3.1 (6.9)	3.7 (8.2)
Prevailing Direction degrees from True North	360	160	160	160	160	160	140	140	160	160	160	360	160
Maximum 5-second speed m/sec (mi/hr)	24.1 (54.0)	24.1 (54.0)	24.1 (54.0)	26.4 (59.0)	24.6 (55.0)	27.7 (62.0)	26.4 (59.0)	20.1 (45.0)	22.8 (51.0)	21.5 (48.0)	23.7 (53.0)	22.8 (51.0)	27.7 (62.0)

Source: (NOAA, 2002b)

Table 3.6-12 Midland-Odessa Five Year (1987-1991) Annual Joint Frequency Distribution For All Stability Classes Combined

Jan. 1, 1987-Dec. 31, 1991
Wind Speed m/s (mi/hr)
Calm = 2.53%

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Direction	0.5-1.3 (1-3)	1.8-3.1 (4-7)	3.6-5.4 (8-12)	5.8-8.1 (13-18)	8.5-10.7 (19-24)	≥11 (24.5)	Total
N	119	702	722	563	225	57	2388
NNE	71	291	509	556	207	58	1692
NE	64	285	645	776	272	61	2103
ENE	51	382	738	726	170	27	2094
E	69	623	1176	713	95	15	2691
ESE	72	589	1061	557	75	12	2366
SE	70	931	1266	818	134	18	3237
SSE	127	1156	1555	1391	371	48	4648
S	168	1755	2763	3178	820	100	8784
SSW	100	813	1276	807	133	7	3136
SW	61	446	943	757	115	23	2345
WSW	68	356	667	637	191	78	1997
W	84	331	577	517	207	171	1887
WNW	77	244	281	269	75	51	997
NW	91	332	350	224	69	38	1104
NNW	79	500	365	228	80	20	1272
SubTotal	1371	9736	14894	12717	3239	784	42741

Table 3.6-13 Midland-Odessa Five Year (1987-1991) Annual Joint Frequency Distribution
Stability Class A

Jan. 1, 1987-Dec. 31, 1991
Wind Speed m/s (mi/hr)
Calm = 0.06%

Direction	0.5-1.3 (1-3)	1.8-3.1 (4-7)	3.6-5.4 (8-12)	5.8-8.1 (13-18)	8.5-10.7 (19-24)	≥11 (24.5)	Total
N	3	16	0	0	0	0	19
NNE	3	7	0	0	0	0	10
NE	0	8	0	0	0	0	8
ENE	2	12	0	0	0	0	14
E	3	15	0	0	0	0	18
ESE	3	8	0	0	0	0	11
SE	2	10	0	0	0	0	12
SSE	0	10	0	0	0	0	10
S	3	16	0	0	0	0	19
SSW	2	9	0	0	0	0	11
SW	0	12	0	0	0	0	12
WSW	1	6	0	0	0	0	7
W	0	5	0	0	0	0	5
WNW	0	2	0	0	0	0	2
NW	1	7	0	0	0	0	8
NNW	0	5	0	0	0	0	5
SubTotal	23	148	0	0	0	0	171

Table 3.6-14 Midland-Odessa Five Year (1987-1991) Annual Joint Frequency Distribution
Stability Class B

Jan. 1, 1987-Dec. 31, 1991
Wind Speed m/s (mi/hr)
Calm = 0.11%

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Direction	0.5-1.3 (1-3)	1.8-3.1 (4-7)	3.6-5.4 (8-12)	5.8-8.1 (13-18)	8.5-10.7 (19-24)	≥11 (24.5)	Total
N	20	43	22	0	0	0	85
NNE	17	25	19	0	0	0	61
NE	16	32	22	0	0	0	70
ENE	14	46	36	0	0	0	96
E	6	69	62	0	0	0	137
ESE	17	50	44	0	0	0	111
SE	9	48	45	0	0	0	102
SSE	15	54	64	0	0	0	133
S	25	96	138	0	0	0	259
SSW	12	53	59	0	0	0	124
SW	14	42	49	0	0	0	105
WSW	12	43	43	0	0	0	98
W	16	51	17	0	0	0	84
WNW	11	25	13	0	0	0	49
NW	18	21	14	0	0	0	53
NNW	15	27	9	0	0	0	51
SubTotal	237	725	656	0	0	0	1618

Table 3.6-15 Midland-Odessa Five Year (1987-1991) Annual Joint Frequency Distribution
Stability Class C

Jan. 1, 1987-Dec. 31, 1991
Wind Speed m/s (mi/hr)
Calm = 0.12%

Direction	0.5-1.3 (1-3)	1.8-3.1 (4-7)	3.6-5.4 (8-12)	5.8-8.1 (13-18)	8.5-10.7 (19-24)	≥11 (24.5)	Total
N	9	54	124	20	8	3	218
NNE	3	36	87	37	5	1	169
NE	5	37	95	46	11	3	197
ENE	0	52	93	43	4	1	193
E	2	54	164	50	7	0	277
ESE	4	41	147	60	7	0	259
SE	3	36	179	109	10	1	338
SSE	1	65	264	199	52	5	586
S	6	103	527	408	95	19	1158
SSW	5	82	266	124	13	1	491
SW	1	59	238	115	11	2	426
WSW	3	43	180	61	22	7	316
W	5	39	100	76	21	10	251
WNW	4	36	57	25	7	1	130
NW	7	21	51	21	4	0	104
NNW	4	32	48	8	8	3	103
SubTotal	62	790	2620	1402	285	57	5216

Table 3.6-16 Midland-Odessa Five Year (1987-1991) Annual Joint Frequency Distribution
Stability Class D

Jan. 1, 1987-Dec. 31, 1991
Wind Speed m/s (mi/hr)
Calm = 0.18%

Direction	0.5-1.3 (1-3)	1.8-3.1 (4-7)	3.6-5.4 (8-12)	5.8-8.1 (13-18)	8.5-10.7 (19-24)	≥11 (24.5)	Total
N	8	112	308	543	217	54	1242
NNE	14	65	302	519	202	57	1159
NE	7	79	389	730	261	58	1524
ENE	6	104	426	683	166	26	1411
E	7	108	550	663	88	15	1431
ESE	13	95	458	497	68	12	1143
SE	5	92	514	709	124	17	1461
SSE	11	98	618	1192	319	43	2281
S	13	151	949	2770	725	81	4689
SSW	3	74	369	683	120	6	1255
SW	1	46	259	642	104	21	1073
WSW	2	42	182	576	169	71	1042
W	4	49	177	441	186	161	1018
WNW	5	29	81	244	68	50	477
NW	3	30	95	203	65	38	434
NNW	7	47	121	220	72	17	484
SubTotal	109	1221	5798	11315	2954	727	22124

Table 3.6-17 Midland-Odessa Five Year (1987-1991) Annual Joint Frequency Distribution
Stability Class E

Jan. 1, 1987-Dec. 31, 1991
Wind Speed m/s (mi/hr)
Calm = 0.00%

Direction	0.5-1.3 (1-3)	1.8-3.1 (4-7)	3.6-5.4 (8-12)	5.8-8.1 (13-18)	8.5-10.7 (19-24)	≥11 (24.5)	Total
N	0	133	268	0	0	0	401
NNE	0	64	101	0	0	0	165
NE	0	66	139	0	0	0	205
ENE	0	81	183	0	0	0	264
E	0	143	400	0	0	0	543
ESE	0	131	412	0	0	0	543
SE	0	236	528	0	0	0	764
SSE	0	259	609	0	0	0	868
S	0	380	1149	0	0	0	1529
SSW	0	145	582	0	0	0	727
SW	0	65	397	0	0	0	462
WSW	0	60	262	0	0	0	322
W	0	42	283	0	0	0	325
WNW	0	36	130	0	0	0	166
NW	0	50	190	0	0	0	240
NNW	0	98	187	0	0	0	285
SubTotal	0	1989	5820	0	0	0	7809

Table 3.6-18 Midland-Odessa Five Year (1987-1991) Annual Joint Frequency Distribution
Stability Class F

Jan. 1, 1987-Dec. 31, 1991
Wind Speed m/s (mi/hr)
Calm = 2.07%

Direction	0.5-1.3 (1-3)	1.8-3.1 (4-7)	3.6-5.4 (8-12)	5.8-8.1 (13-18)	8.5-10.7 (19-24)	≥11 (24.5)	Total
N	79	344	0	0	0	0	423
NNE	34	94	0	0	0	0	128
NE	36	63	0	0	0	0	99
ENE	29	87	0	0	0	0	116
E	51	234	0	0	0	0	285
ESE	35	264	0	0	0	0	299
SE	51	509	0	0	0	0	560
SSE	100	670	0	0	0	0	770
S	121	1009	0	0	0	0	1130
SSW	78	450	0	0	0	0	528
SW	45	222	0	0	0	0	267
WSW	50	162	0	0	0	0	212
W	59	145	0	0	0	0	204
WNW	57	116	0	0	0	0	173
NW	62	203	0	0	0	0	265
NNW	53	291	0	0	0	0	344
SubTotal	940	4863	0	0	0	0	5803

Table 3.6-19 - National Ambient Air Quality Standards

POLLUTANT	STANDARD VALUE *		STANDARD TYPE
Carbon Monoxide (CO)			
8-hr Average	9 ppm	(10 mg/m^3)	Primary
1-hr Average	35 ppm	(40 mg/m^3)	Primary
Nitrogen Dioxide (NO_2)			
Annual Arithmetic Mean	0.053 ppm	(100 µg/m^3)	Primary and Secondary
Ozone (O_3)			
1-hr Average	0.12 ppm	(235 µg/m^3)	Primary and Secondary
8-hr Average **	0.08 ppm	(157 µg/m^3)	Primary and Secondary
Lead (Pb)			
Quarterly Average	1.5 µg/m^3		Primary and Secondary
Particulate (PM_{10}) *Particles with diameters of 10 µm or less*			
Annual Arithmetic Mean	50 µg/m^3		Primary and Secondary
24-hr Average	150 µg/m^3		Primary and Secondary
Particulate ($PM_{2.5}$) *Particles with diameters of 2.5 µm or less*			
Annual Arithmetic Mean **	15 µg/m^3		Primary and Secondary
24-hr Average **	65 µg/m^3		Primary and Secondary
Sulfur Dioxide (SO_2)			
Annual Arithmetic Mean	0.03 ppm	(80 µg/m^3)	Primary
24-hr Average	0.14 ppm	(365 µg/m^3)	Primary
3-hr Average	0.50 ppm	(1300 µg/m^3)	Secondary

* Parenthetical value is an approximately equivalent concentration.

** The ozone 8-hr standard and the $PM_{2.5}$ standards are included for information only.

Source: (EPA, 2003b)

Table 3.6-20 - Hobbs, New Mexico, Particulate Matter Monitor Summary

98% $PM_{2.5}$ $\mu g/m^3$	Annual Mean $PM_{2.5}$ $\mu g/m^3$	99% PM_{10} $\mu g/m^3$	Annual Mean PM_{10} $\mu g/m^3$	Year	County
18	6.6	57	17	2002	Lea
13	5.5	61	23	2003	Lea

Note: National Ambient Air Quality Standards for $PM_{2.5}$ and PM_{10} are located in Table 3.6-19

Source: (EPA, 2003b)

Table 3.6-21 Existing Sources of Criteria Air Pollutants (1999)

Plant Name	Plant Address	CO metric tons (tons)	NO_x metric tons (tons)	VOC metric tons (tons)	SO_2 metric tons (tons)	$PM_{2.5}$ metric tons (tons)	PM_{10} metric tons (tons)	NH_3 metric tons (tons)
MALJAMAR GAS PLANT	3 Mi S Of Maljamar, Maljamar, NM 88264	412 (454)	1610 (1775)	208 (230)	1157 (1275)	15 (17)	15 (17)	0 (0)
EUNICE A COMP ST	1 Mi N Of Oil Center, Oil Center, NM 88240	504 (555)	3272 (3607)	61 (67)	0 (0)	0 (0)	0 (0)	1.3 (1.4)
DENTON PLT	10.5 Mi Ne Of Lovington, Lovington, NM 88260	39 (43)	499 (550)	23 (25)	882 (972)	0 (0)	0 (0)	0 (0)
JAL #3	5 Mi N. Of Jal, Jal, NM 88252	330 (363)	2224 (2452)	79 (87)	1094 (1206)	0 (0)	0 (0)	0.4 (0.4)
JAL #4	11 Mi N Of Jal, Jal, NM 88252	484 (533)	2048 (2257)	44 (48)	0 (0)	0 (0)	0 (0)	0 (0)
MONUMENT COMP STA	5 Km E Of Monument W Of Hwy 8, Monument, NM 88265	144 (158)	1387 (1529)	39 (42)	0 (0)	0 (0)	0 (0)	0 (0)
CAPROCK COMP STA	13 Mi Nw Of Tatum, Tatum, NM 88213	44 (49)	338 (373)	0.7 (0.8)	0.1 (0.1)	0 (0)	0 (0)	0 (0)
KEMNITZ COMPRESSOR STATION	12 Mi W/sw Of Lovington, Lovington, NM 88260	61 (67)	205 (226)	20 (22)	0 (0)	0 (0)	0 (0)	0 (0)
MADDOX STATION	8 Mi W. Hobbs on US 62/180, Hobbs, NM 88240	106 (117)	613 (675)	6.4 (7.0)	1.9 (2.0)	36 (39)	36 (39)	12 (13)
LINAM RANCH GAS PLANT	11525 W Carlsbad Hwy/7mi W Hob, Hobbs, NM 88240	337 (371)	839 (925)	124 (136)	1181 (1302)	0 (0)	0 (0)	0 (0)
EUNICE COMPRESSOR STATION	5 Mi S Of Eunice On Hwy 207, Eunice, NM 88231	238 (263)	476 (525)	20 (22)	0 (0)	3.1 (3.5)	3.1 (3.5)	0 (0)
GOLFCOURSE COMPRESSOR STATION	3 Mi W OF Eunice Hwy 8/176, Eunice, NM 88231	94 (104)	1081 (1191)	105 (116)	0 (0)	0 (0)	0 (0)	0 (0)
MONUMENT COMPRESSOR STATION	1 Mi E Of Monument, Monument, NM 88265	958 (1056)	958 (1056)	35 (38)	0 (0)	3.0 (3.3)	3.0 (3.3)	0 (0)
EUNICE GAS PLANT	1mi W of Oil Center on NM Hwy, Eunice, NM 88231	129 (142)	844 (930)	26 (29)	2452 (2703)	0 (0)	0 (0)	0.1 (0.1)
LEE GAS PLANT	15 Mi Sw Of Lovington, Lovington, NM 88260	50 (55)	50 (55)	6.8 (7.5)	0 (0)	0 (0)	0 (0)	0.3 (0.3)
LUSK PLANT	15 Mi S Of Maljamar, Maljamar, NM 88264	191 (210)	521 (574)	54 (60)	0 (0)	0 (0)	0 (0)	0 (0)
EUNICE SOUTH GAS PLT	6 Mi S Of Eunice, Eunice, NM 88231	123 (135)	563 (620)	29 (31)	3188 (3515)	2.2 (2.4)	2.2 (2.4)	0.4 (0.4)
EUNICE NORTH GAS PLNT	0.5 Mi N Of Eunice, Eunice, NM 88231	211 (233)	958 (1056)	60 (67)	154 (170)	0 (0)	0 (0)	0 (0)
CUNNINGHAM	12.5 Mi West Of Hobbs, Hobbs, NM 88240	284 (313)	1493 (1645)	8.2 (9.0)	4.5 (5.0)	88 (97)	88 (97)	20 (22)
BUCKEYE NATL GAS PLNT	Nm 1, 13 Mi. Sw Of Lovington, Lovington, NM 88260	142 (156)	125 (138)	21 (23)	0 (0)	0 (0)	0 (0)	0 (0)
EUNICE GAS PLANT	1 Mi Se Of Eunice, Eunice, NM 88231	651 (718)	2559 (2821)	114 (126)	2611 (2879)	10.1 (11)	10.1 (11)	0.3 (0.3)
MONUMENT PLANT	3 Mi Sw Of Hwy 322 In Monument, Monument, NM 88265	675 (744)	2535 (2794)	81 (89)	864 (952)	0 (0)	0 (0)	0 (0)
SAUNDERS PLANT	20 Mi Nw Of Lovington, Lovington, NM 88260	173 (191)	1448 (1597)	56 (62)	219 (241)	0 (0)	0 (0)	0 (0)
VADA GAS PLANT	20 Mi Nw Of Tatum, Tatum, NM 88267	23 (25)	207 (228)	7.6 (8.4)	0 (0)	0 (0)	0 (0)	0.2 (0.2)
SKAGGS-MCGEE C. S.	7 Mi Se Of Monument, Monument, NM 88265	22 (24)	175 (193)	6.2 (6.9)	0 (0)	0 (0)	0 (0)	0 (0)

Plant Name	Plant Address	CO metric tons (tons)	NO_x metric tons (tons)	VOC metric tons (tons)	SO_2 metric tons (tons)	$PM_{2.5}$ metric tons (tons)	PM_{10} metric tons (tons)	NH_3 metric tons (tons)
EPPERSON BOOSTER	15 Mi Wnw Of Tatum, Tatum, NM 88267	64 (71)	77 (85)	6.4 (7.1)	0 (0)	0 (0)	0 (0)	0 (0)
ANTELOPE RIDGE GAS PLANT	20 Mi Sw Of Eunice, Eunice, NM 88231	221 (243)	259 (285)	83 (91)	0 (0)	0 (0)	0 (0)	0 (0)
LEA REFINERY	5 Mi Se Of Lovingtion On Nm 18, Lovington, NM 88260	71 (78)	132 (146)	237 (261)	7.4 (8.2)	14 (15)	14 (15)	0 (0)
MCA TANK BATTERY #2	31 Mi East Of Artesia, Maljamar, NM 88264	6.2 (6.8)	3.7 (4.1)	10.1 (11)	33 (37)	0 (0)	0 (0)	0 (0)
KEMNITZ COMP STA	5 Mi Sw Of Maljamar, Maljamar, NM 88264	62 (68)	81 (89)	21 (23)	0 (0)	0 (0)	0 (0)	0 (0)
WT-1 COMP STA	22 Mi E Of Carlsbad On Us 180, Carlsbad, NM 88221	2.3 (2.5)	14 (15)	1.4 (1.6)	0 (0)	0.3 (0.3)	0.3 (0.3)	0 (0)
EAST VACUUM LIQUID RECOVERY	5 Mi E Of Buckeye, Buckeye, NM 88260	212 (234)	172 (190)	60 (66)	201 (221)	0 (0)	0 (0)	0 (0)
LYNCH BOOSTER STA	25 Mi Sw Of Hobbs, Hobbs, NM 88240	260 (287)	276 (304)	30 (33)	3.3 (3.7)	0 (0)	0 (0)	0 (0)
LLANO/GRAMA RIDGE #1 COMP STA	18 Mi Wnw Of Eunice, Eunice, NM 88231	84 (93)	63 (69)	34 (38)	0 (0)	0 (0)	0 (0)	0 (0)
HAT MESA COMPRESSOR STATION	33 Mi Sw Of Hobbs, Hobbs, NM 88240	276 (304)	158 (175)	27 (30)	0 (0)	0 (0)	0 (0)	0 (0)
COMP STA #167	8 Mi Ene Of Maljamar On Us 82, Maljamar, NM 88264	31 (34)	874 (963)	9.0 (10.0)	0 (0)	3.6 (4.0)	3.6 (4.0)	0 (0)
OIL CENTER COMPRESSOR STATION	5 Mi S Of Monument, Monument, NM 88265	312 (344)	801 (883)	86 (95)	0.1 (0.1)	0 (0)	0 (0)	0 (0)
GRAMA RIDGE FED #2 CS	28 Mi Sw Of Hobbs, Hobbs, NM 88240	1.4 (1.6)	16 (18)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
SUNBRIGHT #1 COMP STA	30 Mi W Of Hobbs, Hobbs, NM 88240	3.6 (3.9)	20 (22)	3.6 (3.9)	0 (0)	0 (0)	0 (0)	0 (0)
QUAIL COMPRESSOR STATION	3 Mi Se Of Eunice, Eunice, NM 88231	302 (332)	772 (851)	27 (30)	0 (0)	0 (0)	0 (0)	0 (0)
NBR BOOTLEG COMP STA	27 Mi W Of Eunice, Eunice, NM 88231	21 (23)	21 (23)	145 (160)	0 (0)	0 (0)	0 (0)	0 (0)
LLANO/LEE COMP STA	15 Mi Nw Of Hobbs, Hobbs, NM 88240	9.4 (10.4)	20 (22)	80 (88)	0 (0)	0 (0)	0 (0)	0 (0)
JAL PUMPING STATION	1.5 Mi Sse Of Jal, Jal, NM 88252	22 (24)	30 (34)	94 (104)	1.9 (2.1)	0 (0)	0 (0)	0 (0)
MALJAMAR BOOSTER STA	25 Mi Nw Of Hobbs, Lovington, NM 88240	71 (78)	284 (313)	12 (13)	0 (0)	0 (0)	0 (0)	0 (0)
STATE 35 COMPRESSOR STATION	1.5 Mi Sw Of Buckeye, Buckeye, NM 88260	17 (19)	9.7 (10.7)	6.5 (7.1)	15 (17)	0 (0)	0 (0)	0 (0)
TRISTE PORTABLE	No Address, No City, NM 99999	26 (29)	33 (36)	14 (15)	0 (0)	0 (0)	0 (0)	0 (0)
TOWNSEND REMD	2 Mi W Of Lovington, Lovington, NM 88260	4.5 (5.0)	10.7 (12)	25 (28)	0 (0)	0 (0)	0 (0)	0 (0)
BUCKEYE CO2 PL	13 Mi Southeast Of Lovington, Lovington, NM 88260	3.6 (4.0)	10.9 (12)	19 (21)	0 (0)	13 (14)	15 (17)	0 (0)
BELL LAKE CS	21 Mi N/nw Of Jal, Jal, NM 88252	29 (32)	19 (21)	51 (56)	0 (0)	0 (0)	0 (0)	0 (0)

Table 3.6-21 Existing Sources of Criteria Air Pollutants (1999)

Plant Name	Plant Address	CO metric tons (tons)	NO_x metric tons (tons)	VOC metric tons (tons)	SO_2 metric tons (tons)	$PM_{2.5}$ metric tons (tons)	PM_{10} metric tons (tons)	NH_3 metric tons (tons)
READ & STEVENS COMP STA	22.4 Mi Sw Of Hobbs, Nm, Hobbs, NM 99999	5.6 (6.2)	5.6 (6.2)	4.3 (4.7)	0 (0)	0 (0)	0 (0)	0 (0)
BUCKEYE STATION	1 Mi Se Of Buckeye, Buckeye, NM 99999	0 (0)	0 (0)	1.9 (2.1)	0 (0)	0 (0)	0 (0)	0 (0)
S. ANTELOPE RDG	30 Mi Sw Of Eunice, Eunice, NM 88321	7.8 (8.6)	11 (12)	13 (14)	0 (0)	0 (0)	0 (0)	0 (0)
CS	22.5 Mi Nw, Jal, NM 88252	21 (23)	21 (23)	22 (24)	16 (18)	0 (0)	0 (0)	0 (0)
TOWNSEND	6.5 Mi Ne Of Lovington, Lovington, NM 99999	17 (19)	11 (12)	2.6 (2.9)	0 (0)	0 (0)	0 (0)	0 (0)
DUKE ENERGYFIELD SERVICE LP	2 Mi W OF FRANKEL CITY ON FM 19, FRANKEL CITY, TX 79737	39 (43)	414 (457)	15 (17)	0 (0)	5.7 (6.3)	6.0 (6.6)	0 (0)
GPM GAS SERVICES CO	3 MI WEST OF US 385 ON FM 2, ANDREWS, TX 79714	77 (85)	479 (528)	165 (182)	0 (0)	4.7 (5.1)	4.9 (5.4)	0 (0)
DUKE ENERGY	5 MI N. OF THE INTX. OF HWYS., ANDREWS, TX 79714	720 (794)	1379 (1520)	166 (184)	1233 (1359)	1.5 (1.7)	1.5 (1.7)	0 (0)
PURE RESOURCES	22 MI S.W., S.H. 115; 14 MI., ANDREWS, TX 79714	100 (110)	109 (120)	49 (54)	0.1 (0.1)	1.0 (1.1)	1.1 (1.2)	0 (0)
PALMER OF TEXAS	U.S. 385 N. OF ANDREWS, ANDREWS, TX 79714	0 (0)	0 (0)	52 (57)	0 (0)	0 (0)	0 (0)	0 (0)
GPM GAS SERVICES CO	0.4 MI W., LSE. RD., ANDREWS, TX 79714	109 (120)	103 (114)	8.5 (9.4)	0 (0)	0.1 (0.1)	0.1 (0.1)	0 (0)

Source: (EPA, 2003b)

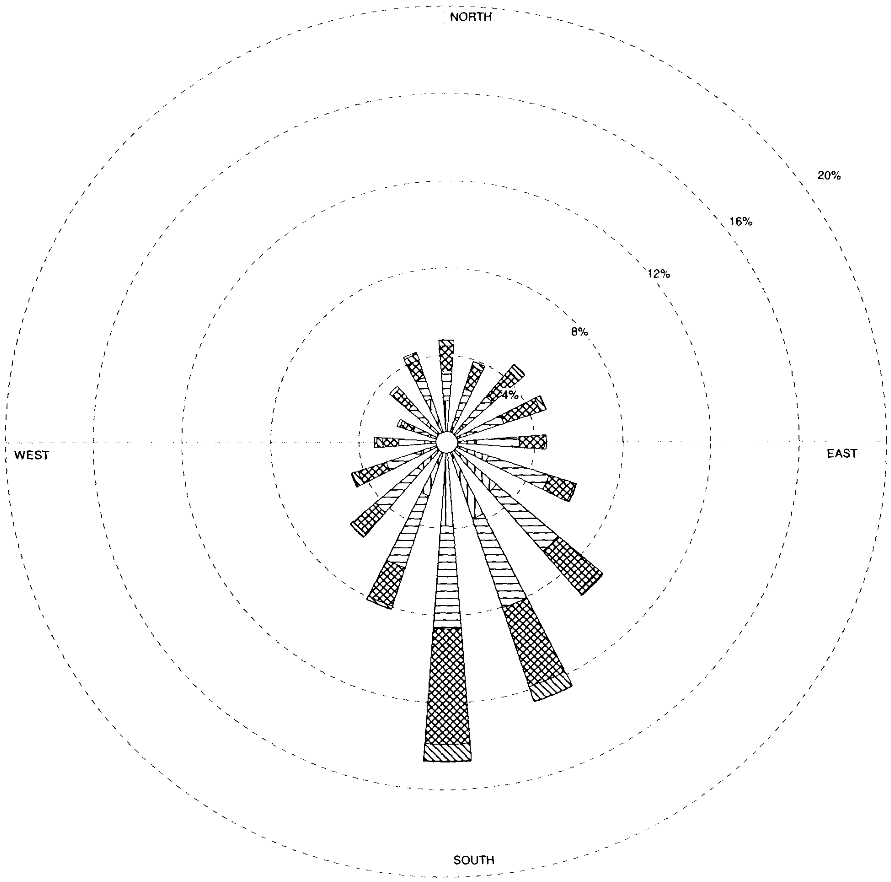
Table 3-6-22 Wind Frequency Distribution

	WCS Data		Midland-Odessa Data	
Compass Sector	**Hours**	**Percent Frequency**	**Hours**	**Percent Frequency**
North (N)	549	3.2	2,388	5.6
North-Northeast (NNE)	788	4.5	1,692	4.0
Northeast (NE)	1,005	5.8	2,103	4.9
East-Northeast (ENE)	1,031	5.9	2,094	4.9
East (E)	1,158	6.7	2,691	6.3
East-Southeast (ESE)	1,071	6.2	2,366	5.5
Southeast (SE)	1,902	11.0	3,237	7.6
South-Southeast (SSE)	2,327	13.4	4,648	10.9
South (S)	2,038	11.8	8,784	20.6
South-Southwest (SSW)	1,280	7.4	3,136	7.3
Southwest (SW)	990	5.7	2,345	5.5
West-Southwest (WSW)	779	4.5	1,997	4.7
West (W)	768	4.4	1,887	4.4
West-Northwest (WNW)	624	3.6	997	2.3
Northwest (NW)	609	3.5	1,104	2.6
North-Northwest (NNW)	417	2.4	1,272	3.0
Total	17,336	100	42,741	100.1[(1)]

(1) The percent frequency total is greater than 100% due to round off.

FIGURES

MIDLAND/ODESSA, TX 1987



Wind Speed (Knots)

- > 21
- 17 - 21
- 11 - 16
- 7 - 10
- 4 - 6
- 1 - 3

DISPLAY **Wind Speed**	UNIT **Knots**
AVG. WIND SPEED **9.17 Knots**	CALM WINDS **2.48%**
ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1987** **Jan 1 - Dec 31** **Midnight - 11 PM**

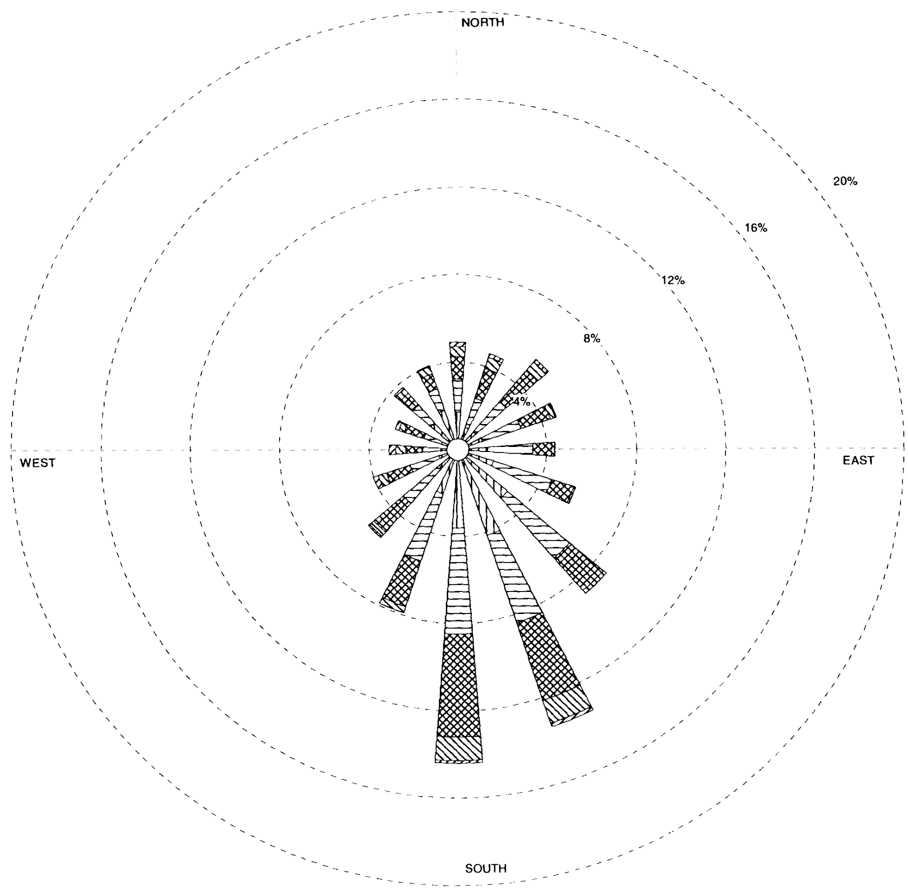
FIGURE 3.6-1

MIDLAND, TX 1987
WIND ROSE
ENVIRONMENTAL REPORT

REVISION DATE: DECEMBER 2003

REFERENCE NUMBER
WINDROSE.DWG

MIDLAND/ODESSA, TX 1988



Wind Speed (Knots)

- > 21
- 17 - 21
- 11 - 16
- 7 - 10
- 4 - 6
- 1 - 3

DISPLAY **Wind Speed**	UNIT **Knots**
AVG. WIND SPEED **9.62 Knots**	CALM WINDS **2.70%**
ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1988** **Jan 1 - Dec 31** **Midnight - 11 PM**

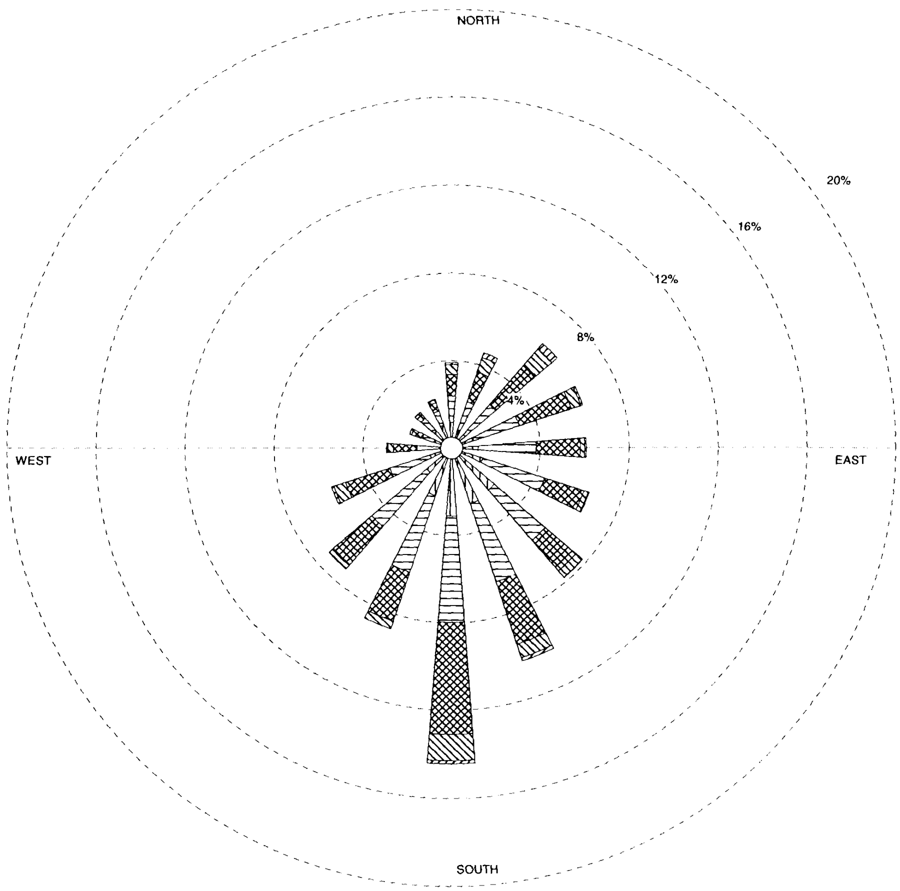
REFERENCE NUMBER
WINDROSE.DWG

FIGURE 3.6-2

MIDLAND, TX 1988
WIND ROSE
ENVIRONMENTAL REPORT

REVISION DATE: DECEMBER 2003

MIDLAND/ODESSA, TX 1989



Wind Speed (Knots)

- > 21
- 17 - 21
- 11 - 16
- 7 - 10
- 4 - 6
- 1 - 3

DISPLAY **Wind Speed**	UNIT **Knots**
AVG. WIND SPEED **9.97 Knots**	CALM WINDS **2.65%**
ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1989 Jan 1 - Dec 31 Midnight - 11 PM**

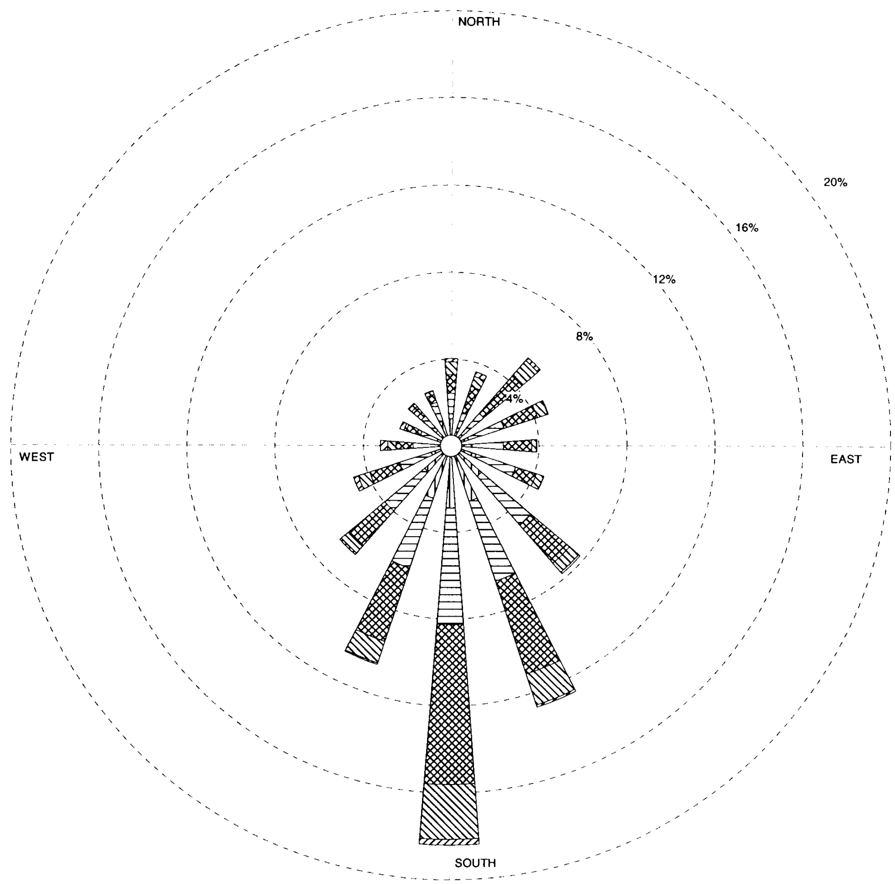
REFERENCE NUMBER
WINDROSE.DWG

FIGURE 3.6-3

MIDLAND, TX 1989
WIND ROSE
ENVIRONMENTAL REPORT

REVISION DATE: DECEMBER 2003

MIDLAND/ODESSA, TX 1990

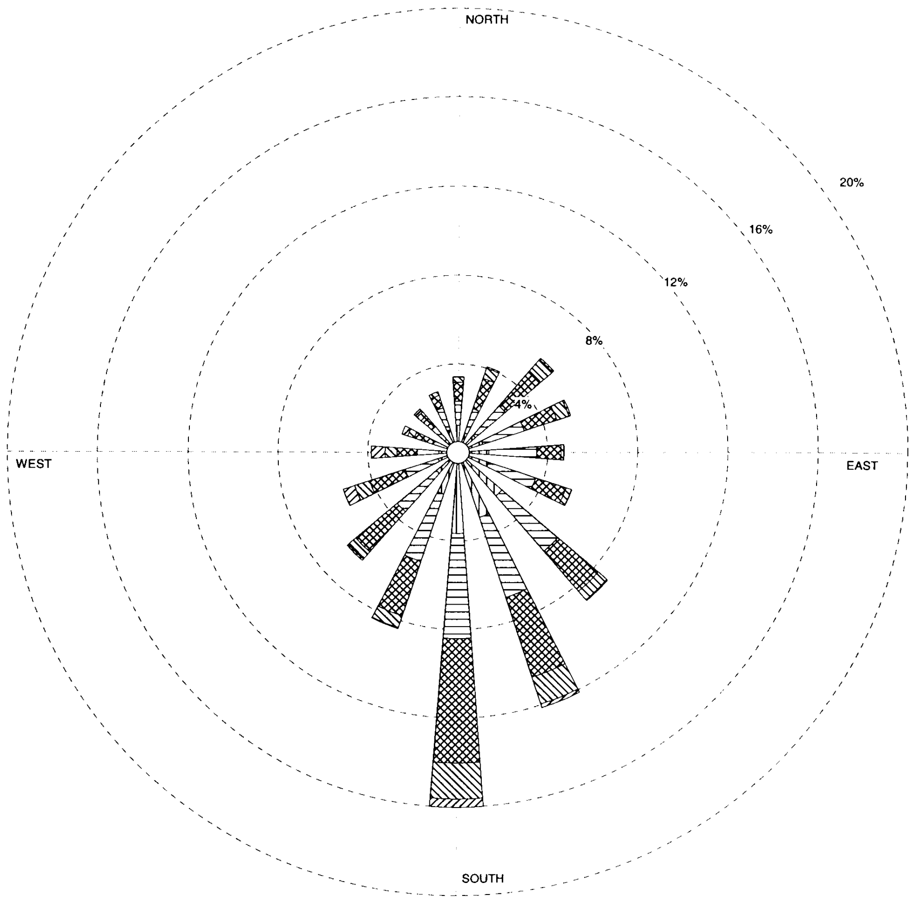


Wind Speed (Knots)			
> 21 17 - 21 11 - 16 7 - 10 4 - 6 1 - 3	DISPLAY **Wind Speed**	UNIT **Knots**	
	AVG. WIND SPEED **10.65 Knots**	CALM WINDS **2.18%**	
	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1990** **Jan 1 - Dec 31** **Midnight - 11 PM**	

REFERENCE NUMBER
WINDROSE.DWG

FIGURE 3.6-4
MIDLAND, TX 1990
WIND ROSE
ENVIRONMENTAL REPORT
REVISION DATE: DECEMBER 2003

MIDLAND/ODESSA, TX 1991



Wind Speed (Knots)

- > 21
- 17 - 21
- 11 - 16
- 7 - 10
- 4 - 6
- 1 - 3

DISPLAY **Wind Speed**	UNIT **Knots**
AVG. WIND SPEED **10.42 Knots**	CALM WINDS **2.36%**
ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1991** **Jan 1 - Dec 31** **Midnight - 11 PM**

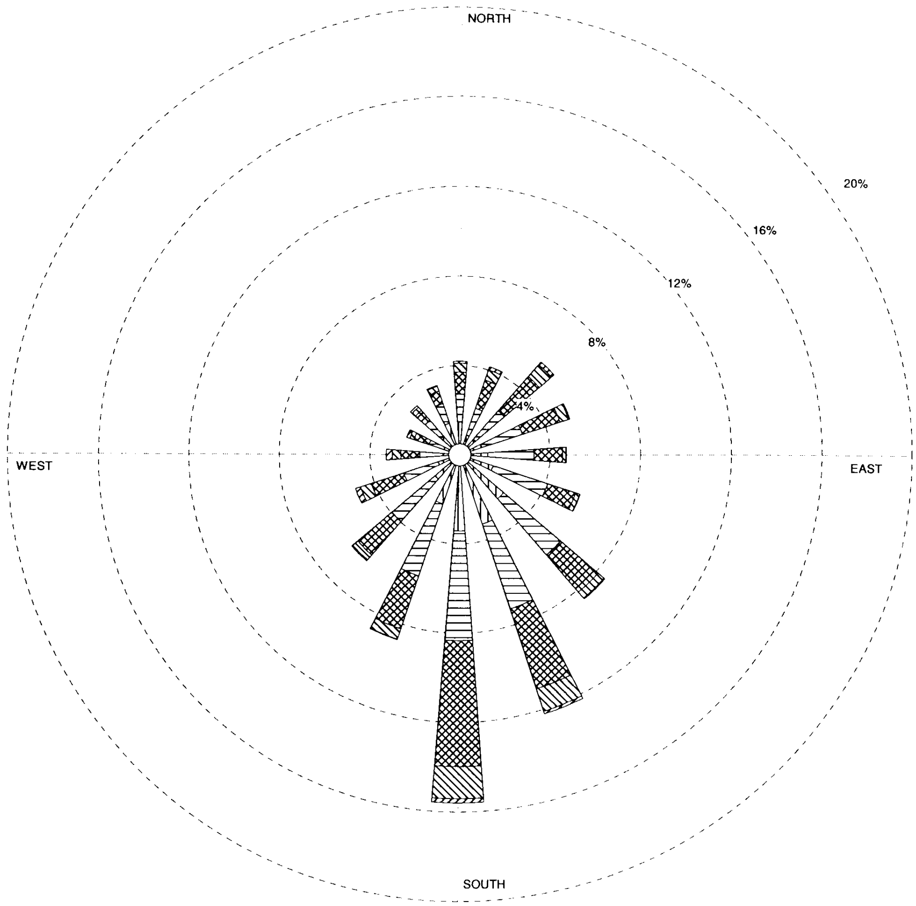
REFERENCE NUMBER
WINDROSE.DWG

FIGURE 3.6-5

MIDLAND, TX 1991
WIND ROSE
ENVIRONMENTAL REPORT

REVISION DATE: DECEMBER 2003

MIDLAND/ODESSA, TX 1987-1991

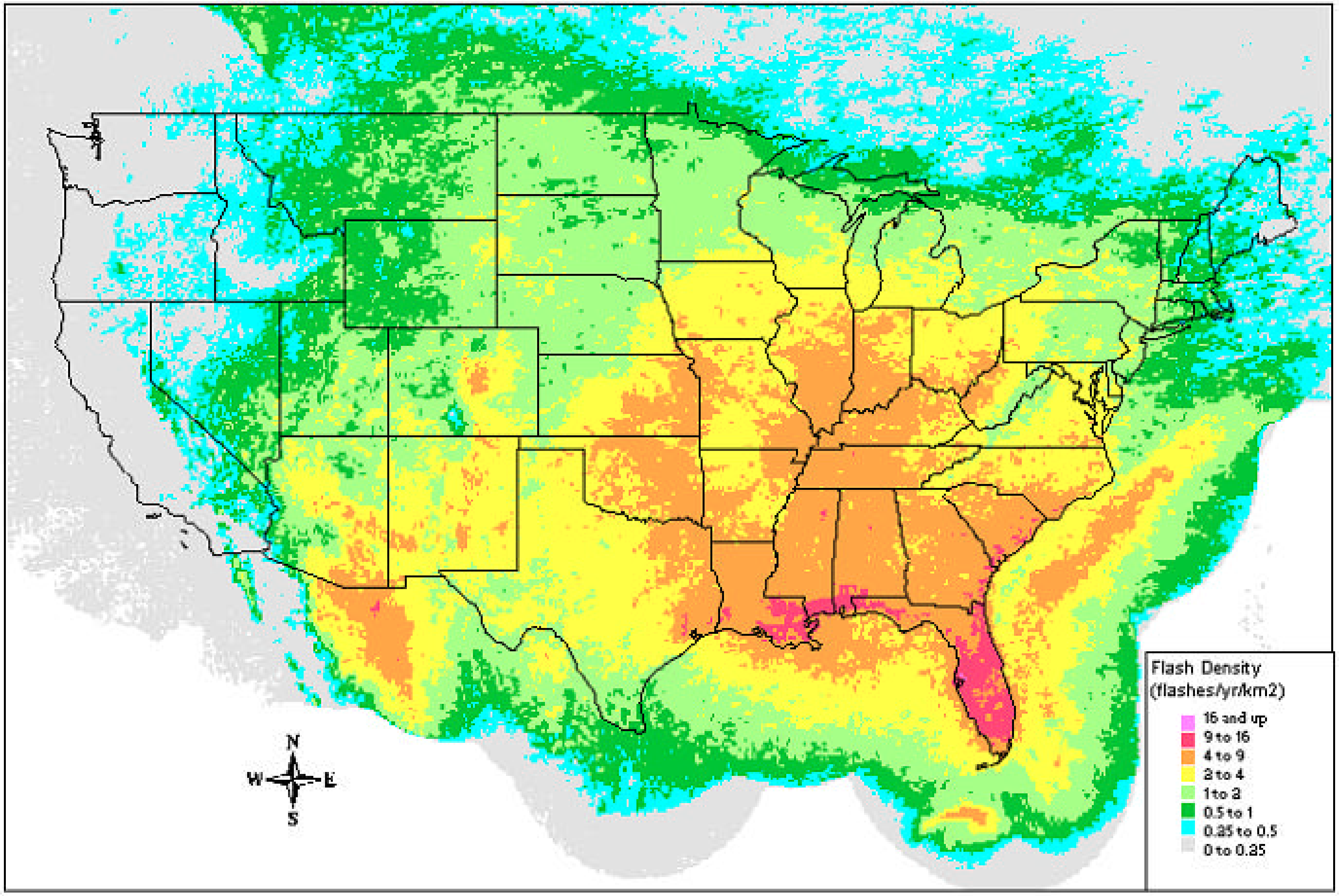


Wind Speed (Knots)		
> 21	DISPLAY **Wind Speed**	UNIT **Knots**
17 - 21		
11 - 16	AVG. WIND SPEED **9.97 Knots**	CALM WINDS **2.47%**
7 - 10		
4 - 6	ORIENTATION **Direction (blowing from)**	PLOT YEAR-DATE-TIME **1987 1988 1989 1990 1991** **Jan 1 - Dec 31** **Midnight - 11 PM**
1 - 3		

REFERENCE NUMBER
WINDROSE.DWG

FIGURE 3.6-6

MIDLAND, TX 1987–1991
WIND ROSE
ENVIRONMENTAL REPORT
REVISION DATE: DECEMBER 2003

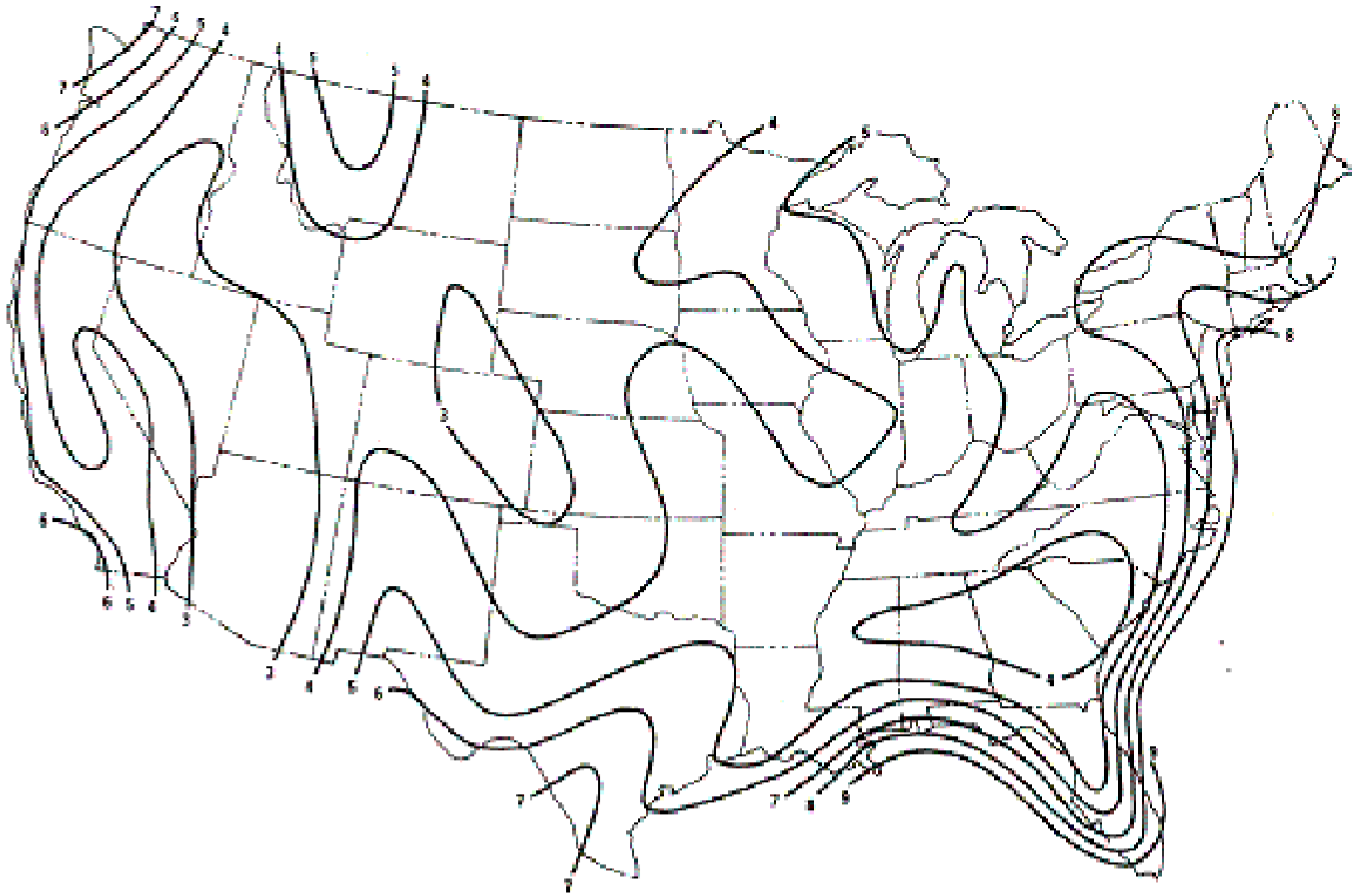


1996-2000 FLASH DENSITY MAP

(NWS, 2003)

REFERENCE NUMBER
Section 3.6 Figures.dwg

FIGURE 3.6-7
AVERAGE LIGHTNING FLASH DENSITY
ENVIRONMENTAL REPORT
REVISION DATE: DECEMBER 2003



Isopleths (m x 10^2) of mean annual morning mixing heights

SOURCE: (EPA, 1972)

FIGURE 3.6-8

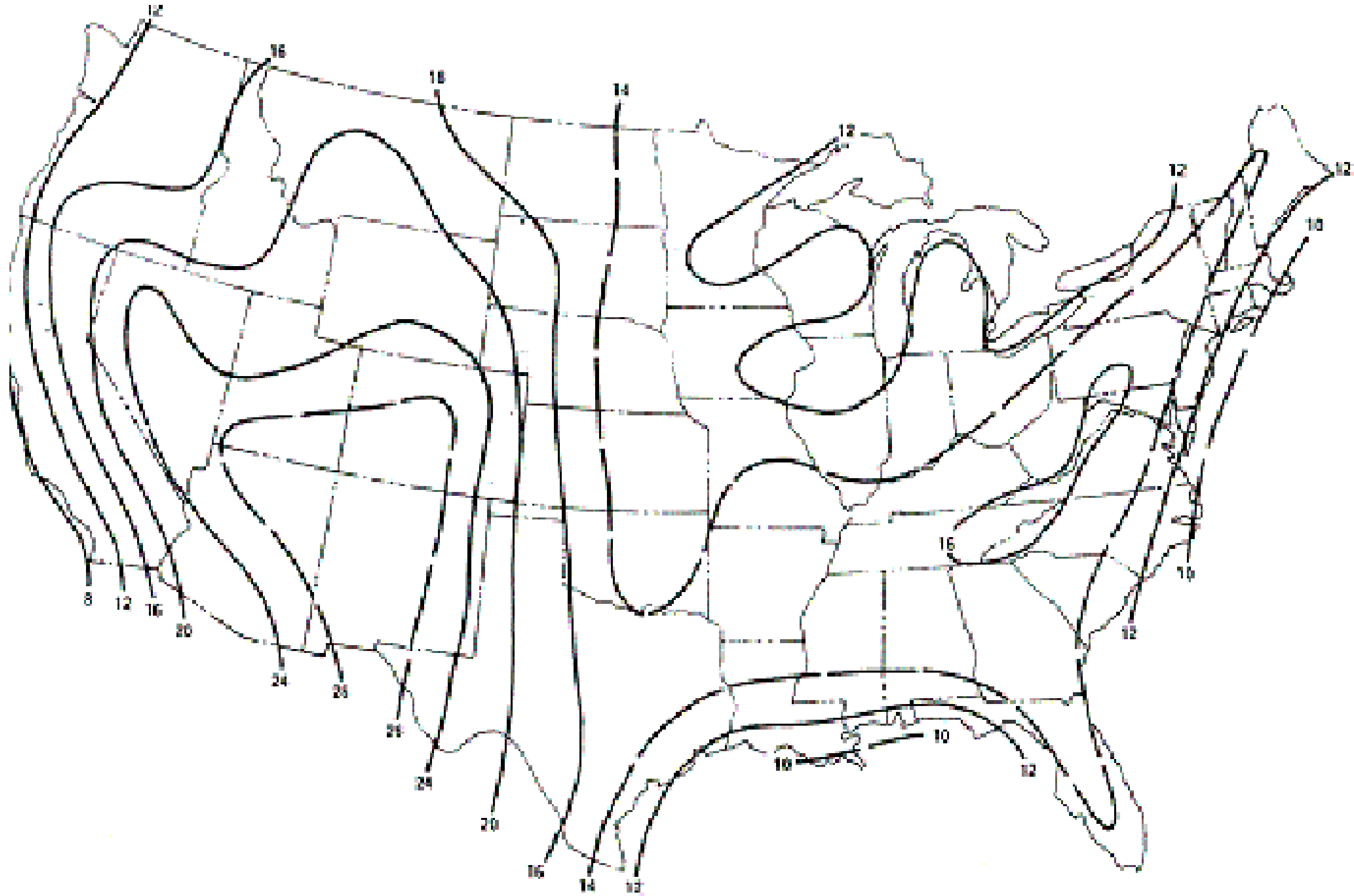
ANNUAL AVERAGE MORNING MIXING HEIGHTS

ENVIRONMENTAL REPORT

REVISION DATE: DECEMBER 2003

REFERENCE NUMBER

Section 3.6B Figures.dwg

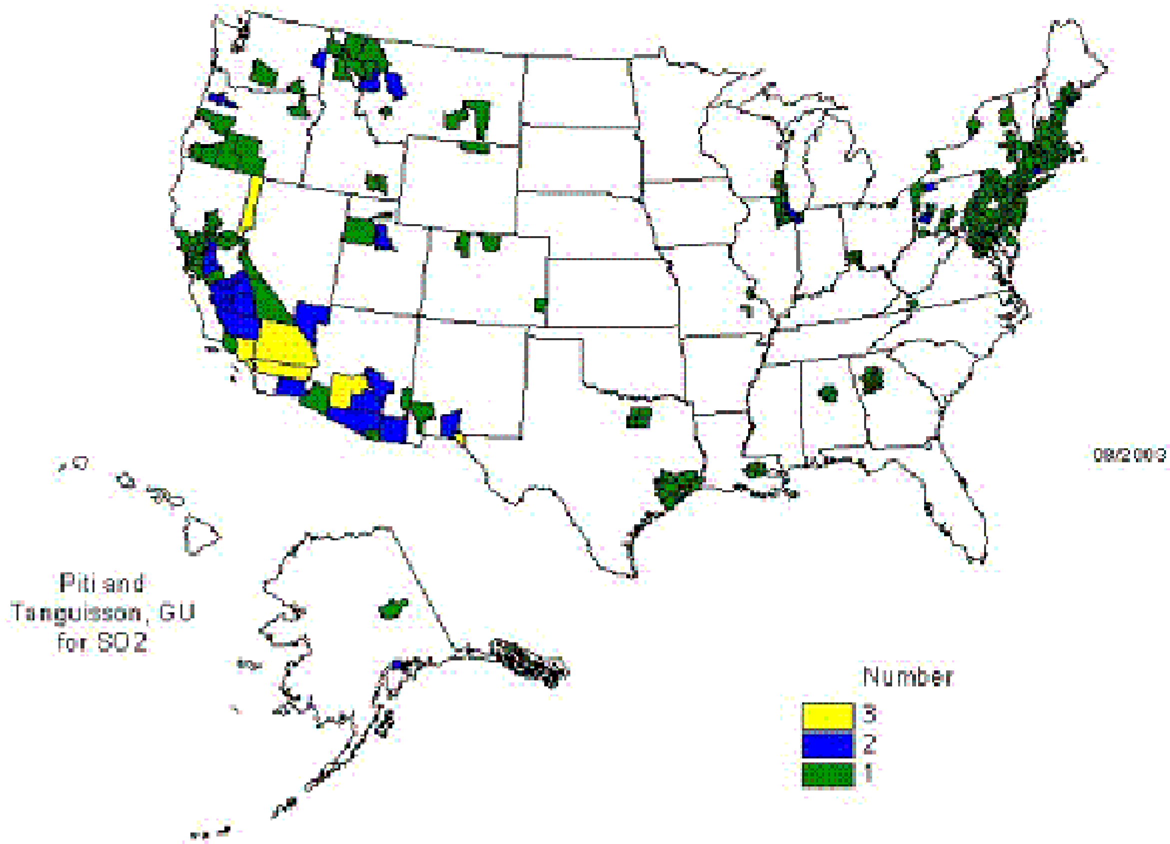


SOURCE: (EPA, 1972) isopleths ($m \times 10^2$) of mean annual afternoon mixing heights

REFERENCE NUMBER
Section 3.6B Figures.dwg

FIGURE 3.6-9
ANNUAL AVERAGE AFTERNOON MIXING HEIGHTS
ENVIRONMENTAL REPORT
REVISION DATE: DECEMBER 2003

Number of Pollutants By County Designated Nonattainment

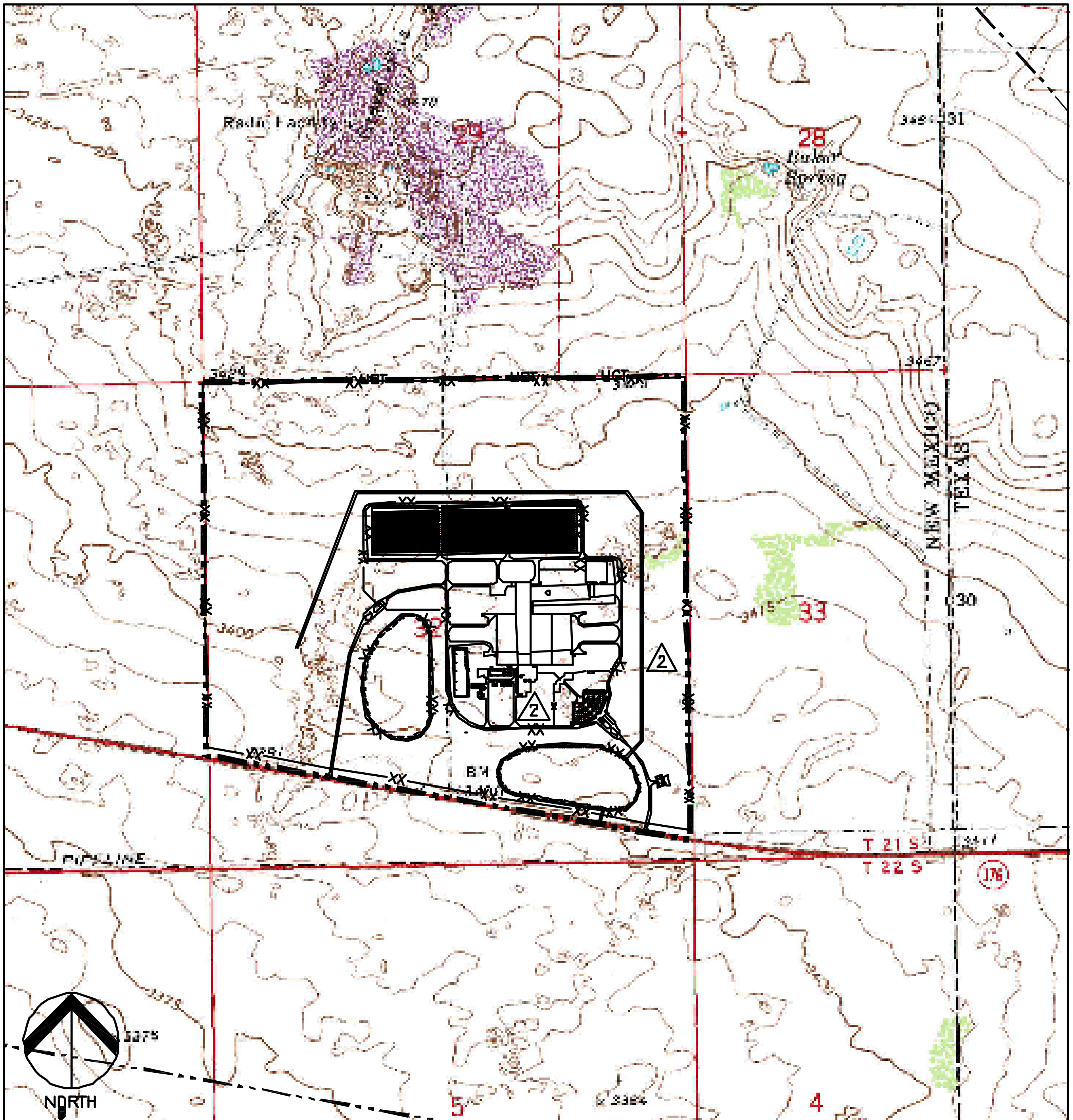


(EPA 2003a)

REFERENCE NUMBER
Figure 3.6-10.dwg

FIGURE 3.6-10
EPA CRITERIA POLLUTANT NONATTAINMENT MAP

ENVIRONMENTAL REPORT
REVISION DATE: DECEMBER 2003



1000 0 1000 2000 3000 FEET

300 0 300 600 900 METERS

MAP SOURCE:
USGS 7.5 MINUTE
EUNICE NE QUADRANGLE
TEX.–N. MEX. 1:24000

CONTOUR INTERVAL:
5 FEET

LOCKWOOD GREENE
ENGINEERING & CONSTRUCTION

REFERENCE NUMBER
7.5Min Figures.dwg

FIGURE 3.6-11

TOPOGRAPHIC MAP OF SITE

ENVIRONMENTAL REPORT

REVISION 2 DATE: JULY 2004

2

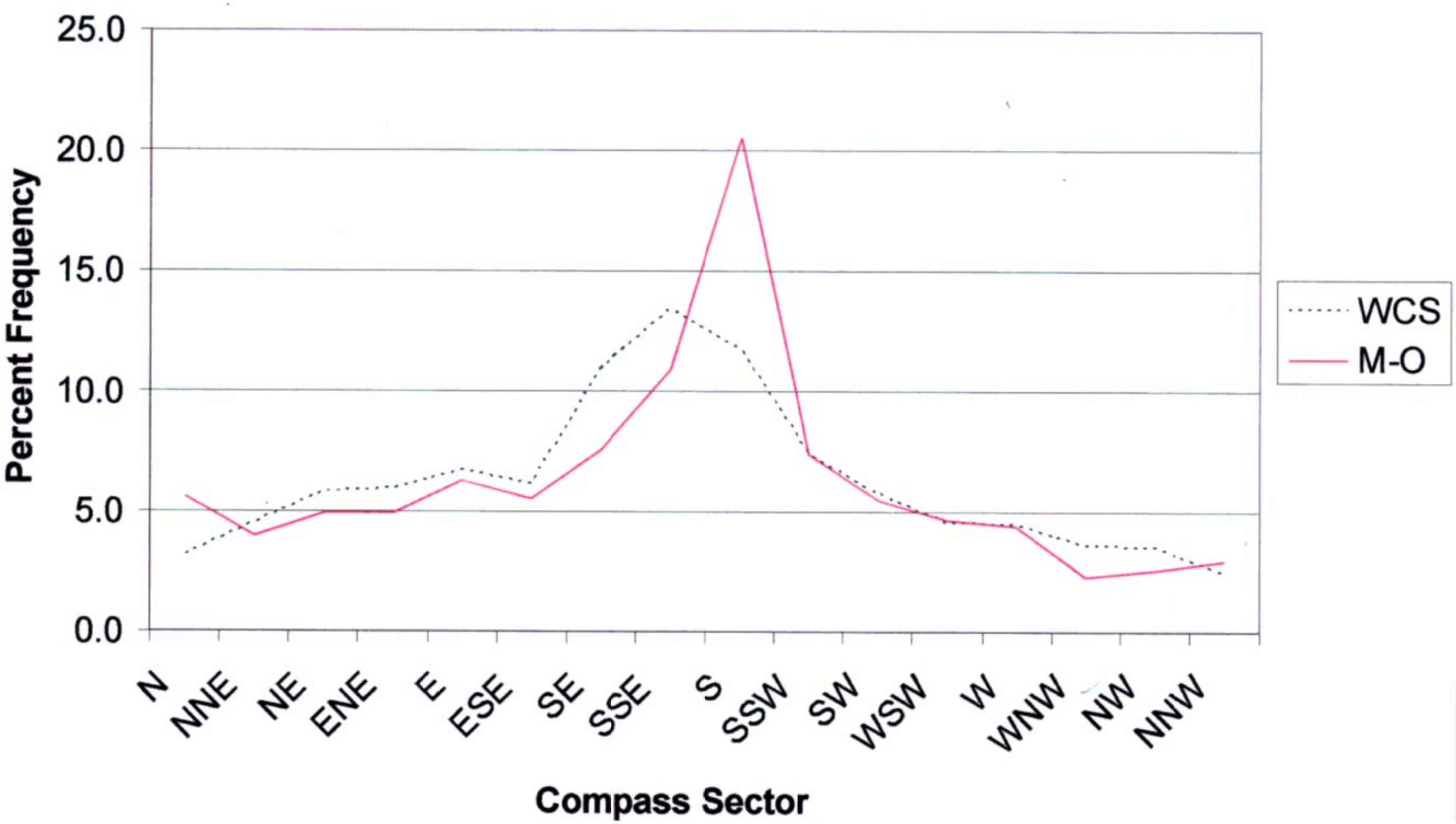


FIGURE 3.6-12

COMPARISON OF WCS AND MIDLAND–ODESSA WIND DIRECTION DATA

ENVIRONMENTAL REPORT

REVISION 2 DATE: JULY 2004

3.7 NOISE

Noise is defined as “unwanted sound.” At high levels noise can damage hearing, cause sleep deprivation, interfere with communication, and disrupt concentration. In the context of protecting the public health and welfare, noise implies adverse effects on people and the environment.

The sound we hear is the result of a source inducing vibration in the air, creating sound waves. These waves radiate in all directions from the source and may be reflected and scattered or, like other wave actions, may turn corners. Sound waves are a fluctuation in the normal atmospheric pressure, which is measurable. This sound pressure level is the instantaneous difference between the actual pressure produced by a sound wave and the average or barometric pressure at a given point in space. This provides us the fundamental method of measuring sound, which is in “decibel” (dB) units.

The dB scale is a logarithmic scale because the range of sound intensities is so great that it is convenient to compress the scale to encompass all the sound pressure levels that need to be measured. The sound pressure level is defined as 20 times the logarithm, to the base 10, of the ratio of the pressure of the sound measured to the reference pressure, which is 20 µPa (0.0002 dyne/cm^2). In equation form, sound pressure level in units of dB is expressed as:

$$dB = 20 \text{ Log}_{10} \frac{p}{p_r}$$

Where:

p = measured sound pressure level µPa (dyne/cm^2)

p_r = reference sound pressure level, 20 µPa (0.0002 dyne/cm^2)

Due to its logarithmic scale, if a noise increases by 10 dB, it sounds as if the noise level has doubled. If a noise increases by 3 dB, the increase is just barely perceptible to humans. Additionally, as a rule-of-thumb the sound pressure level from an outdoor noise source radiates out from the source, decreasing 6 dB per doubling of distance. Thus, a noise that is measured at 80 dB 15 m (50 ft) away from the source will be 74 dB at 30.5 m (100 ft), 68 dB at 61 m (200 ft), and 62 dB at 122 m (400 ft). However, natural and man-made sources such as trees, buildings, land contours, etc., will often reduce the sound level further due to dissipation and absorption of the sound waves. Occasionally buildings and other reflective surfaces may slightly amplify the sound waves, through reflected and reverberated sound waves.

The rate at which a sound source vibrates determines its frequency. Frequency refers to the energy level of sound in cycles per second, designated by the unit of measurement Hertz (Hz). The human ear can recognize sounds within an approximate range of 16 Hz to 20,000 Hz, but the most readily predominant sounds that we hear are between 1,000 Hz and 6,000 Hz (EPA, 1974). To measure sound on a scale that approximates the way it is heard by people, more weight must be given to the frequencies that people hear more easily. The “A-weighted” sound scale is used as a method for weighting the frequency spectrum of sound pressure levels to mimic the human ear. A-weighting was recommended by the EPA to describe noise because of its convenience and accuracy, and it is used extensively throughout the world (EPA, 1974). For the purpose and scope of this report and sound level testing, all measurements will be in the A-weighted scale (dBA).

3.7.1 Extent of Noise Analysis

Community noise levels are often measured by the Day-Night Average Sound Level (L_{dn}). The L_{dn} is the A-weighted equivalent sound level for a 24-hour period. Due to the potential for sleep disturbance, loud noises between 10 p.m. and 7 a.m. are normally considered more annoying than loud noises during the day. This is a psychoacoustic effect that can also contribute to communication interference, distraction, disruption of concentration and irritation. A 10 dB weighting factor is added to nighttime equivalent sound levels due to the sensitivity of people during nighttime hours (EPA, 1974). For example, a measured nighttime (10 p.m. to 7 a.m.) equivalent sound level of 50 dBA can be said to have a weighted nighttime sound level of 60 dBA (50 + 10). For the purposes of this report, however, an Equivalent Sound Level (L_{eq}) is used to measure average noise levels during the daytime hours. The L_{eq} is a single value of sound level for any desired duration, which includes all of the time-varying sound energy in the measurement period. To further clarify the relationship between these two factors, the daytime sound level equivalent averaged with the nighttime sound level equivalent equals the Day-Night Average: L_{eq} (Day) averaged with L_{eq} (Night) = L_{dn}. Since the nighttime noise levels are significantly lower than the daytime noise levels, the daytime L_{eq} is used alone, without averaging the lower nighttime value, to provide a more conservative representation of the actual exposure.

3.7.2 Community Distribution

The area immediately surrounding the National Enrichment Facility (NEF) site is unpopulated and used primarily for intermittent cattle grazing. The nearest noise receptors are five businesses that are between 0.8 km (0.5 mi) and 2.6 km (1.6 mi) of the NEF site. WCS is due east of the site just over the Texas border. The Lea County Landfill is southeast, Sundance Specialists and Wallach Concrete are north, and DD Landfarm is just west of the site. The nearest homes are due west of the site in the city of Eunice, New Mexico, which is approximately 8 km (5 mi) away. The closest residence from the center of the NEF site is approximately 4.3 km (2.63 mi) away on the east side of Eunice, New Mexico.

3.7.3 Background Noise Levels

Since there were no previous measurements performed for noise levels, background noise was surveyed at four locations near the site borders of the NEF on September 16-18, 2003, using a Bruel & Kjaer 2236D Integrating Sound Level Meter. The A-weighted decibel scale (dBA) was used to record and weigh noise that is audible to the human ear. All of the measurements were taken during the day between 7 a.m. and 5 p.m. Measurement locations are shown in Figure 3.7-1, Noise Measurement Locations. Average background noise levels ranged from 40.1 to 50.4 dBA (see Table 3.7-1, Background Noise Levels for the NEF Site). The four locations selected for the noise measurements represent the nearest receptor locations (NEF site fence) for the general public and the locations of expected highest noise levels when the plant is operational. These noise levels are considered moderate, and are below the average range of speech of 48 to 72 dBA (HUD, 1985). See Figure 3.7-2, Sound Level Range Examples.

Data from September 18, 2003 has been excluded from the average background noise levels due to high winds that were of sufficient strength and consistency to cause the instruments to record anomalous readings. Instrument readings were in excess of 75 dBA during high winds due to the sensitivity of the microphones, which are not designed to account for direct wind shear. Noise instrumentation included foam windscreens that covered the microphones, however these are not designed to mitigate the types of high winds that were experienced at NEF that day. Meteorological data retrieved from the WCS nearby to the NEF site showed average wind speeds ranging from 9.0 to 11.6 m/s (20 to 26 mi/hr) during the period of the noise survey on September 18, 2003. Even with the September 18, 2003 data excluded, sufficient data was collected for the analyses.

Current point noise sources consist of operating equipment from Wallach Concrete, Inc. just north of the site, which include bulldozers, cranes, and heavy-duty dump trucks and tractor trailer trucks, heavy-duty truck traffic at Sundance Specialists also north of the site. The only line noise source is vehicle traffic along the southern border of the site on New Mexico Highway 234. Results from measurements taken at each southern corner of the site boundary near New Mexico Highway 234 produced noticeably higher results due to significant vehicle traffic, including multiple heavy-duty tractor-trailer trucks (line sources). Field measurements from the two southern locations were between 30.5 to 46 m (100 to 150 ft) from the road, which resulted in the upper sound pressure level of 50.4 dBA. Other noise sources included low flying small aircraft that operate out of the Eunice Airport approximately 6.4 km (4 mi) from the site, and sudden high wind gusts that would temporarily defeat the windscreen attachment to the noise instrumentation.

3.7.4 Topography and Land Use

The NEF site slopes gently to the south-southwest with a maximum relief of about 12 m (40 ft). The highest elevation is approximately 1,045 m (3,430 ft) msl in the northeast corner of the property. The lowest site elevation is approximately 1,033 m (3,390 ft) msl along the southwest corner of the site.

Rangeland comprises 98.5% of the area within an 8 km (5 mi) radius of the NEF site, encompassing 12,714 ha (31,415 acres) within Lea County, New Mexico and 7,213 ha (17,823 acres) in Andrews County, Texas. (See Figure 3.1-1., Land Use Map.) Rangeland is an extensive area of open land on which livestock wander and graze and includes herbaceous rangeland, shrub and brush rangeland and mixed rangeland. Built-up land and barren land constitute the other two land use classifications in the site vicinity, but at considerably smaller percentages. Land cover due to built-up areas, which includes residential and industrial developments, makes up 1.2% of the land use. This equates to a combined total of 243 ha (601 acres) for Lea and Andrews Counties. The remaining 0.3% of land area is considered barren land which consists of bare exposed rock, transitional areas and sandy areas. Refer to ER Section 3.1 for further discussion of land use.

With regard to noise mitigation, land contours that have changes in elevation will help to absorb sound pressure waves that travel outward from a noise source. A flat surface would allow noise from a source to travel a greater distance without losing its intensity (perceived volume). Wooded areas, trees, and other naturally occurring items will also mitigate noise sources, provided those items are located between the noise and the noise receptor. See ER Section 4.7.5, Mitigation, for further discussion of noise mitigation at the NEF site.

3.7.5 Meteorological Conditions

The meteorological conditions at the NEF have been evaluated and summarized in order to characterize the site climatology. See ER Section 3.6, Meteorology, Climatology and Air Quality, for a detailed discussion.

Monthly mean wind speeds and prevailing wind directions at Midland-Odessa, Texas, are presented in Table 3.6-10, Midland-Odessa, Texas, Wind Data. The annual mean wind speed was 4.9 m/s (11.0 mi/hr) and the prevailing wind direction was wind from the south, i.e., 180 degrees with respect to true north. Monthly mean wind speeds and prevailing wind directions at Roswell, New Mexico, are presented in Table 3.6-11, Roswell, New Mexico, Wind Data. The annual mean wind speed was 3.7 m/s (8.2 mi/hr) and the prevailing wind direction was wind from 160 degrees from true north. The maximum five-second wind speed was 31.3 m/s (70 mi/hr) at Midland-Odessa, Texas, and 27.7 m/s (62 mi/hr) from 270 at Roswell, New Mexico.

Five years of data (1987-1991) from the Midland-Odessa NWS were used to generate joint frequency distributions of wind speed and direction. This data summary is provided in Table 3.6-12, Midland/Odessa Five Year (1987-1991) Annual Joint Frequency Distribution for All Stability Classes Combined.

Noise intensities are affected by weather conditions for a variety of reasons. Snow-covered ground can absorb more sound waves than an uncovered paved surface that would normally reflect the noise. Operational noise can be masked by the sound of a rainstorm or high winds, where environmental noise levels are raised at the point of the noise receptor. Additionally, seasonal differences in foliage, as well as temperature changes, can affect the environmental efficiency of sound wave absorption (i.e., a fully leafed tree or bush will mitigate more sound than one without leaves). Because of those variables, the noise levels, both background and after the plant is built, will be variable. However, even when such variations are taken into consideration, the background noise levels are well within the specified guidelines.

3.7.6 Sound Level Standards

Agencies with applicable standards for community noise levels include the U.S. Department of Housing and Urban Development (HUD, 1985) and the Environmental Protection Agency (EPA, 1973). Both the Eunice City Manager and Lea County Manager have informed LES that there are no city, county, or New Mexico state ordinances or regulations governing environmental noise. In addition, there are no affected American Indian tribal agencies within the sensitive receptor distances from the site. Thus, the NEF site is not subject either to local, tribal, or state noise regulations. Nonetheless, anticipated NEF noise levels are expected to typically fall below the HUD and EPA standards and are not expected to be harmful to the public's health and safety, nor a disturbance of public peace and welfare.

The EPA has defined a goal of 55 dBA for L_{dn} in outdoor spaces, as described in the EPA Levels Document (EPA, 1973). HUD has developed land use compatibility guidelines for acceptable noise versus the specific land use (see Table 3.7-2, U.S. Department of Housing and Urban Development Land Use Compatibility Guidelines). All the noise measurements shown in Table 3.7-1, Background Noise Levels for the NEF Site are below both criterion for a daytime period (as defined above). If the Table 3.7-1 measurements had been averaged to reflect nighttime levels, the average ambient noise levels would be even lower.

TABLES

Table 3.7-1 Background Noise Levels for the NEF Site

Page 1 of 1

Measurement Location	**L_{eq} ***
Receptor 1 (see Figure 3.7-1)	**40.2**
Receptor 2	**40.1**
Receptor 3	**47.2**
Receptor 4	**50.4**

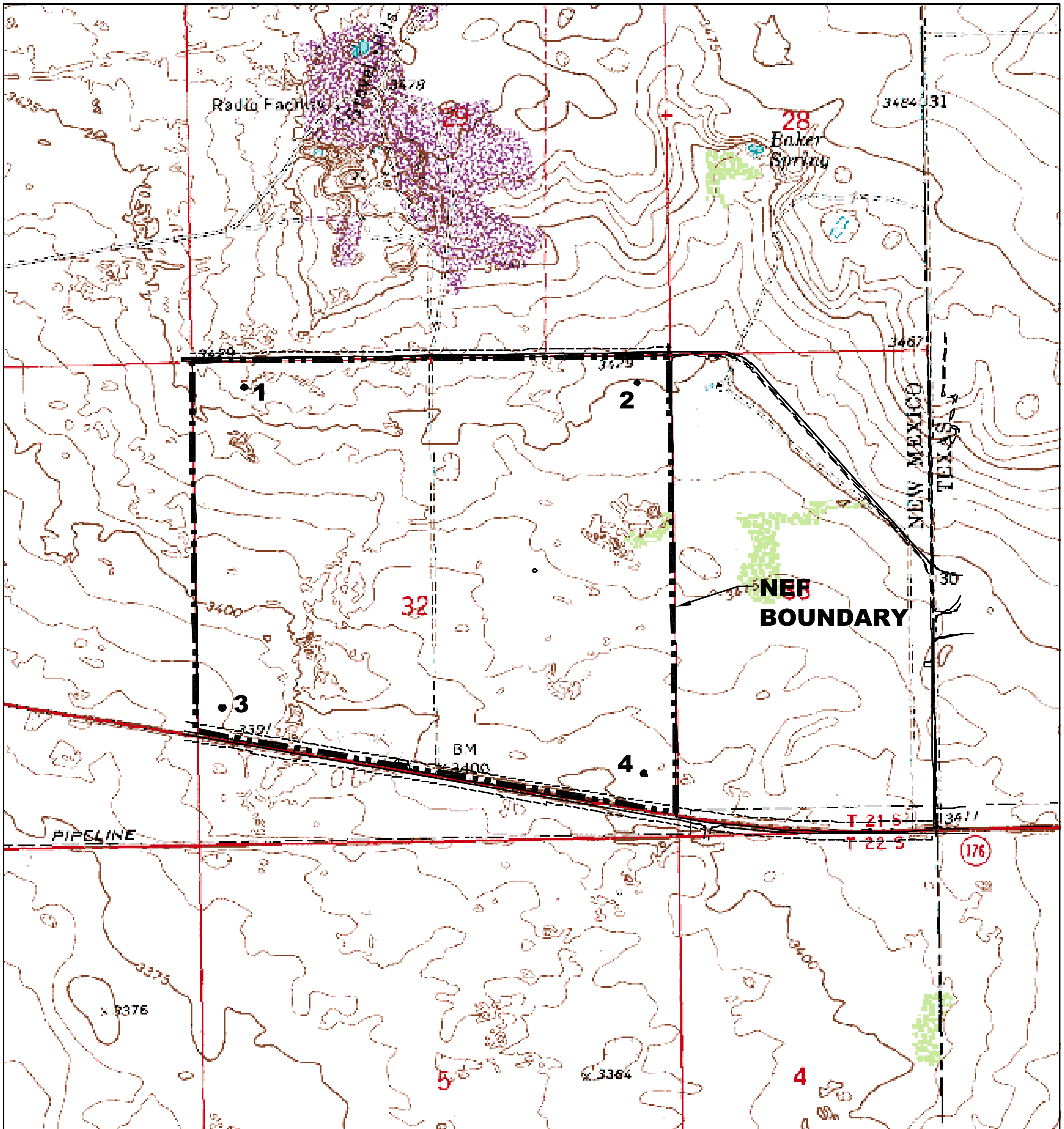
* L_{eq} - Average A-weighted sound level (dBA)

Table 3.7-2 U.S. Department of Housing and Urban Development Land Use Compatibility Guidelines

	Sound Pressure Level (dBA L_{dn})			
Land Use Category	**Clearly Acceptable**	**Normally Acceptable**	**Normally Unacceptable**	**Clearly Unacceptable**
Residential	<60	60-65	65-75	>75
Livestock farming	<60	60-75	75-80	>80
Office buildings	<65	65-75	75-80	>80
Wholesale, industrial, manufacturing & utilities	<70	70-80	80-85	>85

Source: (HUD, 1985)

FIGURES



1000 0 1000 2000 3000 FEET

300 0 300 600 900 METERS

CONTOUR INTERVAL: 5 FT

MAP SOURCE:
EUNICE NE QUAD.
TEX – N. MEX 24K

NORTH

REFERENCE NUMBER
7.5Min Figures.dwg

FIGURE 3.7-1

NOISE MEASUREMENT LOCATIONS

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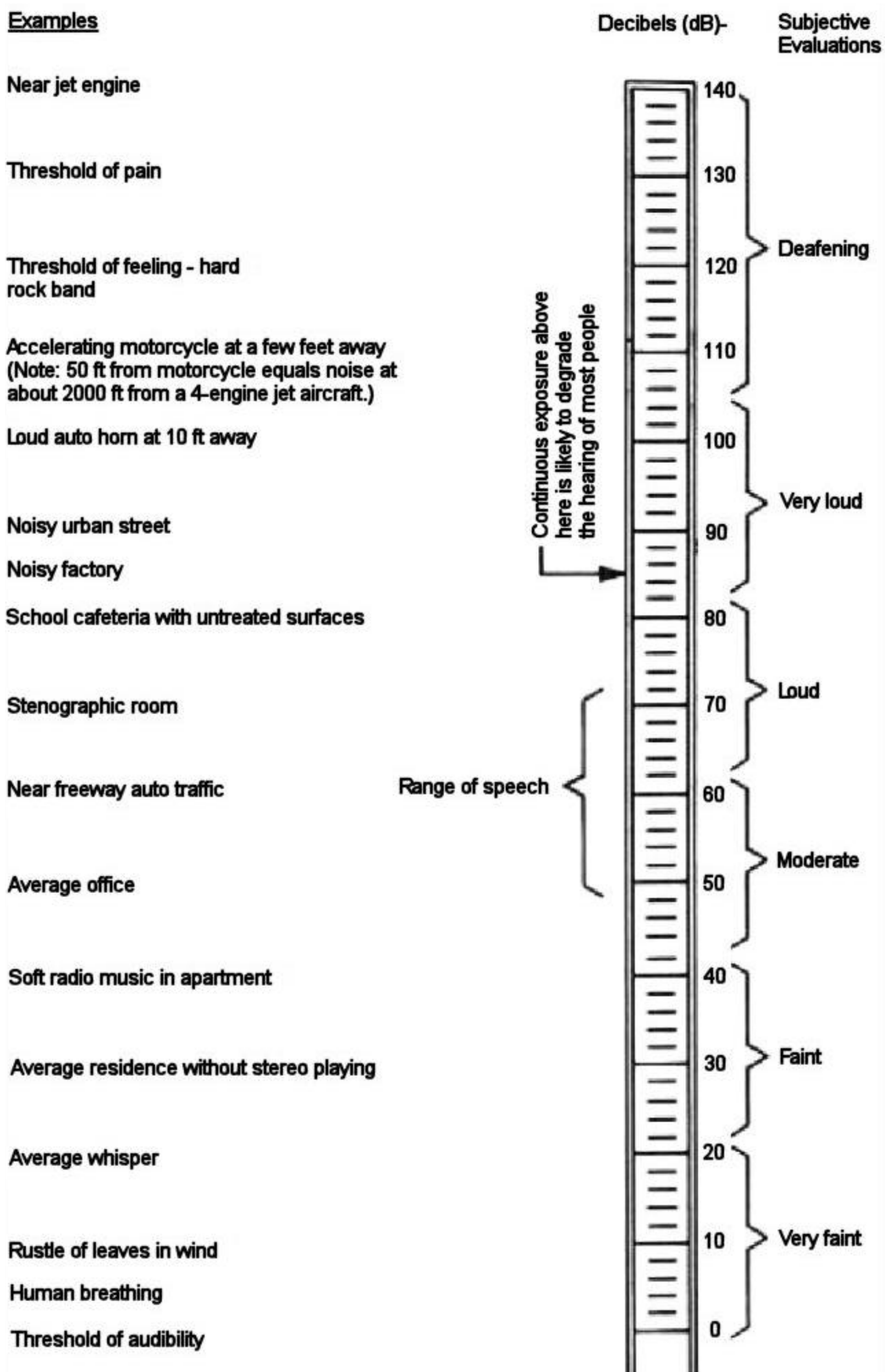

*dB are "average" values as measured on the A-scale of a sound level meter
(From Concepts in Architectural Acoustics: M. David Egan, McGraw Hill, 1972)

REFERENCE NUMBER
figure 3.7–2.dwg

FIGURE 3.7-2

SOUND LEVEL RANGE EXAMPLES

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3.8 HISTORIC AND CULTURAL RESOURCES

3.8.1 Extent of Historical and Cultural Resource Analysis

The proposed National Enrichment Facility (NEF) at the Lea County, New Mexico site had not been surveyed for cultural resources prior to site selection. Given the lack of this survey, LES, in consultation with the New Mexico State Historic Preservation Officer (SHPO), determined that a survey would be conducted to identify and evaluate any cultural resource properties that may be present within the 220-ha (543-acre) area of land. The initial survey of this site was performed in September 2003.

3.8.2 Known Cultural Resources in the Area

Southeastern New Mexico has been an area of human occupation for the last 12,000 years. Prehistoric land use and settlement patterns include short- and long-term habitation sites and are generally located on flood plains and alluvial terraces along drainages and on the edges of playas. Specialized campsites are situated along the drainage basins and playa edges. European interactions began in 1541 with a Spanish entrada into the area in search of great riches in “Quivira” by Francisco Vasquez de Coronado. Colonization of New Mexico began in 1595, though settlement in the NEF region did not occur until the late nineteenth century. The real boom to the region began with the discovery of oil and gas in the region and most settlement of the region began after the 1930’s.

Prior to the survey of the NEF site, three cultural resource surveys had been conducted in the area. These included a survey by the New Mexico Highway and Transportation Department (NMSHTD) in 1984 of 8.4 ha (20.7 acres) (New Mexico Cultural Resource Information System [NMCRIS]) Activity No. 2934), a survey in 1997 by the University of New Mexico Office of Contract Archeology for the Lea County Landfill on the south side of New Mexico Highway 234 just south of the NEF site of 142 ha (350 acres) (UNM, 1997), and a survey in 2001 of 16 ha (40 acres) of private land north of the project for Marron and Associates by Archaeological Services (NMCRIS Activity No. 75255). The survey by NMSHTD recorded no cultural evidence on 3.7 ha (9.2 acres) of private land and 4.3 ha (10.5 acres) of State of New Mexico land (NMSHTD, 1984). A total of 13 isolated (non-connected) occurrences were recorded, but no prehistoric or historic archeological sites were encountered at the Lea County Landfill site (UNM, 1997). The survey of private land in 2001 recorded two isolated occurrences (Michalik, 2001).

3.8.3 Archaeological or Historical Surveys

3.8.3.1 Physical Extent of Survey

The physical extent of the survey of the NEF included the entire site, i.e., 220 ha (543 acres). An intensive pedestrian survey was conducted within the 220 ha (543 acres) of the APE. Survey findings revealed potentially eligible archaeological sites within 18.5 ha (46.3 acres) of this area.

3.8.3.2 Description of Survey Techniques

The survey of the 220-ha (543-acre) area included a pedestrian surface inventory of the area at 15-m (49-ft) intervals. Cultural resource sites were recorded by mapping the surface remains, plotting the sites on an aerial photograph and topographic USGS 7.5' map of the area, and testing cultural feature remains with a trowel to determine subsurface integrity of the features.

A facility layout map of the 220-ha (543-acre) study area was overlain on the USGS 7.5' map of the area and onto USGS orthographic aerial images to assist in locating and assessing the area.The survey was performed in zigzag transects spaced 15 m (49 ft) apart. Special attention was given to depressions, rodent burrows, and anthills. When an isolated occurrence was encountered, its attributes were recorded and a global positioning system (GPS) measurement was taken. Cultural resource sites were recorded on sketch maps produced by compass and pace with assistance from the GPS. The study sites were recorded on Laboratory of Anthropology Site Record forms, and photographs of the site and study area were taken. No artifacts were collected.

3.8.3.3 Cultural Resource Specialist Qualifications

The survey at the Lea County, New Mexico proposed NEF plant was performed by a six-member survey crew. All crew members have professional experience in historical and prehistoric archaeology in the American Southwest. Crew experience ranged between 2 and 23 years. The crew was supervised in the field by a degreed anthropologist.

3.8.3.4 Survey Findings

The survey of approximately 220 ha (543 acres) in the eastern portion of Lea County east of Eunice, New Mexico at the proposed location of a NEF resulted in the recording of seven prehistoric sites and 36 isolated occurrences (finds). Four sites (LA 140704–LA 140707) are potentially eligible for listing on the National Register of Historic Places (NRHP). Three of these sites (LA 140704, LA 140705, and LA 140706) are campsites consisting of lithic scatters and thermal features. The fourth potentially eligible site, LA 140707, is a lithic scatter with potential for intact thermal features. Each of the four sites contains or has the potential to contain data regarding the prehistory of the region. Only one of these sites considered potentially eligible for the NRHP (LA 140705) is within the proposed location of the facility. The results of the survey were submitted to New Mexico State Historic Preservation Officer (SHPO) in March 2004 for a determination of eligibility. On the advice of the SHPO, the location of these sites is not included in this ER so the sites will remain protected from curiosity seekers or vandals.

The SHPO review of the survey has resulted in their conclusion that all seven sites (LA 140701 through LA 140707) are eligible for listing on the NRHP. Three of these sites (LA 140701, LA 140702 and LA 140705) are within the proposed plant footprint. A treatment/mitigation plan is being developed by LES to recover any significant information from these sites.

3.8.4 List of Historical and Cultural Properties

A review of existing information revealed that no previously recorded historical or cultural properties are located within the study area, i.e., the entire NEF site.

3.8.5 Agency Consultation

Consultation will be performed with all appropriate federal and state agencies and affected Native American Tribes. Copies of all response letters are included in Appendix A.

3.8.6 Other Comments

None.

3.8.7 Statement of Site Significance

Seven archaeological sites (LA 140701, LA 140702, LA 140703, LA 140704, LA 140705, LA 140706, LA 140707) have been identified in the 220-ha (543-acre) parcel of land. Four of these (LA 140704, LA 140705, LA 140706, LA 140707) are potentially eligible for listing on the NRHP based on the presence of charcoal, intact subsurface features and/or cultural deposits, or the potential for subsurface features. Only one of these sites (LA 140705) is within the proposed location of the NEF plant. The results of the survey were submitted to the New Mexico SHPO in March 2004 for a determination of eligibility.

The SHPO review of the survey has resulted in their conclusion that all seven sites (LA 140701 through LA 140707) are eligible for listing on the NRHP. Three of these sites (LA 140701, LA 140702 and LA 140705) are within the proposed plant footprint. A treatment/mitigation plan is being developed by LES to recover any significant information from these sites.

3.9 VISUAL/SCENIC RESOURCES

3.9.1 Viewshed Boundaries

Urban development is relatively sparse in the vicinity of the proposed National Enrichment Facility (NEF) site. The nearest city, Eunice, New Mexico, is approximately 8 km (5 mi) to the west; the proposed site is not visible from the city. However, the site is visible from westbound traffic on New Mexico Highway 234, which borders the site to the south, from about the New Mexico/Texas state line, approximately 0.8 km (0.5 mi) to the east. A series of small sand dunes on the western portion of the site provide natural screening from eastbound highway traffic, up until traffic passes the sand dune buffer. Likewise, the onsite sand dunes limit view of the site from the nearest residences located approximately 4.3 km (2.63 mi) to the west. The proposed NEF site is also visible from adjacent industrial properties to the north and east (Wallach Concrete, Inc. and Waste Control Specialists, respectively) and somewhat from the south (Lea County Landfill) and west (DD Landfarm). Considering distances and that the NEF will be centered on the site, onsite structures may be visible from nearby locations, but their details will be weak and tend to merge into larger patterns.

3.9.2 Site Photographs

Figures 3.9-1A through 3.9-1H are site photographs. As shown in the photographs, there are no existing structures on the site.

3.9.3 Affected Residents/Visitors

Due to neighboring industrial properties and expansive oil and gas developments in the site vicinity, very few local residents or visitors will be affected aesthetically by changes to the proposed NEF site.

3.9.4 Important Landscape Characteristics

The landscape of the site and vicinity is typical of a semi-arid climate and consists of sandy soils with desert-like vegetation such as mesquite bushes, shinnery oak shrubs and native grasses. The NEF site is open, vacant land. Except for man-made structures associated with the neighboring industrial properties and the local oil and gas industry, nearby landscapes are similar in appearance. Local and county officials reported that the only agricultural activity in the site vicinity is domestic livestock ranching.

The proposed site is within the southern part of the Llano Estacado or Staked Plains, which is a remnant of the southern extension of the Southern High Plains. The Southern High Plains are remnants of a vast debris apron spread along the eastern front of the mountains of Central New Mexico by streams flowing eastward and southeastward during the Tertiary period. The site and surrounding area has a nearly flat surface. Natural drainage is south to southwest. Monument Draw, a shallow drainage way, situated 4 km (2.5 mi) west of the site, originates in the lower portions of the Southern High Plains and drains towards Texas to the south. It is the only extensive area drainage way. Due to low rainfall and the deposition of sediments along its course, Monument Draw is intermittently dry and contains water only during heavy rainfall periods (USDA, 1974). Surface drainage is into numerous undrained depressions.

The site area overlies prolific oil and gas geologic formations of the Pennsylvanian and Permian age. The Elliott Littman field is to the north, Drinkard field to the south and Monument Jal field to the west. Other common features of the Southern High Plains are undrained depressions called “buffalo wallows” which are believed to have formed by leaching of the caliche cap and the calcareous cement of the underlying sandstone and subsequent removal of the loosened material by wind.

Onsite soils are primarily of the Brownfield-Springer association, and Kermit soils and Dune Land. The Brownfield-Springer association ‘BO’ mapping unit has a 0% to 3% slope and consists mostly of Brownfield fine sand with Springer loamy fine sand and small inclusions of other soils. The Brownfield-Springer association ‘BS’ mapping unit is similar to the ‘BO’ mapping unit with hummocks and dunes forming a complex pattern of concave and convex rolling terrain. Blowing soil has exposed the red sandy clay loam and fine sandy loam subsoil in concave, barren areas. The Kermit soils and Dune Land mapping unit ‘KM’ consists of about half Kermit soils and half active dune land. Slopes range between 0% to 12%. Kermit soil is hummocky and undulating, consisting of excessively drained, non-calcareous loose sands that surround Dune Land areas. Dune Land consists of large barren sand dunes which shift with the wind. Its surface layer is fine sand to coarse sand. Soils associated with the Brownfield-Springer association and Kermit soils and Dune Land are used as range, wildlife habitat and recreational areas. On the western portion of the NEF site, in the vicinity of the sand dune buffer, soils are mapped as active dune land ‘Aa’, which is made up of light-colored, loose sands. Slope range is 5% to 12% or more. Typically, the surface of active dune land soil is mostly bare except for a few shinnery oak shrubs (USDA, 1974).

There are no mountain ranges in the site vicinity. Several “produced water” lagoons and a man-made pond stocked with fish are located on the quarry property to the north. “Produced water” is water that has been injected into oil wells to facilitate the extraction of oil. The water is often reclaimed and reused. Baker Spring, an intermittent surface water feature that contains surface water seasonally, is situated 1.6 km (1 mi) northeast of the site; however, there are no nearby, significant bodies of water such as rivers or lakes. Except for a small, roadside picnic area situated by a historical oil country marker 3.2 km (2 mi) west of the site, there are no parks, wilderness areas or other recreational areas located within or immediately adjacent to the NEF site. In addition, based on site visits and available local information, there are no architectural or aesthetic features that would attract tourists to the area.

3.9.5 Location of Construction Features

Refer to Figure 3.9-2, Constructed Features (Site Plan), for the location of constructed features on the proposed NEF site.

3.9.6 Access Road Visibility

Except for private roadways associated with the adjacent quarry to the north and WCS to the east, which are at slightly higher elevations, visibility of site facilities from access roads, both existing and proposed, will be mainly limited to taller onsite structures. This is partly due to centering the plant on the property, proposed perimeter fencing with natural landscaping that will provide a buffer between proposed facilities and potential viewing areas, and the sand dune buffer on the western portion of the site.

3.9.7 High Quality View Areas

Based on site visits and discussion with local officials, there are no regionally or locally important or high quality views associated with the proposed NEF site. The site is considered common in terms of scenic attractiveness, given the large amount of land in the area that appears similar.

3.9.8 Viewshed Information

Although the site is visible from neighboring properties and from New Mexico Highway 234, due to development of nearby land for various industrial purposes (e.g., WCS facility, landfill and quarry) and oil and gas exploration, very few local residents or visitors will be affected aesthetically by changes to the site. The sand dunes on the western portion of the subject property limit its view from eastbound traffic on New Mexico Highway 234 and from residences to the west. Refer to Figures 3.9-1A through 3.9-1H.

3.9.9 Regulatory Information

Currently the NEF site is not zoned. Based on discussions with the city of Eunice and Lea County officials, there are no local or county zoning, land use planning or associated review process requirements. However, development of the site will meet federal and state requirements for nuclear and radioactive material sites regarding design, siting, construction materials, effluent treatment and monitoring. In addition, all applicable local ordinances and regulations will be followed during construction and operation of the NEF.

3.9.10 Aesthetic and Scenic Quality Rating

The visual resource inventory process provides a means for determining visual values (BLM, 1984; BLM, 1986). The inventory consists of a scenic quality evaluation, sensitivity level analysis, and a delineation of distance zones. Based on these three factors, lands are placed into one of four Visual Resource Classes. These classes represent the relative value of the visual resources: Classes I and II being the most valued, Class III representing a moderate value, and Class IV being of least value. The classes provide the basis for considering visual values in the resource management planning (RMP) process. Visual Resource Classes are established through the RMP process.

The NEF site was evaluated between September 15, 2003 and September 18, 2003 by LES using the BLM visual resource inventory process to determine the scenic quality of the site. The NEF site received a “C” rating and falls into Class IV. Refer to Table 3.9.1, Scenic Quality Inventory and Evaluation Chart. Scenic quality is a measure of the visual appeal of a tract of land which is given an A, B or C rating (A-highest, C-lowest) based on the apparent scenic quality using the seven factors outlined in Table 3.9-1, Scenic Quality Inventory and Evaluation Chart.

Class IV is of the least value and allows for the greatest level of landscape modification. The proposed use of the NEF site does not fall outside the objectives for Class IV, which are to provide for management activities that require major modifications of the existing character of the landscape. The level of change to the landscape characteristics may be extensive. These management activities may dominate the view and be the major focus of viewer attention (BLM, 1984).

3.9.11 Coordination with Local Planners

As noted in ER Section 3.9.9, Regulatory Information, discussions were held between LES and the City of Eunice and Lea County officials to coordinate and discuss local area community planning issues. No local or county zoning, land use planning or associated review process requirements were identified. All applicable, local ordinances and regulations will be followed during the construction and operation of the NEF.

TABLES

Table 3.9-1 Scenic Quality Inventory And Evaluation Chart

Page 1 of 2

Key Factors	**Rating Criteria and Score[1]**		
Landform	High vertical relief as expressed in prominent cliffs, spires, or massive rock outcrops, or severe surface variation or highly eroded formations including major badlands or dune systems; or detail features dominant and exceptionally striking and intriguing such as glaciers. Score: 5	Steep canyons, mesas, buttes, cinder cones, and drumlins; or interesting erosion patterns or variety in size and shape or landforms; or detail features which are interesting though not dominant or exceptional. Score: 3	Low rolling hills, foothills, or flat valley bottoms; or few or no interesting landscape features. **Score: 1**
Vegetation	A variety of vegetative types as expressed in interesting forms, textures, and patterns. Score: 5	Some variety of vegetation, but only one or two major types. **Score: 3**	Little or no variety or contrast in vegetation. Score: 1
Water	Clear and clean appearing, still, or cascading white water, any of which are a dominant factor in the landscape. Score: 5	Flowing, or still, but not dominant in the landscape. Score: 3	Absent, or present, but not noticeable. **Score: 0**
Color	Rich color combinations, variety or vivid color; or pleasing contrasts in the soil, rock, vegetation, water or snow fields. Score: 5	Some intensity or variety in colors and contrast of the soil, rock and vegetation, but not a dominant scenic element. Score: 3	Subtle color variations, contrast, or interest; generally mute tones. **Score: 1**
Influence of Adjacent Scenery	Adjacent scenery greatly enhances visual quality. Score: 5	Adjacent scenery moderately enhances overall visual quality. Score 3	Adjacent scenery has little or no influence on overall visual quality. **Score: 0**
Scarcity	One of a kind; or unusually memorable or very rare within region. Consistent chance for	Distinctive, though somewhat similar to others within the	Interesting within its setting, but fairly common within the

Table 3.9-1 Scenic Quality Inventory and Evaluation Chart

Page 2 of 2

Key Factors	**Rating Criteria and Score**[1]		
	exceptional wildlife or wildflower viewing, etc. Score: 5	region. Score: 3	region. **Score: 1**
Cultural Modifications	Modifications add favorably to visual variety while promoting visual harmony. Score: 2	Modifications add little or no visual variety to the area, and introduce no discordant elements. Score: 0	Modifications add variety but are very discordant and promote strong disharmony. **Score: -4**

Total Score: 2 Scenic Quality: A = 19 or more; B = 12-18; C = 11 or less

Scores in bold represent scores assigned to the NEF site.

[1]Ratings developed from BLM, 1984; BLM, 1986

FIGURES

REFERENCE NUMBER
Figures 3.9.dwg

FIGURE 3.9-1A

VIEW OF PROPOSED NEF SITE LOOKING
FROM THE SOUTHEAST TO THE NORTHWEST
ENVIRONMENTAL REPORT

REVISION DATE: DECEMBER 2003

REFERENCE NUMBER
Figures 3.9.dwg

FIGURE 3.9-1B

VIEW OF PROPOSED NEF SITE LOOKING FROM THE NORTHEAST TO THE SOUTHWEST
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REFERENCE NUMBER
Figures 3.9.dwg

FIGURE 3.9-1C

VIEW OF PROPOSED NEF SITE LOOKING FROM THE SOUTHWEST TO THE NORTHEAST
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Figures 3.9.dwg

FIGURE 3.9-1D

VIEW OF PROPOSED NEF SITE LOOKING FROM THE NORTHWEST TO THE SOUTHEAST
ENVIRONMENTAL REPORT

REVISION DATE: DECEMBER 2003

FIGURE 3.9-1E

VIEW OF CENTER OF PROPOSED NEF SITE
FROM NEW MEXICO HIGHWAY 234
ENVIRONMENTAL REPORT
REVISION DATE: DECEMBER 2003

REFERENCE NUMBER
Figures 3.9.dwg

REFERENCE NUMBER
Figures 3.9.dwg

FIGURE 3.9-1F
VIEW OF WEST HALF OF PROPOSED NEF SITE (SAND DUNE BUFFER) FROM NEW MEXICO HIGHWAY 234
ENVIRONMENTAL REPORT
REVISION DATE: DECEMBER 2003

REFERENCE NUMBER
Figures 3.9.dwg

FIGURE 3.9-1G

LOOKING SOUTH TOWARDS PROPOSED NEF SITE
FROM ADJACENT QUARRY TO THE NORTH
ENVIRONMENTAL REPORT

REVISION DATE: DECEMBER 2003

REFERENCE NUMBER
Figures 3.9.dwg

FIGURE 3.9-1H
LOOKING WEST TOWARDS PROPOSED NEF SITE
FROM NEIGHBORING WASTE CONTROL
SPECIALIST PROPERTY TO THE EAST
ENVIRONMENTAL REPORT
REVISION DATE: DECEMBER 2003

Figure removed under 10 CFR 2.390.

3.10 SOCIOECONOMIC

This section describes the social and economic characteristics of the two-county area around the proposed National Enrichment Facility (NEF). Information is provided on population, including minority and low-income areas (i.e., environmental justice as discussed in ER Section 4.11), economic trends, housing, and community services in the areas of education, health, public safety, and transportation. The information was gathered from a field team who visited local and regional offices, telephone conversations with local and regional officials, and documents from public sources. Local and regional offices and officials included public safety (police and fire), tax assessor, park and recreation, education, agriculture, and transportation. Other contacts included health providers and the county officials.

The proposed NEF site is in Lea County, New Mexico, near the border of Andrews County, Texas, as shown on Figure 3.10-1, Lea-Andrews County Areas. The figure also shows the city of Eunice, New Mexico, the closest population center to the site, at a distance of about 8 km (5 mi). Other population centers are at distances from the site as follows:

- Hobbs, Lea County, New Mexico: 32 km (20 mi) north
- Jal, Lea County, New Mexico: 37 km (23 mi) south
- Lovington, Lea County, New Mexico: 64 km (39 mi) north-northwest
- Andrews, Andrews County, Texas: 51 km (32 mi) east
- Seminole, Gaines County, Texas: 51 km (32 mi) east-northeast
- Denver City, Gaines County, Texas: 65 km (40 mi) north-northeast

Aside from these communities, the population density around the site region is extremely low.

The primary labor market for the operation of the proposed facility will come from within about 120 km (75 mi) of the site. The basis for selection of the 120 km (75 mi) radius is that it encompasses the Midland-Odessa, Texas area which is approximately 103 km (64 mi) to the southeast. This is the farthest distance from which LES expects the bulk of the labor force to originate. Lea County, New Mexico, was established March 17, 1917, five years after New Mexico was admitted to the Union as a State. The county seat is located in Lovington, New Mexico, 64 km (39 mi) north-northwest of the site. The site area is very rural and semi-arid, with commerce in petroleum production and related services, cattle ranching, and the dairy industry. Among U. S. states, New Mexico also ranked 7th in crude oil production in 1999, Lea County, New Mexico ranked first among oil producing counties in New Mexico in 2001.

Lea County covers 11,378 km^2 (4,393 mi^2) or approximately 1,142,238 ha (2,822,522 acres) which is three times the size of Rhode Island and only slightly smaller than Connecticut. The county population density is 16% lower than the New Mexico state average (4.8 versus 5.8 population density per square kilometer) (12.6 versus 15.0 population density per square mile). The county housing density is 20% lower than the New Mexico state average (2.0 versus 2.5 housing units per square kilometer) (5.3 versus 6.4 housing units per square mile). Lea County is served by three local libraries, nine financial institutions, and two daily newspapers, the Hobbs News-Sun and Lovington Daily Leader.

Andrews County, Texas was organized in August 1875. The county seat is located in the city of Andrews, about 51 km (32 mi) east-southeast of the site; there are no population centers in Andrews County closer to the site. The surrounding area is very rural and semi-arid, with commerce in livestock production, agriculture (cotton, sorghum, wheat, peanuts, and hay), and significant oil and gas production, which produces most of the county's income. Andrews County covers 3,895 km^2 (1,504 mi^2). The county population density is 11% of the Texas state average (3.3 versus 30.6 per square kilometer) (8.7 versus 79.6 population density per square mile). The county housing density is low, at just over 11% of the Texas state average (1.4 versus 12.0 housing units per square kilometer) (3.6 versus 31.2 housing units per square mile). The community of Andrews is served by one library, nine financial institutions, and a weekly newspaper. Fraternal and civic organizations include the Lions Club, Rotary Club, 4H, and Boy Scouts/Girl Scouts of America. Local facilities serving the community of Andrews include 35 churches, a museum, a municipal swimming pool, golf course, tennis courts, parks and athletic fields. The two roughly comparably-sized cities of Seminole and Denver City are located in Gaines County Texas, 51 km (32 mi east-northeast) and 65 km (40 mi) north-northeast, respectively.

3.10.1 Population Characteristics

3.10.1.1 Population and Projected Growth

The combined population of the two counties in the NEF vicinity, based on the 2000 U.S. Census (DOC, 2002) is 68,515, which represents a 2.3% decrease over the 1990 population of 70,130 (Table 3.10-1, Population and Population Projections). This rate of decrease is counter to the trends for the states of New Mexico and Texas, which had population increases of 20.1% and 22.8%, respectively during the same decade. Over that 10-year period, Lea County New Mexico had a growth decrease of 0.5% and the Andrews County's, Texas decrease was 9.3%. Lea County experienced a sharp but brief population increase in the mid-1980's due to oil industry jobs that resulted in a population increase to over 65,000. The raw census data was tabulated and used to calculate the above percentage statistics. No other sources of data or information were used. LES has not identified any programs or planned developments in the region that would have an impact on area population.

Based on projections made using historic data (Table 3.10-1), and in consideration of the mature oil industry in the area, Lea County, New Mexico and Andrews County, Texas are likely to grow more slowly than their respective states growth rates over the next 30 years (the expected license period of the NEF) (DOC, 2002). ER Figure 1.2-1, Location of Proposed Site, shows population centers within 80 km (50 mi) of the NEF.

3.10.1.2 Minority Population

Based on U. S. census data the minority populations of Lea County, New Mexico and Andrews County, Texas as of 2000 were 32.9% and 22.9%, respectively. These percentages are consistent with their respective state averages of 33.2% and 29.0% (see Table 3.10-2, General Demographic Profile) (DOC, 2002). The raw census data was tabulated and used to calculate the above percentage statistics. No other sources of data or information were used.

The term "minority population" is defined for the purposes of the U. S. Census to include the five racial categories of black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, and some other race. It also includes those individuals who declared two or more races, an option added as part of the 2000 census. The minority population, therefore, was calculated to be the total population less the white population. In contrast to U. S. Census data, NUREG-1748, Appendix C (NRC, 2003a) defines minority populations to include individuals of Hispanic or Latino origin. This results in a difference between the minority population data discussed here and presented in Table 3.10-2, and the data presented in ER Section 4.11, Environmental Justice.

The U.S. Census data was used to calculate the minority population reported above consistent with the U.S. Census definition of minority population. This same data was also used in the Environmental Justice assessment (see ER Section 4.11), which manipulated the census data to yield minority population estimates consistent with the NRC definition applicable to environmental justice.

ER Section 4.11, Environmental Justice, provides the results of the LES assessment that demonstrates that no disproportionately high minority or low-income populations exist in proximity to the NEF that would warrant further examination of environmental impacts upon such populations.

3.10.2 Economic Characteristics

3.10.2.1 Employment, Jobs, and Occupational Patterns

In 2000, the civilian labor force of Lea County, New Mexico, and Andrews County, Texas, was 22,286 and 5,511, respectively, as shown in Table 3.10-3, Civilian Employment Data, 2000. Of these, 2,032 were unemployed in Lea County, New Mexico, for an unemployment rate of 9.1%. Unemployment in Andrews County, Texas was 447 persons, for an unemployment rate of 8.1%. The unemployment rates for both counties were both higher by about 2% than the rates for their respective states (DOC, 2002).

The distribution of jobs by occupation in the two counties is similar to that of their respective states (Table 3.10-3). However, Lea and Andrews Counties generally have fewer managerial and professional positions, and instead have more blue-collar positions like construction, production, transportation, and material moving, which is a reflection of the rural nature of the area and the presence of the petroleum industry (DOC, 2002).

Oil production and related services are the largest part of the site area economy. About 20% of jobs in both Lea County, New Mexico and Andrews County, Texas involve mining (oil production), as compared to approximately 4% and 3% for their respective states. Education, health and social services account for a combined 19% to 23% of jobs, which is generally similar to that for their respective states (DOC, 2002).

3.10.2.2 Income

Per capita income in the two area counties was lower than the state average at 82.2% in Lea County, New Mexico and 81.1% in Andrews County, Texas (Table 3.10-4, Area Income Data). Within the two-county area, per capita income ranged from $14,184 in Lea County, New Mexico to $15,916 in Andrews County, Texas, as compared to their respective state values of $17,261 and $19,617. Similarly, the median household income in the two counties was also below their respective state averages of $34,133 and $39,927 at 87.3% and 85.2%, respectively (DOC, 2002).

The per capita individual poverty levels in the area at 21.1% for Lea County, New Mexico and 16.4% in Andrews County, Texas, are higher than the respective state levels of 18.4% and 15.4% (Table 3.10-4) (DOC, 2002), respectively. The respective state household poverty levels of 14.5% and 12.0% were below that of Lea County, New Mexico (17.3%) and Andrews County, Texas (13.9%).

3.10.2.3 Tax Structure

New Mexico's property tax is perennially ranked among the three lowest states in the nation with any change requiring an amendment to the state constitution. The property assessment rate is uniform, statewide, at a rate of 33-1/3% of the value (except oil and gas properties). The tax applied is a composite of state, county, municipal, school district and other special district levies. Properties outside city limits are taxed at lower rates. Major facilities may be assessed by the New Mexico State Taxation and Revenue Department instead of by the county. The Lea County, New Mexico tax rate for non-residential property outside the city limits of Eunice is 18.126 mils per $1,000 of net taxable value of a property (EDCLC, 2000). New Mexico communities can abate property taxes on a plant location or expansion for a maximum of 30 years, (usually 20 years in most communities), controlled by the community.

The state also has a Gross Receipts Tax paid by product producers. This tax is imposed on businesses in New Mexico, but in almost every case it is passed to the consumer. In that way, the gross receipts tax resembles a sales tax. The gross receipts tax rate for the Eunice area, outside the city limits is 5.00% (NMEDD, 2003). Certain deductions may apply to this tax for plant equipment.

Property taxes provide a majority of revenue for local services in Texas. Local officials value property and set tax rates. Property taxes are based on the most current year's market value. Any county, municipality, school district or college district may levy property taxes. Andrews County, Texas has a county property tax rate (per $100 assessed value) of 6.152%, a school district rate of 1.50%, and a municipal rate for the city of Andrews of 3.754%. Texas also has a 6.45% sales tax, which may be augmented by local municipalities (TCPA, 2003).

See ER Section 4.10.2.2, Community Characteristic Impacts, for estimated tax revenue and estimated allocations to the State of New Mexico and Lea County resulting from the construction and operation of the NEF.

3.10.3 Community Characteristics

3.10.3.1 Housing

Housing in both Lea County, New Mexico, and Andrews County, Texas, varies from their respective states in general, reflecting the rural nature of the area. Although the number of rooms per housing unit is similar to state averages, the density of housing units and value of housing is considerably different, especially for Andrews County. The densities at 2.0 units per km^2 (5.3 units per mi^2) in Lea County, New Mexico and 1.4 units per km^2 (3.6 units per mi^2) in Andrews County, Texas, are about 82% and 11% of their respective state averages of 2.5 and 12.0 units per km^2 (6.4 and 31.2 units per mi^2). The median cost of a home in Lea County, New Mexico of $50,100 is about 18% higher than in Andrews County, Texas of $42,500. The cost of a home in both counties is about one-half or less of the respective median values for their states (Table 3.10- 5, Housing Information in the Lea, New Mexico-Andrews, Texas County Vicinity) (DOC, 2002).

The percentage of vacant housing units is 15.8% and 14.8% for Lea County, New Mexico and Andrews County, Texas, respectively. This compares to their state vacancy rates of 13.1% and 9.4%, respectively (DOC, 2002).

3.10.3.2 Education

There are four educational institutions within a radius of about 8 km (5 mi), an elementary school, middle school and high school and a private K-12 school, all in Lea County, New Mexico. Table 3.10-6, Educational Facilities Near the NEF, details the location of the educational facilities, population (including faculty/staff members), and student-teacher ratio (ESD, 2003; USDE, 2002; DOC, 2002). The closest schools in Andrews County, Texas, are in the community of Andrews about 51 km (32 mi) east of the NEF site. Apart from the schools in Eunice, New Mexico, the next closest educational institutions are in Hobbs, New Mexico, 32 km (20 mi) north of the site.

Table 3.10-7, Educational Information in the Lea, New Mexico – Andrews, Texas County Vicinity lists the percent ages of school enrollment for the population 3 years and over for the city of Eunice, New Mexico, as well as for Lea County, New Mexico, and Andrews County, Texas as well as their respective states. The table also lists the percent ages of educational attainment for the population 25 years and over in those same areas. In general, the population in Lea County, New Mexico, has less advanced education than the general population in their state. The state population with either a bachelor's, graduate or professional degree is about double the corresponding percentage in Lea County, New Mexico (DOC, 2002; ESD, 2003).

3.10.3.3 Health Care, Public Safety, and Transportation Services

Health Care

There are two hospitals in Lea County, New Mexico. The Lea Regional Medical Center is located in Hobbs, New Mexico about 32 km (20 mi) north of the proposed NEF site. Lea Regional Medical Center is a 250-bed hospital that can handle acute and stable chronic care patients. In Lovington, New Mexico, 64 km (39 mi) north-northwest of the site, Covenant Medical Systems manages Nor-Lea Hospital, a full-service, 27-bed facility. There are no nursing homes or retirement facilities in the site area. The closest such facilities are in Hobbs, New Mexico, about 32 km (20 mi) north of the site.

Public Safety

Fire support service for the Eunice area is provided by the Eunice Fire and Rescue, located approximately 8 km (5 mi) from the plant. It is staffed by a full-time Fire Chief and 34 volunteer firefighters. Equipment at the Eunice Fire and Rescue includes:

Three Ambulances;

Three Pumper Fire Trucks;

- one 340 m^3/hr (1,500 gal per min (gpm)) pump which carries 3,785 L (1,000 gal) of water,
- one 227 m^3/hr (1,000 gpm) pumper which carries 1,893 L (500 gal) of water,
- one 284 m^3/hr (1,250 gpm) pumper which carries 2,839 L (750 gal) of water,

One Water Truck 22,700 L (6,000 gal) with 114 m^3/hr (500 gpm) pumping capacity

Three Grass Fire Trucks:

- one 3,785 L (1,000 gal) water truck with a 68 m^3/hr (300 gpm) pump

- one 1,136 L (300 gal) water truck with a 34 m^3/hr (150 gpm) pump
- one 946 L (250 gal) water truck with a 34 m^3/hr (150 gpm) pump

One Rescue Truck:

- Vehicle Accident Rescue truck with 379 L (100 gal) of water and 45 m^3/hr (200 gpm) pump

If additional fire equipment is needed, or if the Eunice Fire and Rescue is unavailable, the Central Dispatch will call the Hobbs Fire Department. In instances where radioactive/hazardous materials are involved, knowledgeable members of the facility Emergency Response Organization (ERO) provide information and assistance to the responding offsite personnel.

Mutual aid agreements exist with all of the county fire departments. In particular, mutual aid agreements exist between Eunice, New Mexico, and the nearby City of Hobbs Fire Department, as well as with Andrews County, Texas, for additional fire services. If emergency fire services personnel in Lea County are not available, the mutual aid agreements are activated and the Eunice Central Dispatch will contact the appropriate agencies for the services requested at the NEF.

The Eunice Police Department, with five full-time officers, provides local law enforcement. The Lea County Sheriff's Department also maintains a substation in the community of Eunice. If additional resources are needed, officers from mutual aid communities within Lea County, New Mexico, and Andrews County, Texas, can provide an additional level of response. The New Mexico State Police provide a third level of response.

<u>Transportation</u>

The nearest active rail transportation is a short-line carrier, the Texas-New Mexico Railroad (TNMR#815) accessible in Eunice, New Mexico about 5.8 km (3.6 mi) from the site.

The nearest airport facilities are located just west of Eunice and are maintained by Lea County. That facility is about 16 km (10 mi) west from the proposed NEF. The airport consists two runways measuring about 1,000 m (3,280 ft) and 780 m (2,550 ft) each. Privately owned planes are the primary users of the airport. There is no control tower and no commercial air carrier flights (DOT, 2003a). The nearest major commercial carrier airport is Lea County Regional Airport in Hobbs, New Mexico, about 32 km (20 mi) north.

TABLES

Table 3.10-1 Population and Population Projections

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Year(s)	Area (Population/Projected Growth) Lea County, NM	Andrews County, TX	Lea-Andrews Combined	New Mexico	Texas
1970	49,554	10,372	59,926	1,017,055	11,198,657
1980	55,993	13,323	69,316	1,303,303	14,225,512
1990	55,765	14,338	70,103	1,515,069	16,986,335
2000	55,511	13,004	68,515	1,819,046	20,851,820
2010	60,702	15,572	76,274	2,091,675	23,812,815
2020	62,679	16,497	79,176	2,358,278	26,991,548
2030	64,655	17,423	82,078	2,624,881	30,170,281
2040	66,631	18,348	84,979	2,891,483	33,349,013
Year(s)	**Percent Change(%) Lea County, NM**	**Andrews County, TX**	**Lea-Andrews Combined**	**New Mexico**	**Texas**
1970-1980	13.0%	28.5%	15.7%	28.1%	27.0%
1980-1990	-0.4%	7.6%	1.1%	16.2%	19.4%
1990-2000	-0.5%	-9.3%	-2.3%	20.1%	22.8%
2000-2010	9.4%	19.7%	11.3%	15.0%	14.2%
2010-2020	3.3%	5.9%	3.8%	12.7%	13.3%
2020-2030	3.2%	5.6%	3.7%	11.3%	11.8%
2030-2040	3.1%	5.3%	3.5%	10.2%	10.5%

Source: U. S. Census Bureau (DOC, 2002)

Table 3.10-2 General Demographic Profile

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Profile	Areas							
	Lea County, NM		Andrews County, TX		New Mexico		Texas	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total Population	55,511	100.0	13,004	100.0	1,819,046	100.0	20,851,820	100.0
Minority Population*	18,248	32.9	2,980	22.9	604,743	33.2	6,052,315	29.0
Race								
One race	53,697	96.7	12,631	97.1	1,752,719	96.4	20,337,187	97.5
White	37,263	67.1	10,024	77.1	1,214,253	66.8	14,799,505	71.0
Black or African American	2,426	4.4	214	1.6	34,343	1.9	2,404,566	11.5
American Indian and Alaska Native	551	1.0	115	0.9	173,483	9.5	118,362	0.6
Asian	216	0.4	92	0.7	19,255	1.1	562,319	2.7
Native Hawaiian and Other Pacific Islander	24	0.0	3	0.0	1,503	0.1	14,434	0.1
Some other race	13,217	23.8	2,183	16.8	309,882	17.0	2,438,001	11.7
Two or more races	1,814	3.3	373	2.9	66,327	3.6	514,633	2.5

*Calculated as total population less white population
Source: U. S. Census Bureau (DOC, 2002)

Table 3.10-3 Civilian Employment Data, 2000

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Topic	Area Lea County, NM		Andrews County, TX		New Mexico		Texas	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Employment Status								
In labor force	22,286	100.0	5,511	100.0	823,440	100.0	9,830,559	100.0
Employed	20,254	90.9	5,064	91.9	763,116	92.7	9,234,372	93.9
Unemployed	2,032	9.1	447	8.1	60,324	7.3	596,187	6.1
Occupation (population 16 years and over)								
Management, professional, and related occupations	5,077	22.8	1,293	23.5	259,510	31.5	3,078,757	31.3
Service occupations	3,283	14.7	833	15.1	129,349	15.7	1,351,270	13.7
Sales and office occupations	4,670	21.0	1,060	19.2	197,580	24.0	2,515,596	25.6
Farming, fishing, and forestry occupations	331	1.5	64	1.2	7,594	0.9	61,486	0.6
Construction, extraction, and maintenance occupations	3,723	16.7	821	14.9	87,172	10.6	1,008,353	10.3
Production, transportation, and material moving occupations	3,170	14.2	993	18.0	81,911	9.9	1,218,910	12.4
Industry								
Agriculture, forestry, fishing and hunting, and mining	4,188	18.8	1,064	19.3	30,529	3.7	247,697	2.5
Construction	1,268	5.7	256	4.6	60,602	7.4	743,606	7.6
Manufacturing	715	3.2	435	7.9	49,728	6.0	1,093,752	11.1
Wholesale trade	658	3.0	128	2.3	20,747	2.5	362,928	3.7
Retail trade	2,418	10.8	578	10.5	92,766	11.3	1,108,004	11.3

Table 3.10-3 Civilian Employment Data, 2000
Page 2 of 2

Topic	Lea County, NM		Andrews County, TX		New Mexico		Texas	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Transportation and warehousing, and utilities	1,347	6.0	207	3.8	35,710	4.3	535,568	5.4
Information	227	1.0	90	1.6	18,614	2.3	283,256	2.9
Finance, insurance, real estate, and rental and leasing	642	2.9	177	3.2	41,649	5.1	630,133	6.4
Professional, scientific, management, administrative, and waste management services	918	4.1	234	4.2	71,715	8.7	878,726	8.9
Education, health and social services	4,173	18.7	1,244	22.6	165,897	20.1	1,779,801	18.1
Arts, entertainment, recreation, accommodation and food services	1,327	6.0	263	4.8	74,789	9.1	673,016	6.8
Other services (except public administration)	1,343	6.0	226	4.1	38,988	4.7	480,785	4.9
Public administration	1,030	4.6	162	2.9	61,382	7.5	417,100	4.2

Source: U. S. Census Bureau (DOC, 2002)

Table 3.10-4 Area Income Data

Topic	Area			
	Lea County, NM	Andrews County, TX	New Mexico	Texas
Individual				
Per Capita Income (dollars)	14,184	15,916	17,261	19,617
Percent of State (%)	82.2	81.1	100.0	100.0
% Below Poverty Level (1999)	21.1	16.4	18.4	15.4
Household				
Medial Income (dollars)	29,799	34,036	34,133	39,927
Percent of State	87.3	85.2	100.0	100.0
% Below Poverty Level (1999)	17.3	13.9	14.5	12.0

Source: U. S. Census Bureau (DOC, 2002)

Table 3.10-5 Housing Information in the Lea New Mexico Andrews Texas County Vicinity

Topic	Lea County, NM	Area Andrews County, TX	New Mexico	Texas
Total Housing Units	23,405	5,400	780,579	8,157,575
Occupied housing units (percent)	84.2	85.2	86.9	90.6
Vacant housing units (percent)	15.8	14.8	13.1	9.4
Density -- Housing units (per square mile)	5.3	3.6	6.4	31.2
Number of rooms (median)	5.1	5.2	5.0	5.1
Median value (2000 dollars)	50,100	42,500	108,100	82,500

Source: U. S. Census Bureau (DOC, 2002)

Table 3.10-6 Educational Facilities Near the NEF
Page 1 of 1

School	Grades	Distance km (miles)	Direction	Population	Student-Teacher Ratio
Lea County, New Mexico					
Eunice High School	9-12	8.6 (5.3)	W	207	16:1
Caton Middle School	6-8	8.6 (5.3)	W	128	15:1
Mettie Jordan Elementary School	DD, K-5	8.6 (5.3)	W	269	21:1
Eunice Holiness Academy	1-12	8.2 (5.1)	W	14	6:1

Note : DD – Development Delayed Class

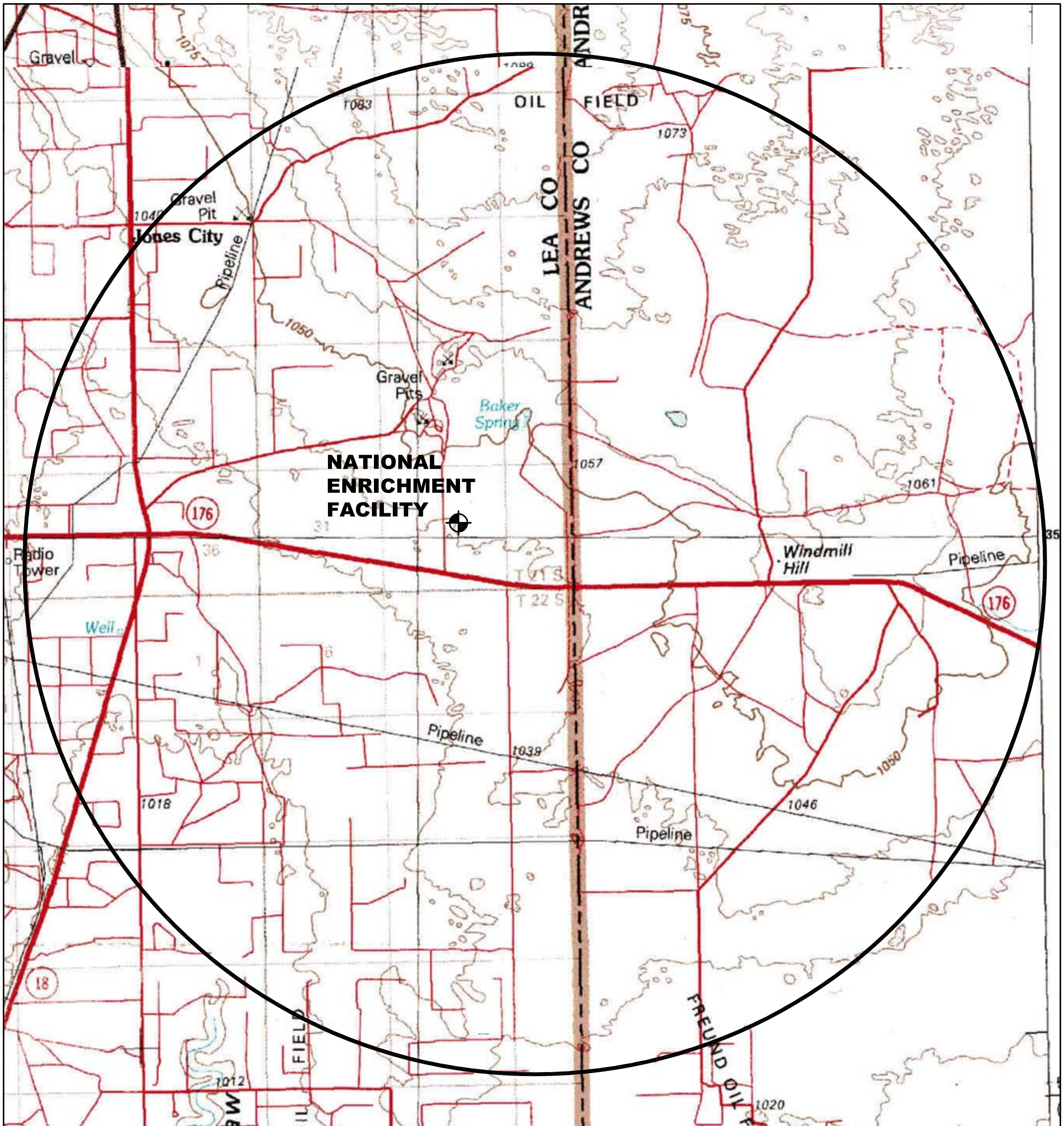
Source: Eunice School District
National Center for Educational Statistics
Source: U.S. Census Bureau (DOC, 2002)

Table 3.10-7 Educational Information in the Lea, New Mexico-Andrews, Texas County Vicinity

	Area									
	Eunice, NM		**Lea County, NM**		**Andrews County, TX**		**New Mexico**		**Texas**	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
School Enrollment (≥3 years of age)	690	100.0	16,534	100.0	3,864	100.0	513,017	100.0	5,948,260	100.0
Nursery School, pre-school	14	2.0	766	4.6	185	4.8	28,681	5.6	390,094	6.6
Kindergarten	41	5.9	785	4.7	203	5.3	25,257	4.9	348,203	5.9
Elementary school	342	49.6	7,999	48.4	1,972	51.0	231,730	45.2	2,707,281	45.5
High school	207	30.0	4,220	25.5	1,170	30.3	114,669	22.4	1,299,792	21.9
College or graduate school	86	12.5	2,754	16.7	334	8.6	112,680	22.0	1,202,890	20.2
School Attainment (≥25 years of age)	1,759	100.0	32,291	100.0	7,815	100.0	1,111,241	100.0	12,790,893	100.0
Less than 9th grade	258	14.7	4,951	15.3	1,126	14.4	94,108	8.5	1,465,420	11.5
9th to 12th grade, no diploma	304	17.3	6,007	18.6	1,378	17.6	143,658	12.9	1,649,141	12.9
High School graduate (includes equivalency)	594	33.8	9,295	28.8	2,548	32.6	296,870	26.7	3,176,743	24.8
Some college, no degree	363	20.6	7,224	22.4	1,306	16.7	242,154	21.8	2,858,802	22.4
Associate's degree	63	3.6	1,939	6.0	389	5.0	63,847	5.7	668,498	5.2
Bachelor's degree	141	8.0	2,481	7.7	662	8.5	162,080	14.6	1,996,250	15.6
Graduate or professional degree	36	2.0	1,394	4.3	306	3.9	108,524	9.8	976,043	7.6

Sources: U. S. Census Bureau, Eunice School District (DOC, 2002)

FIGURES



1 0 1 2 3 MILES

1 0 1 2 3 4 KM

NORTH

MAP SOURCE:
JAL AND HOBBS QUADRANGLES
NEW MEXICO – TEXAS 1:100000
CONTOUR INTERVAL: 10 METERS

REFERENCE NUMBER
Figure 3.10–1.dwg

FIGURE 3.10-1

LEA–ANDREWS COUNTY AREAS

ENVIRONMENTAL REPORT

REVISION 2 DATE: JULY 2004

2

3.11 PUBLIC AND OCCUPATIONAL HEALTH

Routine operations at the National Enrichment Facility (NEF) create the potential for radiation exposure to plant workers, members of the public, and the environment. Workers at the NEF are subject to higher potential radiation exposures than members of the public because they are involved directly with handling UF_6 feed and product cylinders, depleted UF_6 cylinders, processes for the enrichment of uranium, and decontamination of containers and equipment. In addition to the radiological hazards associated with uranium, workers may be potentially exposed to the chemical hazards associated with uranium. However, workers at the NEF are protected by the combination of a Radiation Protection Program and a Health and Safety Program. The Radiation Protection Program complies with all applicable NRC requirements contained in 10 CFR 20 (CFR, 2003q), Subpart B, and the Health & Safety Program at the NEF complies with all applicable OSHA requirements contained in 29 CFR 1910 (CFR, 2003o).

Members of the general public also may be subject to potential radiation exposure due to routine operations at the NEF. Public exposure to plant-related uranium may occur as the result of gaseous and liquid effluent discharges, including controlled releases from the uranium enrichment process lines during decontamination and maintenance of equipment, and transportation and storage of UF_6 feed, product, and Uranium Byproduct Cylinders (UBCs). In each case, the amount of exposure incurred by the general public is expected to be very low. Engineered effluent controls, effluent sampling, and administrative limits as described in Section 6.1.1, Effluent Monitoring Program, are in place to assure that any impacts on the health and safety of the public resulting from routine plant operations are maintained as low as reasonably achievable (ALARA). The effectiveness of the effluent controls will be confirmed through implementation of the Radiological Environmental Monitoring Program (described in ER Section 6.1.2, Radiological Environmental Monitoring Program).

For the public, the potential radiological impacts from routine operations at the NEF are those associated with chronic exposure to very low levels of radiation. It is anticipated that the total annual amount of uranium released to the environment via air effluent discharges from the NEF will be approximately 10 grams (0.35 ounces). Radiological impacts to the public are discussed in ER Section 4.12, Public and Occupational Health Impacts.

3.11.1 Major Sources and Levels of Background Radiation

The sources of radiation at the NEF site historically have been, and still are, associated with natural background radiation sources and residual man-made radioactivity from fallout associated with the atmospheric testing of nuclear weapons in the western United States and overseas in the 1950s and 1960s. Naturally-occurring radioactivity includes primordial radionuclides (nuclides that existed or were created during the formation of the earth and have a sufficiently long half-life to be detected today) and their progeny, as well as nuclides that are continually produced by natural processes other than the decay of the primordial nuclides. These primordial nuclides are ubiquitous in nature, and are responsible for a large fraction of radiation exposure referred to as background exposure. The majority of primordial radionuclides are isotopes of the heavy elements and belong to the three radioactive series headed by ^{238}U (uranium series), ^{235}U (actinium series), and ^{232}Th (thorium series) (NCRP, 1987a). Alpha, beta, and gamma radiation is emitted from nuclides in these series. The relationship among the nuclides in a particular series is such that, in the absence of chemical or physical separation, the members of the series attain a state of radioactive equilibrium, wherein the decay rate of each nuclide is essentially equal to that of the nuclide that heads the series. The nuclides in each series decay eventually to a stable nuclide. For example, the decay process of the uranium series leads to a stable isotope of lead. There are also primordial radionuclides, specifically ^{40}K and ^{87}Rb, which decay directly to stable elements without going through a series of decay sequences. The primordial series of radionuclides represents a significant component of background radiation exposure to the public (NCRP, 1987a). Cosmogenic radionuclides make up another class of naturally occurring nuclides. Cosmogenic radionuclides are produced in the earth's crust by cosmic-ray bombardment, but are much less important as radiation sources (NCRP, 1987a).

Naturally-occurring radioactivity in soil or rock near the earth's surface belonging to the primordial series represents a significant component of background radiation exposure to the public (NCRP, 1987a). The radionuclides of primary interest are ^{40}K and the radioactive decay chains of ^{238}U and ^{232}Th. These nuclides are widely distributed in rock and soil. Soil radioactivity is largely that of the rock from which it was derived. The original concentrations may have been diminished by leaching and dilution by water and organic material added to the soil, or may have been augmented by adsorption and precipitation of nuclides from incoming water. Nevertheless, a soil layer about 0.25 m (0.8 ft) thick furnishes most of the external radiation from the ground (NCRP, 1987a). In general, typical soil and rock contents of these radionuclides indicate that the ^{232}Th series and ^{40}K each contributes an average of about 150 to 250 µGy per year (15 to 25 mrad per year) to the total absorbed dose rate in air for typical situations, while the uranium series contribute about half as much (NCRP, 1987a).

The public exposure from naturally-occurring radioactivity in soil varies with location. In the U.S., background radiation exposures in the Southwest and Pacific areas are generally higher than those in much of the Eastern and Central regions. The public exposure from naturally-occurring radioactivity in soil varies with location. There is also a wide variation in annual background terrestrial radiation across the State of New Mexico. The North Central region (Albuquerque area) exhibits an average annual absorbed dose in air of about 0.75 mGy (75 mrad), while the southeastern corner of the State (Carlsbad area), which includes the NEF site area in Lea County, measures annual average terrestrial absorbed dose of about 0.30 mGy (30 mrad) (NCRP, 1987a). Applying the same weighting factor, the annual average dose equivalent for the Albuquerque and Carlsbad areas are about 525 and 210 µSv (53 and 21 mrem), respectively. Some of the variation is linked to location, but factors such as moisture content of soil, the presence and amount of snow cover, the radon daughter concentration in the atmosphere, the degree of attenuation offered by housing structures, and the amount of radiation originating in construction materials may also account for variation (NCRP, 1987b).

Background radiation for the public also includes various sources of man-made radioactivity, such as fallout in the environment from weapons testing, and radiation exposures from medical treatments, x-rays, and some consumer products. All of these types of man-made sources contribute to the annual background radiation exposure received by members of the public. Of these, fallout from weapons testing should be included as an environmental radiation source for the NEF site. The two nuclides of concern with regard to public exposure from weapons testing are ^{137}Cs and ^{90}Sr due to their relative abundance, long half lives (30.2 and 29.1 years, respectively) and their ability to be incorporated into human exposure pathways, such as external direct dose and ingestion of foods. The average range of doses from weapons testing fallout to residents of New Mexico has been estimated as 1-3 mGy (100-300 mrad) (CDCP, 2001). Use of radiation in medicine and dentistry is also a major source of man-made background radiation exposure to the U.S. population. Although radiation exposures from medical treatments, X-rays, and some consumer products are considered to be background exposures, they would not be incurred by the public at the NEF site. Nevertheless, as a point of reference, medical procedures contribute an average of 0.39 mSv (39 mrem) for diagnostic xrays and nuclear medicine contributes an average of 0.14 mSv (14 mrem) to the annual average dose equivalent received by the U.S. population (NCRP, 1989). Exposures at these levels are approximately the same as the expected exposure in the southwest area of the country which includes the NEF site from primordial radionuclides. Consumer products (e.g., television receivers, ceramic products, tobacco products) also contribute to annual background radiation exposure. The average annual dose equivalent from consumer products and other miscellaneous sources (e.g., x-ray machines at airports, building materials) can range from fractions of a microsievert (millirems) to several Sieverts (hundreds of rems), as illustrated in Table 5.1 of NCRP Report No. 95 (NCRP, 1987b).

3.11.1.1 Current Radiation Sources

Workers at the NEF are subject to higher potential exposures than members of the public because they are involved directly with handling cylinders containing uranium, processes for the enrichment of uranium, and decontamination and maintenance of equipment. During routine operations, workers at the plant may potentially be exposed to direct radiation, airborne radioactivity, and limited surface contamination. These potential exposures include various types of radiation, including gamma, neutron, alpha, and beta. Annual doses to workers performing various tasks in an operating uranium enrichment plant have been evaluated. Activities primarily contributing to worker annual exposures include transporting cylinders, coupling and uncoupling containers, and other feed, product, and UBC handling tasks. Workers may also incur radiation exposure while performing other tasks, such as those related to the decontamination of cylinders and equipment. Office workers at the NEF may be exposed to direct radiation from plant operation associated with handling and storing feed, product, and UBCs.

Since the NEF site has not previously been developed for industrial or commercial purposes, there are no known past uses of the property that would have used man-made or enhanced concentrations of radioactive materials. Therefore, for members of the public, the only sources of radiation exposure currently present at the NEF site are associated with natural background radiation and residual radioactivity from weapons testing fallout.

Initial radiological characterization of the plant location was performed by gamma isotopic and Uranium specific analyses of 10 surface soil samples, which were collected randomly across the site property. All 10 samples indicated the presence of the naturally-occurring primordial radionuclides ^{40}K, the Thorium decay series (as indicated by ^{228}Ac and ^{228}Th) and the uranium decay series (including both ^{238}U and ^{234}U). In addition, the man-made radionuclide ^{137}Cs, produced by past weapons testing, was also detected in all samples. The average soil concentration for ^{40}K was determined to be 149 Bq/kg (4,027 pCi/kg). This falls in the lower end of the typical range in North America of ^{40}K in soil, which is reported to be from 0.5 x 10^{-6} to 3.0 x 10^{-6} g/g (NCRP, 1976). This range equates to approximately 130 to 777 Bq/kg (3,500 to 21,000 pCi/kg). ^{238}Ac/^{238}Th was found to average 6.88 Bq/kg (186 pCi/kg) in the NEF site soils. If it is assumed that the observed ^{238}Ac/^{238}Th is in secular equilibrium with the parent of the Thorium decay series (^{232}Th), then the observed concentrations are just below the typical lower end range value of 2 x 10^{-6} g/g (NCRP, 1976) or equivalent 8.1 Bq/kg (218 pCi/kg). With respect to the Uranium decay series, ^{238}U and its progeny, ^{234}U, were detected on the site property in approximately the same concentrations at 7.57 and 7.24 Bq/kg (205 and 196 pCi/kg), respectively. The typical range of ^{238}U concentrations in soil is from about 1 x 10^{-6} to 4 x 10^{-6} g/g (NCRP, 1976). The lower end of this range equates to about 12 Bq/kg (333 pCi/kg), with the observed value falling just below. The average ^{137}Cs concentration was found to be 2.82 Bq/kg (76.3 pCi/kg) and is credited to past weapons testing fallout. These soil radionuclide concentrations are typical of southeastern New Mexico and consistent with natural background exposures from terrestrial sources in this part of the U.S.

In addition to the 10 soil samples discussed above, eight additional surface soil samples were subsequently collected and analyzed for both radiological and non-radiological chemical analyses. Refer to ER Section 3.3.2, Site Soils, for the locations of the soil samples and the non-radiological analytical results.

Analyses included gamma spectrometry and radiochemical analyses for thorium and uranium. Six of the additional eight soil sample locations were selected to represent background conditions at proposed plant structures. The other two sample locations are representative of up-gradient, on-site locations.

The radiological analytical results for the eight soil samples are provided in Table 3.11-6, Radiological Chemical Analyses of NEF Site Soil. The table provides a comparison of the results between the original 10 samples and the subsequent eight samples. All radionuclides detected in the original 10 samples were also detected in the eight samples taken later. Two radionuclides (^{230}Th and ^{235}U) were detected in the eight soil samples but were not detected in the original 10 samples. ^{230}Th was not analyzed in the initial ten soil samples. The laboratory achieved a lower minimum detectable concentration (MDC) for ^{235}U in the subsequent analyses than for the initial soil samples. ^{230}Th is naturally occurring and associated with the decay of ^{238}U. Similar to ^{234}U and ^{238}U, ^{235}U is a natural uranium isotope found in the environment.

With respect to background exposure rates in the area of the NEF site, an inspector with the Radiation Control Bureau of the New Mexico Environment Department was contacted in May 2004. The inspector indicated that based on field measurements, the direct radiation background in the area of the proposed NEF is approximately 8 to 10 µR/hr. The inspector indicated that this value is somewhat lower than that for other parts of New Mexico.

ER Section 6.1.2, Radiological Environmental Monitoring Program, describes the Radiological Environmental Monitoring Program (REMP) for the NEF. The REMP includes the collection of data during pre-operational years in order to establish baseline radiological information that will be used in determining and evaluating impacts from operations at the plant on the local environment. The REMP will be initiated at least 2 years prior to plant operations in order to develop a sufficient database.

The data summarized above, supplemented with the REMP data, will fully characterize the background radiation levels at the NEF site.

3.11.1.2 Historical Exposure to Radioactive Materials

Annual whole-body dose equivalents accrued by workers at an operating uranium enrichment plant is typically low. The maximum individual annual dose equivalents for the years 1998 through 2002 at the Urenco Capenhurst plant, located in the United Kingdom, were 3.1 mSv (310 mrem), 2.2 mSv (220 mrem), 2.8 mSv (280 mrem), 2.7 mSv (270 mrem), and 2.3 mSv (230 mrem), respectively. For each of those years, the average annual worker dose equivalent was approximately 0.2 mSv (20 mrem) (URENCO, 2000; URENCO, 2001; URENCO, 2002a).

In the United States, individuals receive 2.0 to 3.0 mSv (200 to 300 mrem) per year dose equivalent, on the average, from normal background radiation.

3.11.1.3 Summary of Health Effects

Health effects from radiation exposure became evident soon after the discovery of x-rays in 1895 and radium in 1898. Following World War II, many studies were initiated to investigate the effect of radiation on Japanese populations who survived the atomic bombing of Hiroshima and Nagasaki. The reports of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) (UNSCEAR, 1986; UNSCEAR, 1988) and the National Academy of Sciences Committee of the Biological Effects of Ionizing Radiation (BEIR) (NAS, 1980; NAS, 1988) are comprehensive reviews of the Japanese data. In addition, numerous radiobiological studies have been conducted in animals (e.g., mouse, rat, hamster, dog), and in cells and tissue cultures. Extrapolations to humans from these experiments are problematic and despite the large amount of accumulated data, uncertainties still exist regarding the effects of radiation at low doses and low dose rates. The most reliably estimated risks are those associated with relatively high doses (i.e, greater than 1 Gy (100 rad)) (NCRP, 1989). The radiation health community is in general agreement that risks at smaller doses are at least proportionally smaller (e.g., no more than 1/100 the risk at 1/100 the dose). It is likely that the risks may be considerably smaller (NCRP, 1980).

Serious radiation-induced diseases fall into two categories: stochastic effects and nonstochastic effects. A stochastic effect is defined as one in which the probability of occurrence increases with increasing absorbed dose but the severity in affected individuals does not depend on the magnitude of the absorbed dose (NCRP, 1989). A stochastic effect is an all-or-none response as far as the individuals are concerned. Cancers such as solid malignant tumors, leukemia and genetic effects are regarded as the main stochastic effects to health from exposure to ionizing radiation at low absorbed doses (NCRP, 1989). It is generally agreed among members of the scientific community that a radiation dose of 100 mGy (10 rads) increases the risk of developing cancer in a lifetime by about one percent (NCRP, 1989). In comparison, a nonstochastic effect of radiation exposure is defined as a somatic effect which increases in severity with increasing absorbed dose in affected individuals, owing to damage to increasing numbers of cells and tissues (NCRP, 1989). Examples of nonstochastic effects from radiation exposure are damage to the lens of the eye, nausea, epilation, diarrhea, and a decrease in sperm production in the male (NCRP, 1980; NCRP, 1989). These effects have been observed only following high dose exposures, typically greater than 1 Gy (100 rads) to the whole body (NCRP, 1989). The potential doses to the public due to routine operations at the NEF are presented in ER Section 4.12, Public and Occupational Health Impacts, are several orders of magnitude below the natural background doses discussed here. For further information, NCRP Report No. 64 (NCRP, 1980) provides an overview of research results and data relating to biological effects from radiation exposures.

3.11.2 Major Sources and Levels of Chemical Exposure

The NEF site has no history as an industrial site. Consequently, there are currently no known major sources of chemical exposure at the site that may impact the public. Chemicals that may be brought onto the NEF site during construction or operation of the NEF facility are identified in ER Section 3.12.2.2. ER Section 3.6.2, Existing Levels of Air Pollution and Their Effects on Plant Operations, discusses the regional air quality for both Lea County, New Mexico and

Andrews County, Texas for those parameters or pollutants tracked under EPA requirements, including a listing of existing sources of criteria pollutants, such as volatile organic compounds (VOC). In general, ambient air quality in the region is characterized as very good and in compliance of all EPA criteria for pollutants. ER Section 4.6, Air Quality Impacts, discusses expected NEF emissions of criteria pollutants from house boilers that power the facility's heating system.

3.11.2.1 Occupational Injury Rates

Occupational injury rate at the NEF is expected to be similar to other operating uranium enrichment plants. Common occupational accidents at those plants involve hand and finger injuries, tripping accidents, burns and impacts due to striking objects or falling objects (URENCO, 2000; URENCO 2001, URENCO, 2002a). Table 3.11-1, Lost Time Accidents in Urenco Capenhurst Limited (UCL), tabulates lost time accidents for Urenco Capenhurst Limited (UCL) for the years 1998-2002. The desirable number of lost time accidents is zero. However, URENCO sets a target maximum number of lost time accidents (LTAs) each year. The table specifies this goal as "target max LTAs." URENCO's intent is to foster improvement over time and ultimately bring the goal down to zero LTAs. The target maximum number of LTAs for the NEF is zero. The top three causes of accidents for all severity involve handling tools, slips, trips and falls on the same level and the impact from striking objects or objects falling, and resulted mostly to injuries to fingers and hands. These leading events causes have remained basically the same over the last five-year period (1998-2002). Figure 3.11-1, 2000-2002 Accidents by Cause, illustrates the main causes of all injuries sustained at UCL during 2000, which is representative of the distribution of all lost time accidents over the period 1998-2002.

3.11.2.2 Public and Occupational Exposure Limits

The radiation exposure limits for the general public have been established by the NRC in 10 CFR 20 (CFR, 2003q) and by the EPA in 40 CFR 190 (CFR, 2003f). Table 3.11-2, Public and Occupational Radiation Exposure Limits, summarizes these exposure limits.

The NRC exposure limits place annual restrictions on the total dose equivalent exposure (1 mSv (100 mrem)), which includes external plus internal radiation exposures and dose equivalent rate (0.02 mSv (2 mrem)) in any 1 hour in unrestricted areas that are accessible by members of the public who are not employees, but who may be present during the year at the NEF. The annual whole body (0.25 mSv (25 mrem)), organ (0.25 mSv (25 mrem)), and thyroid (0.75 mSv (75 mrem)) dose equivalent limits established by the EPA apply to members of the public who are at offsite locations (i.e., at or beyond the plant's site boundary). Public exposure at offsite locations due to routine operations comply with the more restrictive EPA limits. Annual exposure to the public is maintained ALARA through effluent controls and monitoring (ER Section 6.1, Radiological Monitoring).

The NRC also places restrictions on radiation exposures incurred by employees at the NEF. The NRC restricts the annual radiation exposure that an employee may receive to a total effective dose equivalent (TEDE) of 50 mSv (5 rem), which includes external and internal exposure. In addition, the NRC places restrictions of the dose equivalent to the lens of the eye (0.15 Sv (15 rem)), skin (0.5 Sv (50 rem)), extremities (0.5 Sv (50 rem)), and on the committed dose equivalent to any internal organ (0.5 Sv (50 rem)). Annual radiation exposure for an employee is controlled, monitored, and maintained ALARA through the radiation safety program at the NEF.

There have been no criticality events or events causing personnel overexposure at Urenco enrichment facilities. During the period from 1972 to 1984, there were 13 reportable worker exposure events of the Urenco Almelo facility in the Netherlands involving releases of small quantities of UF_6. These releases were due to flange or valve leakage. Urenco has stated that there was no impact to the public in any of these releases. In these events, 14 workers were found to have uranium in their urine greater than 50 µg of uranium. After two days, no uranium was detected in urine tests. There have been no reportable events at the Capenhurst or Gronau Urenco facilities. After 1984, there have been no reportable worker exposure events.

Urenco stated to the NRC (NRC, 2002d) that there were two releases to the environment at the Almelo facility in 1998 and 1999. During the releases, concentrations were measured to be 0.8 Bq/m^3 (2.2×10^{-11} µCi/mL) and 1.1 Bq/m^3 (3.0×10^{-11} µCi/mL), respectively, for less than one hour. The total release was less than the 24-hour release limit and much less than the annual release limit. The Dutch release limit is 0.5 Bq/m^3 (1.3×10^{-11} µCi/mL) in one hour. These two releases resulted in a modification to the ventilation system design to add carbon and high efficiency particulate air filters.

The Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) have developed exposure limits for Hydrogen Fluoride (HF). These regulations are enforceable by law. Recommendations for public health have also been developed, but cannot be enforced by law, however accidental release criteria have been established by the EPA for reportability and public protection. Federal organizations that develop recommendations for public health from toxic substances are the Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH). The American Conference of Governmental Industrial Hygienists (ACGIH) also provide occupational exposure limits for HF, which are updated periodically and whose research is used by NIOSH, which in turn provides data and recommendations to OSHA. Lists of these regulations are detailed in Table 3.11-3, Hydrogen Fluoride (HF) Regulations And Guidelines (ACGIH, 2000).

Of primary importance to the NEF is the control of uranium hexafluoride (UF_6). The UF_6 readily reacts with air, moisture, and some other materials. The most significant UF_6 reaction products in this plant are hydrogen fluoride (HF), uranyl fluoride (UO_2F_2), and small amounts of uranium tetrafluoride (UF_4). Of these, HF is the most significant hazard, being toxic to humans. When UF_6 reacts with moisture, it breaks down into UO_2F_2 and HF. See Table 3.11-4, Properties of UF_6 and Table 3.11-5, Chemical Reaction Properties, for further physical and reaction properties.

HF is a colorless, fuming liquid with a sharp, penetrating odor, which is also a highly corrosive chemical. The health dangers of UF_6 stem more from its chemical properties than from its radiological properties. Contact with HF can cause severe irritation of the eyes, inhalation can cause extreme irritation of the respiratory tract, and ingestion can cause vomiting, diarrhea and circulatory collapse. Initial exposure to HF may not cause the appearance of a typical acid burn; instead the skin may appear reddened and painful, with increasing damage occurring over a period of several hours or days. Tissue destruction and loss can occur with contact to HF, and in worst cases large doses of HF can cause death due to the fluoride affecting the heart and lungs. The actual amount of HF that can cause death has not been quantified. Breathing moderate amounts of HF for several months caused rats to develop kidney damage and nervous system changes, as well as learning problems. Inhalation of HF or HF-containing dust will cause skeletal fluorosis, or changes in bones and bone density (HHS, 2001).

OSHA has set a limit of 2.0 mg/m^3 for HF for an 8-hr work shift, while the NIOSH recommendation is 2.5 mg/m^3 (NIOSH, 2001). As with most toxicological information and health exposure regulations, limits have been established based on past exposures, biological tests, accident scenarios and lessons learned, and industrial hygiene data that is continually collected and researched in occupational environments.

It should be noted that the state of California (CAO, 2002) has proposed a much more conservative exposure limit of 30 $\mu g/m^3$ for an 8-hr work shift. This limit is by far the most stringent of any state or federal agency. LES has compared the OSHA and California exposure limits (2.0 mg/m^3 and 30 $\mu g/m^3$, respectively) to the expected HF annual average concentrations from NEF. The annual expected average HF concentration emission from a 3 million SWU/yr Urenco Centrifuge Enrichment Plant was calculated at 3.9 $\mu g/m^3$ at the point of discharge (rooftop) without atmospheric dispersion taken into consideration. This comparison demonstrates that the NEF gaseous HF emissions (at rooftop without dispersion considered) are well below any existing or proposed standards and therefore will have a negligible environmental and public health impact.

TABLES

Table 3.11-1 Lost Time Accidents in Urenco Capenhurst Limited (UCL)

Year	Total Number of Lost Time Accidents (LTAs)	Target Max LTAs[1]	RIDDOR[2] Reportable LTAs	Frequency Rate[3] for Reportable LTAs	OSHA[4] Lost Work Day Case Rate
1998	3	2	1	0.12	0.74
1999	3	2	3	0.37	0.74
2000	4	2	3	0.31	0.82
2001	1	1	0	0	0.23
2002	2	1	1	0.12	0.48

[1] Target maximum number of LTAs is set annually with the intent to foster improvement over time and bring the goal or target down to zero. Target max LTAs for the NEF is zero

[2] RIDDOR Reportable LTA – A lost time accident leading to a major injury or an absence from work of greater than three days (RIDDOR – Reporting of Injuries, Diseases, and Dangerous Occurrences Regulations)

[3] Frequency Rate for Reportable LTAs – Total number of major and greater than three days lost time accidents x 100,000/total hours worked

[4] OSHA Lost Work Day Case Rate – Total number of injuries resulting in absence x 200,000/total hours worked

Table 3.11-2 Public and Occupational Radiation Exposure Limits

Individual	Annual Dose Equivalent Limit	Reference
Worker	50 mSv (5 rem) TEDE 0.5 Sv (50 rem) CDE to any organ 0.15 Sv (15 rem) lens of eye 0.5 Sv (50 rem) skin 0.5 Sv (50 rem) extremity	10 CFR 20 (CFR, 2003q)
General Public	1 mSv (100 mrem) TEDE 0.02 mSv (2 mrem) in any 1 hour period	10 CFR 20 (CFR, 2003q)
	0.25 mSv (25 mrem) whole body 0.25 mSv (25 mrem) any organ 0.75 mSv (75 mrem) thyroid	40 CFR 190 (CFR, 2003f)

Table 3.11-3 Hydrogen Fluoride (HF) Regulations And Guidelines

Agency	Description	Concentration or Quantity	Reference
ACGIH	STEL (ceiling)	3.0 ppm	(ACGIH, 2000)
NIOSH	REL (TWA)	2.5 mg/ m^3	(NIOSH, 2001)
NIOSH	IDLH	30 ppm	(NIOSH, 2001)
OSHA	PEL (8-hr TWA)	2.0 mg/m^3	(CFR, 2003o)
CA	REL	30 $\mu g/m^3$ (40 ppb)	(CAO, 2002)
EPA	Accidental release prevention Toxic end point	0.0160 mg/L	(CFR, 2003s)
EPA	Accidental release prevention Threshold quantity	454 kg (1,000 lbs)	(CFR, 2003t)
OSHA	Highly hazardous chemicals Threshold quantity	454 kg (1,000 lbs)	(CFR, 2003o)
EPA	Superfund – reportable quantity	2,268 kg (5,000 lbs)	(CFR, 2003u)

STEL, Short Term Exposure Limit
REL, Recommended Exposure Limit
IDLH, Immediately Dangerous to Life and Health
TWA, Time Weighted Average
PEL, Permissible Exposure Limit
ACGIH, American Conference of Governmental Industrial Hygienists
NIOSH, National Institute for Occupational Safety and Health
OSHA, Occupational Safety and Health Administration
EPA, Environmental Protection Agency
CA, California (which has its own limits that are open to public comment)
OEHHA, Office of Environmental Health Hazard Assessment

Table 3.11-4 Properties of UF_6

Sublimation Point	101 kPa (14.7 psia) (760 mm Hg) 56.6°C (133.8°F)
Triple Point	152 kPa (22 psia) (1140 mm Hg) 64.1°C (147.3°F)
Density, Solid 20°C (68°F) Liquid, 64.1°C (147.3°F) Liquid, 93°C (200°F) Liquid, 113°C (235°F) Liquid, 121°C (250°F)	5.1 g/cm^3 (317.8 lb/ft^3) 3.6 g/cm^3 (227.7 lb/ft^3) 3.5 g/cm^3 (215.6 lb/ft^3) 3.3 g/cm^3 (207.1 lb/ft^3) 3.3 g/cm^3 (203.3 lb/ft^3)
Heat of Sublimation, 64.1°C (147.3°F)	135,373 J/kg (58.2 BTU/lb)
Heat of Fusion, 64.1°C (147.3°F)	54,661 J/kg (23.5 BTU/lb)
Heat of Vaporization, 64.1°C (147.3°F)	81,643 J/kg (35.1 BTU/lb)
Critical Pressure	4610 kPa (668.8 psia) (34,577 mm Hg)
Critical Temperature	230.2°C (446.4°F)
Specific Heat, Solid, 27°C (81°F)	477 J/kg/°K (0.114 BTU/lb/°F)
Specific Heat, Liquid, 72°C (162°F)	544 J/kg/°K (0.130 BTU/lb/°F)

Table 3.11-5 Chemical Reaction Properties

Major Reactions	**Heat of Reaction* kJ/kg-mole (Btu/lb-mole)**	**Free Energy of Reaction* kJ/kg-mole (Btu/lb-mole)**
UF_6 Decomposition UF_6 ⇨ U + $3F_2$ UF_6 ⇨ UF_4 + F_2	$+2.16 \times 10^{6}$ $(+ 9.29 \times 10^{5})$ $+1.32 \times 10^{5}$ $(+ 1.3 \times 10^{5})$	$+2.03 \times 10^{6}$ $(+ 8.73 \times 10^{5})$ $+2.65 \times 10^{5}$ $(+ 1.14 \times 10^{5})$
UF_6 Hydrolysis UF_6(g) + $2H_2O$(g) ⇨ UO_2F_2(s) + 4HF(g)	-2.11×10^{5} $(- 9.1 \times 10^{4})$	-1.41×10^{5} $(- 6.05 \times 10^{4})$
HF Reaction with Glass HF + SiO_2 ⇨ SiF_4 + $2H_2O$	-1.06×10^{5} $(- 4.58 \times 10^{4})$	-8.37×10^{4} $(- 3.60 \times 10^{4})$

* Reference point = 25°C (77°F) at 101.3 kPa (14.7 psia)

- UF_6 is completely stable with H_2, N_2, O_2 and dry air at ambient temperature.
- UF_6 reacts with most organic compounds to form HF and carbon fluorides.
- Fully fluorinated materials are quite resistant to UF_6 at moderate temperatures.
- UF_6 has metathesis reactions with oxides and hydroxides, for example:

  UF_6 + 2NiO ⇨ UO_2F_2 (s) + Ni*F_2(s)

  UF_6 + Ni(OH)2 ⇨ UO_2F_2 (s) + NiF_2(s) + 2HF

- UF_6 oxidizes metals, for example:

  $2UF_6$ + Ni ⇨ $2UF_5$ + NiF_2

  The reaction of UF_6 with nickel, copper and aluminum produces a protective fluoride film, which slows or stops the reaction.

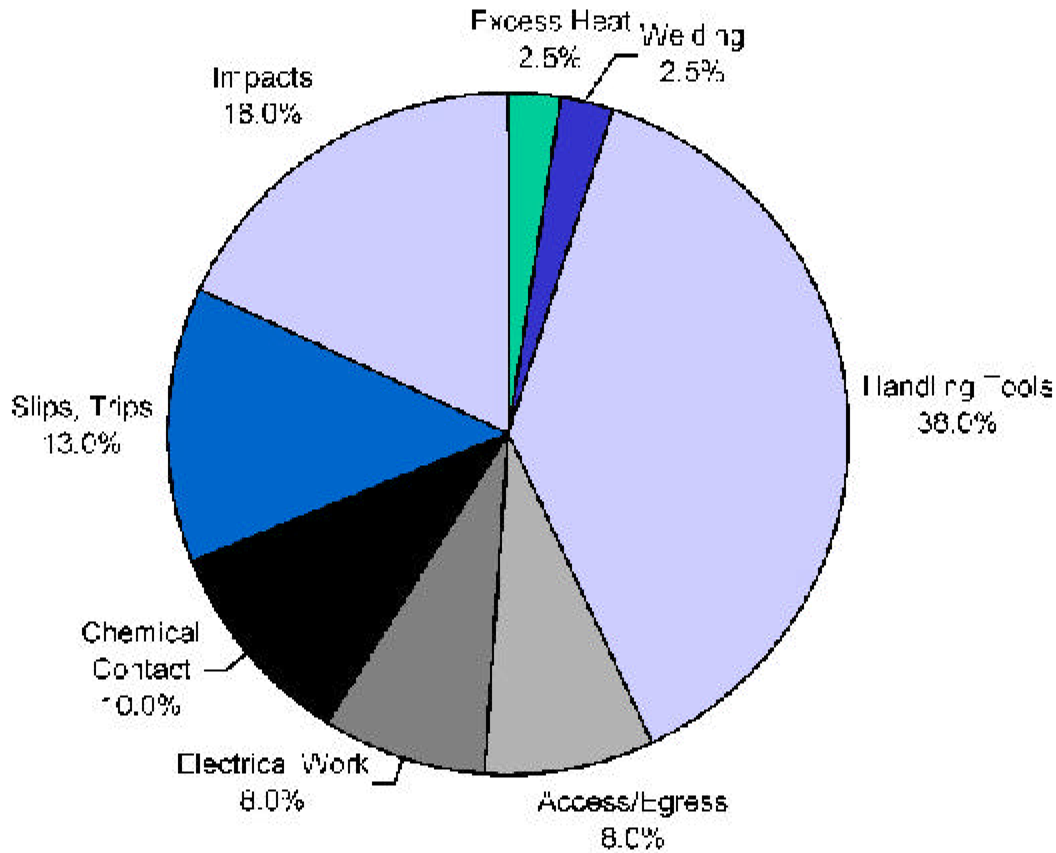
Table 3.11-6 Radiological Chemical Analyses of NEF Site Soil

Page 1 of 1

Analytical Results Bq/kg (pCi/kg)									Comparative Soil Concentration Bq/kg (pCi/kg) (Initial 10 Samples)
Sample No.	**SS-2**	**SS-6**	**SS-9**	**SS-11**	**SS-12**	**SS-13**	**SS-15**	**SS-16**	
Nuclide[1]									
^{228}Ac ^{228}Th	6.7 (181)	5.6 (151)	6.2 (168)	6.5 (175)	7.6 (205)	6.4 (172)	5.8 (156)	7.4 (201)	8.1 (218)[2]
^{137}Cs	4.3 (115.5)	3 (80.7)	3.1 (84)	3.1 (83.5)	2.1 (57.6)	1.2 (32.6)	2.7 (74)	3.3 (89.9)	2.82 (76.3)[3]
^{40}K	137.8 (3720)	140 (3780)	135.2 (3650)	138.9 (3750)	133.7 (3610)	135.6 (3660)	143 (3860)	139.6 (3770)	130 (3,500)[2]
^{228}Th	5.4 (146)	7.7 (207)	5.7 (154)	6.5 (175)	7.7 (207)	7.4 (199)	7.8 (211)	7.4 (200)	8.1 (218)[2]
^{230}Th	5.8 (157)	5.0 (136)	5.9 (160)	5.7 (155)	6 (163)	5.5 (149)	6 (161)	6.8 (183)	NA[4]
^{232}Th	7.6 (204)	6 (163)	6.1 (164)	6.7 (181)	7.3 (196)	7.2 (194)	7.7 (207)	7 (188)	8.1 (218)[2]
^{234}U	5.9 (159.2)	6.1 (165)	6.2 (168.4)	6.1 (165.4)	5.9 (159.4)	5.3 (143)	6.0 (161.5)	6.1 (165.4)	12 (333)[2]
^{235}U	0.24 (6.6)	0.25 (6.7)	0.39 (10.6)	0.43 (11.6)	0.41 (11.1)	0.36 (9.7)	0.28 (7.5)	0.24 (6.4)	NA[4]
^{238}U	5.4 (146.8)	5.9 (158)	6 (161.2)	6.2 (168.5)	6 (162.5)	5.8 (157.6)	5.8 (156.4)	5.7 (152.8)	12 (333)[2]

1 No other nuclides were detected above their laboratory measured MDC.
2 Typical lower end range value.
3 Average in NEF site soils. Credited to past weapons testing fallout.
4 Typical soil concentration data is not available.

FIGURES



REFERENCE NUMBER
Figure 3.11-1.dwg

FIGURE 3.11-1

2000-2002 ACCIDENTS BY CAUSE

ENVIRONMENTAL REPORT

REVISION DATE: DECEMBER 2003

3.12 WASTE MANAGEMENT

Waste Management for the National Enrichment Facility (NEF) is divided into gaseous and liquid effluents, and solid wastes. Descriptions of the sources, systems, and generation rates for each waste stream are discussed in this section. Disposal plans, waste minimization, and environmental impacts are discussed in ER Section 4.13, Waste Management Impacts.

3.12.1 Effluent Systems

The following paragraphs provide a comprehensive description of the NEF systems that handle gaseous and liquid effluent. The effectiveness of each system for effluent control is discussed for all systems that handle and release effluent.

3.12.1.1 Gaseous Effluent Vent System

The function of the Gaseous Effluent Vent System (GEVS) is to remove particulates containing uranium and hydrogen fluoride (HF) from potentially contaminated process gas streams. Prefilters and high efficiency particulate air (HEPA) filters remove particulates and potassium carbonate impregnated activated carbon filters are used for the removal of any HF. Electrostatic filters remove oil vapor from the gaseous effluent associated with exhaust from vacuum pump/chemical trap set outlets wherever necessary.

The systems produce solid wastes from the periodic replacement of prefilters, HEPA filters, and chemical filters. The systems produce no gaseous effluents of their own, but discharge effluents from other systems after treatment to remove hazardous materials. There are two GEVS for the plant: (1) the Separations Building Gaseous Effluent Vent System and (2) the Technical Services Building (TSB) Gaseous Effluent Vent System.

3.12.1.1.1 Sources and Flow Rates

Potentially contaminated exhaust air comes from the rooms and services within the TSB. Air from the Fomblin Oil Recovery System is part of the Decontamination Workshop discharge. The total airflow to be handled by the GEVS for the TSB and Separations Building are 18,700 m^3/hr (11,000 cfm) and 11,000 m^3/hr (6,474 cfm), respectively.

The design requirements for the facility provide a large safety margin between normal and accident conditions so that no single failure could result in the release of significant hazardous material. The amounts of UF_6 in the system also preclude the release of significant quantities of hazardous material from a single failure or multiple failures. Instrumentation is provided to detect abnormal process conditions so that the process can be returned to normal by operator actions.

These requirements and operating conditions also provide assurance that personnel exposure to hazardous materials are maintained "as low as reasonably achievable" and that effluent discharges comply with environmental and safety criteria.

3.12.1.1.2 System Description

The GEVS for the Separations Building and the TSB consists of the following major components:

- Duct system

- Prefilter
- High Efficiency Particulate Air (HEPA) Filter
- Activated carbon filter (impregnated with potassium carbonate)
- Centrifugal Fan
- Monitoring and controls
- Automatically controlled inlet and outlet isolation dampers
- Discharge stack

The GEVS serving the TSB consists of a duct network that serves all of the UF_6 processing systems and operates at negative pressure. The ductwork is connected to one filter station and vents through one fan. Both the filter station and the fan can handle 100% of the effluent. There is no standby filter station or fan. Operations that require the GEVS to be operational will be shut down if the system shuts down. The system capacity is estimated to be 18,700 m^3/hr (11,000 cfm). A differential pressure controller controls the fan speed and maintains negative pressure in front of the filter station.

Gases from the UF_6 processing systems pass through an 85% efficient prefilter. The prefilter removes dust particles and thereby prolongs the useful life of the HEPA filter. Gases then flow through a 99.97% efficient HEPA filter. The HEPA filter removes uranium aerosols which consist of UO_2F_2 particles. Finally, the gases pass through a 99.9% efficient activated charcoal for removal of HF. Specifications for the testing of filter efficiencies will be provided during the design phase. The cleaned gases pass through the fan, which maintains the negative pressure upstream of the filter stations. The cleaned gases are then discharged through the vent stack.

One Separation Building GEVS serves the entire Separations Building. It consists of a duct network that serves all of the uranium processing systems and operates at negative pressure. It is sized to handle the flow from all permanently ducted process locations, as well as up to 13 noncorrugated flexible duct exhaust points at one time. The flexible duct is used for cylinder connection/disconnection or maintenance procedures.

The ductwork is connected to two parallel filter stations. Each is capable of handling 100% of the effluent. One is online and the other is a standby. Each station consists of an 85% efficient prefilter, a 99.97% efficient HEPA filter and a 99.9% efficient activated charcoal filter for removal of HF. The leg of the distribution system securing the exhaust of the vacuum pump/trap set outlets is routed through an electrostatic filter. Electrostatic filters have an efficiency of 97%. Specifications for filter efficiency testing will be provided during the design phase. The filter stations vent through one of two fans. Each fan is capable of handling 100% of the effluent. One fan is online, and the other is a standby. A switch between the operational and standby systems can be made using automatically controlled dampers. The system total airflow capacity is estimated to be 11,000 m^3/hr (6,474 cfm). A differential pressure controller controls the fan speed and maintains negative pressure upstream of the filter station.

Gases from the UF_6 processing systems pass through the prefilter which removes dust and protects the HEPA filter, then through the HEPA filter which removes uranium aerosols (mainly UO_2F_2 particles), then through the potassium carbonate impregnated activated carbon filters which captures HF. The remaining clean gases pass through the fan, which maintains the negative pressure upstream of the filter stations. Finally, the clean gases are discharged through a roof top vent on the TSB. One vent is common to the operational system and the standby system.

3.12.1.1.3 System Operation

For the TSB GEVS, and Separations Building GEVS, HF monitors and alarms are installed downstream of the filtration systems and immediately upstream of the vent stack to detect the release of hazardous materials to the environment. The alarms are monitored in the Control Room.

The units will be located in a dedicated room in the TSB. The filters will be bag-in bag-out. It is estimated that the filters will be changed on a yearly basis or multi-yearly basis.

If the GEVS stops operating, material within the duct will not be released into the building because each of the GEVS connections has a P-trap to catch entrained material that could otherwise fall back into the building from the ductwork during system failure.

3.12.1.1.4 Effluent Releases

Under normal operating conditions, the system will not be contaminated. In the event that an abnormal situation occurs, the GEVS is designed to protect plant personnel against UF_6 and HF exposure. The GEVS is designed to meet all applicable NRC requirements for public and plant personnel safety and effluent control and monitoring. The system design also complies with all standards of OSHA, EPA, and state and local agencies.

The annual discharge of uranium in routine gaseous effluent discharged from the NEF is expected to be less than 10 grams (0.35 ounces). The environmental impacts of gaseous releases and associated doses to the public are described in detail in ER Section 4.12.1.1, Routine Gaseous Effluent.

3.12.1.2 Centrifuge Test and Post Mortem Facilities Exhaust Filtration System

The Centrifuge Test and Post Mortem Facilities Exhaust Filtration System provides exhaust of potentially hazardous contaminants from the Centrifuge Test and Post Mortem Facilities. The system also ensures the Centrifuge Post Mortem Facility is maintained at a negative pressure with respect to adjacent areas. The Centrifuge Test and Post Mortem Facilities Exhaust Filtration System is located in the Centrifuge Assembly Building and is monitored from the Control Room.

Potentially contaminated exhaust air comes from the Centrifuge Test and Post Mortem Facilities. The total airflow to be handled by the Centrifuge Test and Post Mortem Facilities Exhaust Filtration System is 9,345 m^3/hr (5,500 cfm). All flow rates and capacities are subject to change during final design.

The Centrifuge Test and Post Mortem Facilities Exhaust Filtration System consists of a duct network that serves the Centrifuge Test and Post Mortem Facilities and operates at negative pressure. The ductwork is connected to one filter station and vents through either of two 100% fans. Both the filter station and either of the fans can handle 100% of the effluent. One of the fans will normally be in standby. Operations that require the Centrifuge Test and Post Mortem Facilities Exhaust Filtration System to be operational are manually shut down if the system shuts down.

Gases from the associated areas pass through the 85% efficient prefilter which removes dust and protects downstream filters, then through the 99.9% efficient activated charcoal filter that captures HF. Remaining uranic particles, (mainly UO_2F_2) are treated by a 99.7% efficient HEPA filter. After filtration, the clean gases pass through a fan, which maintains the negative pressure upstream of the filter station. The clean gases are then discharged through the monitored (alpha and HF) stack on the Centrifuge Assembly Building.

3.12.1.3 Liquid Effluent System

Quantities of radiologically contaminated, potentially radiologically contaminated, and nonradiologically contaminated aqueous liquid effluents are generated in a variety of operations and processes in the TSB and in the Separations Building. The majority of all potentially radiologically contaminated aqueous liquid effluents are generated in the TSB. All aqueous liquid effluents are collected in tanks that are located in the Liquid Effluent Collection and Treatment System in the TSB. The collected effluent is sampled and analyzed.

3.12.1.3.1 Effluent Sources and Generation Rates

Numerous types of aqueous and non-aqueous liquid wastes are generated in the plant. These effluents may be significantly radiologically contaminated, potentially contaminated with low amounts of contamination, or non-contaminated. Effluents include:

- Hydrolyzed uranium hexafluoride and aqueous laboratory effluent

  These hydrolyzed uranium hexafluoride solutions and the aqueous effluents are generated during laboratory analysis operations and require further processing for uranium recovery.

- Degreaser Water

  This is water, which has been used for degreasing contaminated pump and plant components coated in Fomblin oil. The oil, which is heavier than water will be separated from the water via gravity separation, and the suspended solids filtered, prior to routing for uranium recovery. Most of the soluble uranium components dissolve in the degreaser water.

- Citric Acid

  The decontamination process removes a variety of uranic material from the surfaces of components using citric acid. The citric acid tank contents comprise a suspension, a solution and solids, which are strongly uranic and need processing. The solids fall to the bottom of the citric acid tank and are separated, in the form of sludge, from the citric acid using gravity separation. The other sources of citric acid is from the UF_6 Sample Bottles cleaning rig and flexible hose decontamination cabinet. Part of the cleaning process involves rinsing them in 5-10% by volume citric acid.

- Laundry Effluent

  This is water that has arisen from the washing of the plant personnel laundry including clothes and towels. The main constituents of this wastewater are detergents, bleach and very low levels of dissolved uranium based contaminants. This water is routed into a collection tank, monitored and neutralized as required. The effluent is contained and treated on the NEF site.

- Floor Washings

  This is water, which has arisen from all the active areas of the plant namely the UF_6 Handling Area, Chemical Laboratories, Decontamination Workshop and Rebuild Workshop. The main constituents of this wastewater are detergents, and very low levels of dissolved uranium based contaminants. This water is routed into a collection tank and monitored prior to routing for uranium recovery.

- Miscellaneous Condensates

  This is water which has arisen from the production plant during the defrost cycle of the low temperature take off stations. This water is collected in a common holding tank with floor washings, monitored and pumped into the Miscellaneous Effluent Collection Tank prior to routing.

- Radiation Areas Hand Washing and Shower Water

  Plant personnel generate this uncontaminated water from hand washing and showering. This water is collected and monitored and then released to the Treated Effluent Evaporative Basin.

3.12.1.3.2 System Description

Aqueous laboratory effluents with uranic concentrations are sampled to determine their uranic content and then pumped from the labs to the agitated Miscellaneous Effluent Collection Tank in the Liquid Effluent Collection and Treatment Room. Floor washings are sampled to determine their uranic content and then manually emptied into the tank. Condensate may be either manually transported or piped to the tank after sampling.

All water from the personnel hand washes and showers in the TSB, Separations Building, Blending and Liquid Sampling Area, the Centrifuge Test Facility and the Centrifuge Post Mortem Facility goes to the Hand Wash/Shower Monitor Tanks in the Liquid Effluent Collection and Treatment Room. Since these effluents are expected to be non-contaminated, no agitation is provided in these tanks. Samples of the effluents are regularly taken to the laboratory for analysis. Lab testing determines pH, soluble uranic content, and insoluble uranic content.

All washing machine water is discharged from the clothes washers to the Laundry Effluent Monitor Tanks in the Liquid Effluent Collection and Treatment Room. Due to the very low uranium concentration of this effluent and the constant flow into these tanks, they are not agitated. Samples of the effluents are regularly taken to the laboratory for determination of pH, soluble uranic content, and insoluble uranic content. Based on operating plant experience, the clothes washed contain very small amounts of uranyl fluoride (UO_2F_2) and trace amounts of uranium tetrafluoride (UF_4). Following sampling, the laundry effluent is sent to the Treated Effluent Evaporative Basin.

Effluents containing uranium are treated in the Precipitation Treatment Tank to remove the majority of the uranium that is in solution. After the effluent is transferred to the Precipitation Treatment Tank, a precipitating agent, such as potassium hydroxide (KOH) or sodium hydroxide (NaOH), is added. The addition of the precipitating agent raises the pH of the effluent to the range of 9 to 12. This treatment renders the soluble uranium compounds insoluble and they precipitate from the solution. The tank contents are constantly agitated to provide a homogeneous solution. The precipitated compounds are then removed from the effluent by circulation through a small filter press. The material removed by the filter press is deposited in a container and sent for off-site low-level radioactive waste disposal.

The clean effluent is re-circulated back to the Precipitation Treatment Tank. Depending on the characteristics of the effluent, the effluent may have to be circulated through the filter press numerous times to obtain the percent of solids removal required. A sample of the effluent is taken to determine when the correct percent solids have been removed. When it is determined that the correct amount of solids have been removed, the effluent is transferred to the Contaminated Effluent Hold Tank.

The effluent in the Contaminated Effluent Hold Tank is then transferred to the agitated Evaporator/Dryer Feed Tank. Acid is added via a small chemical addition unit to reduce the pH back down to 7 or 8. This is necessary to help minimize corrosion in the Evaporator/Dryer.

From the Evaporator/Dryer Feed Tank, the effluent is pumped to the Evaporator/Dryer. The Evaporator/Dryer is an agitated thin film type that separates out the solids in the effluent. The Evaporator/Dryer is heated by steam in a jacket or from an electric coil. As the effluent enters the Evaporator/Dryer, the effluent is heated and vaporized. The Evaporator/Dryer discharges a "dry" concentrate into a container located at the bottom of the Evaporator/Dryer. Container contents are monitored for criticality, labeled, and stored in the radioactive waste storage area. When full, the container is sent for shipment offsite to a low-level radioactive waste disposal facility. Liquid vapor exits the evaporator and is condensed in the Evaporator/Dryer Condenser, which is cooled with chilled water.

The condensate from the Evaporator/Dryer Condenser is collected in the Distillate Tank before being transferred to one of the Treated Effluent Monitor Tanks. The effluent in these tanks is sampled and tested for pH and uranic content to ensure compliance with administrative guidelines prior to release to the double-lined Treated Effluent Evaporative Basin with leak detection. If the lab tests show the effluent does not meet administrative guidelines, the effluent can be further treated. Depending on what conditions the lab testing show, the effluent is either directed back to the Evaporator/Dryer Feed Tank for another pass through the Evaporator/Dryer, or it can be directed through the Mixed Bed Demineralizers. After either option, the effluent is transferred back to a Treated Effluent Monitor Tank where it is again tested. When the lab tests are acceptable, the effluent is released to the Treated Effluent Evaporative Basin.

The Citric Acid Tank in the Decontamination Workshop is drained, all the effluent is transferred to the Spent Citric Acid Collection Tank in the Liquid Effluent Collection and Treatment Room . A "sludge" remains in the bottom of the Citric Acid Tank. This "sludge" consists primarily of uranium and metal particles. This sludge is flushed out with deionized water (DI). The combination of the sludge and the DI water also goes to the Spent Citric Acid Collection Tank. The spent citric acid effluent/sludge contains the wastes from the Sample Bottle and Flexible Hose Decontamination Cabinets, which are manually transferred to the Citric Acid Tank in the Main Decontamination System. The contents of the Spent Citric Acid Collection Tank are constantly agitated to keep all solids in suspension and to provide a homogeneous solution. This is necessary to prevent build-up of uranic material in the bottom of the tank.

The Degreaser Tank in the Decontamination Workshop is drained, and the effluent is transferred to the Degreaser Water Collection Tank in the Liquid Effluent Collection and Treatment Room. A "sludge" remains in the bottom of the Degreaser Tank after the degreasing water is drained. This "sludge" consists primarily of Fomblin oil and uranium. This sludge is flushed out with DI water. The combination of the sludge and the DI water also goes to the Degreaser Water Collection Tank. The contents of the Degreaser Water Collection Tank remain agitated to keep all solids in suspension and to provide a homogeneous solution. This is necessary to prevent build-up of uranic material in the bottom of the tank. Since this effluent contains Fomblin oil, it is not possible to send the degreaser water to the Precipitation Treatment Tank for treatment. Therefore, the Fomblin oil must be removed first.

For Fomblin oil removal, the contents of the Degreaser Water Collection Tank circulate through a small centrifuge. The oil and sludge are centrifuged off, collected in a container, and sent for offsite low-level radioactive waste disposal.

3.12.1.3.3 System Operation

Handling and eventual disposition of the aqueous liquid effluents is accomplished in two stages, collection and treatment. All aqueous liquid effluents are collected in tanks that are located in the Liquid Effluent Collection and Treatment Room in the TSB.

There are other tanks in the Liquid Effluent Collection and Treatment Room used for monitoring and treatment prior to release to the Treated Effluent Evaporative Basin.

The Spent Citric Acid Collection Tank, Degreaser Water Tank, Miscellaneous Effluent Collection Tank, and Precipitation Treatment Tank are all located in a contained area. The containment consists of a curb around all the above-mentioned tanks. The confined area is capable of containing at least one catastrophic failure of one given tank 1,325 L (350 gal), minimum. In the event of a tank failure, the effluent in the confined area is pumped out with a portable pump set.

Reduced volume, radiologically contaminated wastes that are a by-product of the treatment system, as well as contaminated non-aqueous wastes, are packaged and shipped to a licensed low-level radioactive waste disposal facility.

3.12.1.3.4 Effluent Discharge

Total liquid effluent from the NEF is estimated at 2,535 m^3/yr (669,844 gal/yr). The uranium source term used in this report for routine liquid effluent releases from the NEF is 2.1×10^6 Bq (56 µCi) per year and is comprised of airborne uranium particulates created due to resuspension at times when the Treated Effluent Evaporative Basin is dry. There is no plant tie-in to a Publicly Owned Treatment Works (POTW). Instead, all effluents are contained on the NEF site. Accordingly, all contaminated liquid effluents are treated and sent to the double-lined Treated Effluent Evaporative Basin with leak detection on the NEF site.

Decontamination, Laboratory and Miscellaneous Liquid Effluents are treated to meet the requirements of 10 CFR 20.2003, 10 CFR 20, Appendix B, Table 3 (CFR, 2003q) and the administrative levels recommended by Regulatory Guide 8.37 (NRC, 1993). The treated effluent is discharged to the double-lined Treated Effluent Evaporative Basin, which has leak detection.

The Treated Effluent Evaporative Basin consists of two synthetic liners with soil over the top liner. The Treated Effluent Evaporative Basin will have leak detection capabilities. At the end of plant life, the sludge and soil over the top of the uppermost liner and the liner itself will be disposed of, as required, at a low-level radioactive waste repository.

Hand Wash and Shower Effluents are not treated. These effluents are discharged to the same Treated Effluent Evaporative Basin as for the Decontamination, Laboratory and Miscellaneous Effluents. Laundry Effluent is treated if necessary and discharged to this basin as well.

Cooling Tower Blowdown Effluent is discharged to a separate on-site basin, the UBC Storage Pad Retention Basin. The single-lined retention basin is used for the collection and monitoring of rainwater runoff from the UBC Storage Pad and to collect cooling tower blowdown. A third unlined basin is used for the collection and monitoring of general site stormwater runoff.

Six septic systems are planned for the NEF site. Each septic system will consist of a septic tank with one or more leachfields. Figure 3.12-1, Planned Septic Tank System Locations, shows the planned location of the six septic tank systems.

The six septic systems are capable of handling approximately 40,125 liters per day (10,600 gallons per day) based on a design number of employees of approximately 420. Based on the actual number of employees, 210, the overall system will receive approximately 20,063 liters per day (5,300 gallons per day). Total annual design discharge will be approximately 14.6 million liters per year (3.87 million gallons per year). Actual flows will be approximately 50 percent of the design values.

The septic tanks will meet manufacturer specifications. Utilizing the percolation rate of approximately 3 minutes per centimeter (8 minutes per inch) established by actual test on the site, and allowing for 76 to 114 liters (20 to 30 gallons) per person per day, each person will require 2.7 linear meters (9 linear feet) of trench utilizing a 91.4-centimeter (36-inch) wide trench filled with 61 centimeters (24 inches) of open graded crushed stone. As indicated above, although the site population during operation is expected to be 210 persons, the building facilities are designed by architectural code analysis to accommodate up to 420 persons. Therefore, a total of approximately 975 linear meters (3,200 linear feet) of percolation drain field will be required. The combined area of the leachfields will be approximately 892 square meters (9,600 square feet).

3.12.2 Solid Waste Management

Solid waste generated at the NEF will be grouped into industrial (nonhazardous), radioactive and mixed, and hazardous waste categories. In addition, solid radioactive and mixed waste will be further segregated according to the quantity of liquid that is not readily separable from the solid material. The solid waste management systems will be a set of facilities, administrative procedures, and practices that provide for the collection, temporary storage, (no solid waste processing is planned), and disposal of categorized solid waste in accordance with regulatory requirements. All solid radioactive wastes generated will be Class A low-level wastes (LLW) as defined in 10 CFR 61 (CFR, 2003r).

Industrial waste, including miscellaneous trash, vehicle air filters, empty cutting oil cans, miscellaneous scrap metal, and paper will be shipped offsite for minimization and then sent to a licensed waste landfill. The NEF is expected to produce approximately 172,500 kg (380,400 lbs) of this normal trash annually. Table 3.12-2, Estimated Annual Non-Radiological Wastes, describes normal waste streams and quantities.

Radioactive waste will be collected in labeled containers in each Restricted Area and transferred to the Radioactive Waste Storage Area for inspection. Suitable waste will be volume-reduced and all radioactive waste disposed of at a licensed low-level waste (LLW) disposal facility.

Hazardous wastes (e.g., spent blasting sand, empty spray paint cans, empty propane gas cylinders, solvents such as acetone and toluene, degreaser solvents, diatomaceous earth, hydrocarbon sludge, and chemicals such as methylene chloride and petroleum ether) and some mixed wastes will be generated at the NEF. These wastes will also be collected at the point of generation, transferred to the Waste Storage Area, inspected, and classified. Any mixed waste that may be processed to meet land disposal requirements may be treated in its original collection container and shipped as LLW for disposal. Table 3.12-2, Estimated Annual Non-radiological Wastes, denotes hazardous waste and quantities.

3.12.2.1 Radioactive and Mixed Wastes

Solid radioactive wastes are produced in a number of plant activities and require a variety of methods for treatment and disposal. These wastes are categorized into wet solid waste and dry solid waste due to differences in storage and disposal requirements found in 40 CFR 264 (CFR, 2003v) and 10 CFR 61 (CFR, 2003r), respectively. Dry wastes are defined as in 10CFR 61 (CFR, 2003r, Subpart 61.56 (a)(3)), containing "as little free standing and non-corrosive liquid as is reasonably achievable, but in no case shall the liquid exceed 1% of the volume." Wet wastes, for NEF, are defined as those that have as little free liquid as reasonably achievable but with no limit with respect to percent of volume.

All solid radioactive wastes generated are Class A low-level wastes as defined in 10CFR 61 (CFR, 2003r). Wastes are transported offsite for disposal by contract carriers. Transportation is in compliance with 49 CFR 107 and 49 CFR 173 (CFR, 2003k; CFR 2003l).

The Solid Waste Collection System is simply a group of methods and procedures applied as appropriate to the various solid wastes. Each individual waste is handled differently according to its unique combination of characteristics and constraints. Wet and dry waste handling is described separately below. (Wastes produced by waste treatment vendors are handled by the vendors and are not addressed here.)

3.12.2.1.1 Wet Solid Wastes

The wet waste portion of the Solid Waste Collection System handles all radiological, hazardous, mixed, and industrial solid wastes from the plant that do not meet the above definition of dry waste. This portion handles several types of wet waste: wet trash, oil recovery sludge, oil filters, miscellaneous oils (e.g., cutting machine oil) solvent recovery sludge, and uranic waste precipitate. The system collects, identifies, stores, and prepares these wastes for shipment. Waste that may have a reclamation or recycle value (e.g., miscellaneous oils) may be packaged and shipped to an authorized waste reclamation firm for that purpose.

Wet solid wastes are segregated into radioactive, hazardous, mixed, or industrial waste categories during collection to minimize recycling and/or disposal problems. Mixed waste is that which includes both radioactive and hazardous waste. Industrial waste does not include either hazardous or radioactive waste.

The Solid Waste Collection System involves a number of manual steps. Handling of each waste type is addressed below.

3.12.2.1.1.1 Wet Trash

In this plant trash typically consists of waste paper, packing material, clothing, rags, wipes, mop heads, and absorption media. Wet trash consists of trash that contains water, oil, or chemical solutions.

Generation of radioactive wet trash is minimized insofar as possible. Trash with radioactive contamination is collected in specially marked plastic-bag-lined drums. These drums are located throughout each Restricted Area. Wet trash is collected in separate drums from dry trash. When the drum of wet trash is full, the plastic bag is removed from the drum and sealed. The bag is checked for leaks and excessive liquid. The exterior of the bag is monitored for contamination. If necessary, excess liquids are drained and the exterior is cleaned. The bag may be placed in a new clean plastic bag. The bag is then taken to the Radioactive Waste Storage Area where the waste is identified, labeled, and recorded.

The radioactive trash is shipped to a Control Volume Reduction Facility (CVRF) that can process wet trash. The licensed CVRF reduces the volume of the trash and then repackages the resulting waste for disposal. The waste package is then shipped to a licensed radioactive waste disposal facility.

Trash with hazardous contamination is collected in specially marked plastic-lined drums. Wet trash is collected separately from dry trash. When full, the drum is taken to the Solid Waste Collection Room (SWCR) and the plastic bag containing wet trash is removed from the container, sealed, and the exterior is monitored for hazardous material, and cleaned if necessary. The trash is identified, labeled, and recorded. All hazardous trash is stored in the Hazardous Waste Area until it is shipped to a hazardous waste disposal facility. Different types of hazardous materials are not mixed in order to avoid accidental reactions.

Empty containers that at one time contained hazardous materials are a special type of hazardous waste, as discussed in 40 CFR 261 (CFR, 2003p). After such a container is emptied, it is resealed and taken to the Hazardous Waste Area for identification, labeling, and recording. The container is handled as hazardous waste and is shipped to a hazardous waste processing facility for cleaning or disposal. Alternately, the container is used to store compatible hazardous wastes and to ship those wastes to a hazardous waste processing facility for processing and container disposal.

"Mixed" trash results from using wipes and rags with solvent on uranium-contaminated components. It is collected in appropriate containers and segregated from other trash. The waste is identified, labeled, recorded, and stored in accordance with regulations for both hazardous and radioactive wastes. Mixed waste is shipped to a facility licensed to process mixed waste. Waste resulting from the processing is then forwarded to a qualified disposal facility licensed to dispose of the particular resulting waste.

Industrial trash is collected in specially marked receptacles in all parts of the plant. The trash from Restricted Areas is collected in plastic bags and taken to the Radioactive Waste Storage Room in the TSB for inspection to ensure that no radioactive contamination is present. The inspected trash and the trash from the Controlled Area are then taken to one of several large containers around the plant. The trash is stored in these containers until a contract carrier transports them to a properly permitted sanitary landfill.

3.12.2.1.1.2 Oil Recovery Sludge

The process for recovering used Fomblin oil generates an oily sludge that must be disposed of offsite. The sludge results from the absorption of hydrocarbons in activated carbon and diatomaceous earth. Sodium carbonate, charcoal, and celite also contribute to this sludge. A contracted radioactive waste processor will process the waste at an offsite location. Alternatively, the waste may be shipped offsite to a CVRF for volume reduction. Regulations and technology current at the time of waste production will dictate treatment methods. In either case the waste is finally disposed of at a licensed low-level radioactive waste disposal facility.

3.12.2.1.1.3 Oil Filters

Used oil filters are collected from the diesel generators and from plant vehicles. No filters are radioactively contaminated. The used filters are placed in containers and transported to the waste storage area of the TSB. There the filters are drained completely and transferred to a drum. The drained waste oil is combined with other waste oil and handled as hazardous waste. The drum is then shipped to an offsite waste disposal contractor.

3.12.2.1.1.4 Resins

Spent resins will not be part of any routine waste stream at the NEF. Use of the Mixed-Bed Demineralizer in liquid waste treatment is a final polishing step, and the resin is expected to last the life of the plant. The demineralizer resin will be properly processed and disposed when the NEF is decommissioned.

3.12.2.1.1.5 Solvent Recovery Sludge

Solvent is used in degreasers and in the workshops. The degreasers are equipped with solvent recovery stills. The degreasers in the decontamination area and the contaminated workshop area handle radioactive components. Solids and sludge removed from these stills and degreasers are collected, labeled, and stored as mixed waste. The waste is shipped to a facility licensed to process mixed waste. Waste resulting from the processing is then forwarded to a licensed disposal facility for the particular resulting waste.

The Vacuum Pump Rebuild Workshop degreaser handles only decontaminated components, so the solids and sludge removed from this degreaser (after checking for radioactivity) are collected, labeled, and stored as hazardous waste. This hazardous waste is shipped to a licensed hazardous waste disposal facility.

3.12.2.1.1.6 Uranic Waste Precipitate

Aqueous uranic liquid waste is processed to remove most of the uranium prior to evaporation of the liquid stream in the Evaporator/Dryer. This aqueous waste is primarily from the decontamination degreaser, citric acid baths and the laboratory. The uranium is precipitated out of solution and water is removed by filter press. The remaining precipitate is collected, labeled, and stored in the radioactive waste storage area. The waste is sent to a licensed low-level radioactive waste disposal facility.

3.12.2.1.2 Dry Solid Wastes

The dry waste portion of the Solid Waste Collection and Processing System handles dry radiological, hazardous, mixed, and industrial solid wastes from the plant. These wastes include: trash (including miscellaneous combustible, non-metallic items), activated carbon, activated alumina, activated sodium fluoride, HEPA filters, scrap metal, laboratory waste and dryer concentrate. The system collects, identifies, stores, and prepares these wastes for shipment.

All solid radioactive wastes generated are Class A low-level wastes as defined in 10 CFR 61 (CFR, 2003r).

The Solid Waste Collection and Processing System involves a number of manual steps. Handling for each waste type is addressed below.

3.12.2.1.2.1 Trash

Trash consists of paper, wood, gloves, cloth, cardboard, and non-contaminated waste from all plant areas. Some items require special handling, and are not included in this category, notably: paints, aerosol cans, and containers in which hazardous materials are stored or transported. Trash from Restricted Areas is collected and processed separately from non-contaminated trash.

The sources of dry trash are the same for the wet trash, and dry trash is handled in much the same way as wet trash. ER Section 3.12.2.1.1.1, Wet Trash, describes the handling of wet trash in more detail. Only the differences between wet and dry trash handling are discussed below.

Steps to remove liquids are of course unnecessary for dry trash. The dry waste portion of the Solid Waste Collection System accepts wet trash that has been dewatered, as well as dry trash.

Radioactive trash is shipped to a CVRF. The CVRF reduces the volume of the trash and then repackages the resulting waste for disposal. Waste handled by the CVRF will be disposed of in a radioactive waste disposal facility.

Trash containing hazardous material is handled as described above in ER Section 3.12.2.1.1.1 regarding the wet waste portion of the Solid Waste Collection System.

Aerosol spray cans may be disposed of as trash if they are first totally discharged and then punctured. Special receptacles for spray cans used in the Separations Building are provided. Each can is inspected for radioactive contamination to ensure total discharge and puncture before it can be included with industrial trash.

"Mixed" trash is handled as described above in ER Section 3.12.2.1.1.1. Mixed trash is generated by the use of rags and wipes, with solvent, on radioactively contaminated components.

3.12.2.1.2.2 Activated Carbon

Activated carbon is used in a number of systems to remove uranium compounds from exhaust gases. Due to the potential hazard of airborne contamination, personnel use respiratory protection equipment during activated carbon handling to prevent inhalation of material. Spent or aged carbon is carefully removed, immediately packaged to prevent the spread of contamination and transported to the Ventilated Room in the TSB. There the activated carbon is removed and placed in an appropriate container to preclude criticality. The contents of that container are sampled to determine the quantities of HF and ^{235}U present. The container is then sealed, monitored for external contamination, and properly labeled. It is then temporarily stored in the Waste Storage Room with radioactive waste. Depending on the mass of uranium in the carbon material, the container may be shipped directly to a low-level radioactive waste disposal facility or to a CVRF. The CVRF reduces the volume of the waste and then repackages the resulting waste for shipment to a low-level radioactive waste disposal facility. The NEF shall comply with all limitations imposed by the burial site and the CVRF on the contained mass of ^{235}U in the carbon filter material that is shipped to their facilities by the NEF.

GEVS carbon filters are discussed in ER Section 3.12.2.1.2.5, Filter Elements, below. Carbon filters are also used in the laboratories where they can become contaminated with hazardous as well as radioactive material. The filters are handled according to their known service. Those filters that are potentially hazardous are handled as hazardous, and those potentially containing both hazardous and radioactive material are handled as mixed wastes. Each type of waste is collected, labeled, stored, and recorded, and is then shipped to an appropriately licensed facility for processing/disposing of hazardous and/or mixed waste.

3.12.2.1.2.3 Activated Alumina

Activated alumina in alumina traps is used in a number of systems to remove HF from exhaust gases. Activated alumina (Al_20_3) as a waste is in granular form. Most activated alumina in the plant is contaminated; instrument air desiccant is not contaminated. The hold up of captured contaminants on the alumina is checked by weighing and the alumina is changed out when near capacity.

Spent or aged alumina is carefully removed in the Ventilated Room in the TSB to prevent the spread of contamination. There the activated alumina is removed and placed in an appropriate container. The contents of a full container are sampled to determine the quantity of ^{235}U present. The container is then sealed, the exterior is monitored for contamination, and the container is properly labeled. It is stored in the Radioactive Waste Storage Room until it is shipped to a radioactive waste disposal facility.

Activated alumina is also used as a desiccant in the Compressed Air System. This alumina is not radioactively contaminated, is non-hazardous and is replaced as necessary. It is disposed of in a landfill.

3.12.2.1.2.4 Activated Sodium Fluoride

Activated sodium fluoride (NaF) is used in the Contingency Dump System to remove UF_6 and HF from exhaust gases. NaF adsorbs up to either 150% of its weight in UF_6 or 50% of its weight in HF. The Contingency Dump System is not expected to operate except during transient conditions that occur during a power failure. The NaF is not expected to saturate during the life of the plant. However, if the system is used often and the NaF saturates, the NaF is removed by personnel wearing respirators and using special procedures for personnel protection. A plastic bag is placed over the vessel and sealed, and the vessel is turned upside down to empty the NaF. Spent contaminated NaF, if ever produced, is processed by a contractor to remove uranium so the wastes may be disposed at a licensed waste facility. It is expected that NaF will not require treatment and disposal until decommissioning.

3.12.2.1.2.5 Filter Elements

Prefilters and HEPA filters are used in several places throughout the plant to remove dust and dirt, uranium compounds, and hydrogen fluoride. Air filters, as a waste, consist of fiberglass or cellulose filters. Generally, only the Gaseous Effluent Vent System filters are contaminated and will contain much less than 1% by weight of UO_2F_2. HVAC filters, instrument air filters, air cooling filters from product take-off and blending systems, and standby generator air filters are not contaminated. HF-resistant HEPA filters are composed of fiberglass.

Filters associated with the HVAC System in the Centrifuge Assembly Building are used to remove dust and dirt from incoming air to ensure the cleanliness of the centrifuge assembly operation. When removed from the housing, the filter elements are wrapped in plastic to prevent the loss of particulate matter. These filter elements are not contaminated with radioactive or hazardous materials so disposal occurs with other industrial trash.

Filters used in the Gaseous Effluent Vent Systems, and Centrifuge Test and Post Mortem Facilities Exhaust Filtration System are used to remove HF and trace uranium compounds from the exhaust air stream. When the filters become loaded with particulate matter, they are removed from the housings and wrapped in plastic bags to prevent the spread of radioactive contamination. Due to the hazard of airborne contamination, either portable ventilation equipment or respiratory protection equipment is used during filter handling to prevent the inhalation of material by plant personnel. The filters are taken to the Solid Waste Collection Room in the TSB where they are sampled to determine the quantity of ^{235}U present. The exterior of the bag is monitored for contamination, the package is properly marked and placed in storage. The filter elements are sent to a CVRF for processing and shipped to a low-level radioactive waste disposal facility.

Air filters from the non-contaminated HVAC systems, Compressed Air System and the Diesel Generators are handled as industrial waste.

3.12.2.1.2.6 Scrap Metal

Metallic wastes are generated during routine and abnormal maintenance operations. The metal may be clean, contaminated with radioactive material hazardous material. Radioactive contamination of scrap metal is always in the form of surface contamination caused by uranium compounds adhering to the metal or accumulating in cracks and crevices. No process in this facility results in activation of any metal materials.

Clean scrap metal is collected in bins located outside the Technical Services Building. This material is transported by contract carrier to a local scrap metal vendor for disposal. Items collected outside of Restricted Areas are disposed of as industrial scrap metal unless there is reason to suspect they contain hazardous material.

Scrap metal is monitored for contamination before it leaves the site. Metal found to be contaminated is either decontaminated or disposed of as radioactive waste. When feasible, decontamination is the preferred method.

Decontamination is performed in situ for large items and in the Decontamination Workshop for regular items used in performing maintenance. Decontamination of large items should not be required until the end of plant life. Items that are not suitable for decontamination are inspected to determine the quantity of uranium present, packaged, labeled, and shipped either to a CVRF or a radioactive waste disposal facility.

Metallic items containing hazardous materials are collected at the location of the hazardous material. The items are wrapped to contain the material and taken to the Waste Storage Room.

The items are then cleaned onsite if practical. If onsite cleaning cannot be performed then the items are sent to a hazardous waste processing facility for offsite treatment or disposal.

3.12.2.1.2.7 Laboratory Waste

Small quantities of dry solid hazardous wastes are generated in laboratory activities, including small amounts of unused chemicals and materials with residual hazardous compounds. These materials are collected, sampled, and stored in the Waste Storage Room of the TSB. Precautions are taken when collecting, packaging, and storing to prevent accidental reactions. These materials are shipped to a hazardous waste processing facility where the wastes will be prepared for disposal.

Some of the hazardous laboratory waste may be radioactively contaminated. This waste is collected, labeled, stored, and recorded as mixed waste. This material is shipped to a licensed facility qualified to process mixed waste for ultimate disposal.

3.12.2.1.2.8 Evaporator/Dryer Concentrate

Potentially radioactive aqueous waste is evaporated in the Evaporator/Dryer to remove uranium prior to release to the dedicated double-lined Treated Effluent Evaporative Basin. The Liquid Waste Disposal (LWD) Dryer discharges dry concentrate directly into drums. These drums are checked for ^{235}U content, labeled, and stored in the radioactive waste storage area. The concentrate is shipped to a licensed low-level radioactive waste disposal facility.

3.12.2.1.2.9 Depleted UF_6

The enrichment process yields depleted UF_6 streams with assays ranging from 0.20 to 0.34 $^{w}/_{o}$ ^{235}U. The approximate quantity and generation rate for depleted UF_6 is 7,800 MT (8,600 tons) per year. This equates to approximately 625 cylinders of UF_6 per year. The Uranium Byproduct Cylinders (UBCs) will be temporarily stored onsite before transfer to a processing facility and subsequent reuse or disposal. The UBCs are stored in an outdoor storage area known as the UBC Storage Pad.

The UBC Storage Pad consists of an outdoor storage area with concrete saddles on which the cylinders rest. A mobile transporter transfers cylinders from the Cylinder Receipt and Dispatch Building (CRDB) to the UBC Storage Area. UBC cylinder transport between the Separations Building and the storage area is discussed in the Safety Analysis Report Section 3.4.11.2, Cylinder Transport Within the Facility. Refer to ER Section 4.13.3.1, Radioactive and Mixed Waste Disposal Plan, for information regarding LES's depleted UF_6 management practices (LES, 1994; NRC, 1994a).

Storage of UBC will be for a temporary period until shipped offsite for use or disposal. Refer to ER Section 4.13.3.1 for the range of options for UBC disposition.

The *Depleted Uranium Hexafluoride Management Study* (LES, 1991b), provides a plan for the storage of UBCs in a safe and cost-effective manner in accordance with all applicable regulations to protect the environment (DOE, 2001b).

The potential environmental impacts from direct exposure are described in ER Section 4.12.2.1.3, Direct Radiation Impacts. For the purposes of the dose calculation in that section, the UBC Storage Pad has a capacity of 15,727 containers. A detailed discussion on the environmental impacts associated with the storage and ultimate disposal of UBCs is provided in ER Section, 4.13.3.1.1, Uranium Byproduct Cylinder (UBC) Storage.

3.12.2.2 Construction Wastes

Efforts are made to minimize the environmental impact of construction. Erosion, sedimentation, dust, smoke, noise, unsightly landscape, and waste disposal are controlled to practical levels and permissible limits, where such limits are specified by regulatory authorities. In the absence of such regulations, LES will ensure that construction proceeds in an efficient and expeditious manner, remaining mindful of the need to minimize environmental impacts.

Wastes generated during site preparation and construction will be varied, depending on the activities in progress. The bulk of the wastes will consist of non-hazardous materials such as packing materials, paper and scrap lumber. These type of wastes will be transported off site to an approved landfill. It is estimated there will be an average of 3,058 m^3 (4,000 yd^3) (non-compacted) per year of this type of waste.

Text removed under 10 CFR 2.390.

Management and disposal of all wastes from the NEF site is performed by a staff professionally trained to properly identify, store, ship wastes, audit vendors, direct and conduct spill cleanup, interface with state agencies, maintain inventories and provide annual reports.

A Spill Prevention, Control and Countermeasure (SPCC) Plan is implemented during construction to minimize both the possibility of spills of hazardous substances, and to minimize the environmental impact of actual spills. The SPCC ensures prompt and appropriate remediation. Spills during construction are more likely to occur around vehicle maintenance and fueling operations, storage tanks, painting operations and warehouses. The SPCC plan identifies sources, locations and quantities of potential spills and provides appropriate response measures. The plan will identify individuals and their responsibilities for implementation of the plan and provides for prompt notifications of state and local authorities, when required.

3.12.3 Effluent and Solid Waste Quantities

Quantities of radioactive and non-radioactive wastes and effluent are described in this section. The information includes quantities and average uranium concentrations. Portions of the waste considered hazardous or mixed are identified.

The first two tables for this section address wastes: Table 3.12-1, Estimated Annual Radiological and Mixed Wastes, and Table 3.12-2, Estimated Annual Non-Radiological Wastes. The next two tables address effluents: Table 3.12-3, Estimated Annual Gaseous Effluent, Table 3.12-4, Estimated Annual Liquid Effluent.

The waste and effluent estimates were developed specifically for the NEF. Each system was analyzed to determine the wastes and effluents generated during operation. These values were analyzed and a waste disposal path was developed for each. LES considered the facility site, facility operation, applicable URENCO experience, applicable regulations, and the existing U.S. waste processing/disposal infrastructure in developing the paths. The Liquid Waste and the Solid Waste Collection Systems were designed in accordance with these considerations.

Applicable experience was derived from each of the existing three URENCO enrichment facilities. The majority of the wastes and effluents from the facility are from auxiliary systems and activities and not from the enrichment process itself. Waste and effluent quantities of specific individual activities instead of scaled site values were used in the development of NEF estimates. An example is the NEF laboratory waste and effluent estimate which was developed by determining which analyses would be performed at the NEF, and using URENCO experience to perform that analysis, determine the resulting expected wastes and effluents. The cumulative waste and effluent values were then compiled.

The customs of URENCO as compared to LES also affect the resultant wastes and effluents. For example, in Europe, employers typically provide work clothes such as coveralls and lab coats for their employees. These are typically washed onsite with the resulting effluent sent to the municipal sewage treatment system. LES provides only protective clothing for employees, and the small volume of effluent that results has a higher quantity of contaminants which must be treated onsite.

Each of the URENCO facilities produces different wastes and effluents depending on the specific site activities, the type of auxiliary equipment installed, and the country-specific regulations. Each of the URENCO facilities is located either in an industrial or municipal area so that the facility water supply and sewage treatment are obtained and performed by municipal systems. The proposed NEF site will use municipal water supplies. However, all liquid effluents will be contained on the NEF site. Unlike other URENCO facilities, LES does not perform any interior cylinder washing activities. Thus, the generation of significant quantities of uranic wastewater is precluded.

13.12.4 Resources and Materials Used, Consumed or Stored During Construction and Operation

Typical construction commodities are used, consumed, or stored at the site during the construction phase. Construction commodities are typically used immediately after being brought to the site. Some materials are stored for a short duration until they are used or installed. Table 3.12-5, Commodities Used, Consumed or Stored at the NEF During Construction, summarizes the resources and materials used during the 3-year period of site preparation and major building construction.

Tables 3.12-1, Estimated Annual Radiological and Mixed Wastes, 3.12-2, Estimated Annual Non-Radiological Wastes, and 3.12-3, Estimated Annual Gaseous Effluent, provide listings of materials and resources that are expected to be used, consumed, or stored on site during plant operation. The resources and materials provided in Table 3.12-6, Commodities Used, Consumed, Or Stored at the NEF During Operation, are also expected to be used, consumed, or stored on an annual basis at the NEF during operation.

TABLES

Table 3.12-1 Estimated Annual Radiological and Mixed Wastes

Waste Type	Radiological Waste Total Mass Kg (lb)	Radiological Waste Uranium Content Kg (lb)	Mixed Waste Total Mass Kg/lb	Mixed Waste Uranium Content Kg/lb
Activated Carbon	300 (662)	25 (55)	-	-
Activated Alumina	2,160 (4,763)	2.2 (4.9)	-	-
Fomblin Oil Recovery Sludge	20 (44)	5 (11)	-	-
Liquid Waste Treatment Sludge	400 (882)	57 (126)[4]	-	-
Activated Sodium Fluoride[1]	-	-	-	-
Assorted Materials (paper, packing, clothing, wipes, etc.)	2,100 (4,631)	30 (66)		
Ventilation Filters	61,464 (135,506)	5.5 (12)	-	-
Non-Metallic Components	5,000 (11,025)	Trace[5]	-	-
Miscellaneous Mixed Wastes (organic compounds)[2 3]			50 (110)	2 (4.4)
Combustible Waste	3,500 (7,718)	Trace[5]	-	-
Scrap Metal	12,000(26,460)	Trace[5]	-	-

[1] No NaF wastes are produced on an annual basis. The Contingency Dump System NaF traps are not expected to saturate over the life of the plant.

[2] A mixed waste is a low-activity radioactive waste containing listed or characteristic of hazardous wastes as specified in 40 CFR 261, subparts C and D (CFR, 2003p).

[3] Representative organic compounds consist of acetone, toluene, ethanol, and petroleum ether

[4] The value of 57 kg (126 lb) is comprised of uranium in the Decontamination System citric acid and degreaser tanks, precipitated aqueous solutions, uranium in precipitated laboratory/miscellaneous effluents, and uranium in sludge from the Decontamination System citric acid and degreaser tanks.

[5] Trace is defined as not detectable above naturally-occurring background concentrations.

Table 3.12-2 Estimated Annual Non-Radiological Wastes

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Waste	Annual Quantity
Spent Blasting Sand	125 kg (275 lbs)
Miscellaneous Combustible Waste	9,000 kg (19,800 lbs)
Cutting Machine Oils	45 L (11.9 gal)
Spent Degreasing Water (from clean workshop)	1 m^3 (264 gal)
Spent Demineralizer Water (from clean workshop)	200 L (53 gal)
Empty Spray Paint Cans*	20 each
Empty Cutting Oil Cans	20 each
Empty Propane Gas Cylinders*	5 each
Acetone*	27 L (7.1 gal)
Toluene*	2 L (0.5 gal)
Degreaser Solvent SS25*	2.4 L (0.6 gal)
Petroleum Ether*	10 L (2.6 gal)
Diatomaceous Earth*	10 kg (22 lbs)
Miscellaneous Scrap metal	2,800 kg (6,147 lbs)
Motor Oils (For I.C. Engines)	3,400 L (895 gal)
Oil Filters	250 each
Air Filters (vehicles)	50 each
Air Filters (building ventilation)	160,652 kg (354,200 lbs)
Hydrocarbon Sludge*	10 kg (22 lbs)
Methylene Chloride*	1,850 L (487 gal)

* Hazardous waste as defined in 40 CFR 261 (in part or whole) (CFR, 2003p)

Table 3.12-3 Estimated Annual Gaseous Effluent

Area	Quantity (yr^{-1})	Discharge Rate m^3/yr (SCF/yr (STP)
Gaseous Effluent Vent Systems	NA	2.6×10^8 (9.18×10^9)
HVAC Systems	NA	
Radiological Areas	NA	1.5×10^9 (max) (5.17×10^{10})
Non-Radiological Areas	NA	1.0×10^9 (max) (3.54×10^{10})
Total Gaseous HVAC Discharge	NA	2.5×10^9 (max) (8.71×10^{10})
Constituents:		
Helium	440 m^3 (STP) (15,540 ft^3)	NA
Nitrogen	52 m^3 (STP) (1,836 ft^3)	NA
Ethanol	40 L (10.6 gal)	NA
Laboratory Compounds	Traces (HF)	NA
Argon	190 m^3 (STP) (6,709 ft^3)	NA
Hydrogen Fluoride	<1.0 kg (<2.2 lb)	NA
Uranium	<10 g (<0.0221 lb)	NA
Methylene Chloride	610 L (161 gal)	NA
Thermal Waste:		
Summer Peak	3.2×10^6 J/hr (3.1×10^6 BTU/hr)	NA
Winter Peak	1.0×10^7 J/hr (9.5×10^6 BTU/hr)	NA

NA – Not Applicable

Table 3.12-4 Estimated Annual Liquid Effluent

Effluent	**Typical Annual Quantities**	Typical Uranic Content
Contaminated Liquid Process Effluents:	**m^3 (gal)**	**kg (lb)**
Laboratory Effluent/Floor Washings/Miscellaneous Condensates	23.14 (6,112)	16 (35)[1]
Degreaser Water	3.71 (980)	18.5 (41)[1]
Spent Citric Acid	2.72 (719)	22 (49)[1]
Laundry Effluent	405.8 (107,213)	0.2 (0.44)[2]
Hand Wash and Showers	2,100 (554,820)	None
Total Contaminated Effluent :	2,535 (669,884)	56.7 (125)[3]
Cooling Tower Blowdown:	19,123 (5,051,845)	None
Sanitary:	7,253 (1,916,250)	None
Stormwater Discharge:		
Gross Discharge[4]	174,100 (46 E+06)	None

[1] Uranic quantities are before treatment, volumes for degreaser water and spent citric acid include process tank sludge.
[2] Laundry uranic content is a conservative estimate.
[3] Uranic quantity is before treatment. After treatment approximately 1% or 0.57 kg (1.26 lb) of uranic material is expected to be discharged into the Treated Effluent Evaporative Basin.
[4] Maximum gross discharge is based on total annual rainfall on the site runoff areas, contributing runoff to the Site Stormwater Detention Basin and the UBC Storage Pad Stormwater Retention Basin, neglecting evaporation and infiltration.

Table 3.12-5 Commodities Used, Consumed, or Stored at the NEF During Construction
Page 1 of 1

Item Description	Quantity
Architectural Finishes, All Areas	77,588 m^2 (835,153 ft^2)
Asphalt Paving	79,767 m^2 (95,400 yd^2)
Chain Link Fence	15,011 m (49,250 ft)
Concrete (including embedded items)	59,196 m^3 (77,425 yd^3)
Concrete Paving	1,765 m^2 (2,111 yd^2)
Copper and Aluminum Wiring	361,898 m (1,187,328 ft)
Crushed Stone	287,544 m^2 (343,900 yd^2)
Electrical Conduit	120,633 m (395,776 ft)
Fence Gates	14 each
HVAC Units	109 each
Permanent Metal Structures	2 each
Piping (Carbon & Stainless Steel)	55,656 m (182,597 ft)
Roofing Materials	52,074 m^2 (560,515 ft^2)
Stainless & Carbon Steel Ductwork	515,125 kg (1,135,657 lbs)
Temporary Metal Structures	2 each

Text removed under 10 CFR 2.390.

FIGURES

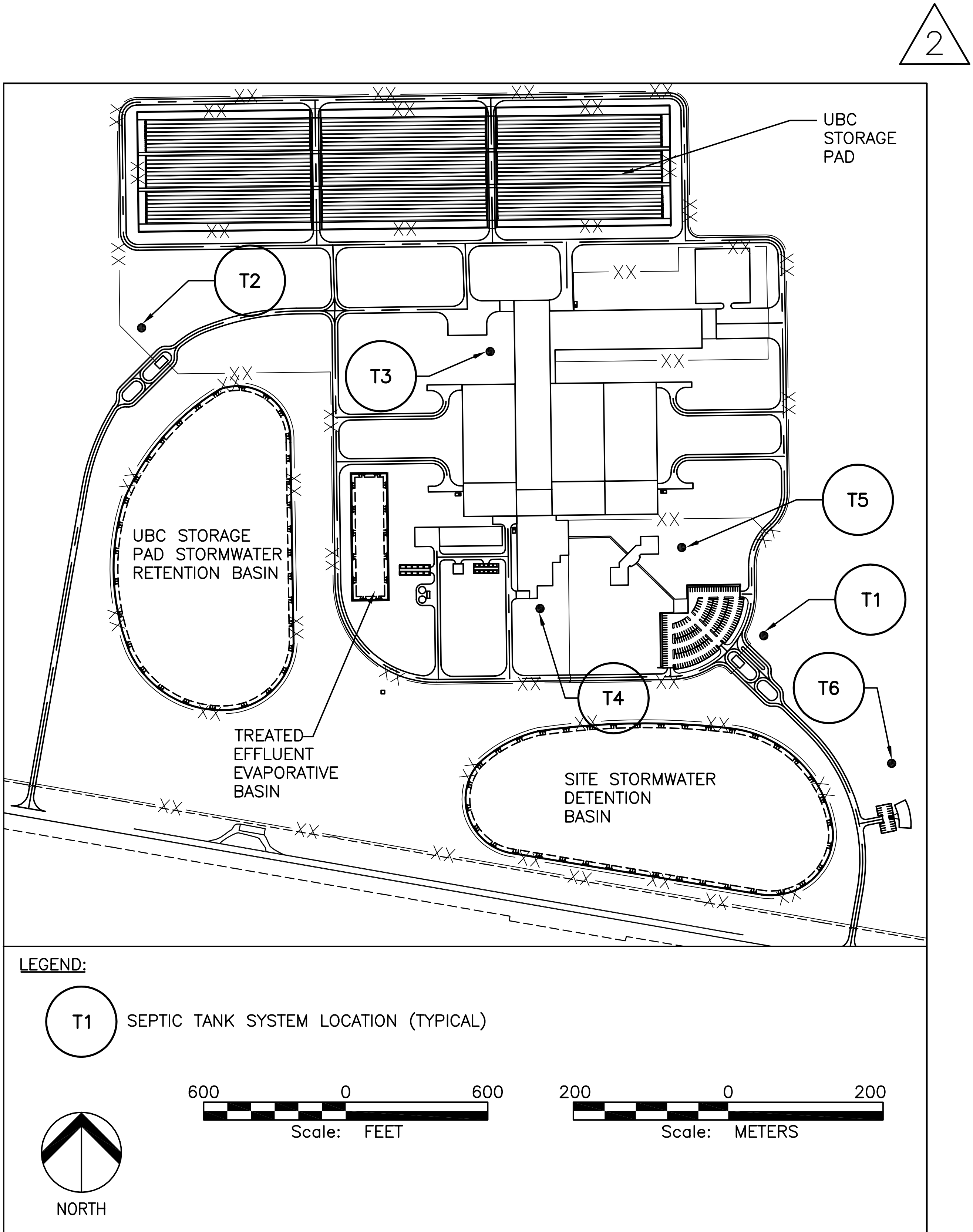

FIGURE 3.12-1

PLANNED SEPTIC TANK SYSTEM LOCATIONS

ENVIRONMENTAL REPORT

REVISION 2 DATE: JULY 2004