1 INTRODUCTION

1.1 Background

The U.S. Nuclear Regulatory Commission (NRC) prepared this Environmental Impact Statement (EIS) in response to an application submitted by Louisiana Energy Services (LES), for a license to construct, operate, and decommission a gas centrifuge uranium enrichment facility near Eunice in Lea County, New Mexico (Figure 1-1). The proposed facility is referred to as the National Enrichment Facility (NEF).

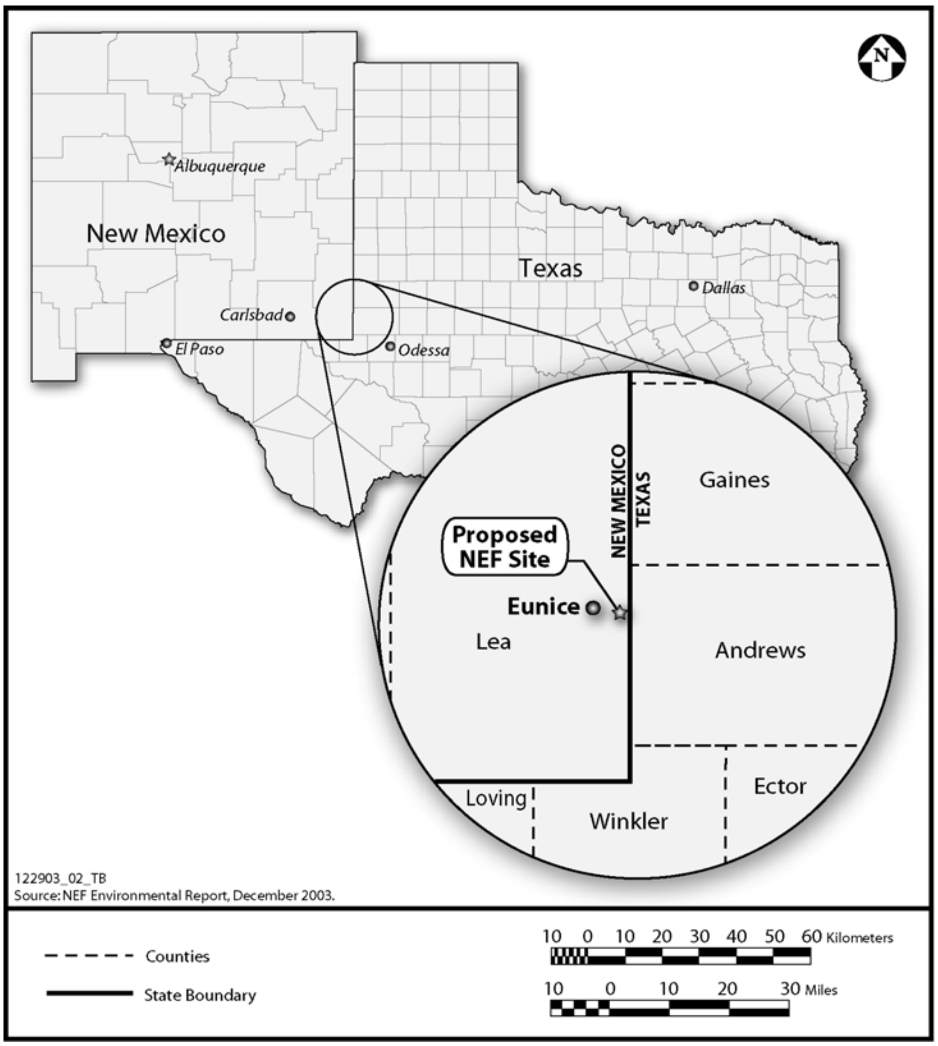

Figure 1-1 Location of the Proposed National Enrichment Facility (LES, 2005a)

The NRC's Office of Nuclear Material Safety and Safeguards and its consultants, Advanced Technologies and Laboratories International, Inc. (ATL), and Pacific Northwest National Laboratory, prepared this EIS in accordance with Title 10, "Energy," of the *U.S. Code of Federal Regulations* (10 CFR) Part 51, which implements the requirements of the *National Environmental Policy Act of 1969* (NEPA), as amended (Public Law 91-190). This EIS assesses the potential environmental impacts of the proposed action.

1.2 The Proposed Action

The proposed action considered in this EIS is for LES to construct, operate, and decommission a uranium enrichment facility (referred to as the proposed NEF) at a site near the city of Eunice in Lea County, New Mexico. LES would own the operation and be responsible for its performance. The proposed NEF property and facilities would remain the property of Lea County until they are deeded over to LES at license termination. The proposed NEF would produce enriched uranium-235 (^{235}U) up to 5 weight percent by the gas centrifuge process. The enriched uranium would be used in commercial nuclear power plants. Uranium enrichment is a step in the nuclear fuel cycle (Figure 1-2) in which natural uranium is converted and fabricated so it can be used as nuclear fuel in commercial nuclear power plants. The proposed NEF would not alter the total amount of enriched uranium used in the U.S. nuclear fuel cycle.

Uranium ore usually contains approximately 0.72 weight percent ^{235}U, and this percentage is significantly less than the 3 to 5 weight percent ^{235}U enrichment required by nuclear power plants as fuel for electricity generation. Therefore, uranium must be enriched. Enrichment is the process of increasing the percentage of the naturally occurring and fissionable ^{235}U isotope and decreasing the percentage of uranium-238 (^{238}U).

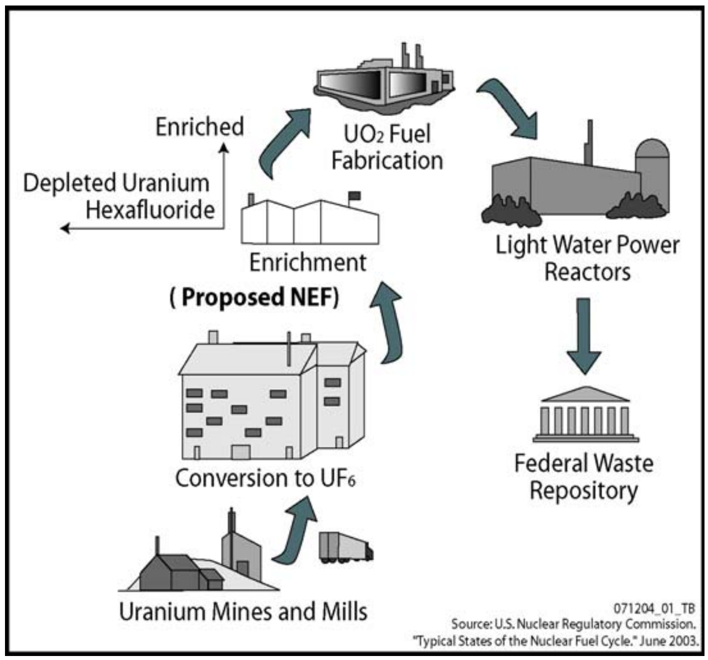

Figure 1-2 Nuclear Fuel Cycle (NRC, 2003a)

The nominal production capacity of the proposed NEF would be 3 million separative work units (SWUs) per year. A SWU is a measure of enrichment in the uranium enrichment industry, and it represents the level of effort or energy required to raise the concentration of ^{235}U to a specified level.

The proposed NEF would be licensed in accordance with the *Atomic Energy Act*. The license would be issued in accordance with 10 CFR Parts 30, 40, and 70. It would allow LES to possess and use special nuclear materials, source materials, and by-product materials so that the proposed NEF could process its own materials.

1.3 Purpose and Need for the Proposed Action

The proposed action is intended to satisfy the need for an additional reliable and economical domestic source of enrichment services. The proposed NEF would contribute to the attainment of the national energy security policy objectives. The Administration's energy policy, which was released in May 2001, called the expansion of nuclear energy dependence "a major component of our national energy policy" (NEP, 2001).

1.3.1 Background

Nuclear power plants are currently supplying approximately 20 percent of the Nation's electricity requirements (EIA, 2003a). Of the 11.5 million SWUs that were purchased by U.S. nuclear reactors in

2002, only about 1.7 million SWUs—or 15 percent—were provided by enrichment plants located in the United States (EIA, 2003b). In 2003, the domestic enrichment facilities provided 14 percent of the total 12 million SWUs purchased (EIA, 2004a).

Over the past 50 years, several uranium enrichment facilities have been used in the United States, including the gaseous diffusion plants near Portsmouth, Ohio (herein referred to as the Portsmouth Gaseous Diffusion Plant), and Paducah, Kentucky (herein referred to as the Paducah Gaseous Diffusion Plant). Both plants are operated by the United States Enrichment Corporation (USEC); only the Paducah Gaseous Diffusion Plant currently remains in operation (USEC, 2003). The end of enriched uranium production at the Portsmouth Gaseous Diffusion Plant in May 2001 has led to reliability risks of U.S. domestic enrichment supply capability. In addition, the Highly Enriched Uranium Agreement deliveries[1] provide for additional U.S. enrichment product. This Agreement is scheduled to expire in 2013. A supply disruption associated with the Paducah Gaseous Diffusion Plant production or the Highly Enriched Uranium Agreement deliveries could impact national energy security because domestic commercial reactors would be fully dependent on foreign sources for enrichment services. Moreover, U.S. Department of Energy (DOE) anticipates "the inevitable cessation of all domestic gaseous diffusion enrichment operations" due to the higher cost of operating diffusion facilities like the Paducah Gaseous Diffusion Plant relative to operating centrifuge facilities (DOE, 2001).

In a 2002 letter to the NRC, the DOE indicated that, since 2000, domestic uranium enrichment had fallen from a capacity greater than domestic demand to a level that was less than half of domestic requirements (DOE, 2002). In this letter, DOE:

- Referenced those interagency discussions led by the National Security Council where there was a clear determination that the United States should maintain a viable and competitive domestic uranium enrichment industry for the foreseeable future.

- Estimated that 80 percent of projected demand for nuclear power in 2020 could be fueled from foreign sources.

- Noted the importance of promoting the development of additional domestic enrichment capacity to maintain a viable and competitive domestic uranium enrichment industry for the foreseeable future.

- Noted that there was sufficient domestic demand to support multiple uranium enrichment facilities and that competition is important to maintain a healthy industry, and encouraged the private sector to invest in new uranium enrichment capacity.

- Indicated its support for the deployment of Urenco gas centrifuge technology in the U.S. market by expressing its support for Urenco to partner with a U.S. company or companies, transferring Urenco's technology to new U.S. commercial uranium enrichment facilities.

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[1] The United States Enrichment Corporation (USEC) implements the 1993 government-to-government agreement between the United States and Russia that calls for Russia to convert 500 metric tons (550 tons) of highly enriched uranium from dismantled nuclear warheads into low-enriched uranium. This is the equivalent of about 20,000 nuclear warheads. USEC purchases the enriched portion of the blended-down material and sells it to its electric utility customers for fuel in their commercial nuclear power plants. This Agreement is also known as Megatons to Megawatts (USEC, 2004a).

1.3.2 Domestic Demand and Supply

Table 1-1 Projected Uranium Enrichment Demand in the United States for 2002–2025 in Million SWUs

Year	LES Projections[a]	EIA Projections[b]
2002	11.5	11.5 (actual)[c]
2005	11.6	14.6
2010	11.8	12.9
2015	11.4	15.4
2020	11.4	13.5
2025	Not Provided	14.2

EIA - Energy Information Agency.
SWU - Separative Work Unit.
[a] LES, 2005a.
[b] EIA, 2003b.
[c] EIA, 2003c.

Forecasts of installed nuclear-generating capacity suggest a continuing demand for uranium enrichment services both in the United States and abroad. Table 1-1 shows the uranium enrichment requirements in the United States for the next two decades as forecasted by LES (LES, 2005a) and the Energy Information Administration (EIA, 2003b). These two forecasts of uranium enrichment requirements were generally consistent. However, LES projections were adjusted for plutonium recycled in the mixed oxide fuel that would use plutonium oxide and uranium oxide mixture as fuel. DOE is planning to convert approximately 34 metric tons (37.5 tons) of surplus plutonium from nuclear weapons into a nuclear fuel comprised of a mixture of plutonium and uranium oxides, called MOX fuel, for use in selected commercial nuclear power plants (NRC, 2003b). Therefore, LES projections tended to be slightly lower than the Energy Information Administration forecast. Annual enrichment services requirements in the United States are forecasted to be 11.4 to 14.2 million SWUs in 2025. The two forecasts indicate a need for additional uranium enrichment capability to ensure national energy security.

The domestic enrichment services would be used in the production of nuclear fuel for commercial nuclear power reactors. By 2020, the United States would need about 393 gigawatts (393,000 megawatts) of new generating capacity (DOE, 2003). Installed nuclear-generating capacity in the United States is projected to increase from approximately 98 gigawatts (98,000 megawatts) in 2001 to about 103 gigawatts (103,000 megawatts) in 2025. This increase includes the uprating of existing plants equivalent to 3.9 gigawatts (3,900 megawatts) of new capacity (EIA, 2004b). This projection, including uprates, would increase U.S. nuclear capacity by more than 5 gigawatts (5,000 megawatts), the equivalent of adding about five large nuclear power reactors. As of July 2004, the NRC has granted 101 uprates (NRC, 2004a). In addition, domestic nuclear facilities reported a record high median 3-year design electrical rating capacity factor of 89.66 percent for the period 2001–2003 as compared to 70.78 percent for the period 1989–1991 (Blake, 2004).

> ***How Much Is a Megawatt?***
>
> *One megawatt roughly provides enough electricity for the demand of 400–900 homes. The actual number is based on the season, time of day, region of the country, power plant capacity factors, and other factors.*
>
> *Source: Bellemare, 2003*.

By combining the production of enriched uranium from its domestic enrichment facilities and the downblending of foreign highly enriched uranium, USEC can provide for approximately 56 percent of the U.S. enrichment market needs (USEC, 2004b) while foreign suppliers provide the remaining 44 percent. These enrichment supplies encompass the enrichment products from its enrichment operation at the energy-intensive Paducah Gaseous Diffusion Plant (USEC, 2004a; NRC, 2004a) and the Highly Enriched Uranium Agreement deliveries from Russia, which expires in 2013 (USEC, 2002; USEC, 2004c). The current trend for domestic enrichment services is to develop more efficient, modern, and less costly means to operate enrichment facilities. The gas centrifuge technology for uranium enrichment is known to be more efficient and require less energy to operate than the gaseous diffusion technology currently in use in the United States (NRC, 2004b). On January 12, 2004, USEC announced plans to build and operate a uranium enrichment plant (known as the American Centrifuge Plant) in Piketon, Ohio. This plant would cost up to $1.5 billion, employ up to 500 people, and reach an initial annual production level of 3.5 million SWUs by 2010 (USEC, 2004b).

Purchasers of enrichment services view diversity and security of supply as vital from a commercial perspective (LES, 2005a). The proposed NEF would supplement the domestic sources of enrichment services provided by USEC's Paducah Gaseous Diffusion Plant and the proposed American Centrifuge Plant. Beginning production in 2008 and achieving full production output by 2013, the proposed NEF would provide roughly 25 percent of the current and projected U.S. enrichment services demand (EIA, 2004a; EIA, 2003b).

1.3.3 Global Supply and Demand

An exclusive focus on domestic supply and demand projections clearly indicates a need for the proposed NEF, but global projections also provide context for assessing the significance of any potential domestic supply shortfall. Global enrichment forecasts indicate that international supply and demand will be in very close balance after 2010 (LES, 2005a; Grigoriev, 2002; NUKEM, 2002; DOE, 2001; Combs, 2004). Enrichment demand forecasts are based on global nuclear generation capacity forecasts and the Energy Information Administration has increased its forecast for 2020 world nuclear generation capacity by about five percent (EIA, 2004c), indicating that earlier enrichment demand forecasts were conservative. Enrichment supply forecasts reflect current sources of enrichment services, the anticipated loss of supply from diffusion technology facilities like the Paducah Gaseous Diffusion Plant, new supply from the proposed NEF and the proposed American Centrifuge Plant, and continuation of current levels of supply from the Russian high enriched uranium agreement. The current Russian high enriched uranium agreement expires in 2013 and while an extension of that agreement through 2020 is a reasonable assumption, any reduction in Russian high enriched uranium supply after 2013 could shift the close balance after 2010 to a supply shortfall. The U.S. market would be especially vulnerable to any unforeseen global supply shortfall if the Paducah Gaseous Diffusion Plant closes, as expected, without an offsetting increase in supply from the combined output of the proposed American Centrifuge Plant and the proposed NEF.

1.4 Scope of the Environmental Analysis

To fulfill its responsibilities under NEPA, the NRC has prepared this EIS to analyze the environmental impacts of the LES proposal as well as reasonable alternatives to the proposed action. The scope of this EIS includes consideration of both radiological and nonradiological (including chemical) impacts associated with the proposed action and the reasonable alternatives. The EIS also addresses the potential environmental impacts relevant to transportation.

This EIS addresses cumulative impacts to physical, biological, economic, and social parameters. In addition, this EIS identifies resource uses, monitoring, potential mitigation measures, unavoidable adverse environmental impacts, the relationship between short-term uses of the environment and long-term productivity, and irreversible and irretrievable commitments of resources.

The development of this EIS is the result of the NRC staff's review of the LES license application and the Environmental Report. This review has been closely coordinated with the development of the Safety

Evaluation Report (SER) prepared by the NRC to evaluate, among other aspects, the health, safety, and security impacts of the proposed action. The SER is the outcome of the NRC safety review of the LES license application and Safety Analysis Report.

1.4.1 Scoping Process and Public Participation Activities

The NRC regulations in 10 CFR Part 51 contain requirements for conducting a scoping process prior to the preparation of an EIS. Scoping was used to help identify those issues to be discussed in detail and those issues that are either beyond the scope of this EIS or are not directly relevant to the assessment of potential impacts from the proposed action.

On February 4, 2004, the NRC published in the *Federal Register* (69 FR 5374) a Notice of Intent to prepare an EIS for the construction, operation, and decommissioning of the proposed NEF and to conduct the scoping process for the EIS. The Notice of Intent set forth in Appendix A summarized the NRC's plans to prepare the EIS and presented background information on the proposed NEF. For the scoping process, the Notice of Intent invited comments on the proposed action and announced a public scoping meeting to be held concerning the project.

On March 4, 2004, the NRC staff and its consultants, ATL and Pacific Northwest National Laboratory, toured the proposed site and held a scoping meeting in Eunice, New Mexico. During the scoping meeting, a number of individuals offered oral and written comments and suggestions to the NRC concerning the proposed NEF and the development of the EIS. In addition, the NRC received written comments from various individuals during the public scoping period that ended on March 18, 2004. The NRC carefully reviewed and identified individual comments (both oral and written). These comments were then consolidated and categorized by topical areas.

After the scoping period, the NRC distributed the *Scoping Summary Report: Proposed Louisiana Energy Services National Enrichment Facility, Lea County, New Mexico* (Appendix A) in April 2004. The *Scoping Summary Report* identified categories of issues to be analyzed in detail and issues beyond the scope of the EIS.

> ***The NRC Environmental and Safety Reviews***
>
> *The focus of an Environmental Impact Statement (EIS) is a presentation of the environmental impacts of the proposed action.*
>
> *In addition to meeting its responsibilities under the National Environmental Policy Act (NEPA), the NRC prepares a Safety Evaluation Report (SER) to analyze the safety of the proposed action and assess its compliance with applicable NRC regulations.*
>
> *The safety and environmental reviews are conducted in parallel. Although there is some overlap between the content of a SER and an EIS, the intent of the documents is different.*
>
> *To aid in the decision process, the EIS provides a summary of the more detailed analyses included in the SER. For example, the EIS does not address how accidents are prevented; rather, it addresses the environmental impacts that could result should an accident occur.*
>
> *Much of the information describing the affected environment in the EIS also is applicable to the SER (e.g., demographics, geology, and meteorology).*
>
> *Source: NRC, 2002; NRC, 2003c.*

1.4.2 Issues Studied in Detail

As stated in the Notice of Intent, the NRC identified issues to be studied in detail as they relate to implementation of the proposed action. The public identified additional issues during the subsequent public scoping process. All the issues that have been identified by the NRC and the public could have short- or long-term impacts from the potential construction and operation of the proposed NEF. These issues are:

- Public and worker health.
- Need for the facility.
- Alternatives.
- Waste management.
- Depleted uranium disposition.
- Water resources.
- Geology and soils.
- Compliance with applicable regulations.
- Air quality.
- Transportation.
- Accidents.
- Land use.
- Socioeconomic impacts.
- Noise.
- Visual and scenic resources.
- Costs and benefits.
- Environmental justice.
- Cultural resources.
- Resource commitments.
- Ecological resources.
- Decommissioning.
- Cumulative impacts.

1.4.3 Issues Eliminated from Detailed Study

The NRC has determined that detailed analysis for mineral resources was not necessary because there are no known nonpetroleum mineral resources at the proposed site that would be affected by any of the alternatives being considered. In addition, detailed analysis of the impact of the proposed NEF on connected actions that include the overall nuclear fuel cycle activities were not considered. The proposed NEF would not measurably affect the mining and milling operations and the demand for enriched uranium. The amount of mining and milling is dependent upon the stability of market prices for uranium balanced with the concern of environmental impacts associated with such operations (NRC, 1980). The demand for enriched uranium in the United States is primarily driven by the number of commercial nuclear power plants and their operation. The proposed NEF will only result in the creation of new transportation routes within the fuel cycle to and from the enrichment facility. The existing transportation routes between the other facilities are not expected to be altered. Because the environmental impacts of all of the transportation routes other than those to and from the proposed NEF have been previously analyzed, they are eliminated from further study (NRC, 1977; NRC, 1980).

1.4.4 Issues Outside the Scope of the EIS

The following issues were identified in the scoping process to be outside the scope of the EIS:

- Nonproliferation.
- Security and safety.
- Terrorism.
- Credibility.

A summary of the scoping process is contained in Appendix A.

1.4.5 Comments on the Draft EIS

The NRC staff issued a Draft EIS for public review and comment on September 17, 2004 (see 69 FR 56104-56105). The public comment period on the Draft EIS began at that time. During the public comment period, the NRC staff held a public meeting in Eunice, New Mexico, on October 14, 2004. The NRC published notice of this meeting in the *Federal Register* (69 FR 56104-56105, September 17, 2004), on its web site, and in local newspapers. Approximately 60 people provided oral comments at the public meeting. A certified court reporter recorded the oral comments and prepared written transcripts. The transcripts of the public meetings are part of the public record for the proposed project and were used in developing the comment summaries contained in Appendix I. In addition to oral comments received at the public meetings, the NRC staff received written comments, letters, facsimile transmittals, and e-mails regarding the Draft EIS and associated issues over the period for comments.

The NRC staff extended the public comment period that was to end on November 6, 2004, to January 7, 2005 (69 FR 64983 and 69 FR 76485). The extension of the public comment period was enacted due to the restriction of public access of the NRC's Agencywide Documents Access and Management System (ADAMS) database accessible through the NRC's web site.

A summary of the comments and responses is included in Appendix I. The written comments and transcripts are reproduced in Appendix J. In addition to the issues identified during the scoping process for the Draft EIS (see section 1.4.1), the comments received during the public comment period identified concerns about potential impacts to water resources, accidents and risks, the conversion of the resulting depleted uranium hexafluoride (DUF_6), the proper disposal of depleted uranium, and transportation risks and impacts. As presented in section 1.4.4, issues that are related to safety and security (e.g., terrorism) and nonproliferation are not part of the scope of the EIS. Other safety issues are addressed in the NRC's SER.

1.4.6 Changes from the Draft EIS

This EIS reflects modifications to the Draft EIS that were made in response to:

- New information received regarding water resources near the proposed NEF, the local infrastructure and support services, transportation, and waste management options for disposal of the DUF_6.

- Corrections to the Draft EIS.

- Public comments received on the Draft EIS.

1.4.7 Public Hearing

By law, a license to construct and operate the proposed NEF cannot be issued until completion of a hearing before the NRC's Atomic Safety and Licensing Board. Notice of the hearing, including guidance on certain aspects, was provided by the Commission in a notice published in the Federal Register on February 6, 2004. Thereafter, a Licensing Board comprised of three administrative judges was established to conduct the hearing. Three parties have been permitted to intervene in the proceeding: Nuclear Information and Resource Services and Public Citizen, the New Mexico Attorney General, and the New Mexico Environment Department. These parties have advanced contentions which are under consideration by the Licensing Board. From February 7 to 10, 2005, the Licensing Board conducted an evidentiary hearing on contentions relating to the Draft EIS. Based on the evidence presented, the Licensing Board issued a Partial Initial Decision on June 8, 2005, resolving the contentions in favor of the

Staff and/or LES and upholding the adequacy of the Draft EIS. Additional evidentiary hearings are expected to be conducted in order to consider other admitted contentions. In addition, the Licensing Board will conduct a mandatory hearing. Following completion of these hearings, the Licensing Board will issue a final decision as to whether the requested license should be issued. The evidence submitted during the hearing and the decisions of the Licensing Board are publically available except to the extent that they contain proprietary information.

1.4.8 Redaction

The NRC has a duty to balance the need for public disclosure of relevant information with the need to protect sensitive information that could, in the wrong hands, pose a danger to the public. To address security concerns about information that could be used to undermine the safety of operations at the proposed NEF, the NRC redacted certain information from the Draft EIS. The NRC made a redacted version of the Draft EIS available to the public in December 2004, replacing the original Draft EIS on its project-specific web site and in ADAMS. Thereafter, in the interest of providing full public disclosure, the unredacted version was placed on the web site and in ADAMS.

1.4.9 Related NEPA and Other Relevant Documents

The following NEPA documents were reviewed as part of the development of this EIS to obtain information related to the issues raised.

- *National Enrichment Facility Environmental Report, Revision 4, Louisiana Energy Services, NRC Docket No. 70-3103, April 2005.* This report was developed by LES as part of its license application to assess the environmental impacts associated with the proposed NEF.

- *Final Environmental Impact Statement for the Construction and Operation of Claiborne Enrichment Center, Homer, Louisiana. NUREG-1484, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, August 1994.* This EIS was developed to analyze the environmental consequences for the construction, operation, and decommissioning of a uranium enrichment facility in Claiborne, Louisiana, by LES. The proposed facility, which was never constructed, was based on a similar technology to that proposed for Lea County, New Mexico. Due to the similarities in technology and facilities, the impacts resulting from implementing the proposed action in Lea County could be compared to those estimated for the Claiborne facility.

- *Final Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride. DOE/EIS-0269, Office of Nuclear Energy, Science and Technology, U.S. Department of Energy, April 1999.* This EIS analyzes strategies for the long-term management of the DUF_6 inventory currently stored at three DOE sites near Paducah, Kentucky; Portsmouth, Ohio; and Oak Ridge, Tennessee. This EIS also analyzes the potential environmental consequences of implementing each alternative strategy for the period from 1999 through 2039. The results presented in this EIS are relevant to the management, use, and potential impacts associated with the DUF_6 that would be generated at the proposed NEF.

- *Final Environmental Impact Statement for the Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at the Paducah, Kentucky, Site. DOE/EIS-0359, Oak Ridge Operations, Office of Environmental Management, U.S. Department of Energy, June 2004.* This site-specific EIS considers the construction, operation, maintenance, and decommissioning of the proposed DUF_6 conversion facility at three locations within the Paducah, Kentucky, site, which is a DOE facility; transportation of DUF_6 conversion products and waste materials to a disposal facility;

transportation and sale of the hydrogen fluoride produced as a conversion co-product; and neutralization of hydrogen fluoride to calcium fluoride and its sale or disposal in the event that the hydrogen fluoride product is not sold. The results presented in this EIS are relevant to the management, use, and potential impacts associated with the DUF_6 that would be generated at the proposed NEF.

- *Final Environmental Impact Statement for the Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at the Portsmouth, Ohio, Site. DOE/EIS-0360, Oak Ridge Operations, Office of Environmental Management, U.S. Department of Energy, June 2004.* This site-specific EIS analyzes the construction, operation, maintenance, and decommissioning of the proposed DUF_6 conversion facility at three alternative locations within the Portsmouth, Ohio, site; transportation of all cylinders (DUF_6, enriched uranium, and empty) currently stored at the East Tennessee Technology Park near Oak Ridge, Tennessee, to Portsmouth; construction of a new cylinder storage yard at Portsmouth (if required) for cylinders from the East Tennessee Technology Park; transportation of DUF_6 conversion products and waste materials to a disposal facility; transportation and sale of the hydrogen fluoride produced as a conversion co-product; and neutralization of hydrogen fluoride to calcium fluoride and its sale or disposal in the event that the hydrogen fluoride product is not sold. The results presented in this EIS are relevant to the management, use, and potential impacts associated with the DUF_6 that would be generated at the proposed NEF.

- *Environmental Assessment: Disposition of Russian Federation Titled Natural Uranium. DOE/EA-1290, Office of Nuclear Energy, Science and Technology, U.S. Department of Energy, June 1999.* This Environmental Assessment analyzed the environmental impacts of transporting natural UF_6 from the gaseous diffusion plants to the Russian Federation. Only domestic transportation by rail and truck were considered. The Environmental Assessment addresses both incident-free transportation and transportation accidents. The results presented in this Environmental Assessment are relevant to the transportation of UF_6 for the proposed NEF.

1.5 Applicable Regulatory Requirements

This section provides a summary assessment of major environmental requirements, agreements, Executive Orders, and permits relevant to the construction, operation, and decommissioning of the proposed NEF.

1.5.1 Federal Laws and Regulations

1.5.1.1 *National Environmental Policy Act of 1969*, as amended (42 U.S.C. § 4321 et seq.)

NEPA establishes national environmental policy and goals for the protection, maintenance, and enhancement of the environment to ensure for all Americans a safe, healthful, productive, and aesthetically and culturally pleasing environment. NEPA provides a process for implementing these specific goals within the Federal agencies responsible for the action. This EIS has been prepared in accordance with NEPA requirements and NRC regulations (10 CFR Part 51) for implementing NEPA.

1.5.1.2 *Atomic Energy Act of 1954,* as amended (42 U.S.C. § 2011 et seq.)

The *Atomic Energy Act*, as amended, and the *Energy Reorganization Act of 1974* (42 U.S.C. § 5801 et seq.) give the NRC the licensing and regulatory authority for nuclear energy uses within the commercial sector. If the license application for the proposed NEF is approved, the NRC would license and regulate the possession, use, storage, and transfer of byproduct, source, and special nuclear materials to protect public health and safety as stipulated in 10 CFR Parts 30, 40, and 70.

1.5.1.3 *Clean Air Act,* as amended (42 U.S.C. § 7401 et seq.)

The *Clean Air Act* establishes regulations to ensure air quality and authorizes individual States to manage permits. The *Clean Air Act*: (1) requires the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards as necessary to protect the public health, with an adequate margin of safety, from any known or anticipated adverse effects of a regulated pollutant (42 U.S.C. § 7409 et seq.); (2) requires establishment of national standards of performance for new or modified stationary sources of atmospheric pollutants (42 U.S.C. § 7411); (3) requires specific emission increases to be evaluated so as to prevent a significant deterioration in air quality (42 U.S.C. § 7470 et seq.); and (4) requires specific standards for releases of hazardous air pollutants (including radionuclides) (42 U.S.C. § 7412). These standards are implemented through plans developed by each State with EPA approval. The *Clean Air Act* requires sources to meet air-quality standards and obtain permits to satisfy those standards.

1.5.1.4 *Clean Water Act,* as amended (33 U.S.C. § 1251 et seq.)

The *Clean Water Act* requires the EPA to set national effluent limitations and water-quality standards, and establishes a regulatory program for enforcement. Specifically, Section 402(a) of the Act establishes water-quality standards for contaminants in surface waters. The *Clean Water Act* requires a National Pollutant Discharge Elimination System (NPDES) permit before discharging any point source pollutant into U.S. waters. EPA Region 6 administers this program with an oversight review by the New Mexico Environment Department Water Quality Bureau. The NPDES General Permit for Industrial Stormwater is required for point source discharge of stormwater runoff from industrial or commercial facilities to State waters. Construction of the proposed NEF would require an NPDES Construction Stormwater General Permit from EPA Region 6 and an oversight review by the New Mexico Environment Department Water Quality Bureau. Section 401(a)(1) of the *Clean Water Act* requires States to certify that the permitted discharge would comply with all limitations necessary to meet established State water-quality standards, treatment standards, or schedule of compliance.

In April 2004, the State of New Mexico began the process of assuming NPDES permitting responsibilities within the State (NMED, 2004a). Jurisdiction would be transferred from EPA Region 6 to the New Mexico Environment Department Surface Water Quality Bureau. The transfer could occur by early 2007 after which State implementation of NPDES permitting would be phased in over a five-year period (NMED, 2004b).

1.5.1.5 *Resource Conservation and Recovery Act,* as amended (42 U.S.C. § 6901 et seq.)

The *Resource Conservation and Recovery Act* (RCRA) requires the EPA to define and identify hazardous waste; establish standards for its transportation, treatment, storage, and disposal; and require permits for persons engaged in hazardous waste activities. Section 3006 of the RCRA (42 U.S.C. § 6926) allows States to establish and administer these permit programs with EPA approval. EPA Region 6 has delegated regulatory jurisdiction to the New Mexico Environment Department Hazardous Waste Bureau for nearly all aspects of permitting as required by the *New Mexico Hazardous Waste Act*. The EPA regulations implementing the RCRA are found in 40 CFR Parts 260 through 283. Regulations imposed on a generator or on a treatment, storage, and/or disposal facility vary according to the type and quantity of material or waste generated, treated, stored, and/or disposed. The method of treatment, storage, and/or disposal also impacts the extent and complexity of the requirements. The proposed NEF would generate small quantities of hazardous waste that are expected to be not greater than 100 kilograms (220 pounds) per month. There would be no plans to store these wastes in excess of 90 days; thus, the proposed NEF would qualify as a small quantity hazardous waste generator in accordance with Section 20.4.1 of the *New Mexico Administrative Code* and RCRA requirements.

1.5.1.6 *Low-Level Radioactive Waste Policy Act of 1980,* as amended (42 U.S.C. § 2021 et seq.)

The *Low-Level Radioactive Waste Policy Act of 1980* amended the *Atomic Energy Act* to specify that the Federal Government is responsible for disposal of low-level radioactive waste generated by its activities and that States are responsible for disposal of other low-level radioactive waste. The *Low-Level Radioactive Waste Policy Act of 1980* provides for and encourages interstate compacts to carry out the State responsibilities. Low-level radioactive waste would be generated from activities conducted from the proposed NEF. The State of New Mexico is a member of the Rocky Mountain compact.

1.5.1.7 *Emergency Planning and Community Right-to-Know Act of 1986* (42 U.S.C. § 11001 et seq.) (also known as SARA Title III)

The *Emergency Planning and Community Right-to-Know Act of 1986*, which is the major amendment to the *Comprehensive Environmental Response, Compensation, and Liability Act* (42 U.S.C. § 9601), establishes the requirements for Federal, State, and local governments; Indian tribes; and industry regarding emergency planning and "Community Right-to-Know" reporting on hazardous and toxic chemicals. The "Community Right-to-Know" provisions increase the public's knowledge and access to information on chemicals at individual facilities, their uses, and releases into the environment. States and communities working with facilities can use the information to improve chemical safety and protect public health and the environment. This Act requires emergency planning and notice to communities and government agencies concerning the presence and release of specific chemicals. The EPA implements this Act under regulations found in 40 CFR Parts 355, 370, and 372. This Act would require the proposed NEF to report on hazardous and toxic chemicals used and produced at the facility, and to establish emergency planning procedures in coordination with the local communities and government agencies.

1.5.1.8 *Safe Drinking Water Act,* as amended (42 U.S.C. § 300f et seq.)

The *Safe Drinking Water Act* was enacted to protect the quality of public water supplies and sources of drinking water. The New Mexico Environment Department Drinking Water Bureau, under 42 U.S.C. § 300g-2 of the Act, established standards applicable to public water systems. These regulations include maximum contaminant levels (including those for radioactivity) in public water systems. Other programs established by the *Safe Drinking Water Act* include the Sole Source Aquifer Program, the Wellhead Protection Program, and the Underground Injection Control Program. In addition, the Act provides underground sources of drinking water with protection from contaminated releases and spills (for example, implementing a Spill Prevention Control and Countermeasure Plan). The proposed NEF would not use onsite groundwater or surface water supplies and would obtain potable water from nearby municipal water supply systems (i.e., the cities of Eunice and Hobbs, New Mexico). The proposed NEF is required to obtain a Groundwater Discharge Permit/Plan for the septic systems from the New Mexico Environment Department Groundwater Quality Bureau to comply with this Act.

1.5.1.9 *Noise Control Act of 1972,* as amended (42 U.S.C. § 4901 et seq.)

The *Noise Control Act* delegates the responsibility of noise control to State and local governments. Commercial facilities are required to comply with Federal, State, interstate, and local requirements regarding noise control. The proposed NEF is located in Lea County, which does not have a noise control ordinance.

1.5.1.10 *National Historic Preservation Act of 1966,* as amended (16 U.S.C. § 470 et seq.)

The *National Historic Preservation Act* (NHPA) was enacted to create a national historic preservation program, including the National Register of Historic Places and the Advisory Council on Historic Preservation. Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties. The Advisory Council on Historic Preservation regulations implementing Section 106, found in 36 CFR Part 800, were revised and became effective on August 5, 2004 (ACHP, 2004). These regulations call for public involvement in the Section 106 consultation process, including Indian tribes and other interested members of the public, as applicable. The NRC staff has initiated the Section 106 consultation process addressing the potential archaeological sites that have been identified on the proposed NEF site (see section 1.5.6.2 and Appendix B).

1.5.1.11 *Endangered Species Act of 1973,* as amended (16 U.S.C. § 1531 et seq.)

The *Endangered Species Act* was enacted to prevent the further decline of endangered and threatened species and to restore those species and their critical habitats. Section 7 of the Act requires consultation with either or both the U.S. Fish and Wildlife Service (FWS) of the U.S. Department of the Interior and the National Marine Fisheries Service of the U.S. Department of Commerce to determine whether endangered and threatened species or their critical habitats are known to be in the vicinity of the proposed action. The NRC has completed the consultation process with the FWS for the proposed NEF (see section 1.5.6.1 and Appendix B).

1.5.1.12 *Occupational Safety and Health Act of 1970,* as amended (29 U.S.C. § 651 et seq.)

The *Occupational Safety and Health Act* establishes standards to enhance safe and healthy working conditions in places of employment throughout the United States. The Act is administered and enforced by the Occupational Safety and Health Administration (OSHA), a U.S. Department of Labor agency. The identification, classification, and regulation of potential occupational carcinogens are found in 29 CFR § 1910.101, while the standards pertaining to hazardous materials are listed in 29 CFR § 1910.120. The OSHA regulates mitigation requirements and mandates proper training and equipment for workers. The proposed NEF would be required to comply with the requirements of these regulations.

1.5.1.13 *Hazardous Materials Transportation Act* (49 U.S.C. § 1801 et seq.)

The *Hazardous Materials Transportation Act* regulates transportation of hazardous material (including radioactive material) in and between States. According to the Act, States may regulate the transport of hazardous material as long as they are consistent with the Act or the U.S. Department of Transportation regulations provided in 49 CFR Parts 171-177. Title 49 CFR Part 173, Subpart I contains other regulations regarding packaging for transportation of radionuclides. Transportation of the depleted uranium cylinders from the proposed NEF would require compliance with the U.S. Department of Transportation regulations.

1.5.1.14 *Environmental Standards for Uranium Fuel Cycle* (40 CFR Part 190, Subpart B)

These regulations establish the maximum doses to the body or organs resulting from operational normal releases received by members of the public. These regulations were promulgated under the authority of the *Atomic Energy Act* of 1954, as amended. The proposed NEF would be required to comply with these regulations for its releases due to normal operations.

1.5.2 Applicable Executive Orders

- *Executive Order 11988* (Floodplain Management) directs Federal agencies to establish procedures to ensure that the potential effects of flood hazards and floodplain management are considered for any action undertaken in a floodplain and that floodplain impacts be avoided to the extent practicable.

- *Executive Order 12898* (Environmental Justice) requires Federal agencies to address environmental justice in minority populations and low-income populations (59 FR 7629), and directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse health or environmental effects of their programs, policies, and activities on minority populations and low-income populations.

1.5.3 Applicable State of New Mexico Laws and Regulations

Certain environmental requirements, including some discussed earlier, have been delegated to State authorities for implementation, enforcement, or oversight. Table 1-2 provides a list of applicable State of New Mexico laws, regulations, and agreements.

1.5.4 Permit and Approval Status

Several construction and operating permit applications would be prepared and submitted, and regulator approval and/or permits would be received prior to construction or facility operation. Table 1-3 lists the required Federal and State permits and their status.

Table 1-2 Applicable State of New Mexico Laws, Regulations, and Agreements

Law/Regulation/Agreement	Citation	Requirements
New Mexico Air Quality Control Act	NMSA, Chapter 74, "Environmental Improvement", Article 2, "Air Pollution", and implementing regulations in NMAC Title 20, Environmental Protection, Chapter 2, "Air Quality"	Establishes air-quality standards and requires a permit prior to construction or modification of an air-contaminant source. Also, requires an operating permit for major producers of air pollutants and imposes emission standards for hazardous air pollutants.
New Mexico Radiation Protection Act	NMSA, Chapter 74, Article 3, "Radiation Control"	Establishes State requirements for worker protection.
New Mexico Water Quality Act	NMSA, Chapter 74, Article 6, Water Quality, and implementing regulations found in NMAC Title 20, Chapter 6, "Water Quality"	Establishes water-quality standards and applies to permitting prior to construction, during operation, closure, post-closure, and abatement, if necessary. Also, all monitoring wells would require a permit from the New Mexico Office of the State Engineer.
New Mexico Groundwater Protection Act	NMSA, Chapter 74, Article 6B, "Groundwater Protection"	Establishes State standards for protection of groundwater from leaking underground storage tanks.
New Mexico Solid Waste Act	NMSA, Chapter 74, Article 9, *Solid Waste Act*, and implementing regulations found in NMAC Title 20, Environmental Protection, Chapter 9, "Solid Waste"	Establishes State standards for the management of solid wastes.
New Mexico Hazardous Waste Act	NMSA, Chapter 74, Article 4, Hazardous Waste, and implementing regulations found in NMAC Title 20, Environmental Protection, Chapter 4, "Hazardous Waste"	Establishes State standards for the management of hazardous wastes.
New Mexico Hazardous Chemicals Information Act	NMSA, Chapter 4, Article 4E-1, Hazardous Chemicals Information	Implements the hazardous chemicals information and toxic release reporting requirements of the *Emergency Planning and Community Right-to-Know Act of 1986* (SARA Title III) for covered facilities.

Law/Regulation/Agreement	Citation	Requirements
New Mexico Wildlife Conservation Act	NMSA, Chapter 17, Game and Fish, Article 2, Hunting and Fishing Regulations, Part 3, *Wildlife Conservation Act*	Requires a permit and coordination if a project may disturb habitat or otherwise affect threatened or endangered species.
New Mexico Raptor Protection Act	NMSA, Chapter 17, Articles 2–14	Makes it unlawful to take, attempt to take, possess, trap, ensnare, injure, maim, or destroy any species of hawks, owls, and vultures.
New Mexico Endangered Plant Species Act	NMSA, Chapter 75, Miscellaneous Natural Resource Matters, Article 6, Endangered Plants	Requires coordination with the State if a proposed project affects an endangered plant species.
Threatened and Endangered Species of New Mexico	NMSA Title 19, Natural Resources and Wildlife, Chapter 33, Endangered and Threatened Species 19.33.6.8	Establishes the list of threatened and endangered wildlife species.
Endangered Plant Species	NMAC Title 19, Chapter 21, Endangered Plants	Establishes endangered plant species list and rules for collection.
Transportation and Highway	NMAC Chapter 18, Title 31, Part 6, State Highway Access Management Requirements	Establishes state highway access management requirements that will protect the functional integrity of, and investment in, the state highway system.
State Trust Lands Land Exchanges	NMAC Title 19, Chapter 21, Natural Resources and Wildlife	Establishes State standards and procedures for exchanges of lands held in trust, including consideration of cultural and natural resources and wildlife.
New Mexico Cultural Properties Act	NMSA, Chapter 18, Libraries and Museums, Article 6, Cultural Properties	Establishes State Historic Preservation Office and requirements to prepare an archaeological and historic survey and consult with the State Historic Preservation Office.

NMSA - *New Mexico Statutes Annotated*
NMAC - *New Mexico Administrative Code.*
Sources: LES, 2005a; NMCPR, 2004; Conway, 2003.

Table 1-3 Required Federal and State Permits

Requirement	Agency	Comments/Status
Federal		
10 CFR Part 70, 10 CFR Part 40, 10 CFR Part 30	NRC	The proposed NEF license application is being reviewed.
NPDES General Permit for Industrial Stormwater	EPA Region 6[a]	LES has the option of claiming "No Exposure" exclusion or filing for coverage under the Multi-Sector General Permit. A decision regarding the option is pending.
NPDES Construction Stormwater General Permit	EPA Region 6[a]	LES will file for coverage under the General Construction Permit for all construction activities onsite. LES will develop a Stormwater Pollution Prevention Plan and file a Notice of Intent at least two days prior to construction commencement.
State		
Access Permit	NMDOT	LES and/or Lea County would coordinate to obtain approval, if necessary, for upgrading the current gravel access road and adding a second entry point from New Mexico Highway 234. The permit, if issued, would stipulate any safety enhancements necessary to the highway.
Air Construction Permit	NMED/AQB	An air construction permit is not required because proposed NEF emissions would be below Federal and State regulatory limits.
Air Operation Permit	NMED/AQB	An air operation permit is not required because proposed NEF emissions would be below Federal and State regulatory limits.
NESHAP Permit	NMED/AQB	A NESHAP permit is not required because proposed NEF emissions would be below Federal and State regulatory limits.
Groundwater Discharge Permit/Plan	NMED/WQB	LES has submitted a Groundwater Discharge Permit/Plan application to the NMED/WQB. The NMED/WQB has deemed the application administratively complete and assigned it number DP#1481. The application is undergoing WQB review.[b]
NPDES Industrial Stormwater	NMED/WQB[a]	LES has the option of claiming "No Exposure" exclusion or filing for coverage under the Multi-Sector General Permit. A decision regarding the option is pending.

Requirement	Agency	Comments/Status
NPDES Construction Stormwater Permit	NMED/WQB[a]	LES will file for coverage under the General Construction Permit for all construction activities onsite. LES will develop a Stormwater Pollution Prevention Plan and file a Notice of Intent at least two days prior to construction commencement.
Hazardous Waste Permit	NMED/HWB	LES would be classified as a small quantity generator; therefore, no hazardous waste permit would be required.
EPA Waste Activity EPA ID Number	NMED/HWB	This number is required for the storage and use of hazardous chemicals. The proposed NEF would be a small quantity generator and the number is currently in the process of being assigned.
Machine-Produced Radiation Registration (X-Ray Inspection)	NMED/RCB	Registration is required for security nondestructive inspection (x-ray) machines. The RCB has been notified that equipment would be registered, but the registration would be deferred until equipment specifications are available.
Rare, Threatened, & Endangered Species Survey Permit	NMDFG	This permit would only be required for conducting surveys of U.S. Bureau of Land Management (BLM) lands. The proposed NEF does not include BLM lands.
Right-of-Entry Permit	NMSLO	LES has obtained this permit for entry onto Section 32.
State Land Swap Arrangement	NMSLO	This arrangement requires that an environmental assessment and a cultural resources survey be conducted on lands offered for exchange. LES has evaluated different candidate properties. LES identified properties to be offered for exchange, purchased these properties, and conveyed them to Lea County for reconveyance to the NMSLO.
Class III Cultural Survey Permit	NMSHPO	LES has obtained this permit to conduct surveys on Section 32.

NPDES - National Pollutant Discharge Elimination System; EPA - U.S. Environmental Protection Agency; NESHAP - National Emission Standards for Hazardous Air Pollutants; NMDOT - New Mexico Department of Transportation; NMED/AQB - New Mexico Environment Department/Air Quality Bureau; NMED/HWB - New Mexico Environment Department/Hazardous Waste Bureau; NMED/RCB - New Mexico Environment Department/Radiological Control Bureau; NMED/WQB - New Mexico Environment Department/ Water Quality Bureau; NMDGF - New Mexico Department of Game and Fish; NMSLO - New Mexico State Land Office; NMSHPO - New Mexico State Historic Preservation Office.

a NMED could assume NPDES permitting authority from EPA Region 6 by early 2007 (NMED, 2005).

[b] LES would consult with the Office of the State Engineer prior to installation of future site groundwater monitoring wells and obtain any required permits (LES, 2005b).

Sources: LES, 2005a; LES, 2005b.

1.5.5 Cooperating Agencies

During the scoping process, no Federal, State, or local agencies were identified as potential cooperating agencies in the preparation of this EIS.

1.5.6 Consultations

As a Federal agency, the NRC is required to comply with the consultations requirements in the *Endangered Species Act of 1973*, as amended, and the *National Historic Preservation Act of 1966*, as amended.

1.5.6.1 *Endangered Species Act of 1973* Consultation

The NRC staff consulted with the U.S. Fish and Wildlife Service (FWS) to comply with the requirements of Section 7 of the *Endangered Species Act of 1973* (see Appendix B). On March 2, 2004, the NRC staff sent a letter to the FWS New Mexico Ecological Services Field Office describing the proposed action and requesting a list of threatened and endangered species and critical habitats that could potentially be affected by the proposed action. By letter dated March 26, 2004, the FWS New Mexico Field Office provided a list of threatened and endangered species, candidate species, and species of concern. The NRC staff reviewed the list, as well as the results of field surveys (see section 4.2.7), and determined that no threatened or endangered species would be affected by the proposed NEF. On August 9, 2004, the NRC notified the FWS of its conclusion of "no effect" on endangered or threatened species or critical habitat. The NRC staff has completed the consultation process.

Additionally, by letter dated February 23, 2004, the State of New Mexico Department of Game and Fish, submitted scoping comments regarding the sand dune lizard and lesser prairie chicken, both of which are candidate species under the *Endangered Species Act*. The NRC discussed the potential impacts of the proposed NEF on these species in section 4.2.7 of Chapter 4 of the EIS. The New Mexico Department of Game and Fish submitted comments on the EIS in a letter to the NRC on November 1, 2004. In this letter, the New Mexico Department of Game and Fish concurred that no significant adverse effects on the sand dune lizard or lesser prairie chicken would be expected.

1.5.6.2 *National Historic Preservation Act of 1966* Section 106 Consultation

The NRC staff has offered State agencies, Federally recognized Indian tribes, and other organizations that may be concerned with the possible effects of the proposed action on historic properties an opportunity to participate in the consultation process required by Section 106 of the *National Historic Preservation Act* (see Appendix B). The following is a list of agencies, tribes, and organizations contacted during the consultation process and a summary of the consultation performed:

<u>New Mexico State Historic Preservation Office</u>

By letter dated February 17, 2004, the NRC staff initiated the Section 106 consultation process with the State of New Mexico Department of Cultural Affairs, Historic Preservation Division, State Historic Preservation Office (SHPO). This letter described the potentially affected area and requested the views of the SHPO on further actions required to identify historic properties that may be affected. The NRC staff submitted a copy of the Cultural Resource Inventory for the proposed NEF to the SHPO, by letter dated March 29, 2004. The Cultural Resource Inventory is required by the NHPA and 36 CFR Part 800 to locate and identify all potential prehistoric and historic properties that could be adversely affected by an undertaking. On April 7, 2004, the NRC staff met with representatives from the SHPO and the New

Mexico State Land Office to discuss the proposed NEF and the Section 106 consultation process. The SHPO responded by letter dated April 26, 2004, summarizing the meeting and providing the following suggestions:

- Enter into a Memorandum of Agreement (Agreement) that outlines agreed-upon measures that LES would undertake to mitigate the potential adverse effects of the proposed action on the historic properties located in the potentially affected area.

- Notify the Advisory Council on Historic Preservation that there would be adverse effects to cultural resources and notify and invite the Council to be a signatory to the Agreement.

- Contact Indian tribes and forward them a copy of the Cultural Resource Inventory.

- Consider several options for mitigating the adverse effects of the proposed action (see Appendix B).

By letter dated November 2, 2004, the NRC staff provided a draft Agreement and accompanying Treatment Plan to the SHPO for review and comment. The SHPO submitted comments on the Treatment Plan by letter dated November 29, 2004. Based on these comments and those received from other parties, the NRC staff provided, by letter dated February 25, 2005, a final Agreement and Treatment Plan for signature by the SHPO.

Federally Recognized Indian Tribes

By letter dated February 17, 2004, the NRC staff initiated the Section 106 consultation process with regional Federally recognized Indian tribes, soliciting their interest in being consulting parties in the Section 106 consultation process for the proposed project. In response to the SHPO's letter dated April 26, 2004, the NRC staff provided the Indian tribes with copies of the Cultural Resource Inventory and requested information regarding historic properties in the area of potential effects that could have cultural or religious significance to them. In addition, during the month of June, the NRC staff contacted the Indian tribes via telephone to discuss the requested information and to invite the Indian tribes to be concurring parties to the Agreement. The Mescalero Apache Tribe, by letter dated June 10, 2004, indicated the proposed NEF would not affect any sites or locations important to the tribe culture or religion. The Kiowa Tribe of Oklahoma, Comanche Tribe of Oklahoma, Mescalero Apache Tribe, and Yseleta del Sur Pueblo indicated they would like to be concurring parties to the Agreement. Subsequently, by letters dated July 6, 2004, the NRC staff provided a followup letter confirming the information provided in the above-mentioned telephone conversation or documenting attempts to contact the Mescalero Apache Tribe and the Apache Tribe of Oklahoma. As recommended by the SHPO, the NRC staff contacted Sam Cata, a Governor-appointed tribal liaison to discuss the project and determine which tribes should be contacted to comment on a treatment/mitigation plan. Project information was provided to Mr. Cata on June 4, 2004.

By letter dated November 2, 2004, the NRC staff provided a draft Agreement and accompanying Treatment Plan to the affected Indian tribes for review and comment. No comments were received from the tribes. Based on comments received from other parties, the NRC staff provided, by letter dated February 25, 2005, a final Agreement and Treatment Plan for signature by each of these Federally-recognized Indian tribes.

Other Organizations

Additionally, in accordance with 36 CFR § 800.3(f), the NRC staff contacted a local organization, the Lea County Archaeological Society, by letter dated March 18, 2004, to solicit information on the proposed project.

Advisory Council on Historic Preservation

By letter dated June 24, 2004, the NRC staff notified the Advisory Council on Historic Preservation that the proposed action would result in an adverse effect on cultural resources and that an Agreement would be prepared. By letter dated November 2, 2004, the NRC staff provided a draft Agreement and accompanying Treatment Plan to the Advisory Council on Historic Preservation for review and comment. By letter dated November 8, 2004, the Advisory Council on Historic Preservation notified the NRC staff that the Advisory Council on Historic Preservation did not believe that its participation in consultation to resolve adverse effects was needed. The Advisory Council on Historic Preservation also reminded the NRC staff that it needed to submit to the Advisory Council on Historic Preservation the final Agreement and related documentation at the close of the consultation process. By letter dated April 1, 2005, the NRC staff provided the Advisory Council on Historic Preservation with a copy of the final Agreement signed by representatives from each of the signatory parties.

1.6 Organizations Involved in the Proposed Action

Four organizations have specific roles in the implementation of the proposed action:

- LES is the NRC license applicant. If the license is granted, LES would be the holder of an NRC license for the construction, operation, and decommissioning of the proposed NEF. LES would own the operation and be responsible for operating the proposed facility in compliance with applicable NRC regulations. LES is a Delaware limited partnership that was formed solely to provide uranium enrichment services for commercial nuclear power plants. LES has one, 100-percent-owned subsidiary operating as a limited liability company (LLC) that was formed for the purpose of purchasing industrial revenue bonds and has no organizational divisions. The LES general partners are Urenco Investments, Inc.[2], and Westinghouse Enrichment Company LLC[3]. The limited partners[4]

[2] Urenco Investments, Inc., is a Delaware corporation and wholly owned subsidiary of Urenco Limited (Urenco), a corporation formed under the laws of the United Kingdom. Urenco is owned in equal shares by BNFL Enrichment Limited (BNFL-EL), Ultra-Centrifuge Nederland NV (UCN), and Uranit GmbH (Uranit) companies formed under English, Dutch, and German law, respectively. BNFL-EL is wholly owned by British Nuclear Fuels plc (BNFL), which is wholly owned by the Government of the United Kingdom. UCN is 99-percent owned by the Government of the Netherlands with the remaining one percent owned collectively by the Royal Dutch Shell Group, Koninklijke Philips Electronics N.V., and Stork N.V. Uranit is owned by Eon Kernkraft GmbH (50 percent) and RWE Power AG (50 percent), which are corporations formed under laws of the Federal Republic of Germany.

[3] Westinghouse Enrichment Company LLC is a Delaware limited liability company and wholly owned subsidiary of Westinghouse Electric Company (Westinghouse) LLC, a Delaware limited liability company whose ultimate parent (through two intermediary Delaware corporations and one corporation formed under the laws of the United Kingdom) is BNFL.

[4] Urenco Deelnemingen B.V. is a Netherlands corporation and wholly owned subsidiary of Urenco Nederlands B.V. (UNL); Westinghouse Enrichment Company LLC is a Delaware limited liability company, wholly owned by Westinghouse, that also is acting as a General Partner; Entergy Louisiana, Inc., is a Louisiana corporation and wholly owned subsidiary of Entergy Corporation, a publicly held Delaware corporation and a public utility holding company; Claiborne Energy Services, Inc., is a Louisiana corporation and wholly owned subsidiary of Duke Energy Corporation, a publicly held North Carolina corporation; Cenesco Company LLC is a Delaware limited liability company and wholly owned subsidiary of Exelon Generation Company

are Urenco Deelnemingen B.V.; Westinghouse Enrichment Company LLC; Entergy Louisiana, Inc.; Claiborne Energy Services, Inc.; Cenesco Company LLC; and Penesco Company LLC. Urenco owns 70.5 percent of the partnership, while Westinghouse owns 19.5 percent of LES. The remaining 10 percent is owned by companies representing three U.S. electric utilities: Entergy Corporation, Duke Energy Corporation, and Exelon Generation Company LLC (LES, 2005a).

LES has indicated that the principal business location is in Albuquerque, New Mexico. Furthermore, LES has stated that no other companies would be present or operating on the proposed NEF site other than services specifically contracted by LES (LES, 2005a). The NRC intends to examine any foreign relationship to determine whether it is inimical to the common defense and security of the United States. The foreign ownership, control, and influence issue will be addressed as part of the NRC SER, and this issue is beyond the scope of this EIS.

- The NRC is the licensing agency. The NRC has the responsibility to evaluate the license application for compliance with the NRC regulations associated with uranium enrichment facilities. These include standards for protection against radiation in 10 CFR Part 20 and requirements in 10 CFR Parts 30, 40, and 70 that would authorize LES to possess and use special nuclear material, source material, and byproduct material at the proposed NEF. The NRC is responsible for regulating activities performed within the proposed NEF through its licensing review process and subsequent inspection program. To fulfill the NRC responsibilities under NEPA, the environmental impacts of the proposed action are evaluated in accordance with the requirements of 10 CFR Part 51 and documented in this EIS.

- The State of New Mexico would play a role in regulating nonradiological aspects of the proposed NEF. The State is comprised of several entities that include State-level regulatory agencies (such as the New Mexico Environment Department), which issue permits and authorizations associated with the construction or operation of industrial facilities. Areas over which the State has jurisdiction include, among others, air quality, surface and groundwater discharges, conservation of wildlife, and the protection of endangered species.

- Lea County would serve as the lessor-owner of the facility during the 30-year term of the Industrial Revenue Bonds. In this capacity, Lea County will hold the legal title to the uranium enrichment facility, including all related buildings, storage, infrastructure, and equipment, and will hold legal title or a possessory interest in the site on which the facility is located during the term of the Industrial Revenue Bonds.

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2 ALTERNATIVES

This chapter describes the Louisiana Energy Services (LES) proposed action and reasonable alternatives including the no-action alternative. Related to the proposed action, the U.S. Nuclear Regulatory Commission (NRC) staff also examined alternatives for the disposition of the depleted uranium hexafluoride (DUF_6) material resulting from the enrichment operation over the lifetime of the proposed National Enrichment Facility (NEF). Under the no-action alternative, LES would not construct, operate, or decommission the proposed NEF. This alternative is included to comply with National Environmental Policy Act (NEPA) requirements. The no-action alternative provides a basis for comparing and evaluating the potential impacts of constructing, operating, and decommissioning the proposed NEF.

This chapter also addresses the site-selection process and reviews alternative enrichment technologies (other than the proposed centrifuge technology) and alternative sources for enriched product.

2.1 Proposed Action

The LES proposed action is the construction, operation, and decommissioning of the proposed NEF in southeastern New Mexico. Figure 2-1 shows the location of the proposed NEF.

The proposed action can be divided into three major activities: (1) site preparation and construction, (2) operation, and (3) decontamination and decommissioning.

The NRC license, if granted, would be for a 30-year period from the date of issuance.

Table 2-1 presents the current schedule for the proposed NEF project.

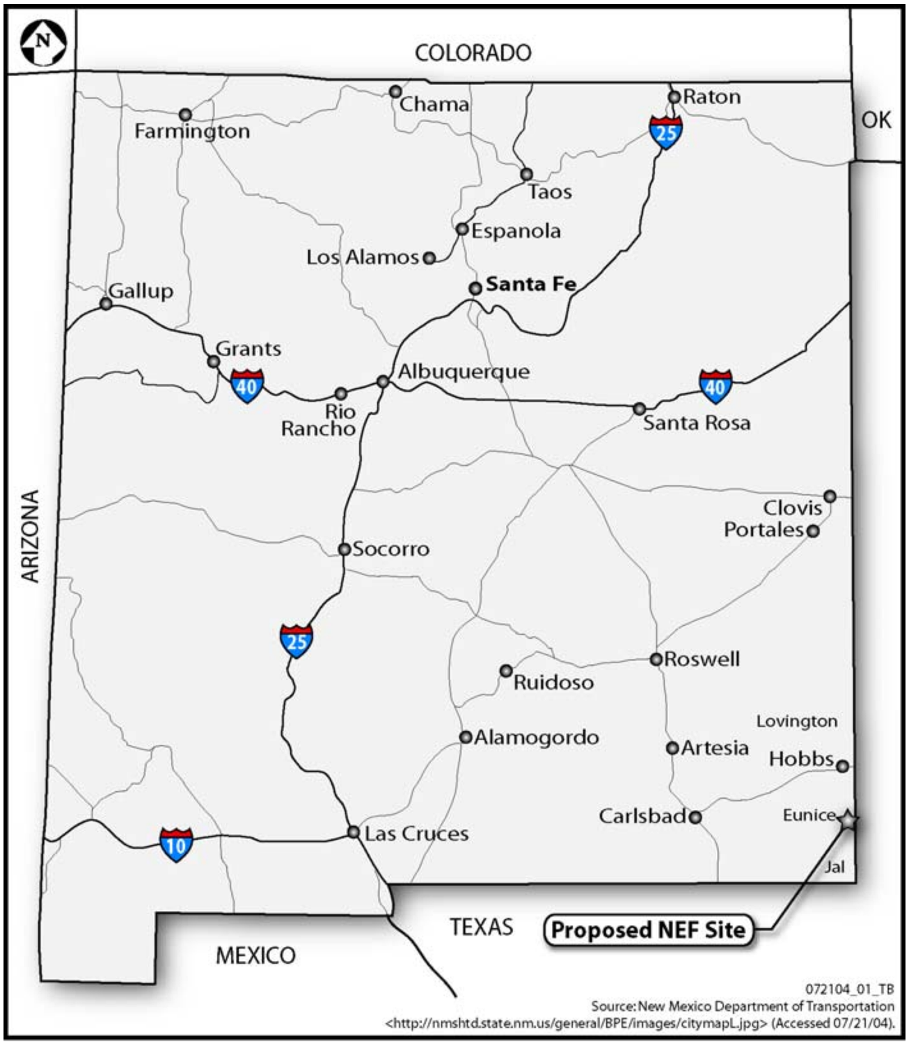


Figure 2-1 Location of Proposed NEF Site (NMDOT, 2004a)

Table 2-1 Proposed National Enrichment Facility Operation Schedule

Task	Start Date
Submit License Application to NRC	December 2003
Begin Construction of Facility	August 2006
Begin Operation of First Cascade	October 2008
Achieve Full Production Output	October 2013
Operate Facility at Full Capacity	October 2013 to October 2027
Submit Decommissioning Plan to NRC	April 2025
Complete Construction of Decontamination and Decommissioning Facility	April 2027
Cease All Operations of Cascades	April 2033
Complete Decommissioning of Facility	April 2036

Source: LES, 2005a.

2.1.1 Location and Description of Proposed Site

The proposed NEF site consists of about 220 hectares (543 acres) located 8 kilometers (5 miles) east of the city of Eunice, New Mexico. The U.S. Bureau of Land Management (BLM) identifies the proposed site as Section 32 of range 38E in Township 21S of the New Mexico Meridian. Lea County currently owns the property; however, on December 8, 2004, LES began a lease for 30 years after which LES would purchase the land from Lea County. The entire site is undeveloped, with the exception of an underground carbon dioxide (CO_2) pipeline and a gravel road, and is used for cattle grazing. There is no permanent surface water on the site, and appreciable groundwater reserves are deeper than 340 meters (1,115 feet). The nearest permanent resident is 4.3 kilometers (2.6 miles) west of the proposed site near the junction of New Mexico Highway 234 and New Mexico Highway 18.

2.1.2 Gas Centrifuge Enrichment Process

The proposed NEF would employ a proven gas centrifuge technology for enriching natural uranium. Figure 2-2 shows the basic construction of a gas centrifuge. The technology uses a rotating cylinder (rotor) spinning at a high circumferential rate of speed inside a protective casing. The casing maintains a vacuum around the rotor and provides physical containment of the rotor in the event of a catastrophic rotor failure.

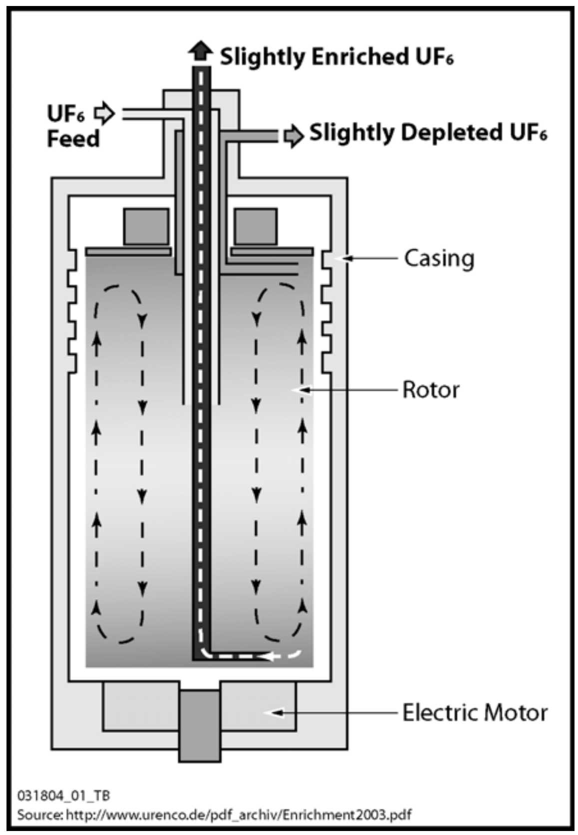


Figure 2-2 Schematic of a Gas Centrifuge (Urenco, 2003)

The uranium hexafluoride (UF_6) gas is fed through a fixed pipe into the middle of the rotor, where it is accelerated and spins at almost the same speed as the rotor. The centrifugal force produced by the spinning rotor causes the heavier uranium-238 hexafluoride ($^{238}UF_6$) molecules to concentrate close to the rotor wall and the lighter uranium-235 hexafluoride ($^{235}UF_6$) molecules collect closer to the axis of the rotor. This separation effect, which initially occurs only in a radial direction, increases when the rotation is supplemented by a convection current produced by a temperature difference along the rotor axis (thermoconvection). A centrifuge with this kind of gas circulation (i.e., from top to bottom near to the rotor axis and from bottom to top by the rotor wall) is called a counter-current centrifuge.

The inner and outer streams become more enriched/depleted in ^{235}U in their respective directions of movement. The biggest difference in concentration in a counter-current centrifuge does not occur between the axis and the wall of the rotor, but rather between the two ends of the centrifuge rotor. In the flow pattern shown in Figure 2-2, the enriched UF_6 is removed from the lower end of the rotor and the DUF_6 at the upper end through take-off pipes that run from the axis close to the wall of the rotor.

The enrichment level achieved by a single centrifuge is not sufficient to obtain the desired concentration of 3 to 5 percent by weight of ^{235}U in a single step; therefore, a number of centrifuges are connected in series to increase the concentration of the ^{235}U isotope. Additionally, a single centrifuge cannot process a sufficient volume for commercial production, which makes it necessary to connect multiple centrifuges in parallel to increase the volume flow rate. The arrangement of centrifuges connected in series to achieve higher enrichment and parallel for increased volume is called a “cascade.” A full cascade contains hundreds of centrifuges connected in series and parallel. Figure 2-3 is a diagram of a segment of a uranium enrichment cascade showing the flow path of the UF_6 feed, enriched UF_6 product, and DUF_6 gas. In the proposed NEF, eight cascades would be grouped in a Cascade Hall, and each separation building would house two cascade halls. There would be three separations buildings in the full-capacity plant.

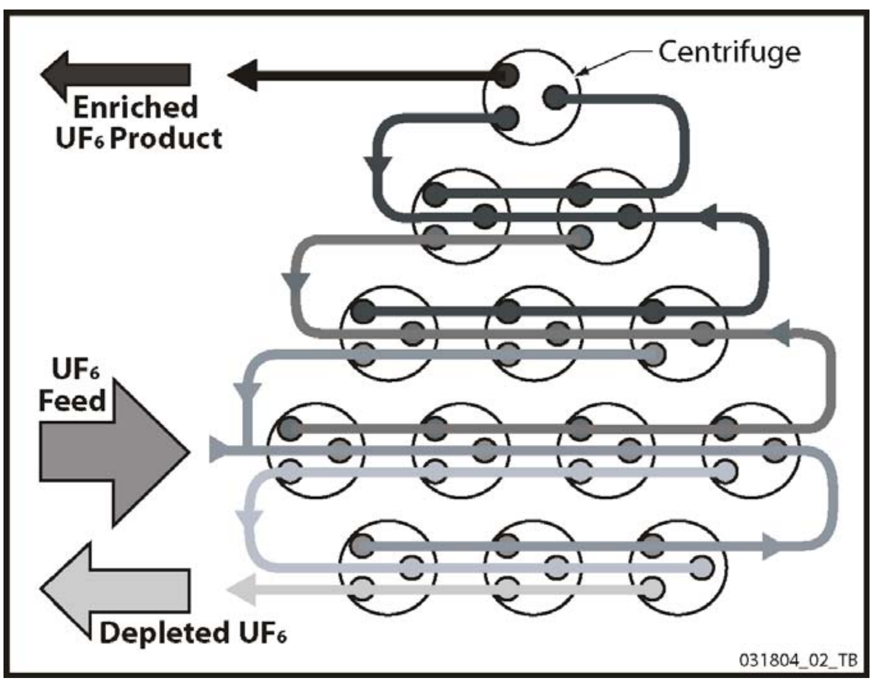


Figure 2-3 Diagram of Enrichment Cascade for Proposed NEF (Urenco, 2003)

What is enriched uranium?

Uranium is a naturally occurring radioactive element. In its natural state, uranium contains approximately 0.72 percent by weight of the uranium-235 isotope (^{235}U*), which is the fissile isotope of uranium. There is a very small (0.0055 percent) quantity of the uranium-234 (*^{234}U*) isotope, and most of the remaining mass (99.27 percent) is the uranium-238 (*^{238}U*) isotope. All three isotopes are chemically identical and only differ slightly in their physical properties. The most important difference between the isotopes is their mass. This small mass difference allows the isotopes to be separated and makes it possible to increase (i.e., "enrich") the percentage of* ^{235}U *in the uranium to levels suitable for nuclear power plants or, at very high enrichment, nuclear weapons.*

Most civilian nuclear power reactors use low-enriched uranium fuel containing 3 to 5 percent by weight of ^{235}U*. Uranium for most nuclear weapons is enriched to greater than 90 percent.*

Uranium would arrive at the proposed NEF as natural UF_6 *in solid form in a Type 48X or 48Y transport cylinder from existing conversion facilities in Port Hope, Ontario, Canada or Metropolis, Illinois. To start the enrichment process, the cylinder of* UF_6 *is heated, which causes the material to sublime (change directly from a solid to a gas). The* UF_6 *gas is fed into the enrichment cascade where it is processed to increase the concentration of the* ^{235}U *isotope. The* UF_6 *gas with an increased concentration of* ^{235}U *is known as "enriched" or "product." Gas with a reduced concentration of* ^{235}U *is referred to as "depleted"* UF_6 *(*DUF_6*) or "tails."*

Source: WNA, 2003.

2.1.3 Description of Proposed National Enrichment Facility

Figure 2-4 shows the general layout of the proposed NEF. Structures within the proposed NEF include the following:

- Uranium Byproduct Cylinder (UBC) Storage Pad.
- Centrifuge Assembly Building.
- Cascade Halls.
- Cylinder Receipt and Dispatch Building.
- Blending and Liquid Sampling Area.
- Technical Services Building.
- Administration Building.
- Visitor Center.
- Security Building.
- Central Utilities Building.

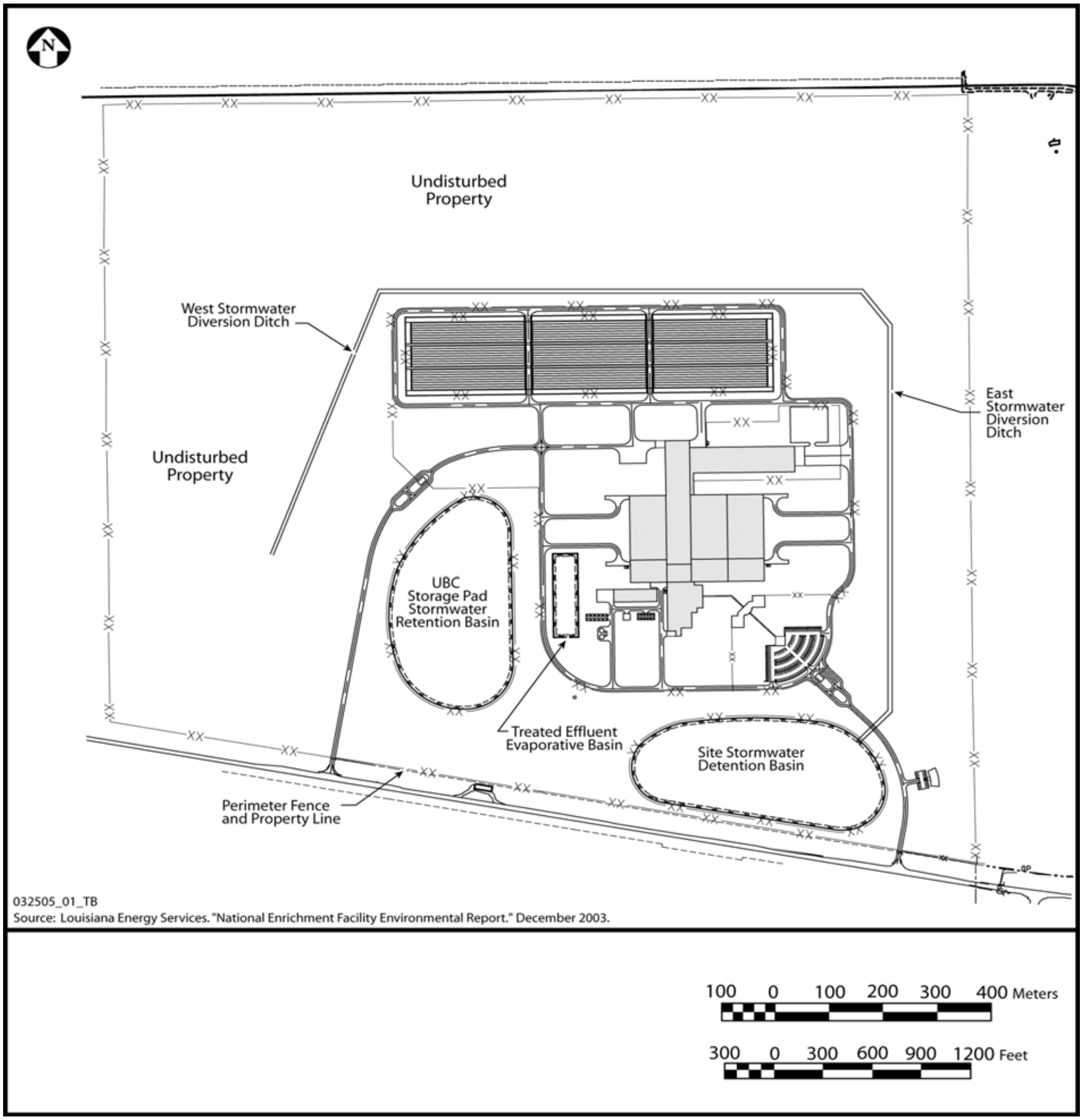


Figure 2-4 Proposed NEF Site Layout (LES, 2005a)

Uranium Byproduct Cylinders (UBC) Storage Pad

The UBC Storage Pad would be constructed on the north side of the controlled area to store transportation cylinders and UBCs. The UBCs are Type 48Y cylinders. The large concrete pad would initially be sized to store the first 5 years' worth of cylinders (about 1,600 cylinders) stacked two high in concrete saddles that would elevate them approximately 20 centimeters (8 inches) above ground level. The pad would be expanded as additional storage is required. The maximum size of the UBC Storage Pad would be 9 hectares (23 acres), and it would be able to store 15,727 cylinders (LES, 2005a).

Centrifuge Assembly Building

The Centrifuge Assembly Building would be used for the assembly, inspection, and mechanical testing of the centrifuges prior to installation in the Cascade Halls. This building would also contain the Centrifuge Test and Postmortem Facilities that would be used to test the functional performance and operational problems of production centrifuges and ensure compliance with design parameters.

Cascade Halls

The six proposed Cascade Halls would be contained in three Separations Buildings near the center of the proposed NEF. Figure 2-5 is a photograph of centrifuges inside a cascade hall at Urenco. Each of the six proposed Cascade Halls would house eight cascades, and each cascade would consist of hundreds of centrifuges connected in series and parallel to produce enriched UF_6. Each Cascade Hall would be capable of producing a maximum of 545,000 separative work units (SWU) per year.

The centrifuges would be mounted on precast concrete-floor-mounted stands (flomels). Each Cascade Hall would be enclosed by a structural steel frame supporting insulated sandwich panels (metal skins with a core of insulation) to maintain a constant temperature within the cascade enclosure.

Figure 2-5 Inside a Cascade Hall (Urenco, 2003)

In addition to the Cascade Halls, each Separations Building module would house a UF_6 Handling Area and a Process Services Area. The UF_6 Handling Area would contain the UF_6 feed input system as well as the enriched UF_6 product, and DUF_6 takeoff systems. The Process Services Area would contain the gas transport piping and equipment, which would connect the cascades with each other and with the product and depleted materials takeoff systems. The Process Services Area would also contain key electrical and cooling water systems.

Cylinder Receipt and Dispatch Building

All UF_6 cylinders (feed, product, and UBCs) would enter and leave the proposed NEF through the Cylinder Receipt and Dispatch Building.

Blending and Liquid Sampling Area

The primary function of the Blending and Liquid Sampling Area would be filling and sampling the Type 30B product cylinders with UF_6 enriched to the customer specifications and verifying the purity of the enriched product.

Technical Services Building

The Technical Services Building would contain support areas for the facility and acts as the secure point of entry to the Separations Building Modules and the Cylinder Receipt and Dispatch Building. This building would contain the following functional areas:

- The *Control Room* would be the main monitoring point for the entire plant and provide all of the facilities for the control of the plant.

- The *Security Alarm Center* would be the primary security monitoring station for the facility. All electronic security systems would be controlled and monitored from this center.

- The *Cylinder Preparation Room* would provide a set-aside area for testing and inspecting Type 30B, 48X, and 48Y cylinders for use in the proposed NEF. It would be maintained under negative pressure and would require entry and exit through an airlock.

- The *Radiation Monitoring Control Room* would separate the non-contaminated areas from the potentially contaminated areas of the proposed plant. It would include personnel radiation monitoring equipment, hand-washing facilities and safety showers.

- The *Decontamination Workshop* would provide a facility for the removal of radioactive contamination from contaminated materials and equipment.

- The *Solid Waste Collection Room* would be used for processing wet and dry low-level solid waste.

- The *Liquid Effluent Collection and Treatment Room* would be used to collect, monitor, and treat potentially contaminated liquid effluents produced onsite.

- The *Gaseous Effluent Vent System Room* would be used to remove uranium and other radioactive particles and hydrogen fluoride from the potentially contaminated process gas streams.

- The *Laboratory Area* would provide space for laboratories where the purity and enrichment percentage of the enriched UF_6 would be measured and the impact of the proposed NEF on the environment would be monitored.

Administration Building

The Administration Building would contain office areas and a security station. All personnel access to the proposed NEF would occur through the Administration Building.

Visitor Center

The Visitor Center would be located outside the security fence close to New Mexico State Highway 234.

Security Building

The main Security Building would be located to monitor all traffic entering and leaving the proposed NEF.

Central Utilities Building

The Central Utilities Building would house two diesel generators, which would provide standby and emergency power for the proposed facility as well as the electrical switchgear and heating, ventilation, and air-conditioning systems for the proposed facility.

2.1.4 Site Preparation and Construction

Site preparation for the construction of the proposed NEF would require the clearing of approximately 81 hectares (200 acres) of undisturbed pasture land within the 220-hectares (543-acre) site. The permanent plant structures, support buildings, and the UBC Storage Pad would occupy about 73 hectares (180 acres) of the 81 hectares (200 acres) if the UBC Storage Pad is expanded to its fullest capacity. Contractor parking and a lay-down area would occupy the remaining 8 hectares (20 acres). The contractor parking and lay-down area and areas around the building exteriors would be graded and restored after completion of the proposed construction (LES, 2005a).

Most of the disturbed area would be graded and would form the owner-controlled area. The disturbed area would comprise about one-third of the total site area. The undisturbed onsite areas (139 hectares [343 acres]) would be left in a natural state with no designated use for the life of the proposed NEF. Figure 2-6 shows the areas that would be cleared for construction activities.

Site Preparation

If licensed, groundbreaking at the proposed NEF site would begin in 2006, with construction continuing for 8 years until 2013. The proposed site terrain currently ranges in elevation from 1,033 to 1,045 meters (3,390 to 3,430 feet) above mean sea level. Because the proposed NEF requires an area of flat terrain, about 36 hectares (90 acres) would be graded to bring the site to a proposed final grade of 1,041 meters (3,415 feet) above mean sea level. All material excavated onsite would be used for onsite fill.

Site preparation would include the cutting and filling of approximately 611,000 cubic meters (797,000 cubic yards) of soil and caliche with the deepest cut being 4 meters (13 feet) and the deepest fill being 3.3 meters (11 feet) (LES, 2005a). In this phase, conventional earthmoving and grading equipment would be used. The removal of very dense soil or caliche could require the use of heavy equipment with ripping tools. Control of soil-removal work for foundations would follow to reduce over excavation and minimize construction costs. In addition, loose soil and/or damaged caliche would be removed prior to installation of foundations for seismically designed structures.

Subsurface geologic materials at the proposed NEF site generally consist of red clay beds, a part of the Chinle Formation of the Triassic-aged Dockum Group. Bedrock is covered with up to 17 meters (55 feet) of silty sand, sand, sand and gravel, and an alluvium that is part of the Antlers and/or Gatuña Formations.

Foundation conditions at the site are generally good, and no potential for mineral development has been found at the site.

A high-pressure CO_2 pipeline would be relocated during the site preparation for safety considerations. The relocation would be performed in accordance with applicable regulations to minimize any direct or indirect impacts on the environment.

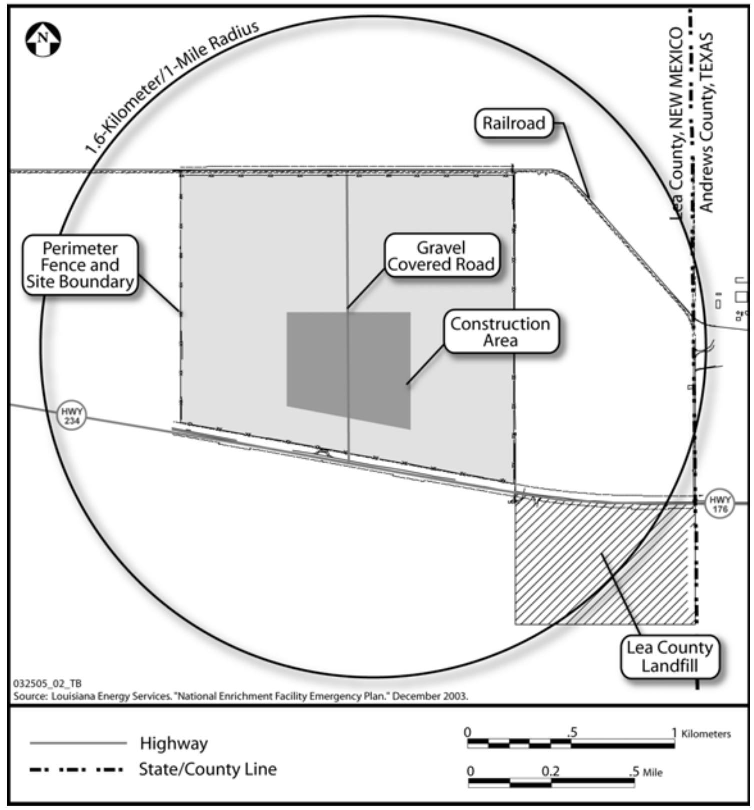


Figure 2-6 Construction Area for the Proposed NEF Site

Soil Stabilization

An engineered system would control surface stormwater runoff for the proposed NEF. Construction and erosion control management practices would mitigate erosional impacts due to site clearing and grading. Part of construction work would involve stabilizing disturbed soils. Earth berms, dikes, and sediment fences would be used as necessary during all phases of construction to limit runoff. Much of the excavated areas would be covered by structures or paved, limiting the creation of new dust sources. Additionally, two stormwater detention basins would be constructed prior to land clearing to be used as sedimentation collection basins during construction, and they would be converted to stormwater detention or retention basins once the site is re-vegetated and stabilized.

One of the construction stormwater detention basins would be converted to the Site Stormwater Detention Basin at the south side of the proposed site. The Site Stormwater Detention Basin would collect runoff from various developed parts of the site including roads, parking areas, and building roofs. It would be unlined and would have an outlet structure to control discharges above the design level. The normal discharge would be through evaporation to the air or infiltration into the ground. The basin's design would enable it to contain runoff for a rainfall of 15.2 centimeter (6.0 inch) in 24 hours, which is equal to the 100-year return frequency storm. In addition, the basin would have 60 centimeters (2 feet) of freeboard beyond design capacity.

The site is currently unimproved ground. Rainfall percolates into the soil or runs off into the roadside drainage ditch. After construction is completed part of the site would be covered with buildings and paved areas that would prevent rainfall from percolating into the soil. Runoff from the buildings and paved areas would be diverted to the Site Stormwater Detention Basin. The Basin would be equipped with an outfall that would be designed to limit the discharge flow rate to the same or less than the site's current runoff rate.

The Site Stormwater Detention Basin would have approximately 123,350 cubic meters (100 acre-feet) of storage capacity. The drainage area served would include about 39 hectares (96 acres), the majority of which would be the developed portion of the proposed NEF site. The water quality of the discharge would be typical of runoff from building roofs and paved areas from any industrial facility. Except for small amounts of oil and grease typically found in runoff from paved roadways and parking areas, the discharge would not be expected to contain contaminants.

The second stormwater detention basin built during construction would be converted to the UBC Storage Pad Stormwater Retention Basin for the operation phase. The UBC Storage Pad Stormwater Retention Basin would collect and contain water discharges from three sources: (1) stormwater runoff from the UBC Storage Pad, (2) cooling tower blowdown discharges, and (3) heating boiler blowdown discharges. This basin would be designed with a membrane lining to minimize ground infiltration of the water. Evaporation would be the primary method to eliminate the water from the UBC Storage Pad Stormwater Retention Basin. The basin would be designed to contain a volume equal to 30.4 centimeters (12 inches) of rainfall, which is double the 24-hour, 100-year return frequency storm plus an allowance for cooling tower and heating boiler blowdown water. The UBC Storage Pad Stormwater Retention Basin would be designed to contain a volume of approximately 77,700 cubic meters (63 acre-feet), which serves 9 hectares (23 acres), the maximum area of the proposed UBC Storage Pad.

Additional mitigation measures would be taken to minimize soil erosion and impacts during the construction phase. Mitigation measures proposed by LES during construction include:

- Watering the onsite construction roads periodically to control fugitive dust emissions, taking into account water conservation.
- Using adequate containment methods during excavation and other similar operations.
- Covering open-bodied trucks transporting materials likely to disperse when in motion.
- Promptly removing earthen materials dispensed on paved roads.
- Stabilizing or covering bare areas once earth-moving activities are completed.

After construction is complete, natural, low-water maintenance landscaping and pavement would be used to stabilize the site.

Spill Prevention

All construction activities would comply with the National Pollutant Discharge Elimination System (NPDES) general construction permit obtained from U.S. Environmental Protection Agency Region 6 with an oversight review by the New Mexico Environment Department Water Quality Bureau. A Spill Prevention, Control, and Countermeasure Plan would also be implemented during construction to minimize environmental impacts from potential spills and to ensure prompt and appropriate remediation. Potential spills during construction would likely occur around vehicle maintenance and fueling locations, storage tanks, and painting operations. The Spill Prevention, Control, and Countermeasure Plan would identify sources, locations, and quantities of potential spills and response measures. The plan would also identify individuals and their responsibilities for implementation of the plan and provide for prompt notifications of State and local authorities, as required. Implementing best management practices for waste management would minimize solid waste and hazardous material generation during construction. These practices would include the placement of waste receptacles and trash dumpsters at convenient locations and the designation of vehicle and equipment maintenance areas for the collection of oil, grease, and hydraulic fluids. If external washing of construction vehicles would be necessary, no detergents would be used, and the runoff would be diverted to an onsite basin. Adequately maintained sanitary facilities would be available for construction crews.

Air Emissions

Construction activity would generate some degree of dust during the various stages of construction activity. The amount of dust emissions would vary according to the types of activity. The first 5 months of construction would likely be the period of highest emissions because approximately one-third of the 220-hectare (543-acre) proposed NEF site would be involved along with the greatest number of construction vehicles operating on an unprepared surface. However, it would be expected that no more than 18 hectares (45 acres) would be involved in this type of work at any one time.

Table 2-2 lists the estimated peak emission rates during construction of the proposed NEF. Emission rates for fugitive dust were estimated for a 10-hour workday assuming peak construction activity levels were maintained throughout the year. The calculated total work-day average emissions result for fugitive emission particulate would be 8.6 kilograms per hour (19.1 pounds per hour). Fugitive dust would most likely be caused by vehicular traffic on unpaved surfaces, earth moving, excavating and bulldozing, and to a lesser extent wind erosion.

Table 2-2 Estimated Peak Emission Rates During Construction (Based on 10 hours per day, 5 days per week, and 50 weeks per year)

Pollutant	Average Emissions, kilograms per hour (pounds per hour)
Vehicle Emissions	
Hydrocarbons	2.1 (4.6)
Carbon Monoxide	13.3 (29.4)
Nitrogen Oxides	7.53 (59.8)
Sulfur Oxides	2.7 (6.0)
Particulate	1.9 (4.3)
Fugitive Emissions	
Particulate	8.6 (19.1)

Source: LES, 2005b.

Sanitary Waste

In lieu of connecting to the local sewer system, six onsite underground septic systems would be installed for the treatment of sanitary wastes. Each septic system would consist of a septic tank with one or more leachfields. Together, the six septic systems would be sized to process 40,125 liters per day (10,600 gallons per day), which is sufficient flow capacity for approximately 420 people. Assuming an average water use of 95 liters per day (25 gallons per day) per person, the planned staff of 210 full-time employees would use approximately 20,000 liters per day (5,283 gallons per day) which, if evenly distributed, means the planned septic systems would operate at about 50 percent of design capacity (LES, 2005a).

Construction Work Force

Table 2-3 presents the estimated average annual number of construction employees who would work on the proposed NEF site during construction and their annual pay. The construction force is anticipated to peak at about 800 workers from 2008 to 2009. During early construction stages of the project, the work force would be expected to consist primarily of structural crafts workers, most of whom would be recruited from the local area. As construction progresses, there would be a transition to predominantly mechanical and electrical crafts. The bulk of this labor force would come from the surrounding 120-kilometer (75-mile) region, which is known as the region of influence.

Table 2-3 Estimated Number of Construction Workers by Annual Pay

Year	Number of Workers by Salary Range				Total Number of Workers
	$0 - 16,000	$17,000 - 33,000	$34,000 - 49,000	$50,000 - 82,000	Average Number per Year
2006	100	100	50	5	255
2007	50	75	350	45	520
2008	50	100	500	50	700
2009	50	100	600	50	800
2010	50	25	300	50	425
2011	10	25	100	60	195
2012	10	15	75	40	140
2013	10	15	75	40	140

Source: LES, 2005b.

Construction Materials

Construction of the proposed NEF would require many different commodities. Table 2-4 lists materials that would be used during the construction phase, and most of these materials would be obtained locally.

Table 2-4 Selected Commodities and Resources to be Used During Construction of Proposed NEF

Description	Quantity
Water	7,570 cubic meters (2 million gallons)[a] annually
Asphalt Paving	72,940 cubic meters (95,400 cubic yards)
Chain Link Fencing	15.1 kilometers (9.3 miles)
Concrete	59,196 cubic meters (77,425 cubic yards)
Concrete Paving	1,614 cubic meters (2,111 cubic yards)
Copper & Aluminum Wiring	362 kilometers (225 miles)
Crushed Stone	287,544 square meters (343,900 square yards)
Electrical Conduit	121 kilometers (75 miles)
Piping (Carbon & Stainless Steel)	56 kilometers (34.6 miles)
Roofing Materials	52,074 square meters (560,500 square feet)
Stainless & Carbon Steel Ductwork	515 metric tons (568 tons)
Clay	55,813 cubic meters (73,000 cubic yards)

[a] Escalated from the formerly proposed Claiborne Enrichment Facility. The value from the Claiborne Enrichment Facility was doubled since the proposed NEF would have double the production capacity, and the total was then increased by 65 percent to account for the semi-arid climate of the proposed site (NRC, 1994).
Source: LES, 2005a.

2.1.5 Local Road Network

New Mexico Highway 234 is a two-lane highway located on the southern border of the proposed NEF site with 3.6-meter (12-foot) wide driving lanes, 2.4-meter (8-foot) wide shoulders, and a 61-meter (200-foot) right-of-way easement on either side. The highway provides direct access to the site. A gravel-covered road currently runs north from the highway through the center of the site to the sand and gravel quarry to the north. Two access roads would be built from the highway to support construction. The materials delivery construction access road would run north from the highway along the west side of the proposed NEF. The personnel construction access road would run north from the highway along the east side of the proposed NEF. Both roadways would eventually be paved and converted to permanent access roads upon completion of construction.

Over-the-road trucks of various sizes and weights would deliver construction material to the proposed NEF. Delivery vehicles would range from heavy-duty 18-wheeled tractor trailers to commercial box and light-duty pick-up trucks. Delivery vehicles from the north and south would travel New Mexico Highway 18 or New Mexico Highway 207 to New Mexico Highway 234. The intersection of New Mexico Highway 18 and New Mexico Highway 234 is approximately 6.4 kilometers (4 miles) west of the site. While the intersection of New Mexico Highway 207 and New Mexico Highway 234 is further west, construction material would also travel from the east by way of Texas Highway 176, which becomes New Mexico Highway 234 at the New Mexico/Texas State line. Construction material from the west would come by way of New Mexico Highway 8, which becomes New Mexico Highway 234 near the city of Eunice west of the site. Due to the presence of a quarry directly north of the site, bulk aggregate trucks might also use the onsite gravel road that currently leads to the quarry.

Planned maintenance to New Mexico Highway 234 include the resurfacing, restoration, and rehabilitation of existing lanes to improve roadway quality, enhance safety, and further economic development. However, no time frame has been established for the maintenance activities (NMDOT, 2004b).

2.1.6 Proposed Facility Utilities and Other Services

The proposed NEF would require the installation of water, natural gas, and electrical utility lines.

<u>Water Supply</u>

The proposed NEF water supply would be obtained from the municipalities of Eunice and Hobbs, New Mexico. This would be performed by running new potable water pipelines from the municipal water supply systems for Eunice and Hobbs to the proposed NEF site. The pipeline from Eunice would be about 8 kilometers (5 miles) long, and the pipeline from Hobbs would be about 32 kilometers (20 miles) long. Both pipelines would run inside the Lea County right-of-way easements along New Mexico Highways 18 and 234.

Current capacities for the Eunice and Hobbs municipal water supply systems are 16,350 cubic meters per day (4.32 million gallons per day) and 75,700 cubic meters per day (20 million gallons per day), respectively. Current Eunice and Hobbs usages are about 5,600 cubic meters per day (1.48 million gallons per day) and 23,450 cubic meters per day (6.2 million gallons per day), respectively. The average and peak water requirements for operation of the proposed NEF would be approximately 240 cubic meters per day (63,423 gallons per day) and 2,040 cubic meters per day (539,000 gallons per day), respectively (Abousleman, 2004; Woomer, 2004).

Natural Gas

The natural gas line feeding the site will connect to an existing, nearby line along available county right-of-way easements.

Electrical Power

The proposed NEF would require approximately 30 megawatts of electricity. This power would be supplied by two new synchronized 115-kilovolt overhead transmission lines on a large loop system. These lines would tie into a trunk line about 13 kilometers (8 miles) west of the proposed site. Currently, there are several power poles along the highway in front of the adjacent vacant parcel east of the proposed site, and a 61-meter (200-foot) right-of-way easement along both sides of New Mexico Highway 234 would allow installation of utility lines within the highway easement. Xcel Energy, the local electrical service company, would install two onsite transformers in conjunction with the new electrical lines serving the site. Associated power-support structures would be installed along New Mexico Highway 234. An application for highway easement modification would be submitted to the State. The average power requirement and the peak power requirement of the facility are approximately 30.3 million volt-amps and 32 million volt-amps, respectively (LES, 2005b).

2.1.7 Proposed Facility Operation

At full production, the proposed NEF would receive 8,600 metric tons (9,480 tons) per year of UF_6 containing a concentration of 0.72 percent by weight of the ^{235}U isotope. The proposed NEF would enrich natural UF_6 feed material to between 3 and 5 percent by weight of the ^{235}U isotope. The enriched DUF_6 would be transferred to a Type 30B cylinder where the gas would be cooled to a solid within the cylinder. DUF_6 gas would be transferred to a Type 48Y cylinder where the gas would be cooled to a solid within the cylinder. LES would store the cylinder on the UBC Storage Pad until final dispositioning.

Receiving UF_6 Feed Material

Figure 2-7 Cylinder of UF_6 Being Unloaded (Urenco, 2004a)

Figure 2-7 shows the unloading of a Type 48Y cylinder. The proposed 8,600 metric tons (9,480 tons) of natural UF_6 feed material would be processed by the cascades to generate up to 800 metric tons (882 tons) of enriched UF_6 product and 7,800 metric tons (8,600 tons) of DUF_6 material each year. The feed material would be shipped to the proposed NEF in standard Type 48X or 48Y cylinders. Both of these cylinders are U.S. Department of Transportation approved containers for transporting Type A material (DOE, 1999a). The radioactive materials transported in these containers are subject to Title 10, "Energy," of the *U.S. Code of Federal Regulations* (10 CFR) Part 71 and 49 CFR Parts 171-173 shipping regulations. These regulations include requirements for an internal pressure test without leakage, free drop test without loss or dispersal of UF_6, and thermal test requirements without rupture of the containment system. In addition, shipments would be required to have fissile controls. A fully loaded Type 48Y cylinder weighs 14.9 metric tons (16.4 tons) and is shipped one per truck (WNTI, 2004). Therefore, the site would receive an average of three shipments of natural UF_6 feed material every day (assuming only weekday shipments). After receipt and inspection, the cylinder could be stored until needed or connected to the gas centrifuge cascade at one of several feed stations. Once installed in the feed station, the transport cylinders would be heated to sublime the solid UF_6 into a gas that would be fed to the gas centrifuge enrichment cascade.

After the cylinder has been emptied, it would be inspected and processed for reuse. The proposed NEF currently has no plans for internal cleaning or decontamination of the cylinders (LES, 2005c). The Type 48X cylinders are smaller than the Type 48Y cylinders and would not be used for onsite storage of the DUF_6 material. They would be returned to the supplier for reuse or disposed of at a licensed facility. The Type 48Y cylinders would be used to store DUF_6 material on the UBC Storage Pad or returned to the supplier. A Type 48Y cylinder filled with DUF_6 would be designated as a UBC.

Producing Enriched UF_6 Product

The proposed NEF would be constructed in stages to allow enrichment operations to begin while additional cascade halls are still under construction. The first set of enrichment cascades would begin operating as soon as practical. This ramped production schedule would allow the proposed facility to begin operation only 2 years after initial groundbreaking. Production of enriched UF_6 product would increase from approximately 77 metric tons (85 tons) in 2008 to a maximum of 800 metric tons (882 tons) by 2013 (LES, 2005a).

Shipping Enriched Product

Enriched UF_6 product would be shipped in a Type 30B cylinder, which is 76 centimeters (30 inches) in diameter and 206 centimeters (81 inches) long and holds a maximum of 2.3 metric tons (2.5 tons) of 5-percent enriched $^{235}UF_6$. Figure 2-8 shows Type 30B enriched product cylinders and overpacks being loaded for transport. At full production, the proposed NEF would produce 800 metric tons (882 tons) of enriched product which, at 2.3 metric tons (2.5 tons) per cylinder and three cylinders per truck, would require approximately two trucks per week to be shipped to the fuel fabricators in Richland, Washington; Wilmington, North Carolina; or Columbia, South Carolina.

Figure 2-8 Shipment of Enriched Product (Urenco, 2004a)

Storing DUF_6 Material

During operation of the proposed NEF, the production of DUF_6 material would increase from 825 metric tons (909 tons) to 7,800 metric tons (8,600 tons) per year. This material would fill between 66 and 627 cylinders per year. Table 2-5 shows the potential maximum and anticipated quantity of Type 48Y cylinders that would be filled with DUF_6 material each year during the anticipated life of the proposed NEF.

The "Maximum" production column shown in Table 2-5 provides a upper limit bounding guide for the operation of the proposed NEF. It does not consider a sequential shutdown or progressive decommissioning of the proposed NEF. The proposed NEF would undergo sequential decommissioning which would reduce the production capability of the proposed facility as the cascades are shut down in sequence and the proposed NEF undergoes sequential decommissioning. The "Anticipated" production column incorporates this sequential shutdown into the estimated production of DUF_6 material during the operational life of the proposed NEF.

Table 2-5 Maximum and Anticipated Yearly Production of Cylinders of DUF_6 over 30-Year License

Year	Maximum		Anticipated	
	Yearly UBCs Filled	Cumulative UBCs Filled	Yearly UBCs Filled	Cumulative UBCs Filled
2008	66	66	66	66
2009	196	262	196	262
2010	313	575	313	575
2011	431	1,006	431	1,006
2012	548	1,554	548	1,554
2013	623	2,177	623	2,177
2014 to 2027	627	2,804 to 10,955	627	2,804 to 10,955
2028	627	11,582	561	11,516
2029	627	12,209	444	11,960
2030	627	12,836	326	12,286
2031	627	13,463	209	12,495
2032	627	14,090	92	12,587
2033	561	14,651	5	12,592
2034	444	15,095	0	12,592
2035	326	15,421	0	12,592
2036	209	15,630	0	12,592
2037	92	15,722	0	12,592
2038	5	15,727	0	12,592
2039	0	15,727	0	12,592

Source: LES, 2004.

The DUF_6 material would be stored in Type 48Y cylinders on the UBC Storage Pad until a final disposition option is identified. The UBC Storage Pad would be able to hold up to 15,727 cylinders, which is the maximum projected production of the DUF_6 material cylinders.

Figure 2-9 shows the material flow of feed, enriched, and DUF_6 material and cylinders during full operation of the proposed NEF.

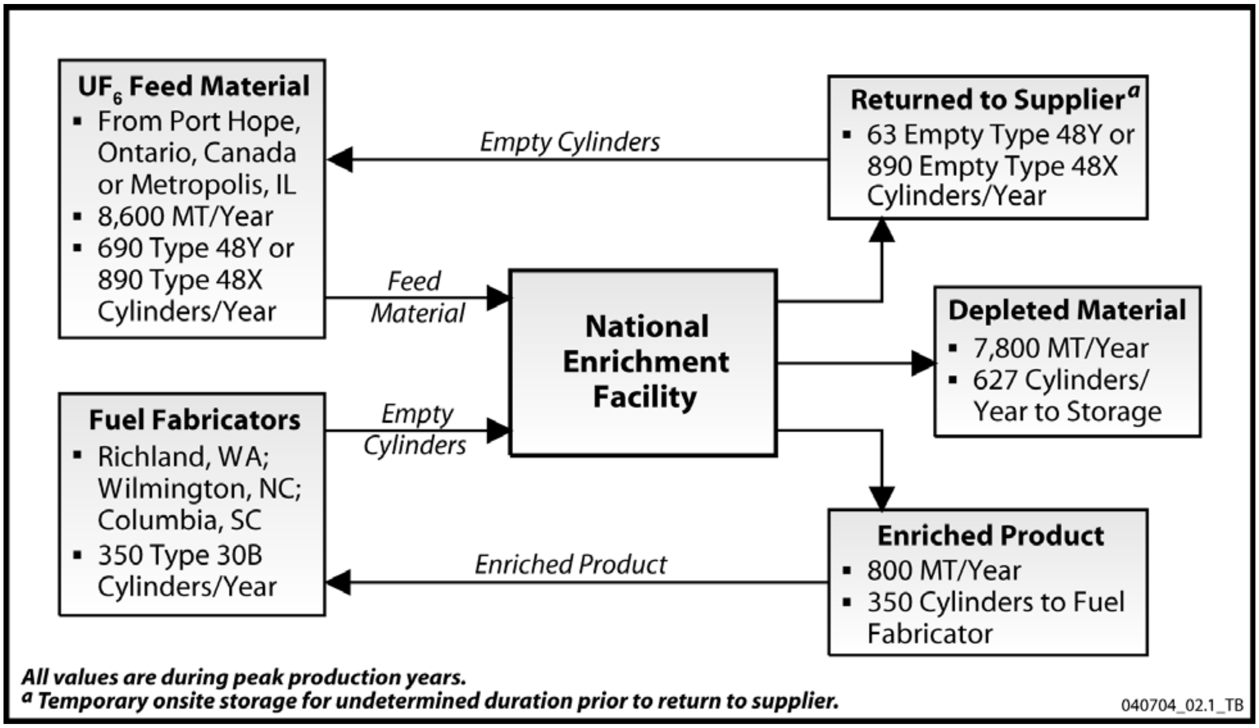


Figure 2-9 Flow from Feed, Enriched, and DUF_6 Material

<u>Operations Work Force</u>

An estimated 210 full-time workers would be required during full operation of the proposed NEF, providing an average of 150 jobs per year over the life of the facility. The average total annual wages and benefits paid to these workers would be $10.5 million per year. The annual number of production workers would increase as construction activities tapered off and, correspondingly, the production work force would reduce as decommissioning activities begin. Table 2-6 shows direct employment and average salaries during operations.

Table 2-6 Direct Employment and Average Salaries During Operations

Position	Number of Jobs	Percentage	Average Salary	Total Payroll
Management	21	10%	$95,000	$1,995,000
Professional	42	20%	$62,000	$2,604,000
Skilled	126	60%	$42,000	$5,292,000
Administrative	21	10%	$30,000	$630,000
Total	210	100%	$50,100	$10,521,000

Source: LES, 2005a.

Containers Used for Transportation and Storage of UF_6

Type 48X or Type 48Y cylinders would be used to transport feed material (natural UF_6) to the proposed NEF site. Only 48Y cylinders would be used for temporary storage of DUF_6 on the UBC Storage Pad. The difference between the Type 48X and 48Y cylinders is their capacity. Both containers are constructed of American Society for Testing and Materials (ASTM) type A-516 steel, and both can be used to transport UF_6 enriched up to 4.5 percent ^{235}U.

Type 30B containers would be used to transport enriched UF_6 to fuel fabrication facilities. Type 30B containers have additional design requirements as specified in 10 CFR § 71.51 to permit the safe transportation of higher enriched UF_6 than the Type 48X or 48Y containers.

	Type 48X	Type 48Y	Type 30B
Diameter	1.2 meters (48 inches)	1.2 meters (48 inches)	0.76 meter (30 inches)
Length	3.0 meters (119 inches)	3.8 meters (150 inches)	2.06 meters (81 inches)
Wall Thickness	16 millimeters (0.625 inch)	16 millimeters (0.625 inch)	12.7 millimeters (0.5 inch)
Empty Weight	2,041 kilograms (4,500 pounds)	2,359 kilograms (5,200 pounds)	635 kilograms (1,400 pounds)
UF_6 Capacity	9,540 kilograms (21,000 pounds)	12,500 kilograms (27,560 pounds)	2,277 kilograms (5,020 pounds)

Sources: DOE, 1999a; LES, 2005a; USEC, 1995.

Production Process Systems

The primary product of the proposed NEF would be enriched UF_6 product. Production of enriched UF_6 would require the safe operation of multiple plant support systems to ensure the safe operation of the facility. The principal process systems required for the safe and efficient production of enriched UF_6 product would include the following:

- Decontamination System.
- Fomblin® Oil Recovery System.
- Liquid Effluent Collection and Treatment System.
- Stormwater Detention/Retention Basins.
- Solid Waste Collection System.
- Gaseous Effluent Vent Systems.
- Centrifuge Test and Postmortem Exhaust Filtration System.

Decontamination System

The Decontamination System would be designed to remove radioactive contamination from centrifuges, pipes, instruments, and other potentially contaminated equipment. The system would contain equipment and processes to disassemble, clean and degrease, decontaminate, and inspect plant equipment. Scrap and waste material from the decontamination process would be sent to the solid or liquid waste processing system for segregation and treatment prior to offsite disposal at a licensed facility. Exhaust air from the decontamination system area would pass through the gaseous effluent vent systems before discharge to the atmosphere.

Fomblin® Oil Recovery System

Vacuum pumps would maintain the vacuum between the rotor and casing of the centrifuge. The pumps would use a perfluorinated polyether oil, such as Fomblin® oil, which is a highly fluorinated, nonflammable, chemically inert, thermally stable oil for vacuum pump lubrication and seal maintenance. The Fomblin® oil would provide long service life and would not react with UF_6 gas. Disposal and replacement of the oil is very expensive, which makes recovery and reuse the preferred practice. The Fomblin® Oil Recovery System would reclaim spent oil from the UF_6 processing system, and filter and recondition it for reuse by the proposed NEF. The recovery would employ anhydrous sodium carbonate (soda ash) in a laboratory-scale precipitation process to remove the primary impurities and activated carbon to remove trace amounts of hydrocarbons.

Liquid Effluent Systems

The Liquid Effluent Collection and Treatment System would collect potentially contaminated liquid effluents generated in a variety of plant operations and processes. These liquid effluents would be collected in holding tanks and then transferred to bulk storage tanks prior to disposal. Significant and slightly contaminated liquids would be processed for uranium recovery while noncontaminated liquids would be rerouted to the Treated Effluent Evaporative Basin. Figure 2-10 shows the annual effluent input streams, which include hydrolyzed UF_6, degreaser water, citric acid, laundry water, floor-wash water, hand-wash/shower water, and miscellaneous effluent.

The Treated Effluent Evaporative Basin would receive liquid discharged from the Liquid Effluent Collection and Treatment System. This liquid could contain low concentrations of uranium compounds and uranium decay products. This uranium-bearing material would settle to the bottom of the Treated Effluent Evaporative Basin and collect in the sludge on the bottom of the basin during the operation of the proposed NEF. The sludge would be disposed of as low-level radioactive waste during the decommissioning of the facility.

The Treated Effluent Evaporative Basin would be a double-lined basin built in accordance with New Mexico Environment Department Guidelines for Liner Material and Site Preparation for Synthetically-Lined Lagoons. The basin foundation would be about 60-centimeter (2-foot) thick clay layer, compacted in place and covered with a high-strength geosynthetic liner. A leak-collection piping system and drainage mat would be installed on top of the liner. A sump system would collect any liquid from the collection piping and pump it back into the Treated Effluent Evaporative Basin. A second geosynthetic liner would cover the collection piping, mat, and sump system. The top liner would be covered with a 30-centimeter (1-foot) thick layer of compacted clay.

Animal-friendly fencing would surround the Treated Effluent Evaporative Basin to prevent access by animals and unauthorized personnel. The surface of the basin would be covered with surface netting or other suitable material to exclude waterfowl.

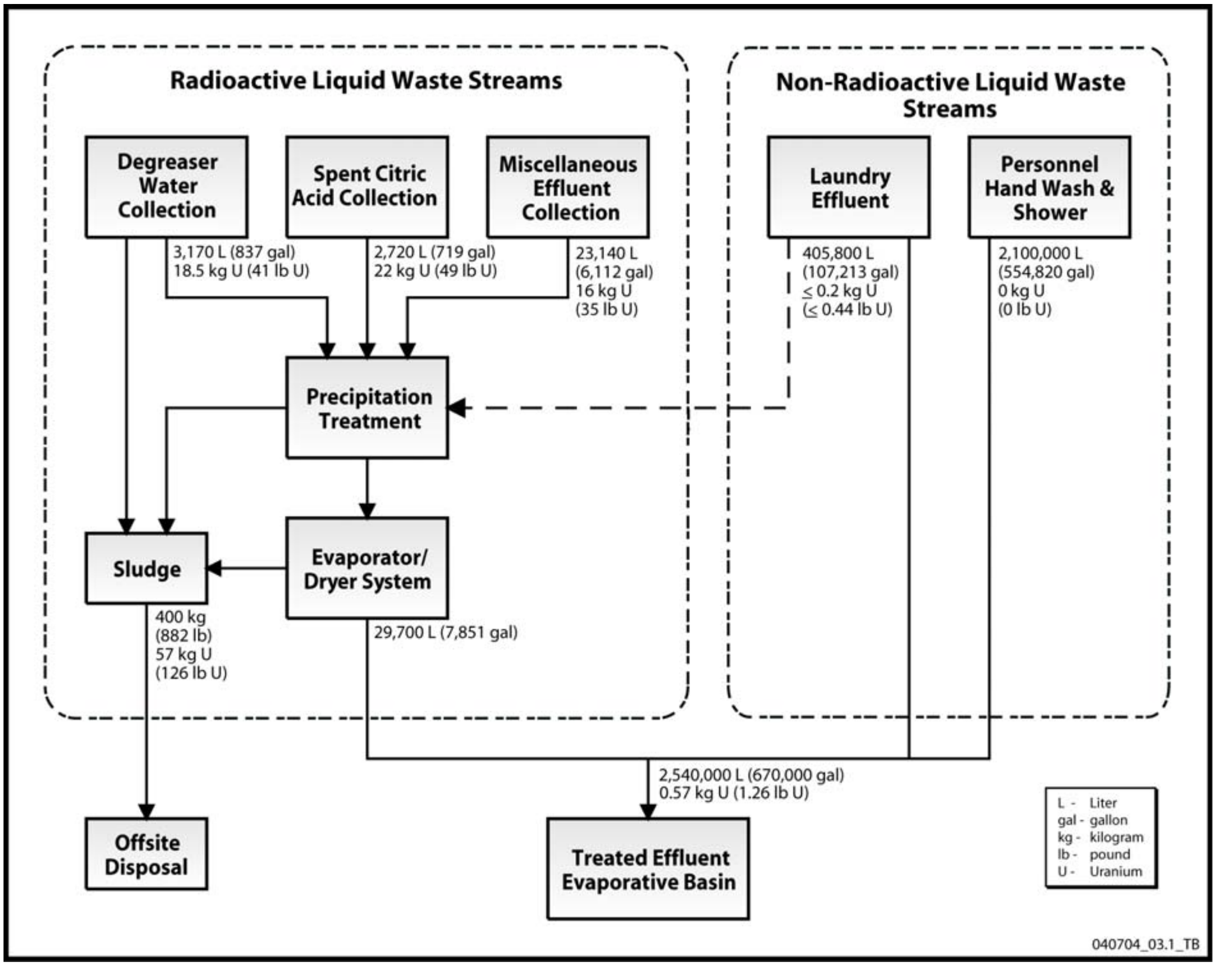


Figure 2-10 Liquid Effluent Collection and Treatment

Stormwater Detention/Retention Basins and Septic Systems

All normal stormwater and runoff waters would be routed from the buildings, parking lot, and roadways to a Site Stormwater Detention Basin and allowed to infiltrate the soil or evaporate. Runoff and stormwaters from the UBC Storage Pad would be routed to the lined UBC Storage Pad Stormwater Retention Basin for evaporation. This would allow the water from the UBC Storage Pad to be monitored and minimize the potential for contaminants entering the soil.

Six separate septic systems throughout the proposed NEF would collect and process all sanitary waste from the facility in accordance with applicable regulations.

Neither the Treated Effluent Evaporative Basin nor the two stormwater basins would meet the definition of "surface water" in the State of New Mexico Standards for Interstate and Intrastate Surface Waters. According to these standards, "Waste treatment systems, including treatment ponds or lagoons designed to meet requirements of the Clean Water Act (other than cooling ponds as defined in 40 CFR § 423.11(m) which also meet the criteria of this definition), are not surface waters of the State, unless they were originally created in surface waters of the State or resulted in the impoundment of surface waters of the State" (NMWQCC, 2002). However, under the *New Mexico Water Quality Act*, the State regulates water-discharge sources. LES has submitted a Groundwater Discharge Permit/Plan application to the w as presented in Table 1-3. The application is undergoing New Mexico Environment Department Water Quality Bureau review.

Solid Waste Collection System

In addition to the DUF_6, operation of the proposed NEF would generate other radioactive and nonradioactive solid wastes. Solid waste would be segregated and processed based on its classification as wet solid or dry solid wastes and segregated into radioactive, hazardous, or mixed-waste categories. Wet solid waste would include wet trash (waste paper, packing material, rags, wipes, etc.), oil-recovery sludge, oil filters, miscellaneous oils (such as cutting machine oils), solvent recovery sludge, and uranic waste precipitate. Dry solid waste would include trash (combustible and non-metallic items), activated carbon, activated alumina, activated sodium fluoride, high efficiency particulate air (HEPA) filters, scrap metal, laboratory waste, and dryer concentrate.

Radioactive solid waste would be sent to a licensed low-level radioactive waste disposal facility. Material that would be classified as mixed waste or *Resource Conservation and Recovery Act* (RCRA) material would be disposed of in accordance with the State of New Mexico regulations (EPA, 2003). Nonradioactive wastes—including office and warehouse trash such as wood, paper, and packing materials; scrap metal and cutting oil containers; and building ventilation filters—would be sent to a commercial landfill for disposal.

Figure 2-11 shows the disposal pathways and anticipated volumes for the miscellaneous solid waste that would be generated by the proposed NEF.

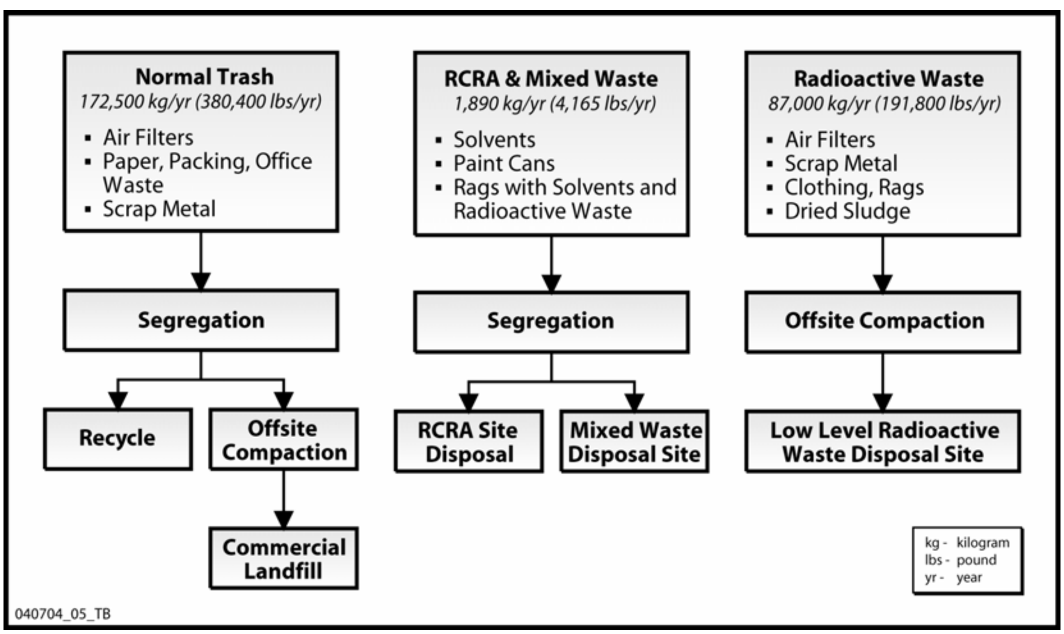


Figure 2-11 Disposal Pathways and Anticipated Volumes for Solid Waste

Gaseous Effluent Vent Systems

Gaseous effluent vent systems would be designed to collect the potentially contaminated gaseous streams in the plant and treat them before discharge to the atmosphere. The system would route these streams through a filter system prior to exhausting out a vent stack which would contain a continuous monitor to measure radioactivity levels. There are two gaseous effluent vent systems for the plant: (1) the Technical Services Building gaseous effluent vent system and (2) the Separations Building gaseous effluent vent system.

The Technical Services Building heating, ventilation, and air conditioning system performs a confinement ventilation function for potentially contaminated areas in the Technical Services Building. Potentially contaminated areas in the Technical Services Building would include ventilation air from the Ventilation Room, Decontamination Workshop, Laundry, Fomblin® Oil Recovery System, Decontamination System, Chemical Laboratory, and Vacuum Pump Rebuild Workshop. The total airflow would be handled by a central gaseous effluent distribution system that would maintain the areas under negative pressure. The treatment system would include a single train of three air filters (a pre-filter, a HEPA filter, and an activated carbon filter impregnated with potassium carbonate); centrifugal fan; automatically operated inlet-outlet isolation dampers; monitoring system; and differential pressure transducers.

The Separations Building gaseous effluent vent system sub-atmospheric duct system transports potentially contaminated gases to a set of redundant filters (a pre-filter, a HEPA filter, and an activated carbon filter impregnated with potassium carbonate) and fans. The cleaned gases would be discharged via rooftop stacks to the atmosphere. The fan would maintain an almost constant sub-atmospheric pressure in front of the filter section by means of a differential pressure controller.

The Technical Services Building gaseous effluent vent system would be the same as the Separations Building gaseous effluent vent system except that it would have one set of filters and a single fan. The gaseous effluent vent system and Technical Services Building heating, ventilation, and air conditioning exhaust points would be on the roof of the Technical Services Building.

Urenco's experience in Europe shows uranium discharges from gaseous effluent vent systems are less than 10 grams (0.35 ounces) per year (LES, 2005a; LES, 2005b).

Nonradioactive gaseous effluents would include argon, helium, nitrogen, hydrogen fluoride, and methylene chloride (LES, 2005a). Approximately 440 cubic meters (15,540 cubic feet) of helium, 190 cubic meters (6,709 cubic feet) of argon, 53 cubic meters (1,872 cubic feet) of nitrogen, and 1.0 kilogram (2.2 pounds) of hydrogen fluoride gaseous effluent would be released each year. The hydrogen fluoride gaseous effluent would be from the chemical reaction of UF_6 with water vapor. In addition, 610 liters (161 gallons) of methylene chloride and 40 liters (11 gallons) of ethanol would be vented each year.

Two natural gas-fired boilers (one in operation and one spare) would be used to provide hot water for the plant heating system. At 100-percent power, each boiler would emit approximately 0.8 metric tons (0.88 tons) per year of volatile organic compounds; 0.5 metric tons (0.55 tons) per year of carbon monoxide; and 5.0 metric tons (5.5 tons) per year of nitrogen dioxide (LES, 2005a). The boilers would not require an air quality permit from the State of New Mexico (LES, 2005a). Specifically, by letter dated May 27, 2004, the New Mexico Environment Department Air Quality Bureau acknowledged receipt of the Notice of Intent application and notified LES that the application will serve as the Notice of Intent in accordance with 20.2.73 NMAC. The New Mexico Environment Department Air Quality Bureau also notified LES of its determination that an air quality permit under 20.2.72 NMAC is not required and that New Source

Performance Standards and National Emission Standards for Hazardous Air Pollutants (NESHAP) do not apply to the proposed NEF (LES, 2005d).

In addition, there would be two diesel generators onsite for use as emergency electrical power sources. Because the diesel generators would have the potential to emit more than 90,700 kilograms (100 tons) per year of a regulated air pollutant, they would only run a limited number of hours per year in order not to be subject to NESHAP. The New Mexico Environment Department Air Quality Bureau stated, along with the specifics mentioned in the previous paragraph, that operation of the two emergency diesel generators and surface-coating activities are exempt from permitting requirements provided all requirements are met, as specified in 20.2.72.202 B (3) and 20.2.72.202 B (6) NMAC (LES, 2005d).

Centrifuge Test and Postmortem Facilities Exhaust Filtration System

The Centrifuge Test and Postmortem Facilities Exhaust Filtration System would exhaust potentially hazardous contaminants from the Centrifuge Test and Postmortem Facilities. The system would also ensure the Centrifuge Postmortem Facility is maintained at a negative pressure with respect to adjacent areas.

The ductwork would be connected to a single-filter station and exhaust through either of two 100-percent fans. The filter station and either of the two fans would be able to handle 100 percent of the effluent exhaust. One of the fans would normally be on standby status. Activities that require the Centrifuge Test and Postmortem Facilities Exhaust Filtration System to be operational would be manually stopped if the system fails or shuts down. After filtration, the clean gases would be discharged through the monitored exhaust stack on the Centrifuge Assembly Building. The Centrifuge Assembly Building exhaust stack would be monitored for hydrogen fluoride and alpha radiation.

2.1.8 Proposed Facility Decontamination and Decommissioning

The proposed NEF would be licensed for 30 years. Before license termination, the proposed NEF would be decontaminated and decommissioned to levels suitable for unrestricted use. All proprietary equipment and radiologically contaminated components would be removed, decontaminated, and shipped to a licensed disposal facility. The buildings, structures, and selected support systems would be cleaned and released for unrestricted use. Before the start of the decontamination and decommissioning activities, LES would prepare a Decommissioning Plan in accordance with the requirements of 10 CFR § 70.38 and submit it to the NRC for approval.

Decontamination and dismantling of the equipment would be conducted in the three Separations Building modules sequentially (in three phases) over a nine-year time frame. Decommissioning of the remaining plant systems and buildings would begin after operations in the final Separations Building module were terminated. The sequential construction of the three Cascade Halls would allow each hall to be isolated during the decommissioning activities. This isolation would help prevent re-contamination of an area once it has been fully decontaminated.

At the end of the useful life of each Separations Building module, the enrichment-process equipment would be shut down and UF_6 removed to the fullest extent possible by normal process operation. This would be followed by evacuation and purging with nitrogen. The shutdown and purging portion of the decommissioning process would take approximately three months for each cascade.

Prompt decontamination or removal of all materials from the site that would prevent release of the facility for unrestricted use would be performed. This approach would avoid long-term storage and monitoring of radiological and hazardous wastes onsite. All of the enrichment equipment would be removed, and only the building shells and site infrastructure would remain. All remaining facilities would be decontaminated to levels that would allow for unrestricted use. DUF_6, if not already sold or otherwise disposed of prior to decommissioning, would be disposed of in accordance with regulatory requirements. Other miscellaneous radioactive and hazardous wastes would be packaged and shipped to a licensed facility for disposal.

Following decommissioning, the entire site would be available for unrestricted use. Decommissioning would generally include the following activities:

- Installation of decontamination facilities.
- Purging of process systems.
- Dismantling and removal of equipment.
- Decontamination and destruction of confidential and secret, restricted-data material.
- Sales of salvaged materials.
- Disposal of wastes.
- Completion of a final radiation survey and spot decontamination.

Decommissioning would require residual radioactivity to be reduced below regulatory limits so the facilities could be released for unrestricted use. The intent of decommissioning would be to release the site for unrestricted use.

As shown in Table 2-1, the decontamination and decommissioning effort would start in 2027 and end by 2036. Specific details of the planned decommissioning of the proposed NEF would be formally proposed in the Decommissioning Plan submitted to the NRC in 2025. Optimization of the decontamination and decommissioning process would occur near the end of the proposed facility's life to take advantage of advances in technology that are likely to occur in between now and the start of the decontamination and decommissioning activities. The timeframe to accomplish both dismantling and decontamination is estimated to be approximately 3 years for each Separations Building module.

<u>Decontamination of Facilities</u>

Decontamination would deal primarily with radiological contamination from ^{238}U, ^{235}U, ^{234}U, and their daughter products. The primary contaminant throughout the plant would be in the form of small amounts of uranium oxide and uranium fluoride compounds.

At the end of the plant's life, some of the equipment, most of the buildings, and all of the outdoor areas should already be acceptable for release for unrestricted use. All basins would be sampled, tested, and disposed of, if required, at the appropriate disposal facility in accordance with pertinent regulations (LES, 2005d). Excavations and berms would be leveled to restore the land to a natural contour (LES, 2005a). If accidentally contaminated during normal operation, they would be cleaned and decontaminated when the contamination was discovered. This would limit the scope of decontamination necessary at the time of decommissioning.

Contaminated plant components would be cut up or dismantled, and then processed through the decontamination facilities. Contamination of site structures would be limited to areas in the Separations Building modules and Technical Services Building, and would be maintained at low levels throughout plant operation by regular surveys and cleaning. The use of special sealing and protective coatings on porous and other surfaces that might become radioactively contaminated during operation would simplify the decontamination process and the use of standard good-housekeeping practices during operation of the proposed facility would ensure that final decontamination of these areas would require minimal removal of surface concrete or other structural material.

Decontamination of Centrifuges

The centrifuges would be processed through a specialized decontamination facility. The following operations would be performed:

- Removal of external fittings.
- Removal of bottom flange, motor and bearings, and collection of contaminated oil.
- Removal of top flange, and withdrawal and disassembly of internals.
- Degreasing of items as required.
- Decontamination of all recoverable items for smelting.
- Destruction of other classified portions by shredding, crushing, smelting, etc.

<u>Dismantling the Facility</u>

Dismantling would require cutting and disconnecting all components requiring removal. The activities would be simple but very labor-intensive and generally require the use of protective clothing. The work process would be optimized through consideration of the following measures:

- Minimizing the spread of contamination and the need for protective clothing.

- Balancing the number of cutting and removal operations with the resultant decontamination and disposal requirements.

- Optimizing the rate of dismantling with the rate of decontamination facility throughput.

- Providing storage and laydown space as required for effective workflow, criticality, safety, security, etc.

To avoid laydown space and contamination problems, dismantling would proceed generally no faster than the downstream decontamination process.

Items to be removed from the facilities would be categorized as potentially re-usable equipment, recoverable scrap, and wastes. However, operating equipment would not be assumed to have reuse value. Wastes would also have no salvage value.

A significant amount of scrap aluminum, steel, copper, and other metals would be recovered during the disassembly of the enrichment equipment. For security and convenience, the uncontaminated materials would likely be shredded or smelted to standard ingots and, if possible, sold at market price. The contaminated materials would be disposed of as low-level radioactive waste.

<u>Disposal</u>

All wastes produced during decommissioning would be collected, handled, and disposed of in a manner similar to that described for those wastes produced during normal operation. Wastes would consist of normal industrial trash, nonhazardous chemicals and fluids, small amounts of hazardous materials, and radioactive wastes. Radioactive wastes would consist primarily of crushed centrifuge rotors, trash, and citric cake. Citric cake consists of uranium and metallic compounds precipitated from citric acid decontamination solutions. Approximately 5,153 cubic meters (6,740 cubic yards) of radioactive waste would be generated over the 9-year decommissioning period. This waste would be subject to further volume-reduction processes prior to disposal. Table 2-7 provides estimates for the amounts and types of radioactive wastes expected to be disposed.

Radioactive wastes would ultimately be disposed of in licensed low-level radioactive waste disposal facilities. Hazardous wastes would be disposed of in licensed hazardous waste disposal facilities. Nonhazardous and nonradioactive wastes would be disposed of in a manner consistent with good industrial practice and in accordance with applicable regulations. A complete estimate of the wastes and effluent to be produced during decommissioning would be provided in the Decommissioning Plan that LES would submit prior to the start of the decommissioning.

Table 2-7 Radioactive Waste Disposal Volume from Dismantling Activities

Low-Level Radioactive Waste Type	Disposal Volume cubic meters (cubic yards)	Maximum Number of Drums[a]
Separation Modules:		
Solidified Liquid Wastes	432 (565)	2,159
Centrifuge Components, Piping, and Other Parts	1,036 (1,355)	5,180
Aluminum	3,602 (4,711)	Not Supplied
Other Buildings:		
Miscellaneous Low-Level Waste	83 (2,930)	400
Total	**5,153 (6,740)**	**7,739**

[a] 55-gallon (208-liter) drums.
Source: LES, 2005b.

Final Radiation Survey

A final radiation survey would verify complete decontamination of the proposed NEF prior to allowing the site to be released for unrestricted use. The evaluation of the final radiation survey would be based in part on an initial radiation survey performed prior to initial operation. The initial site radiation survey would determine the natural background radiation levels in the area of the proposed NEF, thereby providing a benchmark for identifying any increase in radioactivity levels in the area. The final survey would measure radioactivity over the entire site and compare it to the original benchmark survey. The intensity of the survey would vary depending on the location (i.e., the buildings, the immediate area around the buildings, and the remainder of the site). A final radiation survey report would document the survey procedures and results, and would include, among other things, a map of the survey of the proposed site, measurement results, and a comparison of the proposed NEF site's radiation levels to the surrounding area. The results would be analyzed to show that they were below allowable residual radioactivity limits; otherwise, further decontamination would be performed.

2.1.9 DUF_6 Disposition Options

> ***Waste Classification of Depleted Uranium***
>
> *Depleted uranium is different from most low-level radioactive waste in that it consists mostly of long-lived isotopes of uranium, with small quantities of thorium-234 and protactinium-234. Additionally, in accordance with 10 CFR Parts 40 and 61, depleted uranium is a source material and, if treated as a waste, it would fall under the definition of a low-level radioactive waste per 10 CFR § 61.55(a). The Commission reaffirmed this waste classification in the CLI-05-05 Memorandum and Order dated January 18, 2005. This means that it could be disposed of in a licensed low-level radioactive waste facility if it is in a suitably stable form and meets the performance requirements of 10 CFR Part 6l. Therefore, under 10 CFR § 61.55(a), depleted uranium is a low-level radioactive waste.*
>
> *Sources: NRC, 1991; NRC, 2005.*

At full production, the proposed NEF would generate 7,800 metric tons per year (8,600 tons per year) of DUF_6. Initially, the DUF_6 would be stored in Type 48Y cylinders (UBC) on the UBC Storage Pad (LES, 2005a). Each Type 48Y cylinder would hold approximately 12.5 metric tons (13.8 tons), which means that the site, at full production, would generate approximately 627 cylinders of DUF_6 every year. During the operation of the facility, the plant could generate and store up to 15,727 cylinders of DUF_6. LES would own the DUF_6 and maintain the UBC's while they are in storage. Maintenance activities would include periodic inspections for corrosion, valve leakage, or distortion of the cylinder shape, and touch-up painting as required. Problem cylinders would be removed from storage and the material transferred to another storage cylinder. The proposed storage area would be kept neat and free of debris, and all stormwater or other runoff would be routed to the UBC Storage Pad Stormwater Retention Basin for monitoring and evaporation.

Classification of DUF_6

The U.S. Department of Energy (DOE) has evaluated a number of alternative and potential beneficial uses for DUF_6 (DOE, 1999b; Brown et al, 1997). However, the current DUF_6 consumption rate is low compared to the existing DUF_6 inventory (DOE, 1999b), and the potential for a significant commercial market for the DUF_6 to be generated by the proposed NEF is considered to be low. The NRC has assumed that the excess DOE and commercial inventory of DUF_6 would be disposed of as waste (NRC, 1995).

In Memorandum and Order CLI-05-05, the Commission concluded that depleted uranium is appropriately categorized as a low-level radioactive waste (NRC, 2005). Therefore, for the purpose of this EIS, the DUF_6 generated by the proposed NEF will be treated as a Class A low-level waste.

All DUF_6 would be removed from the proposed NEF for disposition outside the State of New Mexico before decommissioning is completed (LES, 2005a). This EIS evaluates in detail two DUF_6 disposition options. These options are described in the following subsections, and Chapter 4 discusses their potential environmental impacts. Section 2.2 discusses additional DUF_6 disposition options but, for the reasons discussed in that section, these options are not evaluated in detail.

The Defense Nuclear Facilities Safety Board has reported that long-term storage of DUF_6 in the UF_6 form represents a potential chemical hazard if not properly managed (DNFSB, 1995). For this reason, alternatives for the strategic management of depleted uranium include the conversion of DUF_6 stock to a more stable uranium oxide (e.g., triuranium octaoxide [U_3O_8]) form for long-term management (OECD, 2001). DOE also evaluated multiple disposition options for DUF_6 and agreed that conversion to U_3O_8 was preferable for long-term storage and disposal of the depleted uranium due to its chemical stability (DOE, 2000a). Therefore, all the options evaluated in the EIS include conversion of the DUF_6 to U_3O_8.

Two options are proposed for disposition of DUF_6. The first option would be to ship the material to a private conversion facility prior to disposal (Option 1). An alternative available under the provisions of the United States Enrichment Corporation (USEC) Privatization Act of 1996 would be to ship the material to a DOE conversion facility, either at Portsmouth, Ohio, or at Paducah, Kentucky, for temporary storage and eventual processing by the DOE conversion facility prior to disposal by DOE (Option 2). DOE has issued two final EISs to construct and operate conversion facilities at Paducah, Kentucky, and Portsmouth, Ohio (DOE, 2004a; DOE, 2004b). Additionally, DOE has issued two Records of Decision and construction of the conversion facilities began in July 2004 (DOE, 2004c; DOE, 2004d). Figure 2-12 shows the disposal flow paths for DUF_6 evaluated in this EIS.

In this EIS, it is assumed that the proposed private conversion facility would be using the same technology adapted for use by DOE in its conversion facilities. This technology would apply a continuous dry-conversion process based on the commercial process used by Framatome Advanced Nuclear Power, Inc., fuel fabrication facility in Richland, Washington (DOE, 2004a; DOE, 2004b; LES, 2005a).

What is Class A Low-level Radioactive Waste?

Low-level radioactive waste is defined by what it is not; that is, material classified as low-level radioactive waste does not meet the criteria of high-level radioactive waste, transuranic waste, or mill tailings. Low-level radioactive waste represents about 90 percent of all radioactive wastes, by volume. It includes ordinary items such as cloth, bottles, plastic, wipes, etc. that become contaminated with some radioactive material. These wastes can be generated anywhere radioisotopes are produced or used -- in nuclear power stations, local hospitals, university research laboratories, etc.

For regulatory purposes, there are three classes of low-level radioactive wastes. The NRC classifies low-level radioactive waste as Class A, Class B, or Class C based on the concentration of certain long-lived radionuclides as shown in Tables 1 and 2 of 10 CFR § 61.55 and the physical form and stability requirements set forth in 10 CFR § 61.56. Waste that contains the smallest concentration of the identified radionuclides and meets the stability requirement is considered Class A waste and could be considered for near-surface disposal. Classes B and C wastes contain greater concentrations of radionuclides with longer half-lives, and have stricter disposal requirements than Class A.

Sources: 10 CFR § 61.55 and 61.56.

Conversion of UF_6 to U_3O_8 generates hydrogen fluoride gas. This gas is dissolved in water to form aqueous hydrofluoric acid which is easier to store and handle than the hydrogen fluoride gas. The aqueous hydrofluoric acid could be sold to a commercial hydrofluoric acid supplier for reuse if the radioactive content is below free release limits, or it could be converted to calcium fluoride (CaF_2) for sale or disposal. Because conversion of the large quantities of DUF_6 at the DOE Portsmouth and Paducah Gaseous Diffusion Plant sites would be occurring at the same time the proposed NEF would be in operation, it is not certain that the market for aqueous hydrofluoric acid[1] and calcium fluoride would allow for the economic reuse of the material generated by the proposed NEF (DOE, 2000a; DOE, 2000b). Therefore, only immediate neutralization of the hydrofluoric acid by conversion to calcium fluoride with disposal at a licensed low-level radioactive waste disposal facility is considered in this analysis. Descriptions of the options are set forth below.

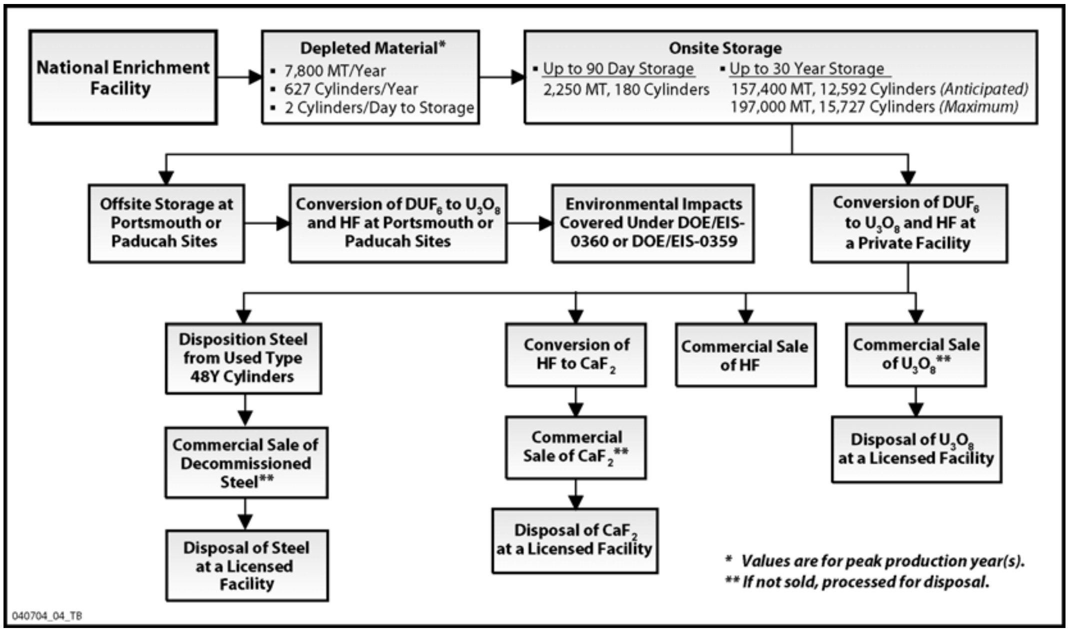


Figure 2-12 Disposal Flow Paths for DUF_6

<u>Option 1: Private Sector Conversion and Disposal</u>

This disposition option is private sector conversion of the depleted uranium hexafluoride into uranium oxide and hydrofluoric acid. The conversion could occur within the region of influence of the proposed NEF or at some other site within the United States. On February 3, 2005, LES and AREVA announced the signing of a memorandum of understanding that could lead to the construction of a privately owned uranium hexafluoride conversion plant to support the operation of the proposed NEF. The memorandum of understanding is only the first step in licensing, building, and operating the conversion facility. No final location has been identified for this private conversion facility. This EIS considers that the private conversion facility could be located beyond the region of influence of the proposed NEF site (this is known as Option 1a).

One potential location for a private conversion facility would be near the ConverDyn UF_6 generation facility in Metropolis, Illinois (LES, 2005a; LES, 2005b). The existing ConverDyn plant converts natural U_3O_8 (yellowcake) from mining and milling operations into UF_6 for feed to enrichment facilities such as the proposed NEF (ConverDyn, 2004). Construction of a private DUF_6 to U_3O_8 conversion facility near the ConverDyn plant in Metropolis, Illinois, could allow for the possible reuse of the hydrogen fluoride produced during the DUF_6 to U_3O_8 conversion process to generate more UF_6 feed material while the depleted U_3O_8 would be shipped for final dispositioning.

[1]For the purposes of this EIS, when discussing the conversion of DUF_6 to U_3O_8, the wording of hydrofluoric acid refers to aqueous hydrofluoric acid. Releases of hydrofluoric acid refers to the vapor that forms from the reaction of UF_6 to the moisture in the atmosphere.

The NRC staff has determined that construction of a private DUF_6 to U_3O_8 conversion plant near Metropolis, Illinois, would have similar environmental impacts as construction of an equivalent facility anywhere in the United States. The advantage of selecting the Metropolis, Illinois, location is the proximity of the ConverDyn natural U_3O_8 (yellowcake) to UF_6 conversion facility and, for the purposes of assessing impacts, the DOE conversion facility in nearby Paducah, Kentucky, for converting DOE-owned DUF_6 to U_3O_8. Because the proposed private plant would be similar in size and the effective area would be the same as the Paducah conversion plant, the environmental impacts would be similar. DOE has completed an EIS for the Paducah conversion facility which defines the impacts of the proposed DOE conversion facility (DOE, 2004a).

The DUF_6 would be shipped from the proposed NEF site to the new conversion facility. The hydrofluoric acid produced by the conversion process could be re-used by ConverDyn in its existing hydrofluorination process to convert natural U_3O_8 (yellowcake) to UF_6 (ConverDyn, 2004). Once converted, U_3O_8 and the associated waste streams would be transported to a licensed low-level radioactive waste disposal facility for final disposition, as discussed below.

This EIS also considers that the private conversion facility could be located near the proposed NEF, (this is known as Option 1b). This would involve a private sector company constructing and operating a new conversion facility close (within 6.4 kilometers [4 miles]) to the proposed NEF. By constructing and operating a private conversion facility in close proximity to the proposed NEF, the environmental impacts from the private conversion facility would affect the same area as the proposed NEF. Additionally, shipping and conversion of the depleted uranium could be accomplished within days of the filling of the Type 48Y cylinders, which would minimize the amount of DUF_6 stored onsite. The nearby conversion facility would be proportionally sized to meet the annual generation of 7,800 metric tons (8,600 tons) of DUF_6 per year. It is further assumed that the hydrofluoric acid generated at the adjacent conversion facility would not be marketable for reuse due to the large amount that would be available from the DOE conversion plants. The hydrofluoric acid would be converted to calcium fluoride for disposal at a licensed low-level radioactive waste disposal site.

Option 2: DOE Conversion and Disposal

DOE is constructing two conversion plants to convert the DUF_6 now in storage at Portsmouth, Ohio; Paducah, Kentucky; and Oak Ridge, Tennessee, to U_3O_8 and hydrofluoric acid. LES proposes to transport the DUF_6 generated by the proposed NEF to either of these new facilities and paying DOE to convert and dispose of the material. This plan is based on Section 3113 of the 1996 *USEC Privatization Act* that states the DOE "shall accept for disposal low-level radioactive waste, including depleted uranium if it were ultimately determined to be low-level radioactive waste, generated by [...] any person licensed by the Nuclear Regulatory Commission to operate a uranium enrichment facility under Sections 53, 63, and 193 of the *Atomic Energy Act of 1954* (42 U.S.C. 2073, 2093, and 2243)." On January 18, 2005, the

Commission issued its ruling that depleted uranium is considered a form of low-level radioactive waste (NRC, 2005). The Commission also stated that "pursuant to Section 3113 of the USEC Privatization Act, disposal of the LES depleted uranium tails at a DOE facility represents a "plausible strategy" for the disposition of depleted uranium tails" (NRC, 2005).

Disposal Options

Converted DUF_6 in the form of U_3O_8 can be considered a Class A low-level radioactive waste (NRC, 1991). Following conversion, the only currently available viable disposal option would be disposal of the depleted U_3O_8, based on its waste classification and site-specific evaluation, in a near-surface emplacement at a licensed low-level radioactive waste disposal facility within the borders of the United States. LES proposed disposal of the U_3O_8 in an abandoned mine as its preferred option but no existing mine is currently licensed to receive or dispose of low-level radioactive waste nor has any application been made to license such a facility.

DUF_6 Conversion Process

DUF_6 conversion is a continuous process in which DUF_6 is vaporized and converted to U_3O_8 by reaction with steam and hydrogen in a fluidized-bed conversion unit. The hydrogen is generated using anhydrous ammonia, although an option of using natural gas is being investigated. Nitrogen is also used as an inert purging gas and is released to the atmosphere through the building stack as part of the clean off-gas stream. The depleted U_3O_8 powder is collected and packaged for disposition. The process equipment would be arranged in parallel lines. Each line would consist of two autoclaves, two conversion units, a hydrofluoric acid recovery system, and process off-gas scrubbers. The Paducah facility would have four parallel conversion lines. Equipment would also be installed to collect the hydrofluoric acid co-product and process it into any combination of several marketable products. A backup hydrofluoric acid neutralization system would be provided to convert up to 100 percent of the hydrofluoric acid to calcium fluoride for storage and/or sale in the future, if necessary.

Sources: DOE, 2004a; DOE 2004b.

DOE recognizes that there could be commercial applications for the U_3O_8, and the possibility exists that other disposal options could become available in the future (after the satisfactory completion of appropriate NEPA or environmental review and licensing processes). If the U_3O_8 could be applied in a commercial application (e.g., as radiation shielding), then it would reduce the disposition impacts in proportion to the amount of U_3O_8 diverted to commercial applications. At this time, no viable commercial application for the material generated by the proposed NEF has been identified.

There are currently three active, licensed commercial low-level radioactive waste disposal facilities, all of which are located in Agreement States (licensing of the use and disposal of radioactive material is regulated by the State in accordance with agreements established with the NRC [NRC, 2003]). Additionally, DOE operates its own low-level radioactive waste disposal facility within the Nevada Test Site that is restricted to DOE-generated waste. Another company, Waste Control Specialists (WCS) is a commercial RCRA waste disposal facility located less than 3.2 kilometers (2 miles) east of the proposed NEF. WCS recently submitted an application to the State of Texas to license the company to dispose of low-level radioactive waste (WCS, 2004). The following summarizes the disposal sites and the regions of the United States that can ship low-level radioactive waste to each site (NRC, 2003):

- Barnwell, located in Barnwell, South Carolina. Currently, Barnwell accepts waste from most U.S. generators, as permitted by Atlantic Compact law. Beginning in 2008, Barnwell would only accept waste from the Atlantic Compact States (Connecticut, New Jersey, and South Carolina). Barnwell is licensed by the State of South Carolina to receive Class A, B, and C wastes.

- Hanford, located in Hanford, Washington. Hanford accepts waste from the Northwest and Rocky Mountain compacts. Hanford is licensed by the State of Washington to receive Class A, B, and C wastes, but not mixed waste (*i.e.*, radioactive and hazardous waste). As New Mexico is a member of the Rocky Mountain Compact, the proposed NEF would be able to ship low-level radioactive waste to Hanford for disposal provided that the waste meets the Waste Acceptance Criteria for the facility.

- Envirocare, located in Clive, Utah. Envirocare accepts waste from all regions of the United States. Envirocare is licensed by the State of Utah to accept for disposal Class A waste only. Therefore, Envirocare is a disposal option for radioactive wastes generated at the proposed NEF.

- Nevada Test Site, located in southern Nye County, Nevada. The Nevada Test Site is a DOE disposal site for low-level radioactive waste from the various DOE sites and facilities across the United States. The Nevada Test Site was selected as the secondary disposal site for converted DUF_6 material generated at the Paducah, Kentucky, and Portsmouth, Ohio, DUF_6 conversion facilities (DOE, 2004a; DOE, 2004b). Because the Nevada Test Site is a DOE disposal site, it could receive low-level radioactive wastes generated by the proposed NEF only if ownership of these wastes is first transferred to the DOE.

- Waste Control Specialists (WCS) disposal facility, located in Andrews County, Texas. The WCS disposal facility is less than 3.2 kilometers (2 miles) east of the proposed NEF site. This facility is currently permitted to dispose of RCRA hazardous waste and licensed to temporarily store, but not dispose of, radioactive material under its current State of Texas Bureau of Radiation Control license L04971 (BRC, 2003). WCS recently submitted an application to the State of Texas to allow them to dispose of Class A, B, and C low-level radioactive waste (WCS, 2004). The application is for two separate facilities, a low-level radioactive waste disposal facility for the Texas Compact and a low-level radioactive waste and mixed low-level radioactive and hazardous waste Federal Waste Disposal Facility. Both the Compact Facility and Federal Waste Disposal Facility would be located within the boundaries of the WCS site in Andrews County, Texas.

  In 1980, Congress passed the "Low-Level Radioactive Waste Policy Act" which requires States to provide for disposal of low-level radioactive waste generated within their own borders. The States of Texas and Vermont have joined together to form the Texas Compact for disposal of low-level radioactive waste generated by these member States. If its August 2, 2004 application is approved, WCS would become the low-level radioactive waste disposal site for the Texas Compact. As previously stated, a disposal site within the Texas Compact can only accept waste generated by the compact member States, unless the Compact specifically approves the disposal of out-of-compact waste. Approval of the other Compact (in this case, the Rocky Mountain Compact, in which the proposed NEF would be located) also would be required.

  The WCS application includes a request for a separate Federal Waste Disposal Facility to dispose of both low-level radioactive waste and mixed low-level radioactive and hazardous wastes from federal facilities such as the DOE. If the license application is approved, the WCS facility would be able to dispose of Class A, B, and C low-level radioactive and mixed wastes (WCS, 2004).

  Before the depleted uranium generated by the proposed NEF could be disposed at the proposed WCS Compact Facility, a series of legal procedures and approval processes would have to be successfully addressed. These procedures and processes include:

1. Approval by the State of Texas of WCS's application, including authorization by the State for the WCS Compact Facility to accept for disposal depleted uranium oxides of the type and quantities expected to be generated as a result of the proposed NEF's operations;
2. Approval by the Rocky Mountain Compact (in which the proposed NEF would be located) for the export of the depleted uranium oxides from the Compact; and
3. Approval by the Texas Compact for the import and disposal of the depleted uranium oxides generated as a result of the proposed NEF's operations.

The disposition of the depleted U_3O_8 generated from the DOE conversion facilities at Paducah and Portsmouth would be either at the Envirocare site (DOE's proposed disposition site) or at the Nevada Test Site (DOE's optional disposal site) (DOE, 2004a; DOE, 2004b). Due to the need for separate regulatory actions prior to disposal at WCS, it is assumed that the depleted U_3O_8 generated from the adjacent or offsite private conversion process would be disposed at another disposal site licensed to accept this material. For example, under its Radioactive Materials License issued by the State of Utah, Envirocare is authorized to accept for disposal the quantities of depleted uranium oxides expected to be generated by the conversion of the proposed NEF's DUF_6 (Envirocare, 2004).

2.2 Alternatives to the Proposed Action

This section examines the alternatives considered for the proposed action described in section 2.1. The range of alternatives was determined by considering the underlying need and purpose for the proposed action. From this analysis, a set of reasonable alternatives was developed and the impacts of the proposed action were compared with the impacts that would result if a given alternative was implemented. These alternatives include:

- A no-action alternative under which the proposed NEF would not be constructed.
- An evaluation of alternative sites for the proposed NEF.
- A discussion of alternative conversion and disposition methods for $DUF_{6.}$
- A review of alternative technologies available for uranium enrichment.
- An evaluation of potential alternative sources of low-enriched uranium.

2.2.1 No-Action Alternative

The no-action alternative would be to not construct, operate, or decommission the proposed NEF in Lea County, New Mexico. The NRC would not approve the license application for the proposed NEF. Under the no-action alternative, the fuel-fabrication facilities in the United States would continue to obtain low-enriched uranium from the currently available sources. Currently, the only domestic source of low-enriched uranium available to fuel fabricators is from production of the Paducah Gaseous Diffusion Plant, the only operating uranium enrichment facility in the United States, and the downblending of highly enriched uranium under the "Megatons to Megawatts" program (USEC, 2003a). Foreign enrichment sources are currently supplying more than 85 percent of the U.S. nuclear power plants demand (EIA, 2004).

Currently, the "Megatons to Megawatts" program will expire by 2013, potentially eliminating downblending as a source of low-enriched uranium. Opened in 1952, the Paducah Gaseous Diffusion Plant utilizes gaseous diffusion technology (as described in section 2.2.2.3), which is more energy intensive and requires higher energy consumption than a comparable gaseous centrifuge facility. These issues and factors such as new and more efficient enrichment technology (e.g., gas centrifuge) could lead to the eventual closure of the Paducah Gaseous Diffusion Plant. On the other hand, USEC could continue operation of the Paducah Gaseous Diffusion Plant to supply the needed low-enriched uranium.

Additional domestic enrichment facilities utilizing these more efficient technologies could be constructed in the future. In this regard, USEC has announced its intention to construct and operate a gaseous centrifuge uranium enrichment facility (i.e., proposed American Centrifuge Plant to be located near the Portsmouth Gaseous Diffusion Plant) which could supplement domestic and international demands (USEC, 2004). The proposed American Centrifuge plant would have an initial annual production level of 3.5 million SWU by 2010. If the proposed American Centrifuge Plant begins operations, this would represent a more efficient and less costly means of producing low-enriched uranium as compared to a gaseous diffusion plant.

At the same time, nuclear-generating capacity within the United States is expected to increase, causing an increase in demand for low-enriched uranium (see section 1.3.2). Given the expected increase in demand and the possible elimination of low-enriched uranium from downblending, along with the uncertainty that any additional domestic supplies will be available, the no-action alternative could generate uncertainty regarding the availability of adequate, reliable domestic supplies of low-enriched uranium in the future.

2.2.2 Alternatives Considered but Eliminated

As required by NRC regulations, the NRC staff has considered other alternatives to the construction, operation, and decommissioning of the proposed NEF. These alternatives were considered but eliminated from further analysis due to economical, environmental, national security, or maturity reasons. This section discusses these alternatives and the reasons the NRC staff eliminated them from further consideration. These alternatives can be categorized as (1) an evaluation of alternative sites for the proposed NEF, (2) a discussion of alternative conversion and disposition methods for DUF_6, (3) a review of alternative technologies available for uranium enrichment, and (4) a review of potential alternative sources of low-enriched uranium.

2.2.2.1 Alternative Sites

The alternative sites considered in this EIS are the result of the LES site-selection process. This section discusses the site-selection process and identifies the candidates sites for the proposed NEF and the criteria used in the selection process. LES undertook a site-selection process to identify viable locations for the proposed NEF (LES, 2005a). This evaluation process yielded six finalist sites which are reviewed below. Figure 2-13 shows the six finalist sites for the proposed NEF.

Because many environmental impacts can be avoided or significantly reduced through proper site selection, the NRC staff evaluated the LES site-selection process to determine if a site considered by LES was obviously superior to the proposed NEF (NRC, 2002)

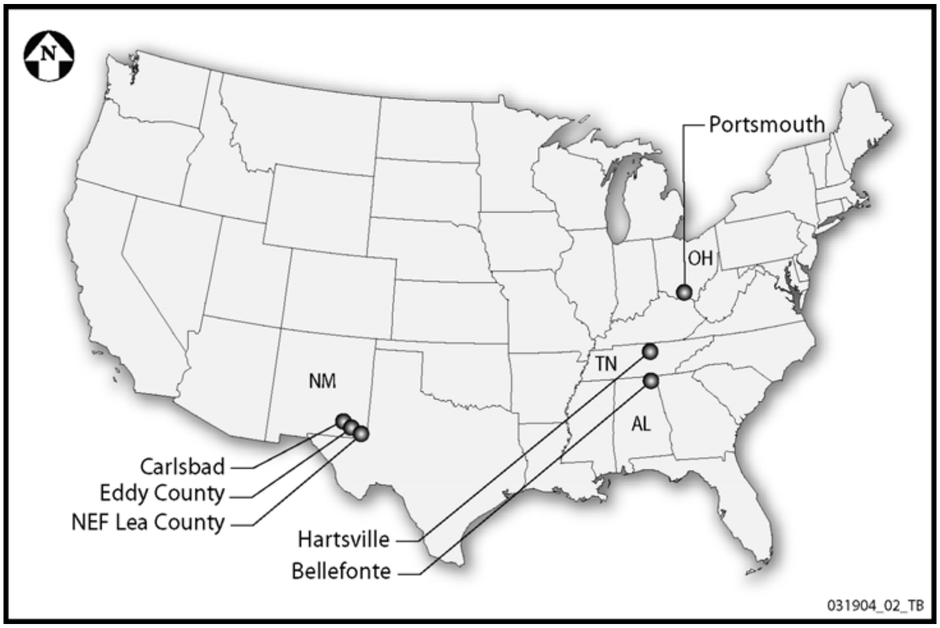


Figure 2-13 Six Final Potential NEF Sites

<u>LES Site-Selection Process</u>

LES evaluated 44 sites throughout the United States. The site-selection process used to locate a suitable site for construction and operation of the proposed NEF was based on various technical, safety, economic, and environmental factors. A multi-attribute-utility-analysis methodology was used for site selection that incorporated all of these factors to assess the relative benefits of a site with multiple, often competing, objectives or criteria. Figure 2-14 is a schematic of the LES site-selection process.

Forty-four potential sites were reviewed for possible analysis in the initial screening phase of the process. Twenty-nine sites were eliminated due to a lack of available environmental information or because they were located next to an operating commercial nuclear power plant. Sites in proximity to operating nuclear power plants would require enhanced security measures (LES, 2005a). The initial screening included the following criteria:

- Availability of adequate site information.
- Location of proposed site for ease of access and security.
- Acceptability of regional climate.

The outcome of the initial screening yielded 15 sites that met the first screening criteria. A second screening program was used to evaluate each of these 15 sites. This second screening program consisted of a “Go/No Go” analysis approach that compared the 15 semifinalist sites using the following criteria:

- Seismology/geology.
- Site characterization surveys.
- Size of plot.
- Land not contaminated.
- Moderate climate.

• Redundant electrical power.

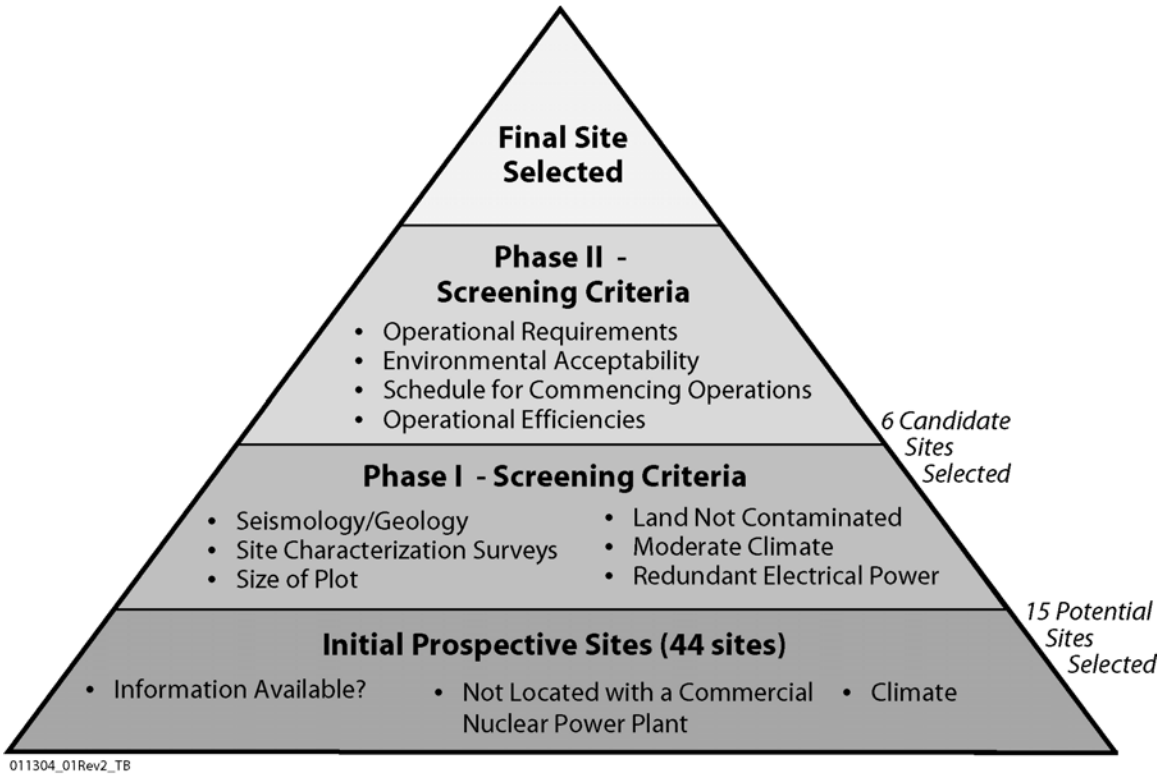
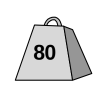


Figure 2-14 LES Site Selection Process (LES, 2005a)

The sites that met all these first-phase screening criteria were further evaluated in the second-phase screening. The second-phase approach in the LES site-selection process involved more detailed analysis using weighted criteria as well as more specific subcriteria for the first-phase criteria. The second-phase screening criteria were placed into the following four site-evaluation categories or objectives:

1. Operational Requirements weighting factor = 

2. Environmental Acceptability weighting factor = 

3. Schedule for Commencing Operations weighting factor = 

4. Operational Efficiencies weighting factor = 

Table 2-8 presents the 15 potential sites formally evaluated against the first-phase screening criteria and the results of the evaluation for each site.

Table 2-8 Summary of First-Phase Evaluation

Potential Site	Reasons for Elimination	Results of Screening
Ambrosia Lake, New Mexico	Earthquake risk.	**W**
Barnwell, South Carolina	Earthquake risk.	**W**
Bellefonte, Alabama	Met all phase I screening criteria.	**U**
Carlsbad, New Mexico	Met all phase I screening criteria.	**U**
Clinch River Industrial Site, Tennessee	Earthquake risk. Site not large enough.	**W**
Columbia, South Carolina	Earthquake risk. Site impacted by a 500-year flood plain.	**W**
Eddy County, New Mexico	Met all phase I screening criteria.	**U**
Erwin, Tennessee	Site not large enough.	**W**
Hartsville, Tennessee	Met all phase I screening criteria.	**U**
Lea County, New Mexico	Met all phase I screening criteria.	**U**
Metropolis, Illinois	Earthquake risk. Site not large enough.	**W**
Paducah, Kentucky	Earthquake risk.	**W**
Portsmouth, Ohio	Met all phase I screening criteria.	**U**
Richland, Washington	Earthquake risk.	**W**
Wilmington, North Carolina	Site not large enough.	**W**

Denotes candidate site status.
Source: LES, 2005a.

Six of the sites met all of the first-phase criteria and were considered in the second-phase screening. These six candidate sites, shown in Figure 2-13, were Bellefonte, Alabama; Carlsbad, New Mexico; Eddy County, New Mexico; Hartsville, Tennessee; Lea County, New Mexico; and Portsmouth, Ohio.

Each of the final six locations underwent a detailed evaluation to identify the best location for the proposed NEF. The results of this evaluation are summarized below.

A sensitivity analysis was conducted after the initial analysis to ensure that the site selection was not sensitive to small changes in the relative weights of objectives or criteria. The sensitivity analysis also helped demonstrate how sites compare to each other. In the sensitivity analysis, the weighting factor for each criterion was adjusted to the minimum and maximum extreme of the weighting scale while the raw score was kept the same. The final score of the site was then reviewed to determine how much it changed (LES, 2005a).

Description of Alternative Sites

Eddy County, New Mexico, Site

The Eddy County site scored highest in the multi-attribute-utility-analysis ranking but, due to potential problems with transferring ownership of the site from the BLM to LES, the site is not the preferred location for the proposed NEF. Federal regulations (43 CFR § 2711.1.3) require that any BLM land currently leased or permitted cannot be sold until the lease or permit holder is given 2 years' prior notification (Sorensen, 2004). Because the Eddy County site is currently leased for cattle grazing, it cannot be transferred to LES for at least 2 years. This two-year period can be waived by the leaseholder or it may run concurrently with preparation of the EIS. However, this could delay the start of construction of the facility and lowered the multi-attribute-utility-analysis ranking of the site (LES, 2005a).

Lea County, New Mexico, Site

Lea County ranked second in the multi-attribute-utility-analysis assessment. It is the preferred LES site for the proposed NEF. Two adjacent sites in Lea County were considered, and the evaluation is applicable to both. The preferred Lea County site consists of 220 hectares (543 acres) in Section 32 of range 38E in Township 21S of the New Mexico Meridian. The alternative Lea County site is 182 hectares (452 acres) in Section 33 of range 38E in Township 21S, which is east of and adjacent to Section 32. The area is in an air-quality attainment zone, and no air-permitting constraints are identified. Because the Lea County site is the preferred site for construction of the proposed NEF, Chapter 3 presents a complete description of the site (LES, 2005a).

Bellefonte, Alabama, Site

The Bellefonte site scored third in the multi-attribute-utility-analysis assessment and is considered an acceptable location for installation of the proposed NEF. However, part of the site is within the historic boundaries of a Cherokee Indian Reservation which may necessitate a historical preservation assessment. Additionally, high-voltage transmission lines cross the site and would have to be relocated before beginning construction. The historical preservation assessment and costly relocation of transmission lines lowered Bellefonte's ranking (LES, 2005a).

Hartsville, Tennessee, Site

The Hartsville site ranked fourth in the multi-attribute-utility-analysis assessment. The major drawback was the business climate in the State of Tennessee and the requirement to rezone the site. The site scored well in environment, labor, and transportation issues. On September 9, 2002, LES identified the Hartsville, Tennessee, site as a location for a uranium enrichment plant. However, because LES was unable to obtain local approval to rezone the site (LES, 2005a), the overall site score was reduced.

Portsmouth, Ohio, Site

The Portsmouth site ranked fifth of the six sites in the multi-attribute-utility-analysis assessment. Contamination on an existing firing range would have to be remediated, and existing waterways and ponds would have to be filled or relocated to make the site useable. Due to the proposed construction of the American Centrifuge Plant by USEC in the same immediate area, the finalization of an agreement between DOE, USEC, and LES would be difficult and would delay construction of the facility, thus lowering the overall score.

Carlsbad, New Mexico, Site

The Carlsbad site ranked sixth in the evaluation. The area around the proposed Carlsbad site contains both active and abandoned facilities including potash mining and oil-field welding services. This creates the possibility that the site soil is contaminated with oils, solvents, and industrial waste products. This potential contamination requires further investigations and surveys prior to selecting the Carlsbad site for the facility. No detailed geological surveys have been completed for the site. However, the general area is geologically and seismically stable and acceptable for construction of the proposed NEF. While no wetlands exist on the site, a dry arroyo, Lone Tree Draw, runs through the site which could require obtaining additional environmental approvals.

An Xcel Energy transmission line passes near the northwest corner of the proposed site. LES would have to pay for a new substation on the main line and new secondary feeder lines from alternate transmission lines to provide a redundant power supply for the site. The potential for soil contamination would make site decommissioning and decontamination more difficult, and the potential for environmental justice issues lowered Carlsbad's overall score.

Conclusion

Based on the above assessment, the NRC staff has determined that the LES site selection process has a rational, objective structure and appears reasonable. None of the candidate sites were obviously superior to the LES preferred site in Lea County, New Mexico; therefore no other site was selected for further analysis.

2.2.2.2 Alternative Sources of Low-Enriched Uranium

The NRC staff examined two alternatives to fulfill the domestic enrichment needs. These alternatives, as shown below, were eliminated from further consideration.

Re-Activate Portsmouth Gaseous Diffusion Facility

USEC closed the Portsmouth Gaseous Diffusion Plant in May 2001 to reduce operating costs (DOE, 2003). USEC cited long-term financial benefits, more attractive power price arrangements, operational flexibility for power adjustments and a history of reliable operations as reasons for choosing to continue operations at the Paducah Gaseous Diffusion Plant. In its June 2000 press release, USEC explained that they "...clearly could not continue to operate two production facilities." Key business factors in USEC's decision to reduce operations to a single production plant included long-term and short-term power costs, operational performance and reliability, design and material condition of the plants, risks associated with meeting customer orders on time, and other factors relating to assay levels, financial results, and new technology issues (USEC, 2000).

The NRC staff does not believe that there has been any significant change in the factors that were considered by USEC in its decision to cease uranium enrichment at Portsmouth. Furthermore, the gaseous diffusion technology (as described in section 2.2.2.3) is more energy intensive than gas centrifuge. The higher energy consumption results in larger indirect impacts, especially those impacts which are attributable to significantly higher electricity usage (e.g., air emissions from coal-fired electricity generation plants) (DOE, 1995). Finally, DOE's FY2006 congressional budget request reflects DOE's intention to cease cold standby activities for the Portsmouth facility, transition to final shutdown, and begin preliminary decontamination and decommissioning activities at the facility (DOE, 2005). Therefore, this proposed alternative was eliminated from further consideration.

Purchase Low-Enriched Uranium From Foreign Sources

There are several potential sources of enrichment services worldwide. However, U.S. reliance on foreign sources of enrichment services, as an alternative to the proposed action, would not meet the U.S. national energy policy objective of a "...viable, competitive, domestic uranium enrichment industry for the foreseeable future" (DOE, 2000b). For this reason, the NRC staff does not consider this alternative action to meet the purpose and need for the proposed action, and this alternative was eliminated from further studies.

2.2.2.3 Alternative Technologies for Enrichment

A number of different processes have been invented for enriching uranium but only two have been proven suitable for commercial and economic use. Only the gaseous diffusion process and the gas centrifuge technology have reached the maturity needed for industrial use. Other technologies—namely the Electromagnetic Isotope Separation Process, Liquid Thermal Diffusion, and a laser enrichment process—have proven too costly to operate or remain at the research and laboratory developmental scale and have yet to prove themselves to be economically viable.

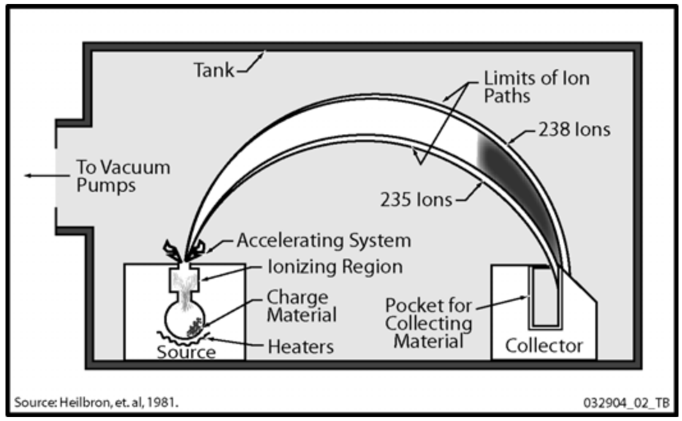


Figure 2-15 Sketch of Electromagnetic Isotopic Separation Process (Heilbron et al., 1981)

Electromagnetic Isotope Separation Process

Figure 2-15 shows a sketch of the electromagnetic isotopic separation process. In the Electromagnetic Isotope Separation Process, or calutron, a monoenergetic beam of ions of normal uranium travels between the poles of a magnet. The magnetic field causes the beam to split into several streams according to the mass of the isotope. Each isotope has a different radius of curvature and follows a slightly different path. Collection cups at the ends of the semicircular trajectories catch the homogenous streams. Because the energy requirements for the calutrons proved very high—in excess of 3,000 kilowatt hour per SWU—and the production was very slow (Heilbron et al., 1981), this process was removed from further consideration.

Liquid Thermal Diffusion

Liquid thermal diffusion process was investigated in the 1940's. Figure 2-16 is a diagram of the liquid thermal diffusion process. It is based on the concept that a temperature gradient across a thin layer of liquid or gas causes thermal diffusion that separates isotopes of differing masses. When a thin, vertical column is cooled on one side and heated on the other, thermal

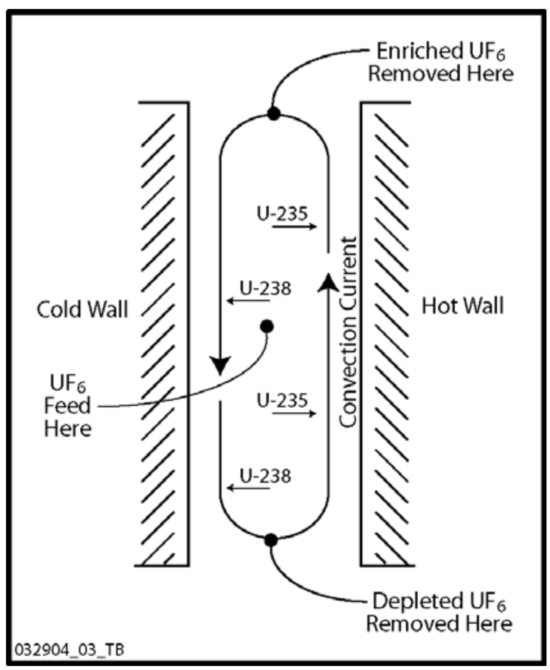


Figure 2-16 Liquid Thermal Diffusion Process

convection currents are generated and the material flows upward along the heated side and downward along the cooled side. Under these conditions, the lighter $^{235}UF_6$ molecules diffuse toward the warmer surface, and heavier $^{238}UF_6$ molecules concentrate near the cooler side. The combination of this thermal diffusion and the thermal convection currents causes the lighter ^{235}U molecules to concentrate on top of the thin column while the heavier ^{238}U goes to the bottom. Taller columns produce better separation. Eventually, a facility was designed and constructed at Oak Ridge, Tennessee, but it was closed after about a year of operation due to cost and maintenance (Settle, 2004). Based on high operating costs and high maintenance requirements, the liquid thermal diffusion process has been eliminated from further consideration.

Gaseous Diffusion Process

The gaseous diffusion process is based on molecular effusion, a process that occurs whenever a gas is separated from a vacuum by a porous barrier. The gas passes through the holes because there are more "collisions" with holes on the high-pressure side than on the low-pressure side (i.e., the gas flows from the high-pressure side to the low-pressure side). The rate of effusion of a gas through a porous barrier is inversely proportional to the square root of its mass. Thus, lighter molecules pass through the barrier faster than heavier ones. Figure 2-17 is a diagram of a single gas diffusion stage.

The gaseous diffusion process consists of thousands of individual stages connected in series to multiply the separation factor. The gaseous diffusion plant in Paducah, Kentucky, contains 1,760 enrichment stages and is designed to produce UF_6 enriched up to 5.5 percent ^{235}U. The design capacity of the Paducah Gaseous Diffusion Plant is approximately 8 million SWU per year, but it has never operated at greater than 5.5 million SWU. Paducah consumes approximately 2,200 kilowatt hours SWU, which is less than the electromagnetic isotopic separation process or liquid thermal diffusion process but still higher than the 40 kilowatt hours per kilogram of SWU possible in modern gas centrifuge plants (DOE, 2000b; Urenco, 2004b). The gaseous diffusion process is 50-year-old technology that is energy intensive and therefore has been eliminated from further consideration.

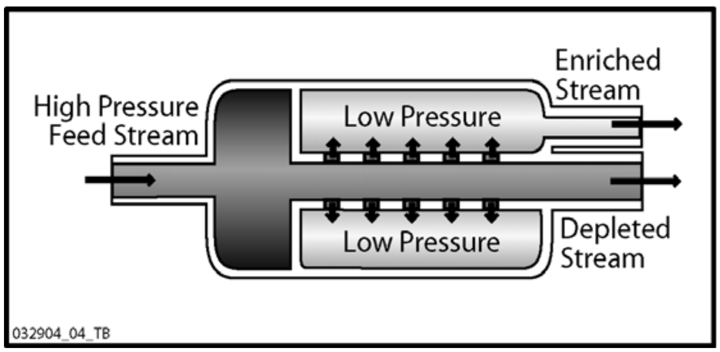


Figure 2-17 Gaseous Diffusion Stage (Urenco, 2003)

Laser Separation Technology

Laser separation technology encompasses two known developmental technologies that have yet to reach the maturity stage for industrial use. These are the Atomic Vapor Laser Isotope Separation and the Separation of Isotopes by Laser Excitation processes.

The Atomic Vapor Laser Isotope Separation process is based on different isotopes of the same element, while chemically identical, having different electronic energies and therefore absorbing different colors of laser light. The isotopes of most elements can be separated by a laser-based process if they can be efficiently vaporized into individual atoms. In Atomic Vapor Laser Isotope Separation enrichment, uranium metal is vaporized and the vapor stream is illuminated with a laser light of a specific wavelength that is absorbed only by ^{235}U. The laser selectively adds enough energy to ionize or remove an electron from ^{235}U atoms while leaving the other isotopes unaffected. The ionized ^{235}U atoms are then collected on negatively charged surfaces inside the separator unit. The collected material (enriched product) is condensed as liquid on the charged surfaces and then drains to a caster where it solidifies as metal nuggets. Figure 2-18 is a diagram of the Atomic Vapor Laser Isotope Separation process (LLNL, 2004). In June 1999, citing budget constraints, USEC stopped further development of the Atomic Vapor Laser Isotope Separation program (USEC, 1999).

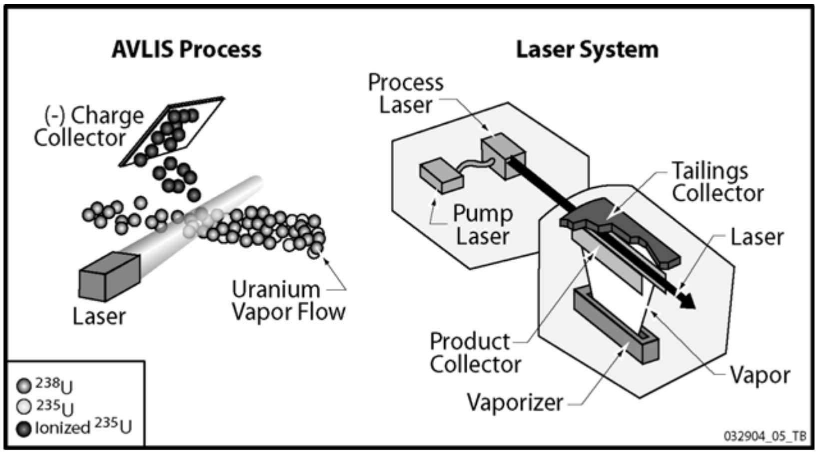


Figure 2-18 AVLIS Process (LLNL, 2004)

The Separation of Isotopes by Laser Excitation technology, developed by the Australian Silex Systems Ltd., uses a similar process to the Atomic Vapor Isotope Separation process. The Separation of Isotopes by Laser Excitation process uses UF_6 vapor that passes through a tuned laser and an electromagnetic field to separate the $^{235}UF_6$ from the $^{238}UF_6$. The process is still under development and will not be ready for field trials for several years. USEC ended its support of the Separation of Isotopes by Laser Excitation program on April 30, 2003, in favor of the proposed American Centrifuge Plant (USEC, 2003b).

Because neither the Atomic Vapor Laser Isotope Separation process nor the Separation of Isotopes by Laser Excitation process is ready for commercial production of low-enriched uranium, these processes have been eliminated from further consideration.

Conclusion

The NRC considered the feasibility of utilizing alternative methods for producing low-enriched uranium. Gas diffusion and liquid thermal diffusion technology would be far more costly than the centrifuge technology proposed. The other technologies reviewed—electromagnetic isotope separation process and laser separation technology—have not been sufficiently developed for commercial application. Accordingly, these technologies were not considered reasonable alternatives.

2.2.2.4 Alternatives for DUF_6 Disposition

In addition to the DUF_6 disposition options discussed in section 2.1.9, other alternatives for dispositioning the DUF_6 include (1) storage of the DUF_6 onsite in anticipation of future use as a resource and (2) continuous conversion of the DUF_6 to U_3O_8 and storage of the oxide as a potential resource. In addition, DOE has evaluated the potential impacts of various disposition options in its "Final Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride" (DOE, 1999b). These include (1) storage as DUF_6 for up to 40 years, (2) long-term storage as depleted U_3O_8, (3) use of depleted U_3O_8, and (4) use of uranium metal.

LES proposed three additional alternatives for DUF_6 disposition that include Russian re-enrichment, French conversion or re-enrichment, and Kazakhstan conversion. Due to the costs for disposition in Russia, France, or Kazakhstan, the NRC staff does not consider these alternatives to be viable; therefore, they are not discussed further in this EIS. Figure 2-12 shows the disposition flow paths considered by the NRC staff in this EIS.

The following subsections discuss the other DUF_6 disposition alternatives in two broad categories—use of DUF_6 and conversion at existing fuel fabrication facilities—and the reasons these alternatives are not evaluated in detail in this EIS.

Beneficial Uses of Depleted Uranium

Some historical beneficial uses for depleted uranium:

- *Further enrichment – DOE originally undertook the long-term storage of DUF_6 because it can be used in the future as feed for further enrichment. The low cost of uranium ore and postponed deployment of advanced enrichment technology have indefinitely delayed this application.*
- *Nuclear reactor fuel – depleted uranium oxide can be mixed with plutonium oxide from nuclear weapons to make mixed oxide fuel (typically about 6 percent plutonium oxide and 94 percent depleted uranium oxide) for commercial power reactors.*
- *Down-blending high-enriched uranium – Nuclear disarmament allows the down-blending of some weapons-grade highly enriched uranium with depleted uranium to make commercial reactor fuel.*
- *Munitions – depleted uranium metal can be used for tank armor and armor-piercing projectiles. This demand is decreasing as environmental regulations become more complex.*
- *Biological shielding – depleted uranium metal has a high density, which makes it suitable for shielding from x-rays or gamma rays for radiation protection.*
- *Counterweights – Because of its high density, depleted uranium has been used to make small but heavy counterweights such as in the aircraft industry.*

Sources: DOE 1999b; Brown et al., 1997.

<u>Use of DUF_6</u>

As discussed above, the NRC staff views DUF_6 as a potential resource with very limited use. If storage of DUF_6 beyond 30 years occurs, then the impacts described in Chapter 4 of this EIS would be extended for that storage period. If a viable use for DUF_6 is found, it could reduce the environmental impacts associated with its disposition. However, the likelihood of a significant commercial market for the DUF_6 generated by the proposed NEF site is considered to be low.

DOE has evaluated a number of alternatives and potentially beneficial uses for DUF_6, and some of these applications have the potential to use a portion of the existing DUF_6 inventory (DOE, 1999b; Brown et al., 1997). However, the current DUF_6 consumption rate is low compared to the DUF_6 inventory (DOE, 1999b), and the NRC has assumed that excess DOE and commercial inventory of DUF_6 would be disposed of as a waste product (NRC, 1995).

The NRC staff has determined that unless LES can demonstrate a viable use, the DUF_6 generated by the proposed NEF should be considered a waste product. Because the current available inventory of depleted uranium in the form of metal (UF_6 and U_3O_8) is in excess of the current and projected future demand for the material, this EIS will not further evaluate DUF_6 disposition alternatives involving its use as a resource, including continued storage at the proposed NEF site for more than 30 years in order to be used in the future.

Conversion at Existing Fuel Fabrication Facilities

Another potential alternative disposition strategy would be to perform the conversion of DUF_6 to U_3O_8 at an existing fuel-fabrication facility. The existing fuel-fabrication facilities are Global Nuclear Fuel-Americas, LLC, in Wilmington, North Carolina; Westinghouse Electric Company, LLC, in Columbia, South Carolina; and Framatome ANP, Inc., in Richland, Washington. These facilities have existing processes and conversion capacities. They also use Type 30B cylinders. Therefore, the existing fuel-fabrication facilities would need to install new equipment to handle the larger Type 48Y cylinders. The facilities would probably need to install separate capacity to process the DUF_6 to avoid quality control issues related to processing enriched UF_6. The facilities would also need to manage and dispose of the hydrofluoric acid that would be generated from the conversion process. Furthermore, these existing facilities have not expressed an interest in performing these services, and the cost for the services would be difficult to estimate. For these reasons, this alternative is eliminated from further consideration in this EIS.

Conclusion

Although DUF_6 does have alternative and beneficial uses, the current U.S. inventory is estimated to be approximately 480,000 metric tons of uranium (OECD, 2001), which far exceeds the existing and projected demand for the material. Consequently, the NRC staff has assumed that all of the DUF_6 to be generated by the proposed NEF would be converted to U_3O_8 and disposed of in a licensed disposal facility.

2.2.2.5 Anhydrous Hydrofluoric Acid Option

As discussed in section 2.1.9, a byproduct of the conversion from DUF_6 to U_3O_8 is hydrofluoric acid. The hydrofluoric acid can be processed in two forms, aqueous (dissolved in water) or anhydrous (without water; especially without water of crystallization). In a Programmatic EIS (DOE, 1999b) addressing the potential impacts of alternative management strategies for DUF_6 stored at various DOE facilities, DOE proposed and discussed the potential environmental impacts from further processing of the aqueous hydrofluoric acid with a yet to be determined distillation process to generate anhydrous hydrofluoric acid. This process was proposed by DOE, because anhydrous hydrofluoric acid has a greater commercial value than does aqueous hydrofluoric acid. DOE assessed the impacts of two conversion options for the DUF_6. The two conversion options considered were (1) a distillation process for anhydrous hydrofluoric acid; and (2) the neutralization of the aqueous hydrofluoric acid with lime to generate calcium fluoride (CaF_2).

Based on its Programmatic EIS, DOE published a request for proposals for the construction and operation of two DUF_6 conversion facilities, one each at DOE's Paducah, Kentucky, and Portsmouth, Ohio, gaseous diffusion plant sites, to process its large inventory of DUF_6. In the request for proposals, DOE allowed for a range of potential conversion product forms and process technologies; however, DOE required that any of the proposed conversion forms must have an assured, environmentally acceptable path for final disposition (DOE, 2004a; DOE, 2004b).

In response to the request for proposals, DOE received five proposals, three of which were deemed to be in the competitive range. Of the three, two proposals would either sell or neutralize aqueous hydrofluoric acid and the other proposal would sell anhydrous hydrofluoric acid. DOE selected a proposal that did not involve the distillation to anhydrous hydrofluoric acid, but rather the sale of aqueous hydrofluoric acid with neutralization to form CaF_2 if the aqueous hydrofluoric acid could not be sold. Therefore, the possibility of distilling the aqueous hydrofluoric acid was not presented as a conversion process in either of DOE's site specific Final EISs prepared for DUF_6 conversion facilities at the Paducah and Portsmouth sites.

Cogema has experience with efforts to generate anhydrous hydrofluoric acid from aqueous hydrofluoric acid. At its DUF_6 conversion facility in Pierrelatte, France, Cogema attempted to generate anhydrous hydrofluoric acid using a process similar to that proposed in the DOE Programmatic EIS (Hartmann, 2001). However, technical issues proved difficult and so Cogema canceled further efforts to generate anhydrous hydrofluoric acid from aqueous hydrofluoric acid.

LES has reviewed the issue of the generation of anhydrous hydrofluoric acid from aqueous hydrofluoric acid. In Revision 4 of its Environmental Report, LES states that "LES will not use a deconversion facility that employs a process that results in the production of anhydrous [hydrofluoric acid]" (LES, 2005a).

In summary, the option of generating anhydrous hydrofluoric acid has not been analyzed because:

- A proven commercially viable technology is not available to distill the aqueous hydrofluoric acid. Cogema was unable to develop a conversion technology to effectively generate anhydrous hydrofluoric acid from the aqueous form.

- DOE selected sale of aqueous hydrofluoric acid followed by sale or by neutralization with lime to generate CaF_2, rather than distillation of aqueous hydrofluoric acid to anhydrous hydrofluoric acid, for its conversion facilities being built at Paducah and Portsmouth.

- LES has committed to not pursuing a private conversion process that employs a process that results in the production of anhydrous hydrofluoric acid. In a letter dated March 29, 2005, LES formally requested a license condition be issued stating that "For the disposition of depleted UF_6, LES shall not use a depleted UF_6 deconversion facility that employs a process that results in the production of anhydrous [hydrofluoric acid]" (LES, 2005e). The NRC staff is proposing the following license condition:

  > For the disposition of depleted UF_6, the licensee shall not use a depleted UF_6 deconversion facility that employs a process that results in the production of anhydrous hydrofluoric acid.

For these reasons, distillation to anhydrous hydrofluoric acid was eliminated from further consideration in this EIS.

2.3 Comparison of Predicted Environmental Impacts

Chapter 4 of this EIS presents a more detailed evaluation of the environmental impacts of the proposed action and the no-action alternative. Table 2-9 summarizes the environmental impacts for the proposed NEF and the no-action alternative.

2.4 Staff Recommendation Regarding the Proposed Action

After weighing the impacts of the proposed action and comparing alternatives, the NRC staff, in accordance with 10 CFR § 51.71(e), sets forth its NEPA recommendation regarding the proposed action. The NRC staff recommends that, unless safety issues mandate otherwise, the proposed license be issued to LES. In this regard, the NRC staff has concluded that the applicable environmental monitoring program described in Chapter 6 and the proposed mitigation measures discussed in Chapter 5 would eliminate or substantially lessen any potential adverse environmental impacts associated with the proposed action.

The NRC staff has concluded the overall benefits of the proposed NEF outweigh the environmental disadvantages and costs based on consideration of the following:

- The need for an additional, reliable, economical, domestic source of enrichment services.

- The beneficial economic impacts of the proposed NEF on the local communities which have been determined to be MODERATE.

- The remaining impacts on the physical environment and human communities would be small with the exception of short-term impacts associated with construction traffic, accidents, and waste management, which would be SMALL to MODERATE.

Table 2-9 Summary of Environmental Impacts for the Proposed NEF and the No-Action Alternative

Affected Environment	Proposed Action: *LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.*	No-Action Alternative: *The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Land Use	SMALL. Construction activities would occur on about 81 hectares (200 acres) of a 220-hectare (543-acre) site that would be fenced. While the land is currently undisturbed except for an access road, CO_2 pipeline, and cattle grazing, there are sufficient lands surrounding the proposed NEF for relocation of the cattle grazing and the CO_2 pipeline. Impacts from installation of municipal water supply piping, natural gas supply piping, and electrical transmission lines would also be SMALL.	SMALL. Under the no-action alternative, no local impact would occur because the proposed NEF would not be constructed or operated. The land use of cattle grazing would continue and the property would be available for alternative use. There would also be no land disturbances. Impacts to local land use would be expected to be SMALL. The existing activities such as enrichment services from existing uranium enrichment facilities, from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future and would have land use impacts that would be similar to those of the proposed action, depending on site conditions either at a new location or an existing industrial site. Impacts to land use would be expected to be SMALL.

Affected Environment	Proposed Action: *LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.*	No-Action Alternative: *The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Historical and Cultural Resources	SMALL. Seven archaeological sites were recorded on the proposed site. All of these sites are considered potentially eligible for listing on the National Register of Historic Places. Two sites would be impacted by construction activities, and a third is located along the access road. Based on the terms and conditions of a Memorandum of Agreement, a historic properties treatment plan would be fully implemented prior to construction of the proposed NEF. Once measures from the treatment plan are implemented, adverse impacts would be mitigated.	SMALL to MODERATE. Under the no-action alternative, the land would continue to be used for cattle grazing and historical and cultural resources would remain in place unaffected by the proposed action. Without the proposed treatment plan and its mitigation measures, historical sites identified at the proposed NEF site could be exposed to the possibility of human intrusion and continued weathering. Local impacts to historical and cultural resources would be expected to be SMALL, providing that requirements included in applicable Federal and State historic preservation laws and regulations are followed or could be MODERATE if not followed. The existing activities such as enrichment services from existing uranium enrichment facilities, from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future and could have potential impacts to cultural resources if at a new location. The impacts would be expected to be SMALL if built and operated at an existing industrial site. The impacts could be SMALL to MODERATE if additional domestic enrichment facilities were located at a new site, depending on the specific site conditions.

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Visual and Scenic Resources	SMALL. Impacts from construction activities would be limited to fugitive dust emissions that can be controlled using dust-suppression techniques. The proposed NEF cooling towers could contribute to the formation of local fog less than 0.5 percent of the total number of hours per year (44 hours per year). The proposed NEF site received the lowest scenic-quality rating using the BLM visual resource inventory process.	SMALL. Under the no-action alternative, the visual and scenic resources would remain the same as described in the affected environment section. Local impacts to visual and scenic resources would be expected to be SMALL. The existing activities such as enrichment services from existing uranium enrichment facilities, from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future and would have visual and scenic resources impacts that would be similar to those of the proposed action, depending on site conditions either at a new location or an existing industrial site. Impacts to visual and scenic resources would be expected to be SMALL.

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Air Quality	SMALL. Air concentrations of the criteria pollutants predicted for vehicle emissions and PM_{10} emissions for fugitive dust during construction would all be below the National Ambient Air Quality Standards, temporary, and highly localized. A NESHAP Title V permit would not be required for operations due to the low levels of estimated emissions.	SMALL. Under the no-action alternative, air quality in the general area would remain at its current levels described in the affected environment section. Impacts to air quality would be expected to be SMALL. The existing activities such as enrichment services from existing uranium enrichment facilities, from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future . Depending on the construction methods and design of these facilities, the likely impact on air quality would be similar to the proposed action. Impacts to air quality would be expected to be SMALL.

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Geology and Soils	SMALL. Construction-related impacts to soil would occur within the 81-hectare (200-acre) portion of the site that would contain the proposed NEF structures. Only onsite soils would be used during construction except for clay and gravel from a nearby quarry. No soil contamination would be expected during construction and operations although soil contamination could occur. A plan would be in place to address any spills that may occur during operations and any contaminated soil in excess of regulatory limits would be properly disposed of.	SMALL. Under the no-action alternative, the land would continue to be used for cattle grazing. The geology and soils on the proposed site would remain unaffected because no land disturbance would occur. Natural events such as wind and water erosion would remain as the most significant variable associated with the geology and soils of the site. Impacts to geology and soils would be expected to be SMALL. The existing activities such as enrichment services from existing uranium enrichment facilities, from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future and would have geology and soils impacts that would be similar to those of the proposed action, depending on site conditions either at a new location or an existing industrial site. Impacts to geology and soils would be expected to be SMALL.

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Water Resources	SMALL. There are no existing surface water resources, and groundwater resources under the proposed NEF site are not considered potable or near the surface. NPDES general permits for construction and operations would be required to manage stormwater runoff. Construction-related impacts would be SMALL to both surface water and groundwater. Retention basins (i.e., the Treated Effluent Evaporative Basin and the UBC Storage Pad Stormwater Retention Basin) would be lined to minimize infiltration of water into the subsurface. Infiltration from the Site Stormwater Detention Basin and septic systems' leach fields could be expected to form a perched layer on top of the Chinle Formation, but there would be limited downgradient transport due to soil-storage capacity and upward flux to the root zone. Operations impacts would be SMALL. Impacts on water use would be SMALL due to the availability of excess capacity in the Hobbs and Eunice water systems. The proposed NEF's use of Ogallala waters indirectly through the Eunice and Hobbs water-supply systems would constitute a small portion of the aquifer reserves in New Mexico.	SMALL. Under the no-action alternative, water resources would remain the same as described in the affected environment section. Water supply demand would continue at the current rate. The natural surface flow of stormwater on the site would continue, and potential groundwater contamination could occur due to surrounding operations related to the oil industry. Impacts to water resources local to Lea County would be expected to be SMALL. The existing activities such as enrichment services from existing uranium enrichment facilities, from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future. Depending on the design, location of these facilities and local water resources, the likely impact on water resources (including water usage) would be similar to the proposed action. Impacts to water resources would be expected to be SMALL

Affected Environment	Proposed Action: *LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.*	No-Action Alternative: *The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Ecological Resources	SMALL. There are no wetlands or unique habitats for threatened or endangered plant or animal species on the proposed NEF site. Impacts from use of stormwater detention/retention basins would be SMALL. Animal-friendly fencing and netting or other suitable material over the basins (where appropriate) would be used to minimize animal intrusion. Revegetation using native plant species would be conducted in any areas impacted by construction, operation, and decommissioning activities.	SMALL. Under the no-action alternative, the land would continue to be used for cattle grazing and the ecological resources would remain the same as described in the affected environmental section. Local land disturbances would also be avoided. Impacts to ecological resources would be expected to be SMALL The existing activities such as enrichment services from existing uranium enrichment facilities, from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future and would have ecological resources impacts that would be similar to those of the proposed action, depending on the site conditions either at a new location or an existing industrial site. Impacts to ecological resources would be expected to be SMALL.
Socioeconomics	MODERATE. During the 8-year construction period, there would be an average of 397 jobs per year created (about 19 percent of the Lea, Andrews, and Gaines counties' construction labor force) with employment peaking at 800 jobs in the fourth year. Construction would cost $1.24 billion (2004 dollars). Spending on goods and services and wages would create 582 new jobs on average. About 15 percent of the construction work force would take up residency in the surrounding	SMALL to MODERATE. Under the no-action alternative, socioeconomics in the local area would continue as described in the affected environmental section. The socioeconomic impacts would be SMALL. The existing activities such as enrichment services from existing uranium enrichment facilities, from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
	community, and about 15 percent of the local housing units are unoccupied. The impact to housing and the educational system would be SMALL. Gross receipts taxes paid by LES and local businesses could approach \$3.1 million during the 8-year construction period. Income taxes during construction are estimated to be about \$4.1 million annually. LES would employ 210 people annually during peak operations with an additional 173 indirect jobs with about \$20.8 million in annual operations spending. Increase in demand for public services would be SMALL. Decommissioning would have a SMALL impact. Approximately 300 direct and indirect jobs at Paducah, Kentucky, or Portsmouth, Ohio, would be extended for 11 to 15 years, respectively, if DUF_6 conversion takes place at either site. If a private conversion facility is constructed, approximately 180 total jobs would be created. The tax revenue impacts of the proposed NEF operations to Lea County and the city of Eunice would be MODERATE given the size of current property tax collection and gross receipts taxes received from the State of New Mexico.	documentation and historical environmental monitoring. Additional domestic enrichment facilities in the future could be constructed. Depending on the construction methods, design of these facilities and local demographics, the likely socioeconomic impact would be similar to the proposed action. Socioeconomic impacts would be expected to be SMALL to MODERATE.

Affected Environment	Proposed Action: *LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.*	No-Action Alternative: *The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Environmental Justice	SMALL. The environmental justice study was chosen to encompass an 80-kilometer (50-mile) radius around the proposed NEF site. Demographic data from the 2000 census data were analyzed to characterize minority and low-income populations near the proposed NEF site. In addition, state and local governments and representatives of the minority community were contacted. The largest minority population within 80 kilometers (50 miles) of the proposed NEF site is the Hispanics/Latino population. Although the impacts to the general population were SMALL to MODERATE, examination of the various environmental pathways by which low-income and minority populations could be affected found no disproportionately high and adverse impacts from construction, operation or decommissioning would occur to minority and low-income populations living near the proposed NEF or along the transportation routes into and out of the proposed NEF.	SMALL. Under the no-action alternative, no changes to environmental justice issues other than those that may already exist in the community would occur. No disproportionately high or adverse impacts would be expected. Environmental justice impacts would be expected to be SMALL. The existing activities such as enrichment services from existing uranium enrichment facilities, from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities in the future could be constructed, with site-specific impacts on environmental justice. The impacts could be similar to the proposed action if the location has a similar population distribution or at a site with a similar industrial process. Environmental justice impacts would be expected to be SMALL under most likely circumstances.

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Noise	SMALL. Noise levels would be predominately due to traffic noise. Construction and decommissioning activities could be limited to normal daytime working hours. The nearest residence would be 4.3 kilometers (2.6 miles) away from the proposed site, and noises at this distance from construction activities would be SMALL. Noise levels during operations would primarily be confined to inside buildings and would be within the U.S. Department of Housing and Urban Development guidelines.	SMALL. Under the no-action alternative, there would be no construction or operational activities or processes that would generate noise. Noise levels would remain as is currently observed at the site. Noise impacts would be expected to be SMALL. The existing activities such as enrichment services from existing uranium enrichment facilities, from foreign sources and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future. Depending on the construction methods, design of these facilities, and surrounding land uses, the likely noise impact would be similar to the proposed action. Noise impacts would be expected to be SMALL.

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Transportation	SMALL to MODERATE during construction. Traffic on New Mexico Highway 234 would almost double during construction for a period of approximately two years, and three injuries and less than one fatality could occur during the peak construction employment year due to work force traffic. Peak truck traffic during construction could cause less than one injury and less than one fatality. New Mexico Highway 18 is a four-lane road; therefore impacts to it would be smaller than to New Mexico Highway 234. SMALL during operations. Truck trips removing nonradioactive waste and delivering supplies would have a small impact on the traffic on New Mexico Highway 234. Work force traffic would also have a SMALL impact on New Mexico Highways 18 and 234 with less than one injury and less than one fatality annually due to traffic accidents. All truck shipments of feed, product, and waste materials would result in less than 3×10^{-2} latent cancer fatalities to the public and workers from direct radiation and two or less from vehicle emissions. All rail shipments of feed, product, waste materials, and empty cylinders would result in less than 1×10^{-1} latent cancer fatalities to the public and workers from direct radiation and less than 8×10^{-2} from vehicle emissions during the life of the facility.	SMALL to MODERATE. Under the no-action alternative, traffic volumes and patterns would remain the same as described in the affected environment section. The current volume of radioactive material and chemical shipments would not increase. Transportation impacts would be expected to be SMALL. The existing activities such as enrichment services from existing uranium enrichment facilities, from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities in the future could be constructed and would have transportation impacts that would be similar to those of the proposed action, depending on site conditions either at a new location or an existing industrial facility. Impacts to transportation would be expected to be SMALL to MODERATE.

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Transportation *(continued)*	SMALL to MODERATE during accidents. If a rail accident involving the shipment of DUF_6 occurs in an urban area, approximately 28,000 people could suffer adverse, but temporary, health effects with no fatalities due to chemical impacts. A truck accident involving the shipment of DUF_6 in an urban area could cause temporary adverse chemical impacts to approximately 1,700 people. SMALL during decommissioning if DUF_6 is temporarily stored at the proposed NEF for the duration of operations. Assuming that all material is shipped during the first 8 years (the final radiation survey and decontamination would occur during year 9), the proposed NEF would make about 1,966 truck shipments per year. If the trucks are limited to weekday, non-holiday shipments, approximately 10 trucks per day or 2-1/2 railcars per day would leave the site for the DUF_6 conversion facility.	

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Public and Occupational Health	SMALL during construction and normal operations. During construction, there could be less than one fatality per year based on State statistics from the year 2002. Construction workers could receive up to 0.05 millisieverts (5 millirem) of radiation exposure per year once proposed NEF operations are initiated. Precautions would be taken to prevent injuries and fatalities. During operations, there would be approximately eight injuries per year and 4×10^{-4} fatalities per year due to nonradiological occurrences based on statistical probabilities. A typical operations or maintenance technician could receive 1 millisievert (100 mrem) of radiation exposure annually. A typical cylinder yard worker could receive 3 millisievert (300 mrem) of radiation exposure annually. All public radiological exposures are significantly below the 10 CFR Part 20 regulatory limit of 1 millisieverts (100 millirem) and 40 CFR Part 190 regulatory limit of 0.25 millisieverts (25 millirem) for uranium fuel-cycle facilities. The nearest resident would receive less than 1.3×10^{-5} millisievert (1.3×10^{-3} millirem) due to proposed NEF operations. SMALL to MODERATE for accidents. Although highly unlikely, the most severe accident is estimated to be the release of UF_6 caused by rupturing an over-filled and/or	SMALL to MODERATE. Under the no-action alternative, the public health would remain the same as described in the affected environment section. No radiological exposures are estimated to the general public other than from background radiation levels. Local public and occupational health impacts would be expected to remain SMALL. The existing activities such as enrichment services from existing uranium enrichment facilities, from foreign sources, and from the “Megatons to Megawatts” program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future. Depending on the construction methods and design of these facilities, the likely public and occupational health impacts from normal operations and accidents would be similar to the proposed action. Public and occupational health impacts for additional domestic enrichment facilities would be expected to be SMALL to MODERATE.

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Public and Occupational Health *(continued)*	over-heated cylinder, which could incur a collective population dose of 120 person-sieverts (12,000 person-rem) and seven latent cancer fatalities. The proposed NEF design reduces the likelihood of this event by using redundant heater controller trips.	
Waste Management	SMALL. Solid wastes would be generated during construction and operations. Existing disposal facilities would have the capacity to dispose of the nonhazardous solid wastes. The proposed NEF would implement waste management programs to minimize waste generation and promote recycling where appropriate. In particular, impacts to the Lea County Landfill would be SMALL. There would be enough existing national capacity to accept the low-level radioactive waste that could be generated at the proposed NEF. SMALL to MODERATE impact for DUF_6 Waste Management. Public and occupational exposures would be monitored and controlled to meet NRC regulations for radiation protection. LES identified two potential pathways for the disposition of DUF_6, either by private conversion and disposal facilities or by DOE through Section 3113 of the USEC Privatization Act. LES's preferred strategy is to have the DUF_6 byproduct converted and disposed of using private facilities outside of the State of New Mexico. No final location has yet been determined for a private conversion facility. Alternatively, DOE's processing of the DUF_6 would	SMALL to MODERATE. Under the no-action alternative, new wastes including sanitary, hazardous, low-level radioactive wastes, or mixed wastes would not be generated that would require disposition. Local impacts from waste management would be expected to remain SMALL. The existing activities such as enrichment services from existing uranium enrichment facilities, from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future. Depending on the construction methods, design of these facilities, and the status of DUF_6 conversion facilities, the likely waste management impacts would be similar to the proposed action. For additional domestic enrichment facilities, impacts from waste management would be expected to be SMALL to MODERATE.

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Waste Management **(continued)**	extend operation of its conversion facilities. This would prolong their associated impacts as described in DOE's NEPA documentation. A private conversion facility would have comparable impacts to the planned DOE conversion facilities at Paducah, Kentucky, and Portsmouth, Ohio.	

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3 AFFECTED ENVIRONMENT

This Chapter describes the regional and local environmental characteristics at the proposed National Enrichment Facility (NEF) site. These data and information provide a starting point from which to assess impacts (Chapter 4) of the proposed action (Chapter 2) of this Environmental Impact Statement (EIS). This Chapter presents information on land use; water resources; historic and cultural resources; visual and scenic resources; climatology, meteorology, and air quality; geology, minerals and soils; ecology; noise; socioeconomic; public health; transportation; and waste disposal.

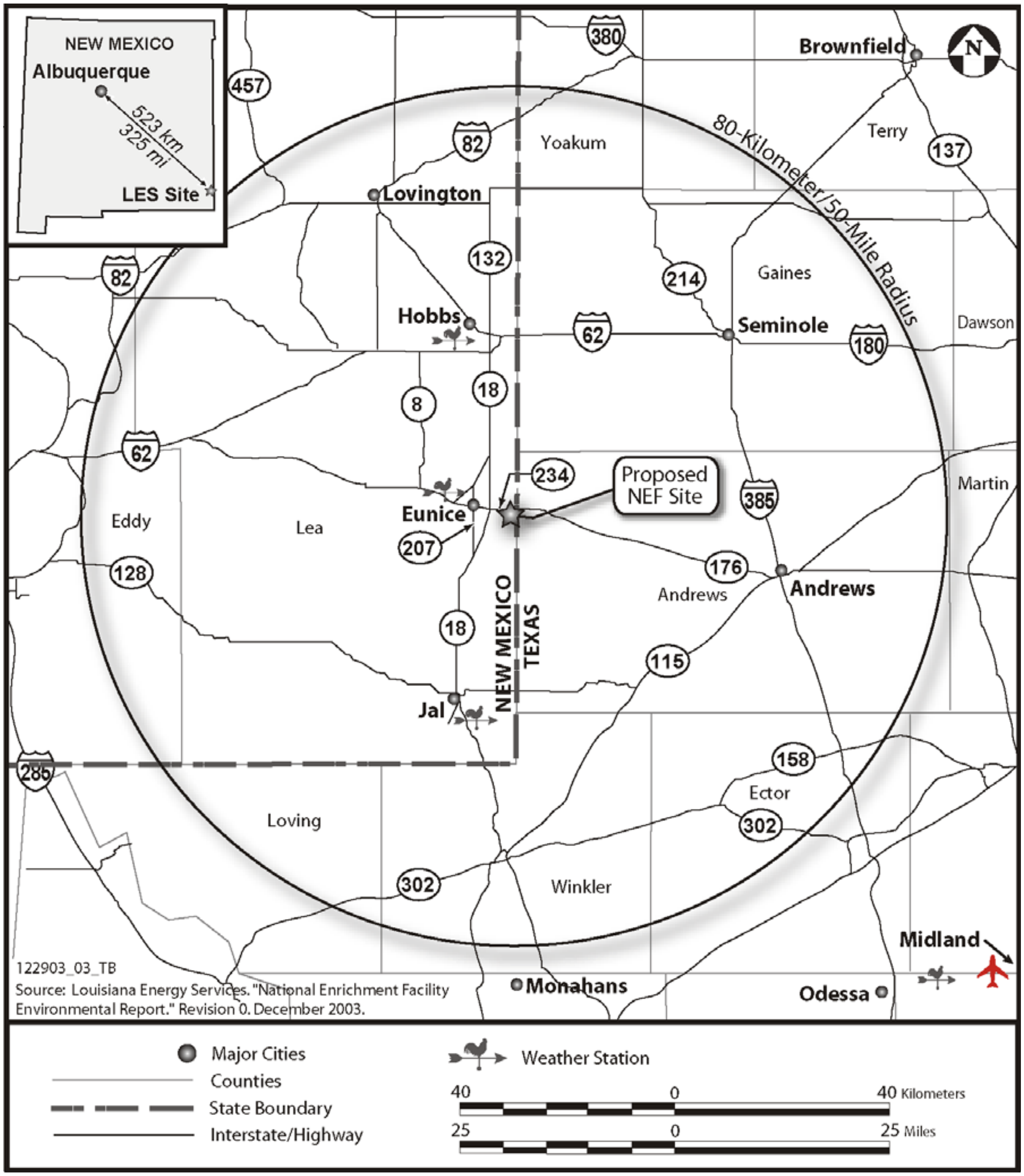

Figure 3-1 Proposed NEF Site and Surrounding Areas (LES, 2005a)

3.1 Site Location and Description

The proposed NEF site is located in southeastern New Mexico in Lea County, approximately 32 kilometers (20 miles) south of Hobbs, New Mexico; 8 kilometers (5 miles) east of Eunice, New Mexico; and about 0.8 kilometer (0.5 mile) from the New Mexico/Texas State line (Figure 3-1). Eunice, the closest population center, is located at the cross-junction of New Mexico Highways 207 and 234. The site is about 51 kilometers (32 miles) northwest of Andrews, Texas, and 523 kilometers (325 miles) southeast of Albuquerque, New Mexico. The nearest population center with an international airport is Midland-Odessa, located 103 kilometers (64 miles) southeast of the proposed site.

As the result of a land exchange, ownership of the property was transferred from the State of New Mexico to Lea County. On December 8, 2004, Lea County leased the property to Louisiana Energy Services (LES). This lease would last for a period of 30 years, after which LES would purchase the land (LES, 2005a; LES, 2005b; LES, 2004).

The proposed NEF site consists of mostly undeveloped land that is used for cattle grazing. As shown in Figure 3-2, a gravel-covered road bisects the east and west halves of the site. In addition, the site is traversed by an underground carbon dioxide pipeline. An underground natural gas pipeline is located along the southern property line. A barbed-wire fence runs along the eastern, southern, and western property lines. The north fence has been dismantled.

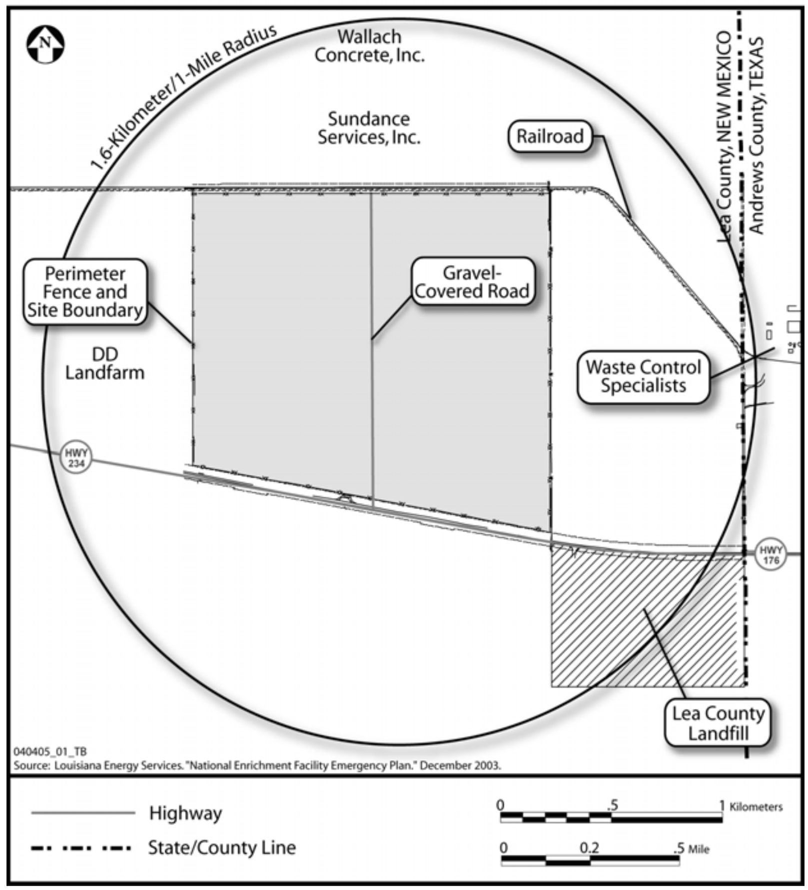

Figure 3-2 Proposed NEF Site Area (LES, 2005b)

3.2 Land Use

This section includes a description of the land uses on and near the proposed NEF site as well as a discussion of offsite areas and the regional setting. Figure 3-3 shows a general land use map for the proposed site vicinity.

The area surrounding the proposed site consists of vacant land and industrial developments. The northern side of the site is bordered by a railroad spur, beyond which is a sand/aggregate quarry operated by Wallach Concrete, Inc. (Wallach, 2004) and an oil-reclamation operation owned by Sundance Services, Inc. The Sundance facility disposes of oil industry solid wastes in a disposal facility and treats soils contaminated with hydrocarbons via landfarming (NMCDE, 2004a; Sundance, 2004a; BLM, 1992).

Further east of the proposed site, a hazardous waste treatment facility operated by Waste Control Specialists (WCS) is situated within the State of Texas. The WCS facility owns buffer areas that border the immediate eastern boundary of the proposed NEF site. The WCS facility holds a renewable seven-year license to temporarily store low-level radioactive and mixed wastes. In addition, WCS holds:

- A *Resource Conservation and Recovery Act* (RCRA) Part B permit (Texas Natural Resources and Conservation Commission Permit No. HW-50358).

- A *Toxic Substances Control Act* Land Disposal Authorization (Environmental Protection Agency [EPA] Identification No. TXD988088464).

- A Texas Natural Resources and Conservation Commission Naturally Occurring Radioactive Material Disposal Authorization, and a Texas Department of Health, Bureau of Radiation Control, Radioactive Material License (Texas Department of Health License No. L04971) (WCS, 2004a; TDH, 2000).

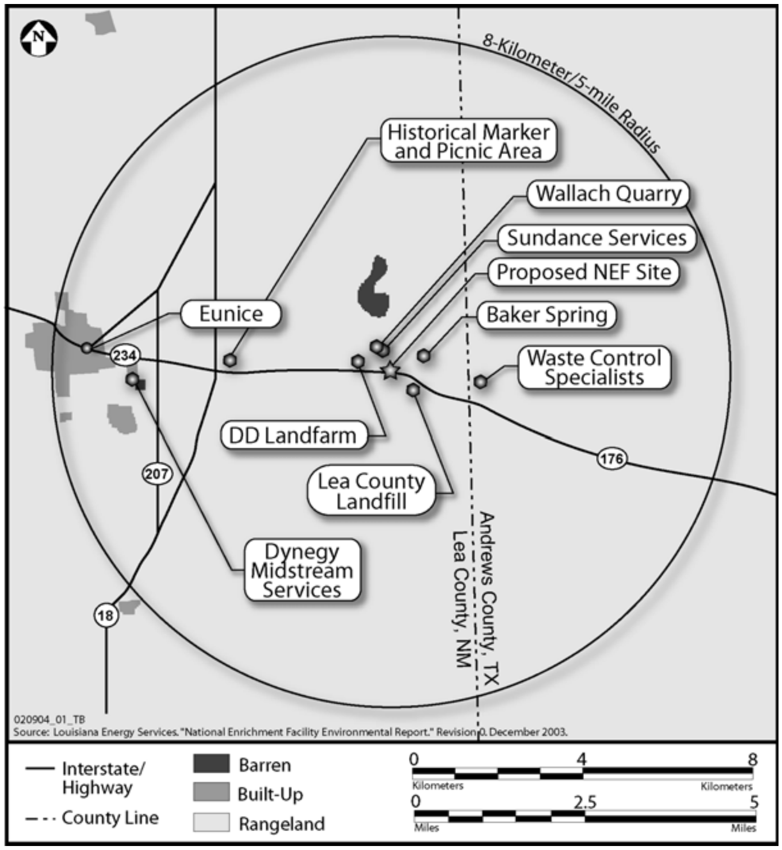

Figure 3-3 Land Use Within 8 Kilometers (5 Miles) of the Proposed NEF Site (LES, 2005a)

Under these licenses, permits, and authorizations, WCS treats, processes, and/or temporarily stores low-level radioactive wastes (including greater-than-class-C, sealed sources, solids, and liquids), 11e(2) material, and mixed wastes (i.e., hazardous waste with radioactive contamination) in addition to the disposal of RCRA/*Toxic Substances Control Act* hazardous materials (WCS, 2004b). WCS is an Agreement State licensee with the State of Texas. On November 12, 2004, the U.S. Nuclear Regulatory Commission (NRC) published in the *Federal Register* (69 FR 65468 to 65470) the issuance of an order to modify WCS' exemption from the requirements of Title 10, "Energy," of the *U.S. Code of Federal Regulations* (10 CFR) Part 70.

The Lea County Landfill is located to the southeast and across New Mexico Highway 234 from the proposed NEF. This landfill disposes of municipal solid waste for the Lea County Solid Waste Authority under New Mexico Environment Department Permit Number SWM-130302. The landfill services Lea County and its municipalities, and other communities within a 160-kilometer (100-mile) radius (LCSWA, 2004).

Bordering the proposed site from the west is privately held land, beyond which is the DD Landfarm, a petroleum-contaminated-soil treatment facility (NMEMNRD, 2000). A historical marker and picnic area are also situated approximately 3.2 kilometers (2 miles) west of the proposed NEF at the intersection of

New Mexico Highway 18 and Highway 234. Also, Dynegy Midstream Services, a gathering and processing plant of natural gas, is located 6 kilometers (4 miles) west of the proposed NEF site. The nearest residences are situated approximately 4.3 kilometers (2.6 miles) west of the site (LES, 2005a).

The oil and gas industry has developed the land further to the north, south, and west of the proposed site with hundreds of operating oil pump jacks and associated rigs (Figure 3-4). The more than 33,700 oil wells in the southeastern region of New Mexico produced approximately 63.4 million barrels of oil and more than 16 million cubic meters (570 million cubic feet) of gas in 2003 (NMCDE, 2004b; NMEMNRD, 2004). There is no evidence of prior exploration or production oil wells at the proposed NEF site.

Figure 3-4 Oil Pump Jack

As shown in Figure 3-3, the area surrounding the proposed NEF is extensively dominated by open rangeland used for cattle grazing. Over 98 percent of the land within the 8-kilometer (5-mile) radius of the proposed NEF site is comprised of herbaceous rangeland, shrub and brush rangeland, and mixed rangeland. Rangeland encompasses 12,714 hectares (31,415 acres) within Lea County, New Mexico, and 7,213 hectares (17,823 acres) within Andrews County, Texas (USGS, 1986). Throughout the year, cattle grazing occurs on adjacent local lands including those owned by Wallach Concrete, Inc., and WCS (Wallach, 2004; Berry, 2004).

Built-up land and barren land constitute the other two land use classifications in the proposed site vicinity, but at considerably smaller percentages. Built-up land (i.e., land with residential and industrial developments) comprises approximately 243 hectares (601 acres) of Lea and Andrews Counties and makes up 1.2 percent of the land use. Barren land, consisting of bare exposed rock and transitional and sandy areas, make up the remaining 0.3 percent of land area. There are no special land use classifications (i.e., Indian tribe reservations, national parks, or prime farmland) within the proposed site vicinity. Also, there is only one known public recreational area, a historical marker and picnic area, located within 8 kilometers (5 miles) of the site. With the exception of cattle grazing, no agricultural activities have been identified in the proposed site vicinity (LES, 2005a). Cattle are the primary livestock for both Lea and Andrew Counties (USDA, 1998; USDA, 1999). The nearest dairy farms in Lea County (where milk cows make up a large portion of the cattle) are located near the city of Hobbs (Wallach, 2004). There are no milk cows in Andrews County (LES, 2005a).

The following nonindustrial water resources are located in the proposed NEF site vicinity:

- A manmade pond on the adjacent quarry property to the north that is stocked with fish for private catch-and-release use and is recharged using municipal water (Wallach, 2004).

- Baker Spring, an intermittent surface-water feature situated about 1.6 kilometers (1 mile) northeast of the site that contains water seasonally.

- Several cattle-watering holes where groundwater is pumped by windmill and stored in aboveground tanks.

- A well by an abandoned home about 4 kilometers (2.5 miles) to the west.

- Monument Draw, a natural shallow drainageway situated several kilometers southwest of the site. Local residents indicated that Monument Draw only contains water for a short period of time following a significant rainstorm (LES, 2005a).

Industrial water uses include "produced water" lagoons, a freshwater pond, evaporation ponds, and a settlement basin. The freshwater pond, a settlement basin, and several evaporation ponds are located on the adjacent quarry property to the north (Wallach, 2004). Five produced-water lagoons and an oil-reclamation pit are located on the Sundance Services, Inc., property (Sundance, 2004b). Produced water is salty wastewater that is brought to the surface during production of natural gas and is also a byproduct of the cleaning process of raw crude oil from a well head (ANL, 2004; Emerson, 2003).

In addition, three Superfund*/Comprehensive Environmental Response, Compensation, and Liability Act* sites are located in Lea County, and six are located in Eddy County, New Mexico (EPA, 2003a). These sites are not in close proximity to the proposed NEF site. There are no sites in Andrews County (EPA, 2003a).

Currently, other than the construction of the proposed NEF and the potential siting of a low-level radioactive waste disposal site at WCS, there are no other known future or proposed land use plans in the area. In addition, the proposed site is not subject to local or county zoning, land use planning, or associated review process requirements, and there are no known potential conflicts of land use plans, policies, or controls (LES, 2005a). However, the city of Eunice is working on a new zoning plan for expansion of the city limits (Consensus Planning, 2004). The city plan includes an eastward commercial and heavy industrial zoning area that follows New Mexico Highway 234 towards the proposed NEF site. Figure 3-5 presents details of the preferred land use for the city of Eunice.

3.3 Historic and Cultural Resources

The region surrounding the proposed NEF site in southeastern New Mexico and western Texas is rich in prehistoric and historic American Indian and Euro-American history. However, the environmental setting in the immediate vicinity of the proposed site has greatly affected both prehistoric and historic occupation and use of the area. This local setting, which occurs well onto the Llano Estacado (see section 3.6, "Geology, Minerals, and Soils"), is a flat, treeless plain lacking nearby permanent or semipermanent surface water. As a result, the proposed NEF site was not conducive to extensive human use over the centuries. By comparison, both prehistoric and historic occupation and use were more extensive in all directions from the proposed site. In contrast to the proposed NEF site area, shelter and other resources were more readily available at selected locales elsewhere on the Llano Estacado where temporary and some permanent springs and lakes were found.

The cultural sequence in the region extends back approximately 11,000 years, and several chronological prehistoric and historic periods can be defined (Sebastian and Larralde, 1989). These periods include the Paleo-Indian period (9000 B.C.-7000 B.C.); the Archaic period (5000-6000 B.C.–A.D. 900-1000); the

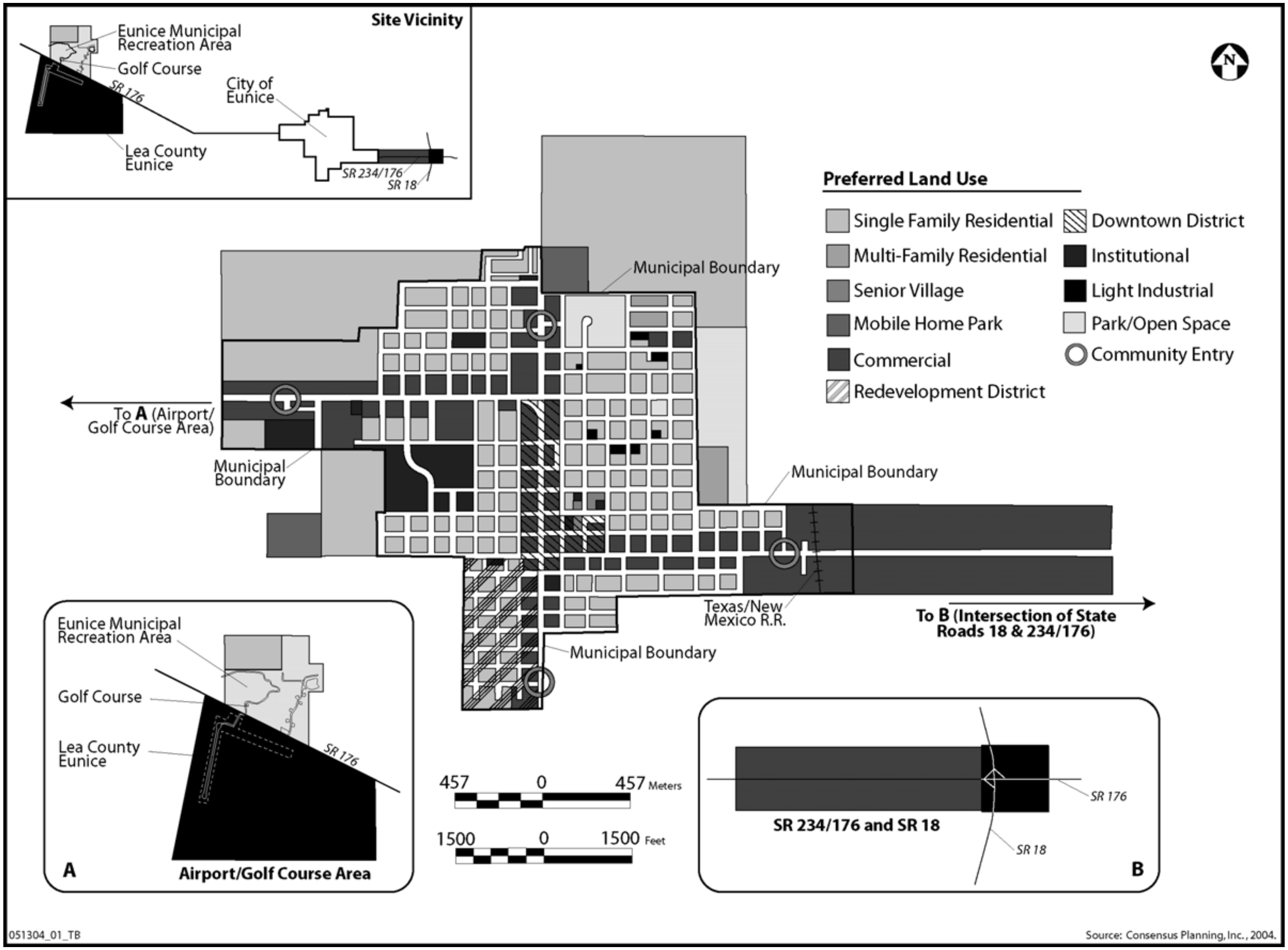

Figure 3-5 Preferred Land Use for the City of Eunice, New Mexico (Consensus Planning, 2004)

Ceramic period (A.D. 900-1500); the Protohistoric Native American and Spanish Colonial period (A.D. 1541-1800); and the Historic Hispanic, American Indian, and American period (A.D. 1800-present). The following subsections present brief background summaries of these eras.

3.3.1 Prehistoric

According to the cultural resource overview for southeastern New Mexico (Sebastian and Larralde, 1989), the initial prehistoric period in the region was characterized by a big-game-hunting subsistence pattern with small groups of nomadic humans preying on now extinct animal species such as mammoths and large bison. Some of the classic Paleo-Indian archaeological hunting sites were discovered on the Llano Estacado and nearby areas, although none are located in close proximity to the project area. The subsequent Archaic period was also marked by nomadic groups relying on increased use of smaller game animals and plant foods. In general, the Ceramic period was characterized by a trend towards more sedentary villages and reliance on cultivated crops. However, the environment in the vicinity of the project area was not conducive to this lifestyle, and the presence of Ceramic period sites reflects more limited occupations than other areas such as the Pecos River Valley to the west. Reviews of existing archaeological site files (Sebastian and Larralde, 1989) and area overviews (Leslie, 1979; Runyon, 2000) reveal that archaeological materials associated with each of these prehistoric periods have been found in the vicinity of the project area. All previously recorded archaeological sites close to the proposed NEF site are designated as seasonally used temporary prehistoric campsites.

3.3.2 Protohistoric and Historic Indian Tribes

Similar to the prehistoric era, protohistoric and historic period exploitation of the immediate vicinity of the proposed NEF project area by Indian tribes was also sparse, although occupation and use of the larger region was intensive. At the time of contact by Spanish expeditions, the area was occupied by groups that are nearly nonexistent today. These groups include the Suma and Tigua (Gerald, 1974) and the Jumano (Kelley, 1986; Hickerson, 1994), who were centered to the south in western present-day Texas and to the west along the Pecos River drainage. These groups were replaced in historic times by Plains immigrants from the north and east, including the Kiowa (Mayhall, 1971), Comanche (Fehrenbach, 1974; Kavanagh, 1996; Wallace and Hoebel, 1952), and the Mescalero Apaches who occupied the mountainous areas of south-central New Mexico (Opler, 1983; Sonnichsen, 1973). Each of these protohistoric- and historic-period groups frequented the vicinity of the project area over time, but their primary occupations and activities took place elsewhere in areas with better resources.

Based on various testimonies before the U.S. Indian Claims Commission, the area proximal to the project area was found to have been used and/or occupied by Federally recognized present-day tribes known as the Plains Apache, Comanche, and Kiowa. Today, these tribes occupy a reservation in southwestern Oklahoma (ICC, 1979). The U.S. Indian Claims Commission also noted that the historically occupied area of the Mescalero Apache Tribe lies just to the west of the project area, although Mescalero did at times extend over an area that includes the proposed NEF site. Today, the Mescalero Reservation is located about 201 kilometers (125 miles) northwest of the project area. A remnant group of the Tigua (Ysleta del Sur Pueblo near El Paso, Texas) also has a traditional use presence in the area. Based on these data, the NRC staff consulted the following modern-day tribes:

- Apache Tribe of Oklahoma.
- Comanche Tribe of Oklahoma.
- Kiowa Tribe of Oklahoma.
- Mescalero Apache Tribe.
- Ysleta del Sur Pueblo.

Review of the extant literature has not identified any known individual tribal properties and resources or traditional cultural places of significance within or near the proposed NEF site.

3.3.3 Historic Euro-American

The historic Euro-American period in the region began with Spanish exploration expeditions, beginning in 1541 with the Coronado expedition. However, no information was available that indicates any of the Spanish expeditions approached the project area (Morris, 1997). The first Anglo presence in the vicinity of the proposed NEF site was associated with U.S. military activities involved in conflicts with and the subjugation of the Indian tribes. Treaties in the 1860's and 1870's essentially ended the American Indian presence in the area as the various tribes were relocated to reservations. Following these events, American settlers slowly but steadily occupied the area in the vicinity of the proposed NEF site. This era leading to the present day was characterized by several phases of occupation and use. These phases included the open-cattle-ranching era (from the 1860's to about 1910), homesteading and settlement (beginning about 1905), and the development of the oil and gas industry (beginning in the 1920's). These events are summarized in the following county histories: Andrews County, Texas (organized in 1910) (ACHC, 1978); Gaines County, Texas (organized in 1905) (Coward, 1974); and Lea County, New Mexico (organized in 1917) (Brooks, 1993; Hinshaw, 1976; Mauldin, 1997; Mosely, 1973), on which sources the following discussion is based as it pertains to the proposed NEF site.

The 84 Ranch (also known as the Half Circle 84) was one of the earliest ranches in the area. The 84 Ranch was established in 1884 or 1885 with the digging of a well and the emplacement of a windmill (Hinshaw, 1976; Price, 1967). The well and ranch headquarters were located east of the present-day town of Eunice, about 4.8 kilometers (3 miles) northwest of the project area. The proposed NEF site was originally included in the ranch's grazing lands. The 84 Ranch was eventually purchased by the larger JAL Ranch, which raised about 40,000 head of cattle on an expansive tract of land that occupied the southeast quarter of Lea County until about 1910.

After 1900, changes in the *Homestead Act* allowed larger acreages that permitted settlers to take up tracts of the former open range. In 1908, John Carson homesteaded 129 hectares (320 acres) of former 84 Ranch land, a tract that would eventually become the city of Eunice. The Carson homestead was located about 8 kilometers (5 miles) west of the proposed NEF site. In 1909, Carson established a post office and general store at the locale named for his eldest daughter, Eunice. Other settlers were attracted to the location, and Eunice reached its pinnacle as a pioneer settlement in the years 1914-1915. However, drought and other larger events—including recession, World War I, and the influenza epidemic of 1918—led to a decline in the area's population. A regional oil boom reached Eunice in 1929, and the town began to again grow. In 1937, Eunice was incorporated as a city with a population of 2,188.

3.3.4 Historic and Archaeological Resources at the Proposed NEF Site

Lea County, New Mexico, currently owns the proposed NEF site, which comprises 220 hectares (543 acres) of land lying north of U.S. Highway 234 in Section 32 of range 38E in Township 21S. Information obtained from the Historic Preservation Division of the New Mexico Office of Cultural Affairs, Archaeological Resource Management Records Section, reveals that prior to the current project, no cultural resources surveys have been conducted within the proposed project area nor were there any previously recorded archaeological sites. A review of the current listings for the New Mexico State Register of Cultural Resource Properties and the National Register of Historic Places indicate no listed properties within 8 kilometers (5 miles) of the project area.

In September 2003, an intensive cultural resources inventory was completed for the 220-hectare (543-acre) tract, resulting in the identification and recording of 7 new archaeological sites and 35 instances of isolated artifacts (Graves, 2004). The latter included isolated occurrences of prehistoric artifacts, except for two U.S. General Land Office bench markers dated 1911 located at the northeast and northwest corners of the section, and parts of an historic barbed-wire fence enclosure.

Each of the seven archaeological sites recorded within the proposed project area is designated as a prehistoric campsite of indeterminate age. In the New Mexico site file system, the archaeological sites are listed as Laboratory of Anthropology 140701-140707. All of the sites are similar in configuration, with a presence of one or more thermal features (concentrations of fire-cracked rocks), scattered fire-cracked rocks, and a scatter of stone tools and/or flakes. Field analysis of the artifacts indicates that these campsites and artifact scatters may have been associated with procurement of stone tool materials from nearby gravel cobbles.

Applying the significance criteria for possible listing in the National Register of Historic Places, the field investigators recommended to the New Mexico State Historic Preservation Office that each of the recorded archaeological sites falls into one of the following categories:

- **Not eligible** for listing in the National Register of Historic Places based on lack of buried cultural materials (field recording has exhausted the research potential) (Laboratory of Anthropology 140701, 140702, and 140703).

- **Potentially eligible** for listing in the National Register of Historic Places based on an observed potential for buried cultural deposits (Laboratory of Anthropology 140707).

- **Eligible** for listing in the National Register of Historic Places based on the expectation that buried cultural deposits exist and/or the surface data indicate a definite research potential (Laboratory of Anthropology 140404, 140705, and 140706).

Each of the recommendations for potential eligibility or eligible status for the proposed NEF archaeological sites falls under the National Register of Historic Places criterion (d), which identifies sites that have either yielded, or may likely yield, information important in prehistory or history. By designation, cultural items recorded as isolated artifacts are not considered as potentially eligible for listing in the National Register of Historic Places. All seven sites have been determined to be eligible for listing in the National Register of Historic Places.

3.4 Visual and Scenic Resources

The proposed NEF site consists of open, vacant land. Nearby landscapes are similar in appearance, except for manmade structures associated with the neighboring industrial properties and the local oil and gas well heads. Figures 3-6 and 3-7 show that no existing structures are located on the site. The only agricultural activity in the site vicinity is cattle grazing.

The proposed NEF site is considered indistinguishable in terms of scenic attractiveness when compared to surrounding land. With the exception of a roadside picnic area and historical marker, no recreational resources are identified in the immediate area of the site.

The scenic quality of the proposed NEF site was assessed using the U.S. Bureau of Land Management (BLM) visual resource inventory process (LES, 2005a). The visual rating is determined by assessing the contrast of a proposed project on the surrounding area from key observation points. Based on the visual resource inventory process, the proposed NEF site received the lowest scenic-quality rating. This rating means that the level of change to the characteristic landscape can be high, and allows for the greatest level of landscape modification (BLM, 2003a; BLM, 2003b).

Source: Louisiana Energy Services. "National Enrichment Facility Environmental Report." Revision 0. December 2003.
020604_01_TB

Figure 3-6 View of the Proposed NEF Site Looking from the Northwest to the Southeast (LES, 2005a)

The proposed NEF site is not visible from the city of Eunice, which is located 8 kilometers (5 miles) to the west. However, the site is bordered to the south by New Mexico Highway 234 and is visible to westbound traffic approaching from the New Mexico/Texas State line, approximately 0.8 kilometer (0.5 mile) to the east. Eastbound highway traffic is partially shielded by a naturally occurring series of small sand dunes on the western portion of the site. Once traffic passes the sand dune buffer, the site becomes visible. The view from the nearest residences situated approximately 4.3 kilometers (2.6 miles) away is also limited by onsite sand dunes.

Source: Louisiana Energy Services. "National Enrichment Facility Environmental Report." Revision 0. December 2003.
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Figure 3-7 View of the West Half of the Proposed NEF Site (LES, 2005a)

Properties adjacent to the site include Wallach Concrete, Inc., and Sundance Services, Inc., to the north and WCS to the east. The site is visible from these properties and slightly visible from the Lea County Landfill, located to the southeast, and from DD Landfarm, located to the west.

3.5 Climatology, Meteorology, and Air Quality

3.5.1 Regional Climatology

The climate in the region of the proposed NEF site is semi-arid with mild temperatures, low precipitation and humidity, and a high evaporation rate. The weather is often dominated in the winter by a high-pressure system in the central part of the western United States and a low-pressure system in north-central Mexico. The region is affected by a low-pressure system located over Arizona in the summer.

3.5.2 Site and Regional Meteorology

There are no site-specific meteorological data available at the proposed NEF site. Data is available from WCS, 1.6 kilometers (1 mile) from the proposed NEF site, but these data are not fully verified. Climatological averages for atmospheric variables such as temperature, pressure, winds, and precipitation presented in this EIS are based on data collected from four weather stations. These stations are located in Eunice, New Mexico; Hobbs, New Mexico; Roswell, New Mexico; and Midland-Odessa, Texas (Figure 3-1). Table 3-1 presents the distances and directions of these stations from the site and the length of the records for the reported data.

Table 3-1 Weather Stations Located near the Proposed NEF Site

Station	Distance and Direction from Proposed Site	Length of Record*	Station Elevation (meters)
Eunice, New Mexico	8 kilometers (5 miles) west of site	1 (1993)	1,050
Hobbs, New Mexico	32 kilometers (20 miles) north of site	16 (1982-1997)	1,115
Midland-Odessa, Texas	103 kilometers (64 miles) southeast of site	16 (1982-1997)	872
Roswell, New Mexico	161 kilometers (100 miles) northwest of site	16 (1982-1997)	1,118

* Years of compiled data for climatological analysis.
Source: WRCC, 2004

The Midland-Odessa monitoring station is the closest first-order National Weather Service station to the proposed NEF site. First-order weather stations record a complete range of meteorological parameters for 24-hour periods, and they are usually fully instrumental (NCDC, 2003). The National Oceanic and Atmospheric Administration (NOAA) compiles and certifies the hourly meteorological data for Midland-Odessa, Roswell, and Hobbs (NCDC, 1998). In addition to hourly data, the Western Regional Climate Center compiles and certifies the climatological summaries for Hobbs (WRCC, 2004). The State of New Mexico Environment Department Air Quality Bureau collects the only available data from Eunice (NMAQB, 2003).

3.5.2.1 Temperature

Local climate data are available from a monitoring station in Hobbs, New Mexico. The Hobbs station is a part of the National Climatic Data Center Cooperative Network. The Hobbs, New Mexico, station shows a mean annual temperature of 16.6/C (61.9 /F) with the mean monthly temperature ranging from 5.7/C (42.2/F) in January to 26.8/C (80.2/F) in July. The highest daily maximum temperature on record is 45.6/C (114/F) (June 27, 1998) and the lowest daily minimum temperature is -21.7/C (-7/F) (January 11, 1962). Table 3-2 presents a summary of temperatures in the Hobbs area from 1914 to 2003.

3.5.2.2 Precipitation

The normal annual total rainfall as measured in Hobbs, New Mexico, is 40 centimeters (16 inches). Precipitation amounts range from an average of 1.14 centimeter (0.45 inch) in January to 6.68 centimeters (2.63 inches) in September.

Maximum and minimum monthly totals are 35 centimeters (13.8 inches) and zero. Table 3-3 presents a summary of precipitation in the Hobbs area for monthly and annual means.

Summer rains fall almost entirely during brief, but frequently intense thunderstorms. The general southeasterly circulation from the Gulf of Mexico brings moisture from these storms into the State of New Mexico, and strong surface heating combined with orographic lifting as the air moves over higher terrain causes air currents and condensation. Orographic lifting occurs when air is intercepted by a mountain and is forcefully raised up over the mountain, cooling as it rises. If the air cools to its saturation point, the water vapor condenses and a cloud forms. August and September are the rainiest months with 30 to 40 percent of the year's total moisture falling at that time.

Table 3-2 Summary of Monthly Temperatures at Hobbs, New Mexico, from 1914 to 2003[a]

Month	Monthly Averages			Daily Extremes			
	Maximum	**Minimum**	**Mean**	**High**	**Date**	**Low**	**Date**
January	13.6°C (56.5°F)	-2.3°C (27.9°F)	5.7°C (42.2°F)	28.3°C (83°F)	01/11/1953	-21.7°C (-7°F)	01/11/1962
February	16.7°C (62.0°F)	0.0°C (32.0°F)	8.3°C (47.0°F)	30.6°C (87°F)	02/12/1962	-18.9°C (-2°F)	02/02/1985
March	20.5°C (68.9°F)	2.9°C (37.3°F)	11.7°C (53.1°F)	35.0°C (95°F)	03/27/1971	-17.2°C (1°F)	03/02/1922
April	25.5°C (77.8°F)	7.9°C (46.2°F)	16.7°C (62.0°F)	36.7°C (98°F)	04/30/1928	-7.8°C (18°F)	04/04/1920
May	29.7°C (85.5°F)	13.0°C (55.3°F)	21.3°C (70.4°F)	41.7°C (107°F)	05/30/1951	1.1°C (34°F)	05/02/1916
June	33.8°C (92.9°F)	17.5°C (63.4°F)	25.6°C (78.1°F)	45.6°C (114°F)	06/27/1998	4.4°C (40°F)	06/03/1919
July	34.3°C (93.8°F)	19.2°C (66.6°F)	26.8°C (80.2°F)	43.3°C (110°F)	07/15/1958	10.0°C (50°F)	07/01/1927
August	33.4°C (92.1°F)	18.7°C (65.6°F)	26.0°C (78.8°F)	41.7°C (107°F)	08/09/1952	8.3°C (47°)	08/29/1916
September	30.0°C (85.9°F)	15.2°C (59.4°F)	22.6°C (72.6°F)	40.6°C (105°F)	09/05/1948	1.1°C (34°F)	09/23/1948
October	25.1°C (77.1°F)	9.2°C (48.5°F)	17.1°C (62.8°F)	36.7°C (98°F)	10/03/2000	-11.1°C (12°F)	10/29/1917
November	18.5°C (65.2°F)	2.6°C (36.7°F)	10.5°C (50.9°F)	31.1°C (88°F)	11/01/1952	-15.6°C (4°F)	11/29/1976
December	14.5°C (58.1°F)	-1.3°C (29.6°F)	6.7°C (44.0°F)	28.9°C (84°F)	12/09/1922	-17.2°C (-1°F)	12/24/1983

[a]For monthly and annual means, thresholds, and sums: months with five or more missing days are not considered, years with one or more missing months are not considered.
Source: WRCC, 2004.

Table 3-3 Summary of Monthly Precipitation at Hobbs, New Mexico, from 1914 to 2003

	Precipitation							Total Snowfall		
Month	**Mean**	**High**	**Year**	**Low**	**Year**	**1-Day Maximum**		**Mean**	**High**	**Year**
January	1.14 cm (0.45 in)	7.52 cm (2.96 in)	1949	0.00	1924	3.07 cm (1.21 in)	01/11/1949	3.56 cm (1.4 in)	31.75 cm (12.5 in)	1983
February	1.14 cm (0.45 in)	6.20 cm (2.44 in)	1923	0.00	1917	3.53 cm (1.39 in)	02/05/1988	3.05 cm (1.2 in)	36.32 cm (14.3 in)	1973
March	1.35 cm (0.53 in)	7.57 cm (2.98 in)	2000	0.00	1918	5.08 cm (2.00 in)	03/20/2002	1.52 cm (0.6 in)	25.40 cm (10.0 in)	1958
April	2.03 cm (0.80 in)	13.13 cm (5.17 in)	1922	0.00	1917	4.75 cm (1.87 in)	04/20/1926	0.51 cm (0.2 in)	22.86 cm (9.0 in)	1983
May	5.23 cm (2.06 in)	35.13 cm (13.83 in)	1992	0.00	1938	13.21 cm (5.20 in)	05/22/1992	0.0	0.0	1948
June	4.78 cm (1.88 in)	23.62 cm (9.30 in)	1921	0.00	1924	11.23 cm (4.42 in)	06/07/1918	0.0	0.0	1948
July	5.36 cm (2.11 in)	23.90 cm (9.41 in)	1988	0.00	1954	11.35 cm (4.47 in)	07/19/1988	0.0	0.0	1948
August	6.02 cm (2.37 in)	23.29 cm (9.17 in)	1920	0.10 cm (0.04 in)	1938	11.30 cm (4.45 in)	08/09/1984	0.0	0.0	1948
September	6.68 cm (2.63 in)	32.99 cm (12.99 in)	1995	0.00	1939	19.05 cm (7.50 in)	09/15/1995	0.0	0.0	1948
October	3.99 cm (1.57 in)	20.70 cm (8.15 in)	1985	0.00	1917	14.22 cm (5.60 in)	10/09/1985	0.25 cm (0.1 in)	11.43 cm (4.5 in)	1976
November	1.45 cm (0.57 in)	11.00 cm (4.33 in)	1978	0.00	1915	9.65 cm (3.80 in)	11/04/1978	1.52 cm (0.6 in)	41.91 cm (16.5 in)	1980
December	1.42 cm (0.56 in)	12.90 cm (5.08 in)	1986	0.00	1917	4.72 cm (1.86 in)	12/21/1942	2.54 cm (1.0 in)	24.13 cm (9.5 in)	1986
Annual	40.59 cm (15.98 in)	81.76 cm (32.19 in)	1941	13.41 cm (5.28 in)	1917	19.05 cm (7.50 in)	09/15/1995	12.95 cm (5.1 in)	68.83 cm (27.1 in)	1980

cm - centimeter.
in - inch.
Source: WRCC, 2004.

As these storms move inland, much of the moisture is precipitated over the coastal and inland mountain ranges of California, Nevada, Arizona, and Utah. Much of the remaining moisture falls on the western slope of the Continental Divide and over northern and high-central mountain ranges. Winter is the driest season in New Mexico except for the portion west of the Continental Divide. This dryness is most noticeable in the Central Valley and on eastern slopes of the mountains. In New Mexico, much of the winter precipitation falls as snow in the mountain areas, but it may occur as either rain or snow in the valleys.

Climatological data collected from the Midland-Odessa station indicate the relative humidity throughout the year ranges from 45 to 61 percent, with the highest humidity occurring during the early morning hours (LES, 2005a).

Atmospheric Stability Classes

Stability classes are used to assess the dispersion behavior of materials released into the atmosphere. Dispersion is affected by ambient air temperature changes with height above ground and is categorized by Pasquill. Seven stability classes for use in dispersion calculations are established. Many times, the EPA and NRC will use only six stability classes by merging the sixth and seven (F and G) classes into one class.

Stability Classification	*Pasquill Category*	*Temperature Change with Height (ºC/100 meters)*
Extremely Unstable	*A*	*<-1.9*
Moderately Unstable	*B*	*-1.9 to -1.7*
Slightly Unstable	*C*	*-1.7 to-1.5*
Neutral	*D*	*-1.5 to -0.5*
Slightly Stable	*E*	*-0.5 to 1.5*
Moderately Stable	*F*	*1.5 to 4.0*
Extremely Stable	*G*	*<4.0*

Source: NRC, 1972.

3.5.2.3 Meteorological Data Analyses

The NRC staff examined the data from the four meteorological stations in Table 3-1 (NCDC, 1998; NMAQB, 2003). Because the Eunice meteorological data are limited to 1993, annual wind roses for Midland-Odessa, Roswell, Hobbs, and Eunice for 1993 were compared (Figure 3-8). From this one-year comparison, the general wind patterns for Midland-Odessa, Hobbs, and Eunice were somewhat similar. Roswell data, on the other hand, appeared to be different with a stronger northerly and westerly component. To illustrate such comparison further, Figure 3-9 presents the frequency distributions of atmospheric stability classes that were plotted for the 1993 data.

Histograms of atmospheric stability at Midland-Odessa, Roswell, Hobbs, and Eunice for the same year show that the stability-class frequency distribution for Midland-Odessa and Hobbs are similar. Distributions for Eunice and Roswell are different from Midland-Odessa and Hobbs. Stability class was determined using the solar radiation/cloud cover method for Midland-Odessa, Roswell, and Hobbs. The New Mexico Environment Department Air Quality Bureau provided stability categories for Eunice, which is limited to one year of data (NMEDAQB, 2003). Also, no information was available on the methods used to calculate the stability categories at this location.

Table 3-4 presents a statistical summary of the data completeness for Hobbs and Midland-Odessa that was performed to comply with EPA data completeness guidance for air quality modeling. The EPA requires that meteorological data be at least 75-percent complete (with less than 25 percent missing data) to be reliably usable as inputs for dispersion models (EPA, 2003b). Despite the fact that Hobbs is the closest station to the proposed NEF site, the Hobbs data did not meet the 75-percent completeness criteria. Therefore, these data were not used for dispersion modeling. However, Hobbs observations can be used

for a general description of the meteorological conditions at the proposed NEF site as they are all located within the same region and have similar climates.
Midland-Odessa and Hobbs had comparable climate data based on a comparative analysis of

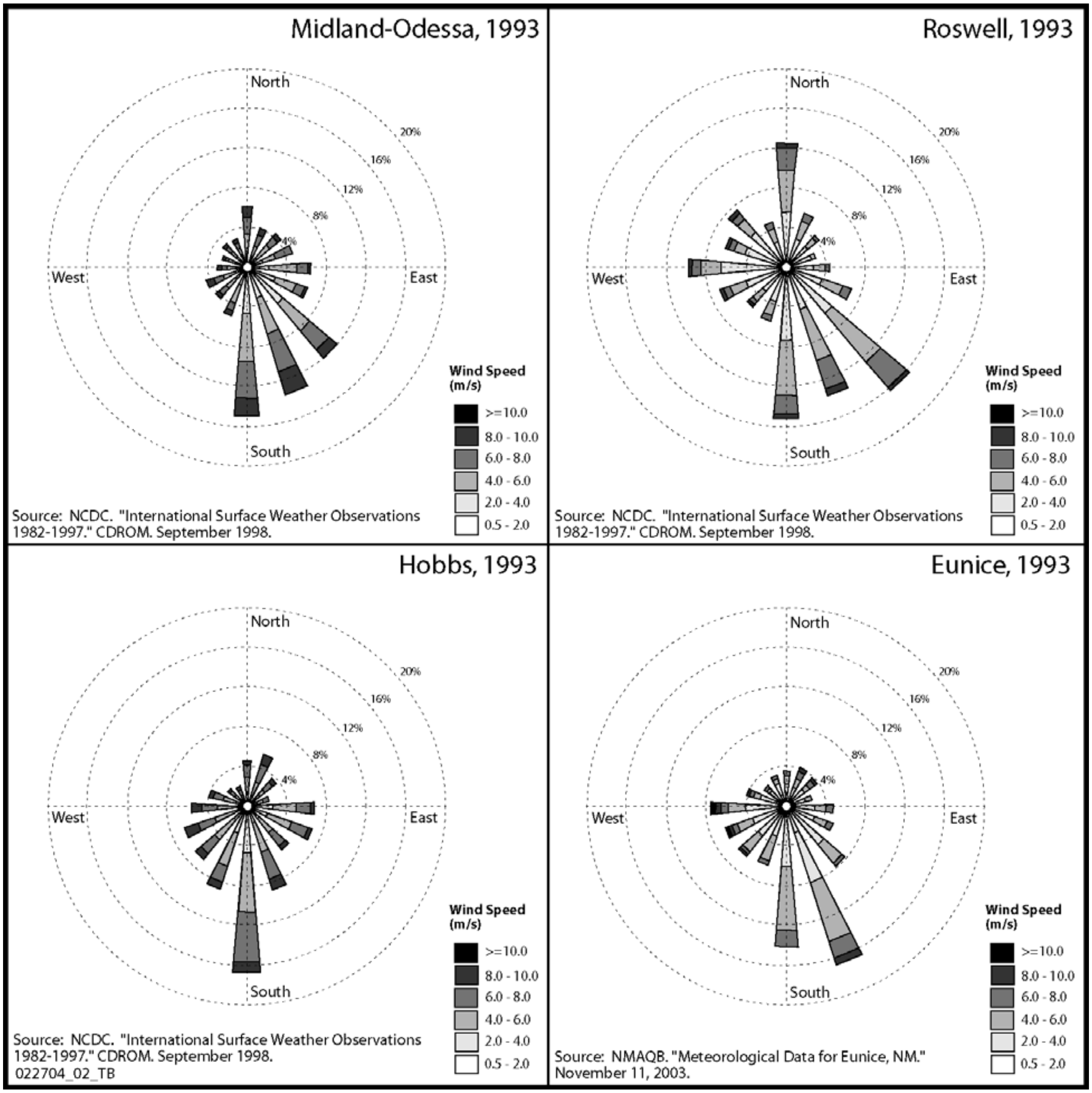

Figure 3-8 Wind Roses for Midland-Odessa, Roswell, Hobbs, and Eunice for 1993 (NCDC, 1998; NMAQB, 2003)

meteorological data at the four locations surrounding the proposed NEF site. Roswell climate data were different, and Eunice data had too many severe shortcomings to be used reliably. Since Midland-Odessa was a first-order weather station with data completeness exceeding EPA guidance, it was used as the representative meteorological station for the dispersion modeling needs in this EIS.

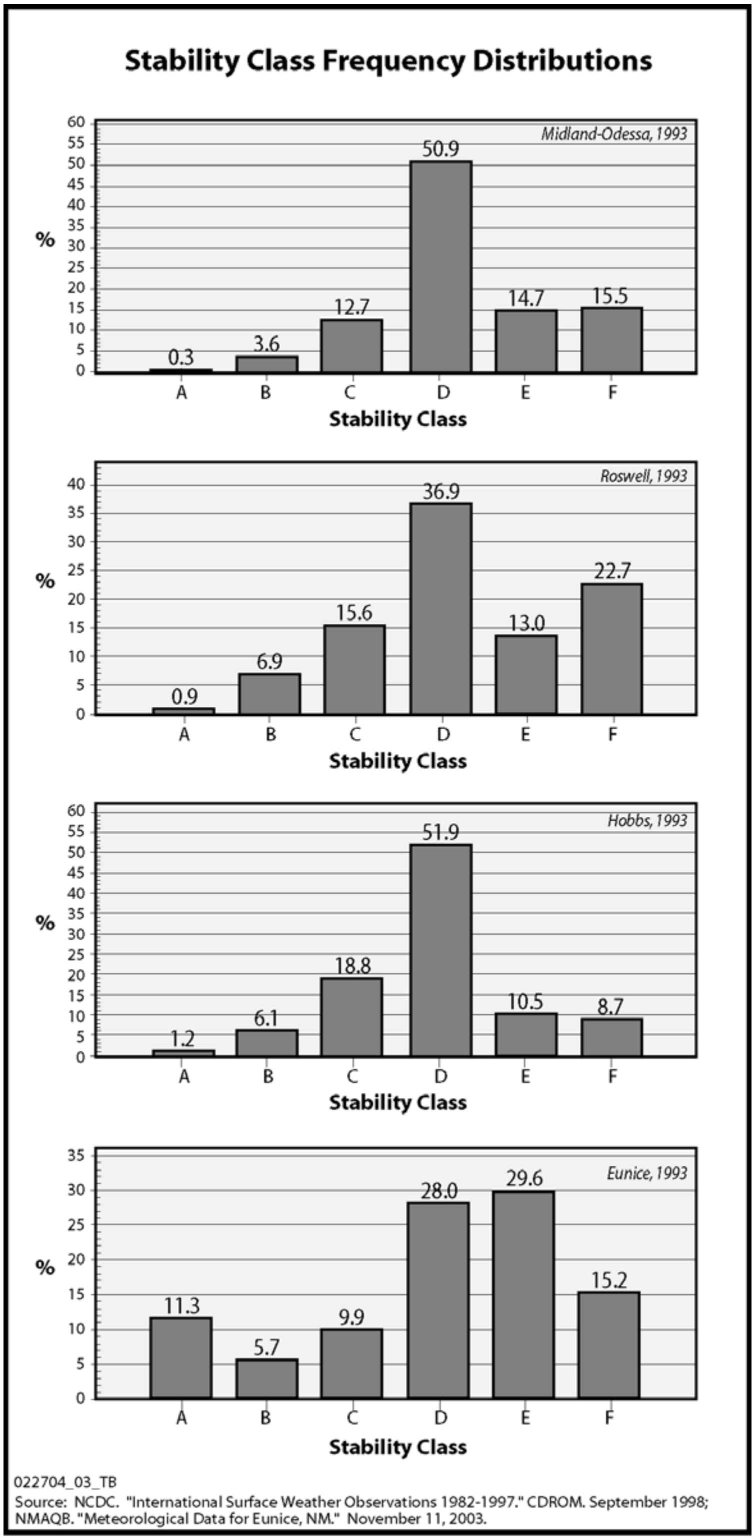

Figure 3-9 Histograms of Stability Categories for Midland-Odessa, Roswell, Hobbs, and Eunice, 1993 (NCDC, 1998; NMAQB, 2003)

Table 3-4 Statistical Summary of the Data Completeness for Midland-Odessa and Hobbs

Hobbs, NM			Midland-Odessa, NM		
Year	Number of Observations	% Complete	Year	Number of Observations	% Complete
1990	5,670	64.7	1990	8,168	93.2
1991	5,768	65.8	1991	8,251	94.2
1992	5,985	68.1	1992	8,431	96.0
1993	5,767	65.8	1993	8,368	95.5
1994	5,770	65.9	1994	8,325	95.0
1995	5,399	61.6	1995	7,863	89.8
1996	5,627	64.1	1996	6,621	75.4
1997	5,640	64.4	1997	8,208	93.7

Source: NCDC, 1998.

3.5.2.4 Winds and Atmospheric Stability

Wind speeds over the State of New Mexico are usually moderate, although relatively strong winds often accompany occasional frontal activity during late winter and spring months and sometimes occur just in advance of thunderstorms. Frontal winds may exceed 13 meters per second (30 miles per hour) for several hours and reach peak speeds of more than 22 meters per second (50 miles per hour).

Spring is the windy season. Blowing dust and serious soil erosion of unprotected fields may be a problem during dry spells. Winds are generally stronger in the eastern plains than in other parts of the State. Winds generally predominate from the southeast in summer and from the west in winter, but local surface wind directions will vary greatly because of local topography and mountain and valley breezes.

The hourly meteorological observations at Midland-Odessa were used to generate wind rose plots. Figure 3-10 shows wind speed and direction frequency for the years 1987 to 1991. Calculated annual mean wind speed was 5.1 meters per second (11.4 miles per hour), with prevailing winds from the south and a maximum 5-second wind speed of 31.2 meters per second (70 miles per hour). Figure 3-11 presents frequency distributions of wind speed and direction as a function of Pasquill stability class (A-F). The most stable classes—E and F—occur 18.9 and 13 percent of the time, respectively. The least stable classes, A and B, occur 0.3 and 3.5 percent of the time, respectively. Figure 3-12 presents frequency distribution of stability classes for a five-year period (1987-1991) at the Midland-Odessa National Weather Service Station.

The use of recent data generated at WCS from October 1999 through August 2002 (LES, 2005a) shows a similarity in wind patterns and distribution of wind speed between the Midland-Odessa and WCS locations. Although the meteorological data are from different time periods and the two sites are separated in distance, the data from both sites show a predominance of southerly winds, and both data sets shows similar distributions of wind speed.

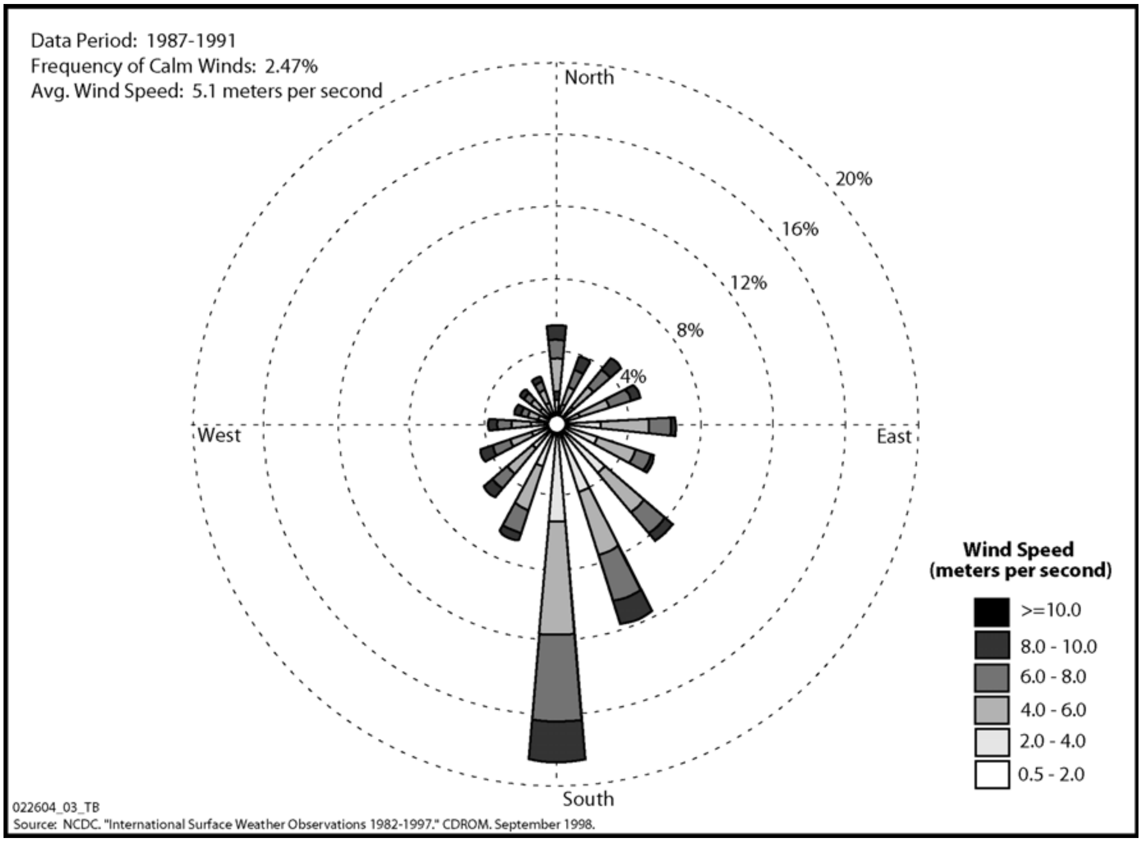

Figure 3-10 Wind Rose for Midland-Odessa, 1987-1991 (NCDC, 1998)

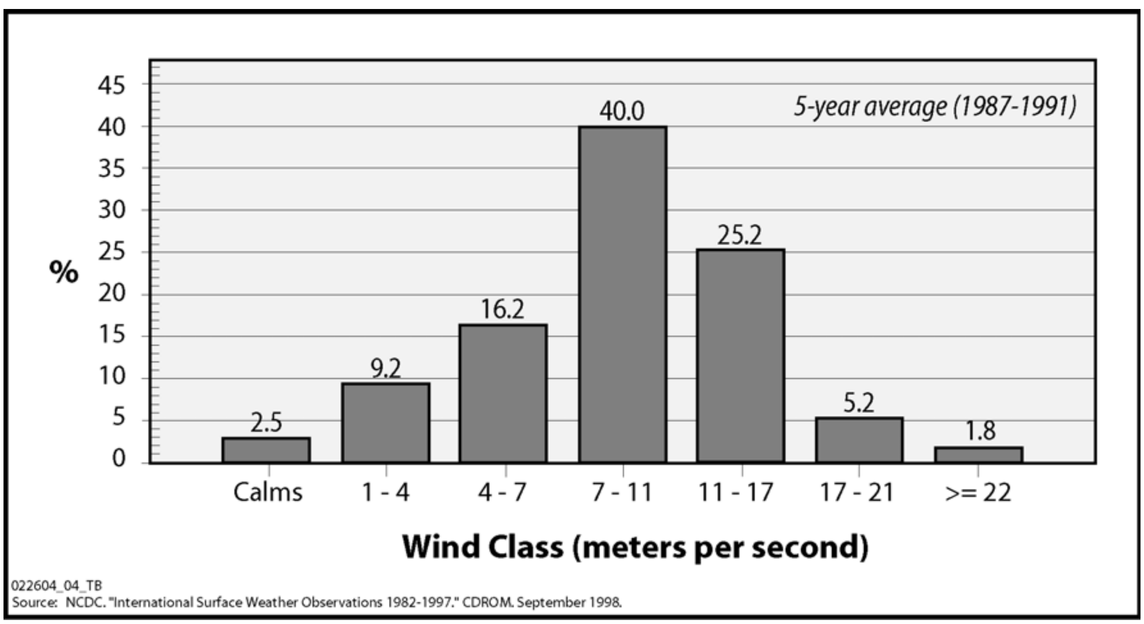

Figure 3-11 Wind Distribution for Midland-Odessa, 1987-1991 (NCDC, 1998)

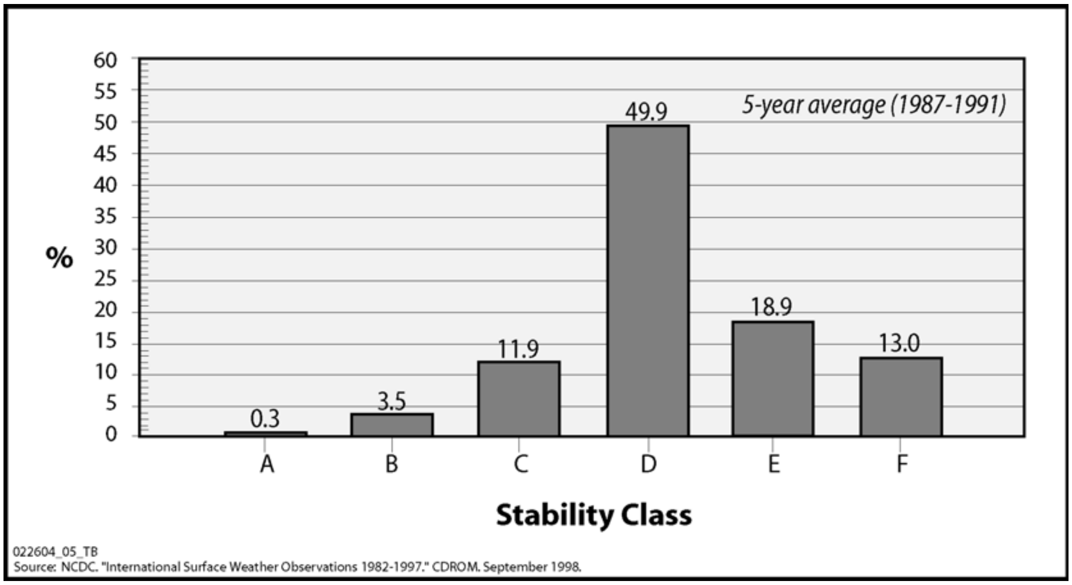

Figure 3-12 Distribution of Stability Classes for Midland-Odessa, 1987-1991 (NCDC, 1998)

3.5.2.5 Severe Weather Conditions

According to data from Midland-Odessa, thunderstorms occur an average of 36.4 days/year in the southeastern area of New Mexico where the proposed site is located. Thunderstorms are most frequent in summer, averaging 17.4 days per year, and least frequent in winter, averaging 1.3 days per year. Occasionally, thunderstorms are accompanied by hail.

Using Marshall's methodology for determining attractive area and lightning strike frequency, it was determined that the proposed NEF site has an attractive area of 0.34 square kilometer (0.13 square mile) and a lightning strike frequency of 1.36 flashes per year. Only two lightning events having sufficient intensity to cause loss of life, injury, significant property damage, and/or disruption to commerce were reported in Lea County, New Mexico, between January 1, 1950, and April 30, 2004 (NCDC, 2004). The closest lightning event occurred in Hobbs with minor property damage of $3,000 on August 12, 1997. The second occurred in Lovington on August 8, 1996, causing two deaths.

Tornadoes are occasionally reported in New Mexico, most frequently during afternoon and early evening hours from May through August. There is an average of nine tornados a year in New Mexico. Tornados are classified using the F-scale with classifications ranging from F0-F5 (NOAA, 2004) as follows:

- F0-classified tornados have winds of 64 to 116 kilometers per hour (40 to 72 miles per hour).
- F1-classified tornados have winds of 117 to 181 kilometers per hour (73 to 112 miles per hour).
- F2-classified tornados have winds of 182 to 253 kilometers per hour (113 to 157 miles per hour).
- F3-classified tornados have winds of 254 to 332 kilometers per hour (158 to 206 miles per hour).
- F4-classified tornados have winds of 333 to 419 kilometers per hour (207 to 260 miles per hour).
- F5-classified tornados have winds of 420 to 512 kilometers per hour (261 to 318 miles per hour).

In the 54-year period between January 1, 1950, and April 30, 2004, a total of 88 tornados were reported in Lea County, New Mexico. F2 or greater tornados occur infrequently in the vicinity of proposed NEF. No F4 or F5 tornadoes have ever been reported in the vicinity of the proposed NEF site. The strongest tornado in Lea County was an F3 that was reported on May 17, 1954. On May 27, 1982, an F2 tornado caused an estimated $25 million in damage. All told, a reported 26 tornados have caused more than $26 million in property damage in Lea County since 1950.

The proposed NEF site is located about 805 kilometers (500 miles) from the coast. Because hurricanes lose their intensity quickly once they pass over land, a hurricane would most likely lose its intensity before reaching the proposed NEF site and dissipate into a tropical depression.

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. Sandstorms that cover an extensive region are rare (NCDC, 2004).

3.5.2.6 Mixing Heights

Mixing height is defined as the height above the earth's surface through which relatively strong vertical mixing of the atmosphere occurs. G.C. Holzworth developed mean annual morning and afternoon mixing heights for the contiguous United States (Holzworth, 1972). According to Holzworth's calculations, the mean annual morning and afternoon mixing heights at the proposed NEF site are approximately 436 meters (1,430 feet) and 2,089 meters (6,854 feet), respectively. Table 3-5 shows the average morning and afternoon mixing heights for Midland-Odessa, Texas.

Table 3-5 Average Morning and Afternoon Mixing Heights for Midland-Odessa, Texas

	Winter	Spring	Summer	Fall	Annual
Morning	290 meters (951 feet)	429 meters (1,407 feet)	606 meters (1,988 feet)	419 meters (1,375 feet)	436 meters (1,430 feet)
Afternoon	1,276 meters (4,186 feet)	2449 meters (8,035 feet)	2,744 meters (9,003 feet)	1,887 meters (6,191 feet)	2,089 meters (6,854 feet)

Source: Holzworth, 1972.

3.5.3 Air Quality

To assess air quality, the EPA has established maximum concentrations for pollutants that are referred to as the National Ambient Air Quality Standards (NAAQS) (EPA, 2003c). Table 3-6 presents a list of the NAAQS and the State of New Mexico Air Quality Standards. Six criteria pollutants are used as indicators of air quality: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead (EPA, 2003c). Figure 3-13 shows the criteria air-pollutants attainment areas (i.e., areas within which air quality standards are met). Both Lea and Andrews Counties are in attainment for all of the EPA criteria pollutants (EPA, 2004a).

EPA lists 54 sources of criteria pollutants in Lea County, eight sources in Andrews County, and five sources in Gaines County for 2001. None of these sources are located near the proposed site. Table 3-7 presents a summary of the annual emissions for six of the criteria air pollutants for the three counties surrounding the proposed NEF site.

Table 3-6 EPA National Ambient Air Quality Standards and State of New Mexico Air Quality Standards

Pollutant	EPA Standard Value[a]		Standard Type	New Mexico Standard
Carbon Monoxide (CO)				
8-hour Average	9 ppm	(10 mg/m^3)	Primary	8.7 ppm
1-hour Average	35 ppm	(40 mg/m^3)	Primary	13.1 ppm
Nitrogen Dioxide (NO_2)				
Annual Arithmetic Mean	0.053 ppm	(100 :g/m^3)	Primary and Secondary	0.05 ppm
Ozone (O_3)				
1-hour Average	0.12 ppm	(235 :g/m^3)	Primary and Secondary	None
8-hour Average	0.08 ppm	(157 :g/m^3)	Primary and Secondary	None
Lead (Pb)				
Quarterly Average	1.5 :g/m^3		Primary and Secondary	None
Particulate (PM_{10}) *Particles with diameters of 10 :m or less*				
Annual Arithmetic Mean	50 :g/m^3		Primary and Secondary	60 :g/m^3
24-hour Average	150 :g/m^3		Primary and Secondary	150 :g/m^3
Particulate ($PM_{2.5}$) *Particles with diameters of 2.5 :m or less*				
Annual Arithmetic Mean	15 :g/m^3		Primary and Secondary	None
24-hour Average	65 :g/m^3		Primary and Secondary	None
Sulfur Dioxide (SO_2)				
Annual Arithmetic Mean	0.03 ppm	(80 :g/m^3)	Primary	0.02 ppm
24-hour Average	0.14 ppm	(365 :g/m^3)	Primary	0.10 ppm
3-hour Average	0.50 ppm	(1,300 :g/m^3)	Secondary	None
Hydrogen Sulfide (H_2S)				
1-hour Average (not to be exceeded more than once per year)	Not a NAAQS Pollutant		N/A	0.010 ppm
Total Reduced Sulfur				
½-hour Average	Not a NAAQS Pollutant		N/A	0.003 ppm

[a] Parenthetical value is an approximately equivalent concentration.
NAAQS - National Ambient Air Quality Standards.
:m - 10^{-6} meters or 0.000001 meters. ppm - parts per million.
:g/m^3 - micrograms per cubic meter. mg/m^3 - milligrams per cubic meter.
N/A - not applicable.
Sources: EPA, 2003c; NMED, 2002.

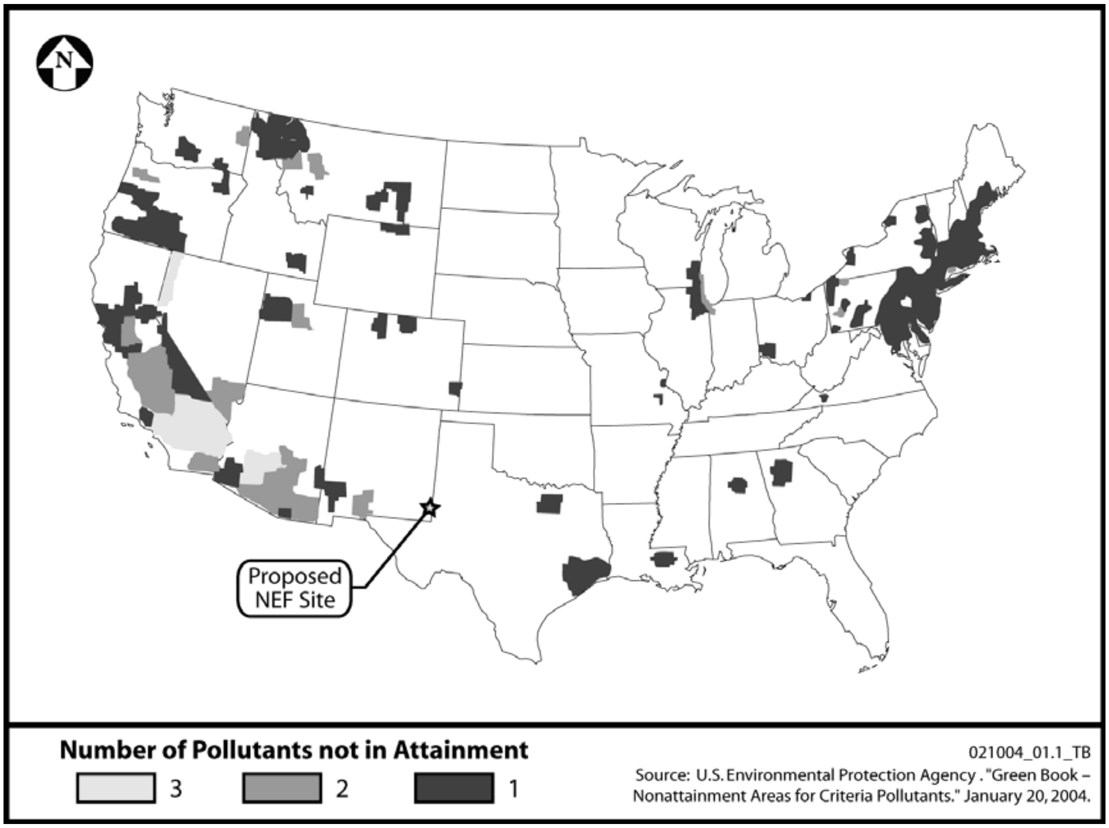

Figure 3-13 Criteria Air Pollutants Attainment Areas (EPA, 2004a)

Table 3-7 Total Annual Emissions (tons per year) of Criteria Air Pollutants at Lea County, New Mexico, and Andrews and Gaines Counties, Texas

County, State	VOC	NO_X	CO	SO_2	$PM_{2.5}$	PM_{10}
Lea County, New Mexico	6,713	38,160	31,185	16,096	5,188	28,548
Andrews County, Texas	2,873	3,259	6,680	1,398	440	1,577
Gaines County, Texas	2,696	2,791	7,709	735	1,825	8,650

A ton is equal to 0.9078 metric ton.

VOC: volatile organic compounds.
NO_X: nitrogen oxides.
CO: carbon monoxide.
SO_2: sulfur dioxide.
PM_{25}: particulate matter less than 2.5 microns.
PM_{10}: particulate matter less than 10 microns.
Source: Based on 1999 data (EPA, 2003d).

Criteria Pollutants

Nitrogen dioxide *is a brownish, highly reactive gas that is present in all urban atmospheres. Nitrogen dioxide can irritate the lungs, cause bronchitis and pneumonia, and lower resistance to respiratory infections. The major mechanism for the formation of nitrogen dioxide in the atmosphere is the oxidation of the primary air pollutant nitric oxide. Nitrogen oxides plays a major role, together with volatile organic carbons, in the atmospheric reactions that produce ozone. Nitrogen oxides form when fuel is burned at high temperatures. The two major emissions sources are transportation and stationary fuel combustion sources such as electric utility and industrial boilers.*

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.*

Lead *can be inhaled and 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.*

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.*

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 affect 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.*

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.*

Source: EPA, 2004a.

The New Mexico Environment Department Air Quality Bureau operates a monitoring station about 32 kilometers (20 miles) north of the proposed NEF site in Hobbs, New Mexico, that monitors particulate matter. One exceedance for particulate matter (PM) occurred at Hobbs, New Mexico, on April 15, 2003, when air monitors in Hobbs recorded a PM_{10} level of 387 ug/m^3. This exceedance was caused by a dust storm. Because of this exceedance, a Natural Events Action Plan is being developed for PM_{10} for Lea County, New Mexico, in which best available control measures will be implemented. By putting in place the action plan, the New Mexico Environment Department avoids having the area declared in nonattainment of the NAAQS (NMEDAQB, 2005).

3.6 Geology, Minerals, and Soils

This section provides a brief description of regional and local geology and identifies the characteristics of the soil and mineral resources at the proposed NEF site. As described in Chapter 1 of this EIS, the NRC staff process for reviewing the license application includes an examination of the ability of the proposed NEF to withstand earthquakes. The discussion of geology in this section, however, is not intended to support a detailed safety analysis of the proposed NEF to resist seismic events. The NRC staff will document its analysis of hazards related to earthquakes in the Safety Evaluation Report.

Figure 3-14 shows a geologic time scale to depict when different geologic units formed, as described in section 3.6.1.

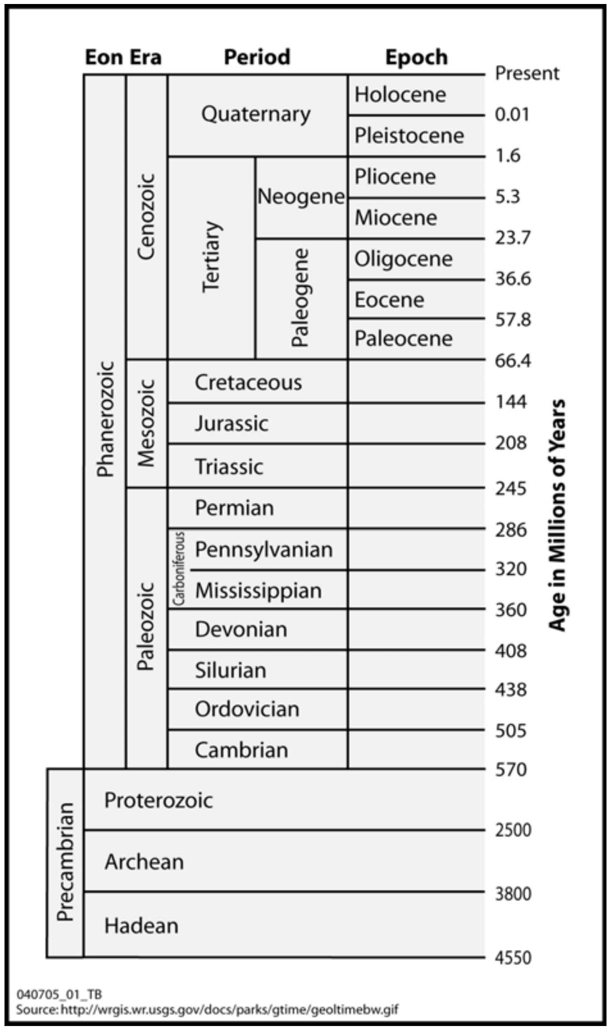

Figure 3-14 Geologic Time Scale (USGS, 2003a)

3.6.1 Regional Geology

The proposed NEF site is located near the boundary between the Southern High Plains section (Llano Estacado) of the Great Plains Province to the east and the Pecos Plains section to the west. Figure 3-15 shows the regional physiography of the area.

The primary difference between the Pecos Plains and the Southern High Plains physiographic sections is a change in topography. The High Plains is a large flat mesa that uniformly slopes to the southeast. The Pecos Plains section is characterized by its more irregular erosional topographic expression (Scholle, 2000). The boundary between the two sections is locally referred to as Mescalero Ridge. In southern Lea County, Mescalero Ridge is an irregular erosional topographic feature with a relief of about 9 to 15 meters (30 to 50 feet) compared with a nearly vertical cliff and relief of approximately 46 meters (150 feet) in northwestern Lea County. The lower relief of the ridge in the southeastern part of the county is due to partial cover by wind-deposited sand. The proposed NEF site is located on the Southern High Plains, about 6.2 to 9.3 kilometers (10 to 15 miles) from the ridge.

The dominant geologic feature of this region is the Permian Basin. The Permian Basin is a massive subsurface bedrock structure that has a downward flexure of a large thickness of originally flat-lying, bedded, sedimentary rock. The Permian Basin extends to 4,880 meters (16,000 feet) below mean sea level. Figure 3-16 shows the major physiographic features of the Permian Basin (LES, 2005a).

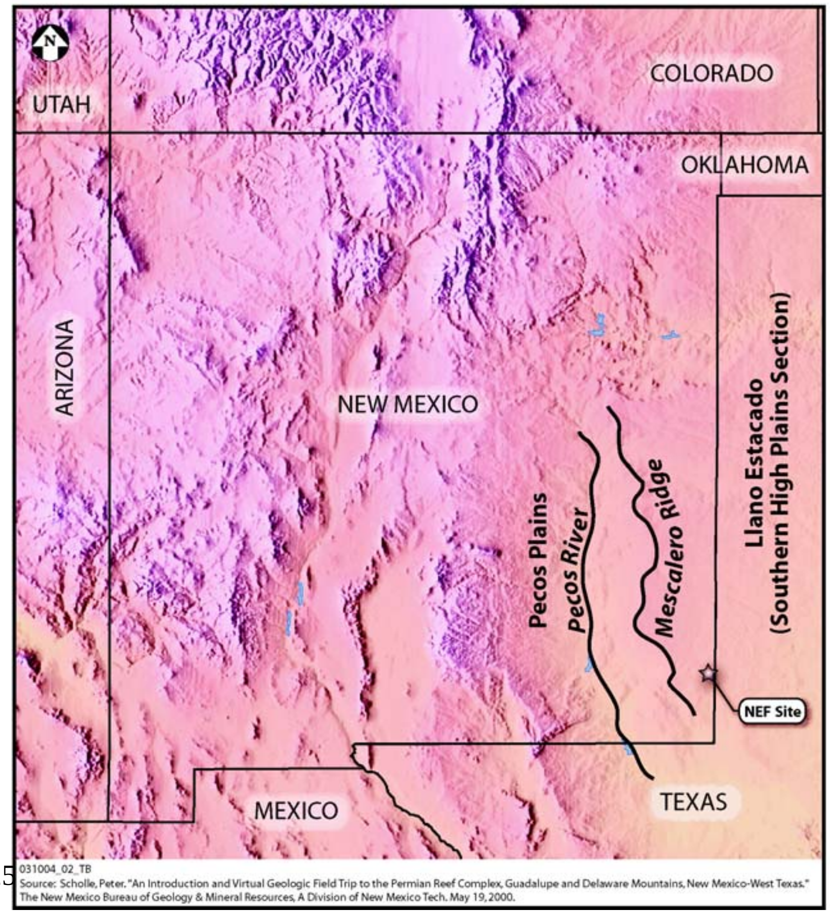

Figure 3-15 Regional Physiography (Scholle, 2000)

The proposed NEF site is located within the Central Basin Platform area. The Central Basin Platform divides the Permian Basin into the Midland and Delaware subbasins. The top of the Permian deposits are approximately 434 meters (1,425 feet) below ground surface at the proposed NEF site (LES, 2005a). Overlying the Permian are the sedimentary rocks of the Triassic Age Dockum Group.

The upper formation of the Dockum Group is the Chinle Formation, a tight claystone and silty clay layer. The Chinle Formation is regionally extensive with outcrops as far away as the Grand Canyon region in Arizona. In the vicinity of the site, the Chinle Formation consists of red, purple, and greenish micaceous claystone and siltstone with interbedded fine-grained sandstone. The Chinle (also known as Red Bed) Formation is overlain by Tertiary Ogallala, Gatuña, or Antlers Formations (alluvial deposits). Only the latter two are found at the proposed NEF site. Caliche is a partly indurated zone of calcium carbonate accumulation formed in the upper layers of surficial deposits. Soft caliche is interbedded with the alluvial deposits near the surface. A fractured caliche layer can be found extending to the surface near the proposed NEF site. This “caprock” is not present at the proposed NEF site. Quaternary (dune) sands frequently overlie the Tertiary alluvial deposits (LES, 2005a). Figure 3-17 shows a generalized cross-section of these formations in the site area.

Red Bed Ridge is an escarpment of about 15 meters (50 feet) in height that occurs just north and northeast of the proposed NEF site. It is a buried ridge on the upper surface of the Red Bed Formation and extends for at least 161 kilometers (100 miles) from northern Lea County, New Mexico through western Andrews County, Texas and southward. The Red Bed Ridge is not associated with the Mescalero Escarpment.

The Southeast New Mexico-West Texas area is considered to be structurally stable. Since the Laramide Orogeny (a series of mountain-building events that affected much of western North America in Late

Cretaceous and Early Tertiary time), the Permian Basin has subsided slightly, most likely as a result of the dissolution of the Permian evaporate layers by ground-water infiltration and possibly from oil and gas extraction.

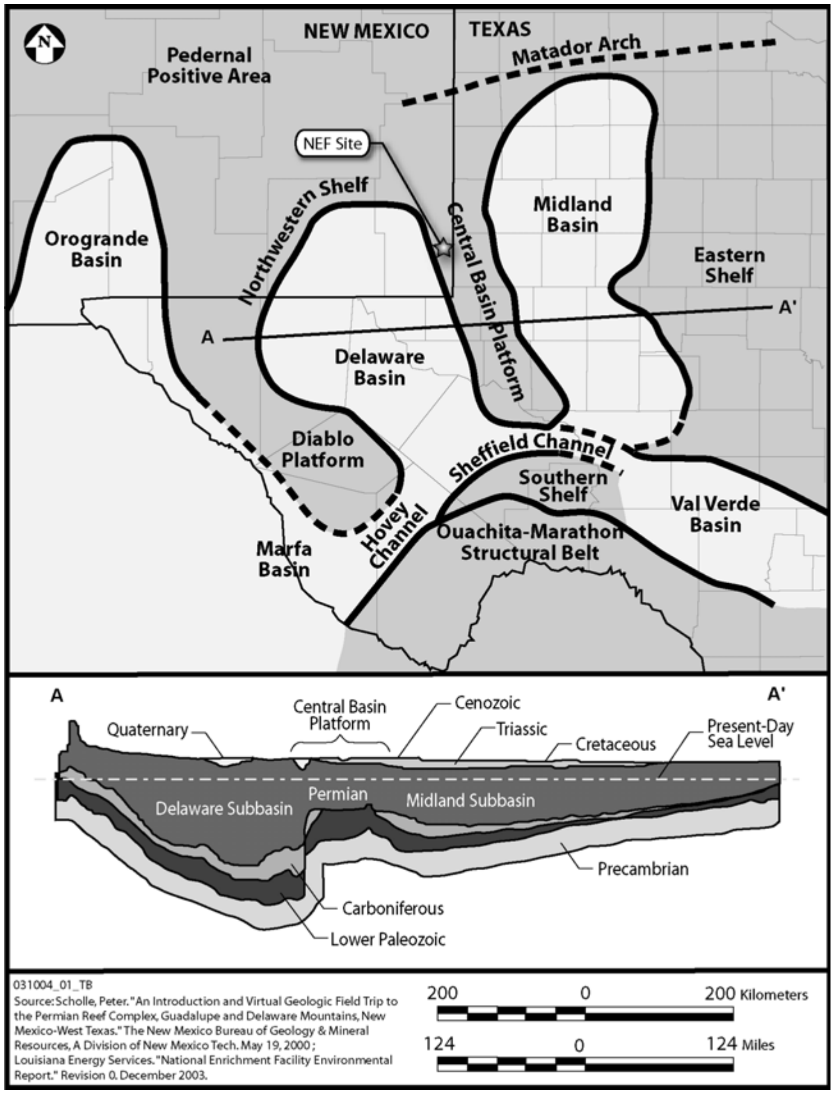

Figure 3-16 Major Physiographic Features of the Permian Basin (Scholle, 2000; LES, 2005a)

Two types of faulting are associated with the early Permian deformation. Most of the faults are long, high-angle reverse faults with well over 100 meters (328 feet) of vertical displacement that often involved the Precambrian basement rocks. The second type of faulting is found along the western margin of the platform where long strike-slip faults with displacements of tens of kilometers are found. The closest evaluated fault to the site within the Permian deposits is over 161 kilometers (100 miles) to the west associated with the deeper portions of the Permian Basin. No major tectonic event has occurred within the Permian Basin since the Laramide Orogeny that ended about 35-million years ago (WCS, 2004c). Recently, a small reverse fault in the Triassic beds with about 3 to 6 meters (10 to 20 feet) of offset was observed on the WCS site approximately 1.6 kilometer (1 mile) to the east of the proposed NEF in Texas. There was no fault displacement through the overlying younger Antlers Formation or the Caprock caliche. The fault in the Triassic beds is believed to be inactive (WCS, 2004c; NRC, 2004).

There has been virtually no tectonic movement within the basin since the Permian period. The faults that uplifted the platform do not appear to have displaced the younger Permian sediments. No Quaternary age faults were identified in New Mexico within 161 kilometers (100 miles) of the site. Quaternary age faults within 240 kilometers (150 miles) of the site include the Guadalupe fault located approximately 191 kilometers (119 miles) west of the site in New Mexico and in Texas; and the West Delaware Mountains fault zone, the East Sierra Diablo fault, and the East Flat Top Mountain fault, located 185 kilometers (115 miles) southwest, and 196 kilometers (122 miles) southwest, and 200 kilometers (124 miles) west-southwest of the site, respectively. The East Baylor Mountain-Carrizo Mountain fault, located 201 kilometers (125 miles) southwest of the proposed NEF site, is considered a possible capable fault but there has been no demonstration of movement within the last 35,000 years (LES, 2005a).

3.6.1.1 Regional Earthquakes

The majority of earthquakes in the United States are located in the tectonically active western portion of the country. The southwestern portion of the United States tends to experience earthquakes at a lower rate and lower intensity. Much of New Mexico's historical seismicity has been concentrated in the Rio Grande Valley between Socorro and Albuquerque (USGS, 2003b). A fault zone exists deep in the subsurface along the eastern side of the Delaware Basin bordering the Central Basin Platform (Hill, 1996). The zone is believed to extend from the west of Hobbs, New Mexico, to southeast of Fort Stockton, Texas. Although most of the activity in this zone was ancient (i.e., dating back to the Pennsylvanian and early Permian times), it may still be active, resulting in low to moderate earthquake activity (Hill, 1996).

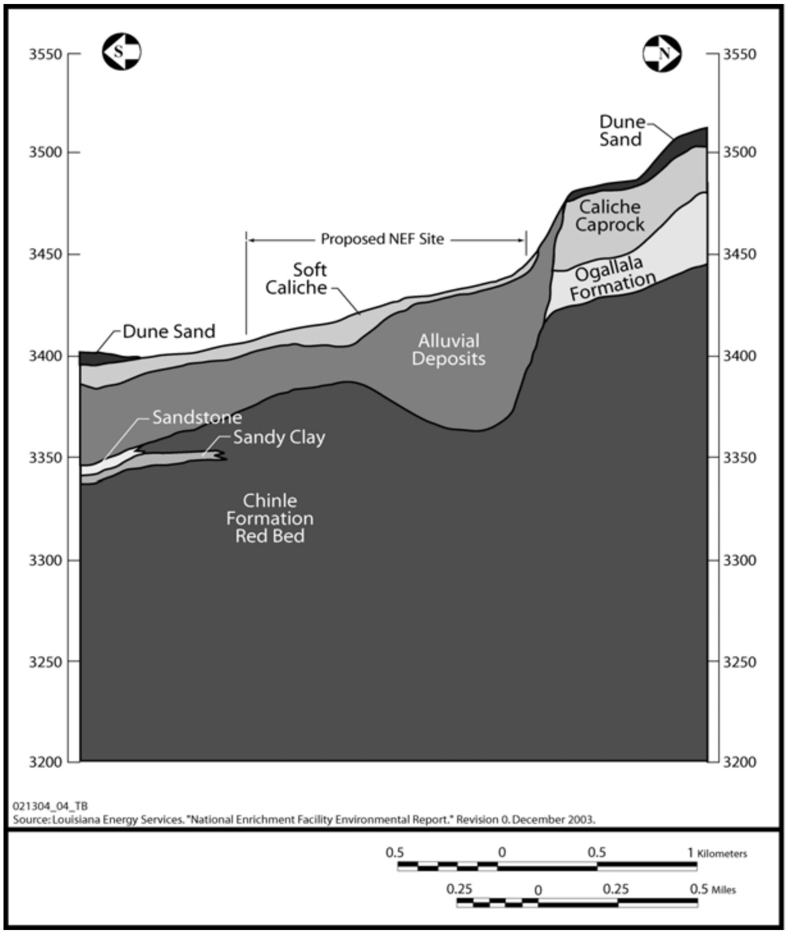

Figure 3-17 Geologic Units in the Proposed NEF Site Area (LES, 2005a)

Earthquakes in the vicinity of the proposed NEF site include isolated, small clusters of low- to moderate-size events (i.e., Richter magnitude earthquakes of 3 to 5.9). A review of earthquake data collected for the site and vicinity indicates that the vast majority of earthquakes that occurred near the proposed NEF site were likely induced by gas/oil recovery methods and were not tectonic in origin (NMBMMR, 1998). A magnitude 5.0 earthquake occurred in the area of Eunice in 1992. This earthquake is attributed to a tectonic origin as seismological data for this event was insufficient to constrain the focal depth sufficiently to permit a correlation with local oil/gas-producing horizons (LES, 2005a). No volcanic activity exists in the region surrounding the proposed NEF site.

3.6.1.2 Mineral Resources

LES has not found any abandoned petroleum drill holes or existing or former well locations for petroleum within the proposed NEF site. No significant nonpetroleum mineral deposits are known to exist on the proposed NEF site (LES, 2005a). According to information collected by the New Mexico Bureau of Mines and Mineral Resources on behalf of the U.S. Geological Survey (USGS), the top nonpetroleum minerals in New Mexico are, by value, potash, copper, construction sand and gravel, crushed stone, and cement. Figure 3-18 shows the potential mineral resources in the State of New Mexico.

According to the New Mexico Bureau of Mines and Mineral Resources/USGS survey, there are suitable mineral resources in Lea County for the excavation of construction sand and gravel, crushed stone, and

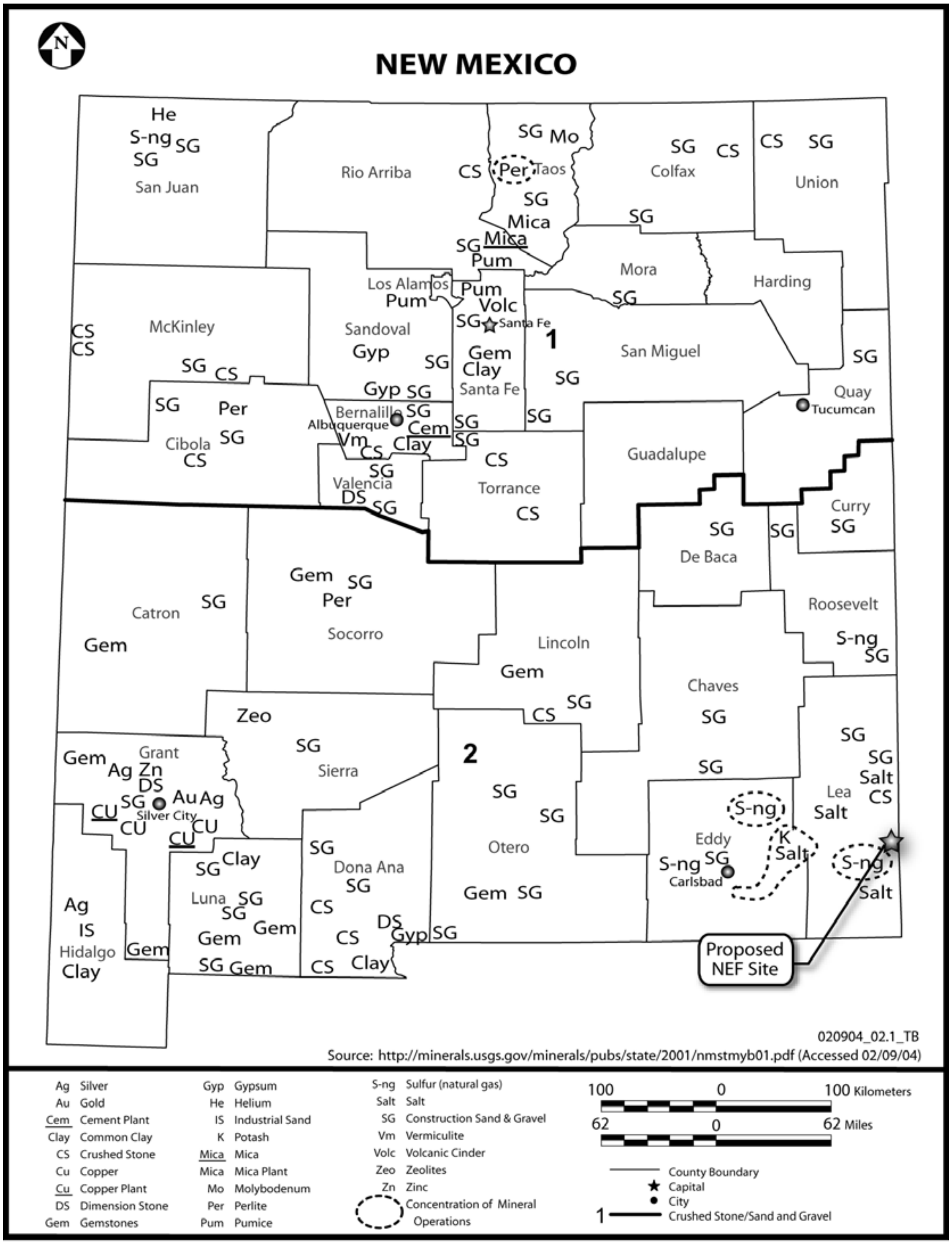

Figure 3-18 New Mexico Mineral Resources (USGS, 2004a)

salt. There is also an area of Lea County that has a concentration of mineral operations for sulfur (USGS, 2001). An active sand and gravel quarry located to the north of the proposed NEF site is operated by Wallach Concrete, Inc.

3.6.2 Site Geology

Geologically, the proposed NEF site is located in an area where surface exposures consist mainly of Quaternary-aged eolian and piedmont sediments along the far eastern margin of the Pecos River Valley. Surface soils in the vicinity of the site are described as sandy alluvium with subordinate amounts of gravel, silt, and clay. Other surficial units in the site vicinity include Caliche and loose sand deposits, the latter would be subject to wind erosion.

Topographic relief on the site is generally subdued. Site elevations range between about 1,033 and 1,045 meters (3,390 and 3,430 feet) above mean sea level, generally sloping to the south and southwest. Eolian processes resulted in a closed depression evident at the northern center of the site. Dune sand creates a topographic high at the southwest corner of the site. The dune sands, also known as the Brownsfield-Springer Association, are reddish-brown, fine to loamy-fine sands (USDA, 1974a).

The major geologic features underlying the site generally follow those of the region. The Gatuna and Antlers formations are sand and silty sand with sand and gravel at the base. A layer of caliche below this alluvium is present at some locations on the proposed NEF site. The formation directly beneath the alluvium is the Chinle Formation. The Santa Rosa Formation lies between the base of the Chinle formation and the top of the Permian. This formation includes sandy beds containing a groundwater aquifer. Table 3-8 shows the stratigraphy, including the depths and thicknesses, underlying the proposed NEF site.

3.6.3 Site Soils

Figure 3-19 presents a soil map of the proposed NEF site area. Geotechnical and site boring investigations confirm a thin layer of loose sand at the surface that overlies about 12 meters (40 feet) of alluvial silty sand, and sand and gravel cemented with caliche. Chinle Formation clay extends from about 12 meters (40 feet) below ground surface to a depth of approximately 340 meters (1,115 feet). The granular soils located in the uppermost 12 meters (40 feet) of the subsurface provide potentially high-quality bearing materials for building and heavy machine foundations. For extremely heavy or settlement-intolerant facilities, foundations can be constructed in the Chinle Formation, which has an unconfined compressive strength of over 195,000 kilograms per square meter (20 tons per square foot).

The USDA soil survey indicates the proposed NEF site surface soils consist primarily of Dune Land, Kermit soils, and the Brownfield-Springer association (USDA, 1974a; USDA, 1974b). Soils associated with the Brownfield-Springer association, Kermit soils, and dune land are suitable for range, wildlife habitat, and recreational areas. On the western portion of the proposed NEF site in the vicinity of the sand dune buffer, soils are mapped as active dune land, which is made up of light-colored, loose sands. Sloping ranges from 5 to 12 percent or more. The surface of active dune land soil is typically bare except for a few shinnery oak shrubs.

Table 3-8 Geologic Units at or near the Proposed NEF Site

Formation	Geologic Age	Descriptions	Estimates for the Proposed NEF Site Area[a]	
			Depths: meters (feet)	**Thickness: meters (feet)**
Topsoils	Recent	Silty fine sand with some fine roots—eolian	Range: 0 to 0.6 (0 to 2) Average (Top/Bottom): 0/0.4 (0/1.4)	Range: 0.3 to 0.6 (1 to 2) Average: 0.4 (1.4)
Mescalero Sands/ Blackwater Draw Formation	Quaternary	Dune or dune-related sands	Range (sporadic across site) : 0 to 3 (0 to 10) Average: N/A[b]	Range (sporadic across site): 0 to 3 (0 to 10) Average: N/A[c]
Gatuña/ Antlers Formation	Pleistocene/ mid-Pliocene	Pecos River Valley alluvium: Sand and silty sand with interbedded caliche near the surface and a sand and gravel base layer	Range: 0.3 to 17 (1 to 55) Average (Top/Bottom): 0.4/12 (1.4/39)	Range: 6.7 to 16 (22 to 54) Average: 12 (38)
Mescalero Caliche	Quaternary	Soft to hard calcium carbonate deposits	Range: 1.8 to 12 (6 to 40) Average (Top/Bottom): 3.7/8 (12/26)	Range: 0 to 6 (0 to 20) Average (all 14 borings)[d]: 1.4 (5) Average (five borings that encountered caliche): 4.3 (14)
Chinle Formation	Triassic	Claystone and silty clay: red beds	Range: 7 to 340 (23 to 1,115) Average (Top/Bottom): 12/340 (39/1,115)	Range: 323 to 333 (1,060 to 1,092) Average: 328 (1,076)
Santa Rosa Formation	Triassic	Sandy red beds, conglomerates, and shales	Range: 340 to 434 (1,115 to 1,425) Average: N/A[b]	Range: N/A[e] Average: 94 (310)
Dewey Lake Formation	Permian	Muddy sandstone and shale red beds	Range: 434 to 480 (1,425 to 1,575) Average: N/A[b]	Range: N/A[e] Average: 46 (150)

[a] Range of depths is below ground level to shallowest top and deepest bottom of geological unit determined from site boring logs, unless noted. Average depths are below ground level to average top and average bottom of geological unit determined from site boring logs, unless noted. Range of thickness is from the smallest thickness to the largest thickness of geological unit determined from site boring logs, unless noted. Average thickness is the average as determined from site boring logs, unless noted. Bottom of Chinle Formation, top and bottom of Santa Rosa Formation, and top and bottom of Dewey Lake Formation are single values from a deep boring just south of the proposed NEF site.

[b] Average depths are not available.

[c] Average thickness is not available.

[d] Caliche is not present at some locations of the site. Where not present in a particular boring, a thickness of '0' meter (feet) is used in calculating the average.

[e] Range of thickness is not available.

Sources: LES, 2005a; Nicholson and Clebsch, 1961.

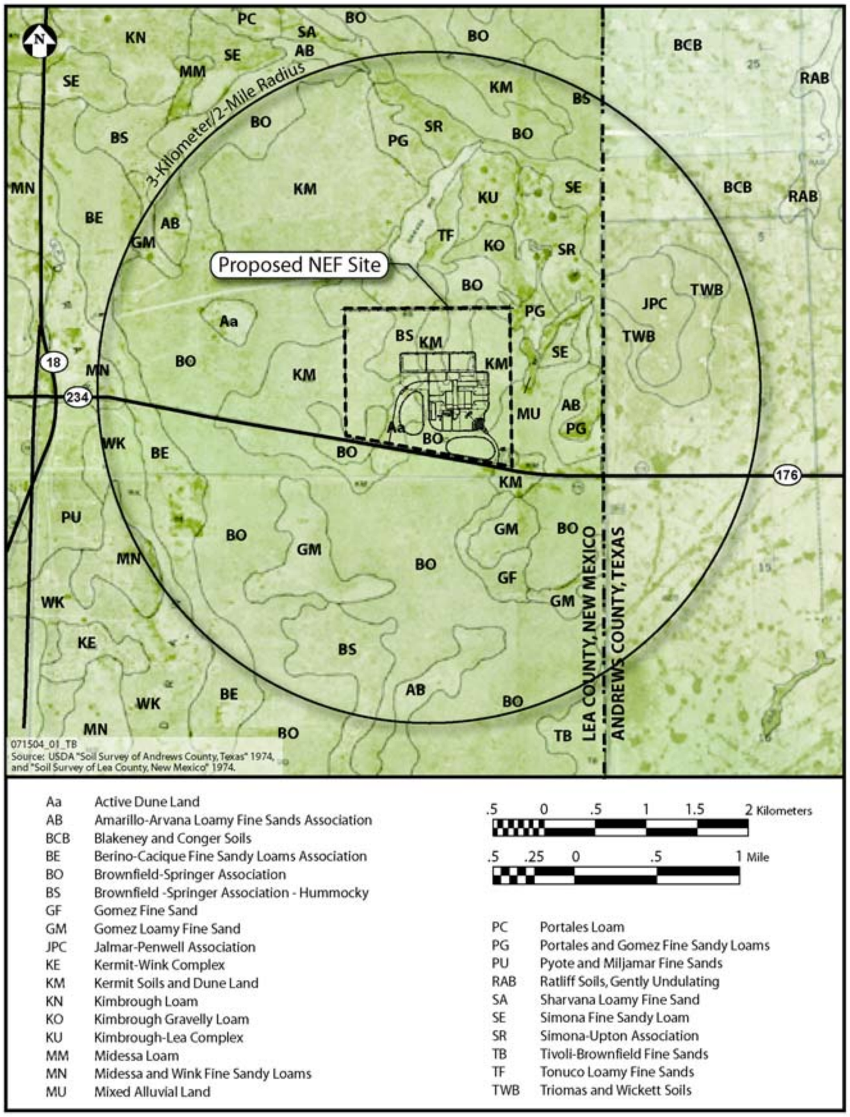

Figure 3-19 Soil Map of the Proposed NEF Site Area (USDA, 1974a; USDA, 1974b)

3.6.4 Soil Radiological and Chemical Characteristics

LES conducted soil sampling at 10 random locations across the proposed NEF site (LES, 2005a). The soil was sampled for radioactive components including uranium, thorium, and their daughter products. Potassium-40, a naturally occurring radionuclide, and cesium-137, produced by past weapons testing, were also measured. Subsequent to this, LES performed an additional round of testing of both radionuclides and nonradionuclide chemicals. Six of the eight sites sampled in the latter round were selected to represent background conditions at proposed plant structures (e.g., the proposed basins and storage pads). The other two sites were representative of topographically upgradient, onsite locations (LES, 2005a). Table 3-9 presents the results of the most recent measurements; the previous sampling measurements were consistent with these latest results.

Table 3-9 Chemical Analyses of Proposed NEF Site Soil

Radionuclides	**Measured Concentration becquerels/kilogram (picocuries/kilogram)[a, b]**	**Representative Soil Concentration[b] becquerels/kilogram (picocuries/kilogram)**
Potassium-40	138 ± 3 (3,730 ± 82)	130 (3,500)
Cesium-137	2.9 ± 0.9 (77 ± 24)	N/A
Actinium-228	6.5 ± 0.7 (176 ± 19)	8.1 (218)
Thorium-228	7.0 ± 1.0 (187 ± 26)	8.1 (218)
Thorium-230	5.8 ± 0.5 (158 ± 13)	N/A
Thorium-232	7.0 ± 0.6 (187 ± 17)	8.1 (218)
Uranium-234	6.0 ± 0.3 (161 ± 7.9)	12 (333)
Uranium-235	0.33 ± 0.08 (8.8 ± 2.2)	N/A
Uranium-238	5.9 ± 0.2 (158 ± 6.5)	12 (333)
Chemicals	**Measured Concentration (milograms/kilogram) [a, b]**	**New Mexico Soil Screening Level (milograms/kilogram) [c]**
Barium	23 ± 12	1,440
Chromium	3.6 ± 0.9	180
Lead	2.7 ± 0.3	400

N/A = not available.
[a] Concentrations noted as average ± standard deviation.
[b] LES, 2005a; NCRP, 1992.
[c] NMEDHWB, 2004.

No nuclides other than those in the table were above minimum detectable concentrations in the laboratory. The measured radionuclides are all naturally occurring except for cesium-137, which is ubiquitous in the environment as a result of past atmospheric weapons testing. Chemicals analyzed for but not detected above minimum detectable concentrations include volatiles, semivolatiles, metals (arsenic, cadmium, mercury, selenium, and silver), organochlorine pesticides, organophosphorous compounds, chlorinated herbicides, and fluoride. Only barium, chromium, and lead were detected above minimum detectable concentrations in the soil samples. These measured levels were orders of magnitude less than the New Mexico soil-screening concentrations. The soil-screening concentrations are intended to be levels below which there are no health concerns (NMEDHWB, 2004).

3.7 Surface Water

This section addresses the surface-water features at or near the proposed NEF site.

3.7.1 Surface Water Features in the Vicinity of the Proposed NEF Site

There are no surface-water bodies or surface-drainage features on the proposed NEF site (USGS, 1979). The site topography is relatively flat, ranging between about 1,033 and 1,045 meters (3,390 and 3,430 feet) above mean sea level, with an average slope of 0.0064 centimeter per centimeter. Wind erosion has created localized depressions; however, these depressions are not large enough to have an impact on surface-water collection. The vegetation on the site is primarily shrubs and native grasses. The surface soils tend to hold moisture in storage rather than allow rapid infiltration to depth. Water held in storage in the soil is subsequently subject to evapotranspiration. The evapotranspiration processes are significant enough to severely limit potential groundwater recharge. Essentially all of the precipitation that occurs at the site is subject to infiltration and subsequent evapotranspiration. Net evaporation/transpiration, as measured at Red Bluff Dam, approximately 97 kilometers (60 miles) southwest of the site, is estimated as 165 centimeters (65 inches) per year (Reed and Associates, 1977). Figure 3-20 illustrates local topography in the area of the proposed NEF site.

The site is contained within the Monument Draw watershed; however, there are no freshwater lakes, estuaries, or oceans in the vicinity of the site. Local surface hydrologic features in the vicinity of the site include Monument Draw, Baker Spring, and several ponds on the Wallach Concrete, Inc., Sundance Services, Inc., and WCS properties. Monument Draw is an intermittent stream and the closest surface-water-conveyance feature to the proposed NEF site. Figure 3-21 shows the location of Monument Draw. While Monument Draw is typically dry, the maximum historical flow occurred on June 10, 1972, and measured 36.2 cubic meters per second (1,280 cubic feet per second).

Baker Spring is located to the northeast of the proposed NEF site at the edge of an escarpment where the caprock ends. Surface water is present in Baker Spring intermittently. The Baker Spring area is underlain by Chinle Formation clay, whose low permeability

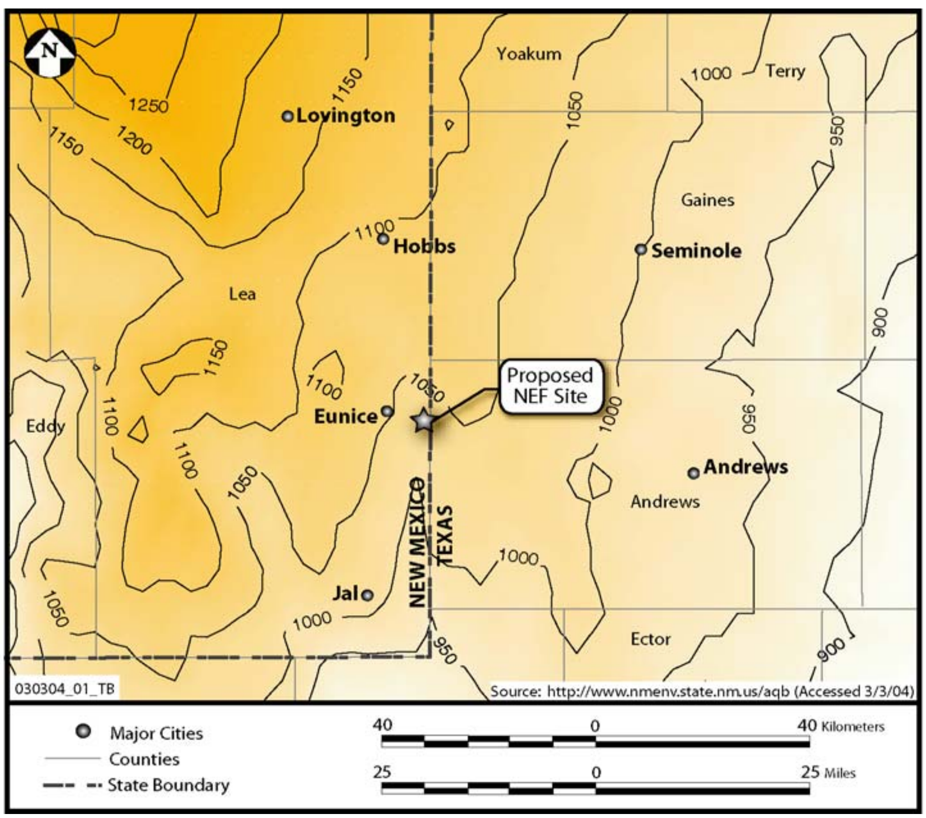

Figure 3-20 General Topography Around the Proposed NEF Site (NMEDAQB, 2004)

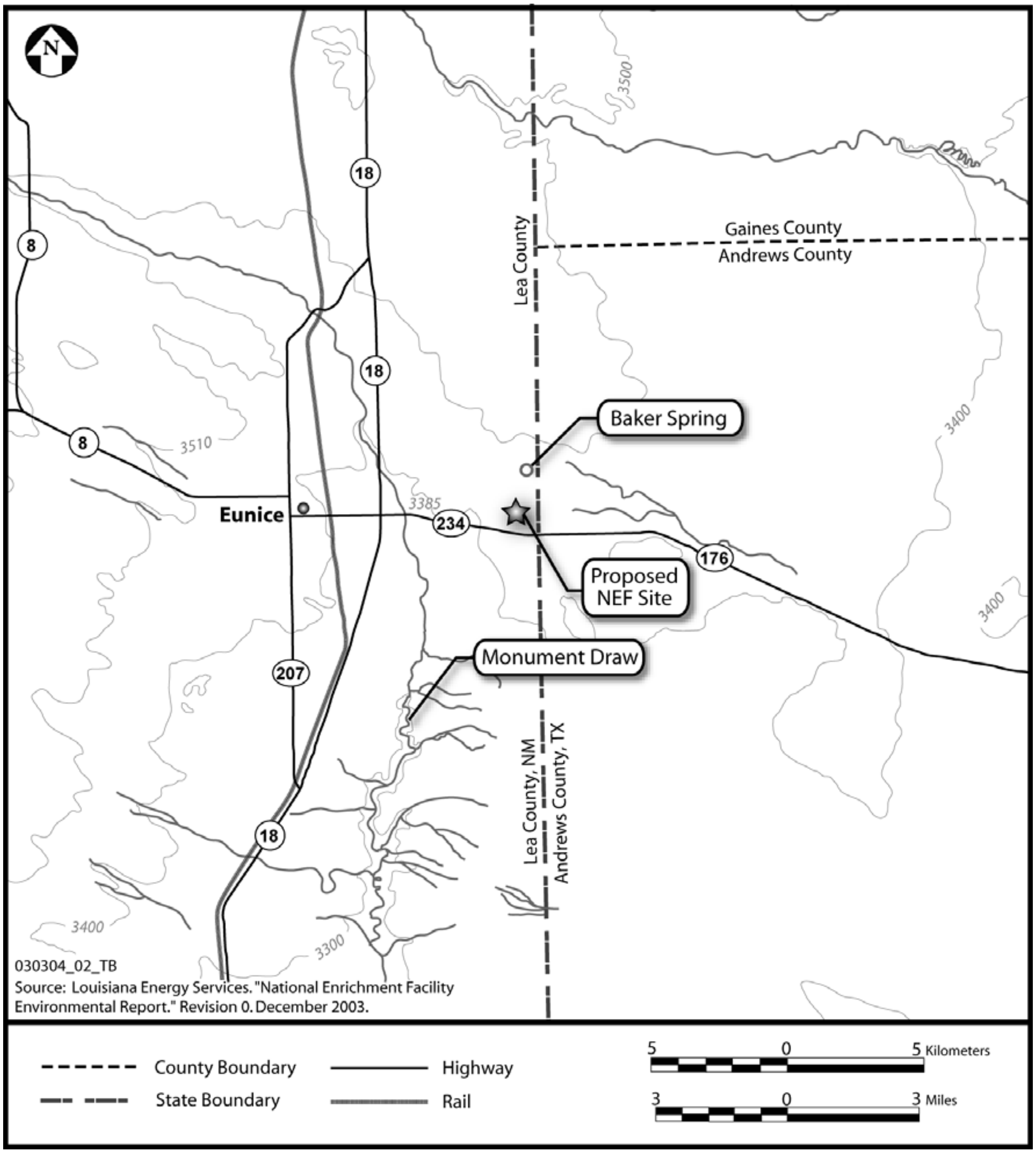

Figure 3-21 Regional Hydrologic Features (LES, 2005a)

impedes deep infiltration
of that water. Therefore, the intermittent localized flow and ponding of water in this area may be attributed to seepage and/or precipitation/runoff. LES conducted a pedestrian survey of the Baker Spring area and noted the presence of a surface engineering control or diversion berm just north of the Baker Spring area. Based on field observations, it appears that the berm was constructed to divert surface water from the north and redirect the flow to the east of the Baker Spring area. Aerial photographs suggest that the sand and gravel reserves in this area have been excavated to the top of the red bed. These excavation activities have resulted in the Baker Spring area having a lower elevation than the natural drainage features, and the surface water that formerly flowed through the natural drainage features now ponds in Baker Spring.

Because the excavation floor consists of very low permeability red-bed clay, limited vertical migration of the ponded water occurs. Shading from the high wall and trees that have flourished in the excavated area slow the natural evaporation rates, and water stands in the pond for extended periods of time. It is also suspected that during periods of ponding, surface water infiltrates into the sands at the base of the excavated wall and is retained as bank storage. As the surface-water level declines, the bank storage is discharged back to the excavation floor.

On the Wallach Concrete, Inc., property, a shallow surface depression is located at the base of one of the gravel pits. Water is perennially present in the pit due to a seep at the base of the sand and gravel unit at the top of the Chinle Formation clay. Wallach Concrete, Inc., occasionally pumps water out of this depression for use onsite; however, the amount of water in the depression is insufficient to fully supply the quarry operations. While the rate of replenishment has not been quantified, it appears to be relatively slow. This shallow zone of groundwater is not observed throughout Wallach's property; therefore, it appears to be representative of a local perched water condition and is not considered to be an aquifer.

3.7.1.1 Wetlands

The proposed NEF site does not contain wetlands, freshwater streams, rivers, or lakes. No commercial and/or sport fisheries are located on the proposed NEF site or in the local area. The closest fishery is situated about 121 kilometers (75 miles) west of the site on the Pecos River near Carlsbad, New Mexico. No important aquatic ecological systems are onsite or in the local area that are vulnerable to change or contain important species habitats such as breeding and feeding areas. Relative regional significance of the aquatic habitat is low.

3.7.1.2 Flooding

The proposed NEF site is not located near any floodplains. The site grade is above the elevation of the 100-year and the 500-year flood elevations. As described in section 3.7.1, the site is in the Monument Draw watershed. The draw, an intermittent stream, is the closest surface water conveyance feature to the site, at approximately 4 kilometers (2.5 miles) from it, and has a maximum historical flow of 36.2 cubic meters per second (1,280 cubic feet per second). There is no direct outfall to a surface water body on the site.

3.8 Ground-Water Resources

This section describes the groundwater resources and uses in the area that are available for the proposed NEF construction, operations, and decommissioning.

3.8.1 Site and Regional Hydrogeology

Because the climate in southeastern New Mexico is semi-arid, the onsite vegetation consists predominately of shrubs and native grasses. The surface soils are predominately of an alluvial or eolian origin. The near-surface soils are primarily silts and silty sands. These silty types of soils have relatively low permeability compared with sands and tend to hold moisture in storage rather than allow for rapid infiltration to deeper below the ground surface (DeWiest, 1969).

The top approximately 17 meters (56 feet) of soil are comprised of a silty sand, grading to a sand and gravel just above the red-bed-clay unit. The porosity of the surface soils is on the order of 25 to 50 percent, and the saturated hydraulic conductivity of the surface soils is likely to range from 10^{-5} to 10^{-1} centimeters per second (3.9×10^{-6} to 3.9×10^{-2} inches per second) (Freeze and Cherry, 1979).

Field investigation and computer modeling were used to show that no precipitation recharge (i.e., rainfall seeping deeply into the ground) occurs in thick, desert vadose zones with desert vegetation (Walvoord et al., 2002). Precipitation that infiltrates into the subsurface is, instead, efficiently transpired by the native vegetation. Sites with thick vadose zones, such as the proposed NEF site, have a natural thermal gradient in the deeper part of the vadose zone that induces water vapor to diffuse upward toward the vegetation root zone. The water vapor creates a negative pressure potential at the base of the root zone that acts like a sink where water is taken up by the plants and transpired. Measurements in the High Plains of Texas, which indicated an upward hydraulic gradient in the upper 10-15 meters (33-49 feet) of the vadose zone, support this behavior (Walvoord et al., 2002).

Localized shallow groundwater, which can occur under specific circumstances, exists to the east of the proposed NEF site on the WCS property and to the north on the Wallach Concrete, Inc. and Sundance Services, Inc. property. Several abandoned windmills are located on the WCS property. The windmills were used to supply water for stock tanks by tapping small saturated lenses above the Chinle Formation red beds. The amount of groundwater in these zones is limited, and the source of recharge is likely to be "buffalo wallows" located near the windmills. The buffalo wallows are substantial surface depressions that collect surface-water runoff. Water collecting in these depressions is inferred to infiltrate below the root zone due to the ponding conditions. A subsurface investigation by WCS in the vicinity of the windmills found that when water was encountered in the sand and gravel above the Chinle Formation red beds, the water level was slow to recover following a sampling event. This slow recovery is attributed to the low permeability of the saturated zones and the high water storage in the overlying soils. The discontinuity of this saturated zone and its low permeability suggest that the groundwater is representative of a perched water condition and not an aquifer.

Below this lies approximately 328 meters (1,076 feet) of Chinle Formation (red bed) clay with measured permeabilities in the range of 1×10^{-9} to 1×10^{-8} centimeters per second (3.9×10^{-10} to 3.9×10^{-9} inches per second). Moisture content in the Chinle Formation generally averages from 8 to 12 percent, with a dry density of the clay averaging 2.12 grams per cubic centimeter (132 pounds per cubic foot) (JHA, 1993). The Chinle Formation has a surface slope of approximately 0.02 centimeter per centimeter towards the south-southwest under the proposed NEF site. It is thought that the Chinle Formation is exposed in a large excavation about 3.2 kilometers (2 miles) southeast of the town of Monument (approximately 22.5 kilometers [14 miles] northwest of the proposed NEF site) and at Custer Mountain (approximately 33.8 kilometers [21 miles] southwest of the proposed NEF site) (Nicholson and Clebsch, 1961). The presence of the thick Chinle Formation clay beneath the site isolates the deep and shallow hydrologic systems. Although the presence of fracture zones that can significantly increase vertical water transport through the Chinle Formation has not been precluded, the low measured permeabilities indicate the absence of such zones. Visual inspection of this clay has also shown that it is continuous, solid, and tight with few fracture planes (Rainwater, 1996).

Ground water occurring beneath the surface of the red-bed clay occurs at distinct and distant elevations. The most shallow of these occurs approximately 67 meters (220 feet) beneath the land surface, just below the surface of the red-bed unit. This siltstone or silty sandstone unit has low permeability and does not yield groundwater readily. The permeability of this layer was measured in the field at the proposed NEF site as 3.7×10^{-6} centimeters per second (1.5×10^{-6} inches per second). The local gradient was 0.011 centimeter per centimeter towards the south-southeast with a porosity estimated as 0.14.

There is also a 30.5-meter-thick (100-foot-thick) water-bearing sandstone layer at about 183 meters (600 feet) below ground surface. However, the first occurrence of a well-defined aquifer capable of producing significant volumes of water is the Santa Rosa Formation. This formation is located about 340 meters

(1,115 feet) below ground surface (LES, 2005a). The Santa Rosa is recharged by precipitation on sand dunes and directly on outcrop areas in the western part of southern Lea County and the eastern part of Eddy County (Nicholson and Clebsch, 1961). No local investigations of this aquifer were conducted due to the depth of the aquifer and the thickness and low permeability of the overlying Chinle Formation clay, which inhibits potential groundwater migration to the Santa Rosa. There is no indication of a hydraulic connection among the Chinle saturated horizons and the Santa Rosa Formation.

Ground-water velocities were estimated based on the above parameters for both the saturated siltstone unit in the red-bed clay and vertical travel through the clay. The velocity in the saturated siltstone unit within the clay is a slow 0.09 meters per year (0.3 feet per year) towards the south-southeast, reflecting the low permeability of this layer (Cook-Joyce, 2003). Using the largest measured Chinle Formation permeability, vertical groundwater velocity through the clay is conservatively estimated as 0.04 meters per year (0.13 feet per year); the resulting travel time from the surface of the clay to its base (the top of the Santa Rosa Formation) would be greater than 8,000 years.

Figure 3-22 depicts the locations of borings on the proposed NEF site. Onsite borings include nine site groundwater exploration boreholes, the installation of three groundwater monitoring wells, and five geotechnical borings in the soil above the Chinle Formation. The nine borings were also to the top of the Chinle Formation ranging in depth from 10-18 meters (35-60 feet) (Cook-Joyce, 2003). No groundwater was observed in any of the finished boreholes nor was groundwater observed after allowing the boreholes to stand open for 24 hours. The cuttings taken from the boreholes were dry or contained only residual saturation. The dry nature of the soils from the boreholes indicates no recharge from the ground surface at the site.

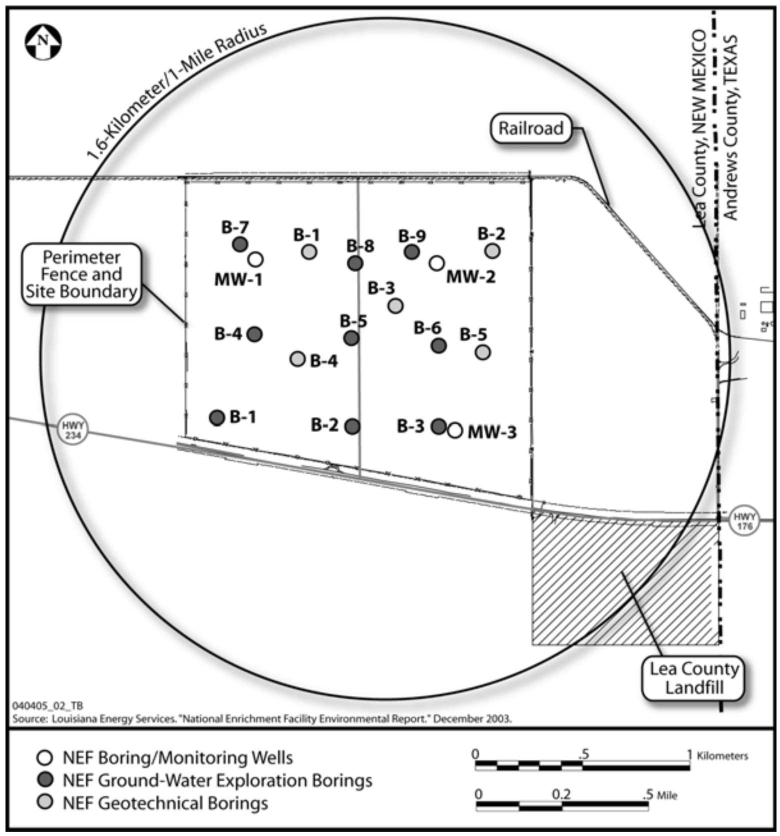

Figure 3-22 Borings on or Near the Proposed NEF Site (LES, 2005a)

The three groundwater monitoring wells were installed in the uppermost water-bearing zone. This 4.5-meter-thick (15-foot-thick) pocket of water is within the Chinle Formation (red beds) at a depth of approximately 67 meters (220 feet) below ground level. Ground water was not observed in any of the groundwater monitoring wells upon completion of the wells. One well (MW-2) did produce water after one month of monitoring, and the groundwater in that well continued to recharge throughout the monitoring period.

3.8.2 Ground-Water Use

No surface water would be used from the proposed NEF site nor groundwater from beneath the site. Instead, the proposed site would receive all of its water supply from the Eunice and/or Hobbs municipal water supply systems. No water wells are located within 1.6 kilometers (1 mile) of the site boundary.

Water wells completed in the alluvium above the Chinle are present approximately 4.8 kilometers (3 miles) south-southwest of the proposed site in the neighborhood of Monument Draw. Of these wells, those on the east side of Monument Draw are dry or have been abandoned, while those on the west side provide limited water for domestic and livestock use (NMSE, 2005). Nicholson and Clebsch (1961) propose a groundwater divide associated with Rattlesnake Ridge, a north-south trending topographic rise east of Eunice, as the cause for this difference in the availability of alluvial water east and west of Monument Draw.

The local municipalities obtain water from groundwater sources in the Ogallala Aquifer near the city of Hobbs, approximately 32 kilometers (20 miles) north of the site. The drinking water wells are positioned in the most productive portion of the Ogallala Formation in New Mexico where hydraulic conductivity approaches 70 meters per day (240 feet per day) (Woomer, 2004). Specific yields are between 0.1 and 0.28, and the saturated thickness is about 30 meters (90 feet) (LCWUA, 2003).

3.8.2.1 The Ogallala Aquifer

The Ogallala Aquifer, also known as the High Plains Aquifer, is a huge underground reservoir created millions of years ago that supplies water to the region which includes the proposed NEF site. The aquifer extends under the High Plains from west of the Mississippi River to the east of the Rocky Mountains. The aquifer system underlies 450,000 square kilometers (174,000 square miles) in parts of eight States (Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming). Figure 3-23 shows the Ogallala Aquifer and the proposed NEF site. Approximately 20 percent of the irrigated land in the United States is in the High Plains, and about 30 percent of the groundwater used for irrigation in the United States is pumped from the Ogallala Aquifer. Irrigation accounts for about 94 percent of the daily aquifer use of more than 60 million cubic meters (16 billion gallons). Irrigation withdrawals in 1990 were greater than 53 million cubic meters (14 billion gallons) daily. Domestic drinking is the second largest groundwater use within the High Plains States, amounting to about 2.5 percent or 1.6 million cubic meters (418 million gallons) of total daily withdrawals (USGS,2003c). In 1990, 2.2 million people were supplied by groundwater from the Ogallala Aquifer with total public-supply withdrawals of 1.3 million cubic meters (332 million gallons) per day (USGS, 2004b). Withdrawals from the aquifer exceed recharge to it, and so the Ogallala Aquifer is being depleted. The amount of water in storage in the aquifer in each State depends on the actual extent of the formation's saturated thickness.

The Ogallala Aquifer, the largest groundwater system in North America, contains approximately 4 trillion cubic meters (3.3 billion acre-feet) of water. About 65 percent of the Ogallala Aquifer’s water is located under Nebraska (USGS, 2003c; RRAT, 2004); about 12 percent is located under Texas; about 10 percent is located under Kansas; about 4 percent is located under Colorado; and 3.5, 2, and 2 percent are located under Oklahoma, South Dakota, and Wyoming, respectively. The remaining 1.5 percent—or about 60 billion cubic meters (16 trillion gallons)—of the water is located under New Mexico (HPWD,2004).

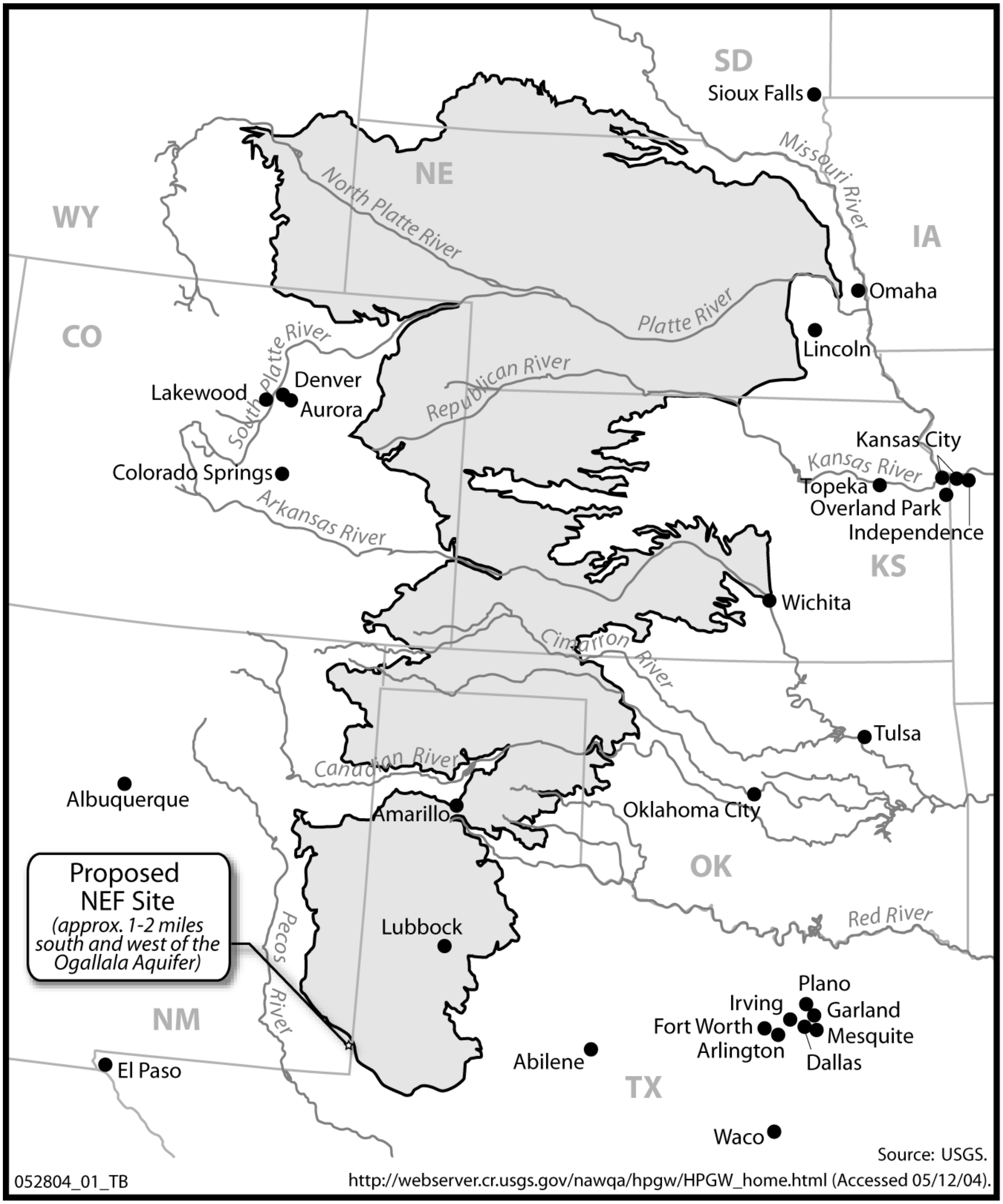

Figure 3-23 Ogallala Aquifer (USGS, 2004b)

3.8.2.2 Municipal Water Supply Systems

The Eunice and Hobbs, New Mexico, municipal water-supply systems have capacities of 16,350 cubic meters per day (4.32 million gallons per day) and 75,700 cubic meters per day (20 million gallons per day), respectively. Current usage of the Eunice and Hobbs municipal water-supply systems are 5,600 cubic meter per day (1.48 million gallons per day) and 29,678 cubic meters per day (7.84 million gallons per day), respectively (LCWUA, 2000). Figure 3-24 reflects the local water uses (withdrawals) for community water systems (including Eunice and Hobbs) in Lea County for the year 2000.

The Lea County Water Users Association report also estimated the year 2000 uses for the water that Lea County pumps from the Ogallala Aquifer. Irrigation uses for agricultural purposes was 69 percent of the total usage (LCWUA, 2003). Public water supply constitutes 8 percent of the groundwater uses. Hobbs and Lovington pump more than 70 percent of the water needs for Lea County. Other Lea County communities, including Eunice, Jal, and Tatum, together account for only 17 percent. Carlsbad, an Eddy County community, pumps about 10 percent of the water from Lea County public water-supply sources (LCWUA, 2003).

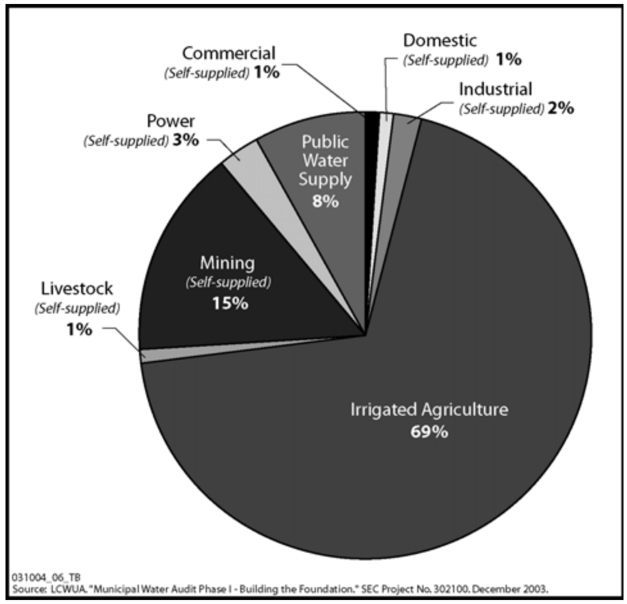

Figure 3-24 Lea County Water Use for 2000 (LCWUA, 2003)

The city of Eunice's residential use poses the single largest demand for water from its municipal system (LCWUA, 2003). Figure 3-25 shows that it accounts for 41 percent of the total demand, while sales to retailers make up the second largest demand. Figure 3-26 shows that the city of Hobbs produces similar findings with residential (domestic) and commercial uses accounting for more than 70 percent of total water use (LCWUA, 2003).

Future regional demand for water would deplete Lea County's current water supply contingent upon usage and conservation efforts (LCWUA, 2003). County plans for increasing the water supply include conservation efforts and developing additional water supplies such as developing deeper aquifers (e.g., Santa Rosa Aquifer) and desalinization of saline waters. Model studies have shown that the Ogallala Aquifer may be completely dewatered in some areas by the year 2040 (LCWUA, 2003). In addition, the Lea County Water Users Association has drafted drought management plans (LCWUA, 2003) that include action levels denoted as Advisory, Alert, Warning, and Emergency with associated water-use actions ranging from voluntary reductions through allocation reductions of 20 (Warning) to 30 (Emergency) percent.

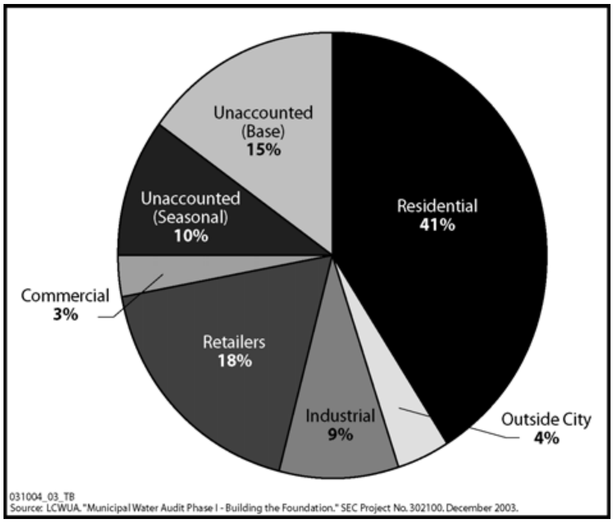

Figure 3-25 Eunice, New Mexico, Average Water Use for 2000-2002 (LCWUA, 2003)

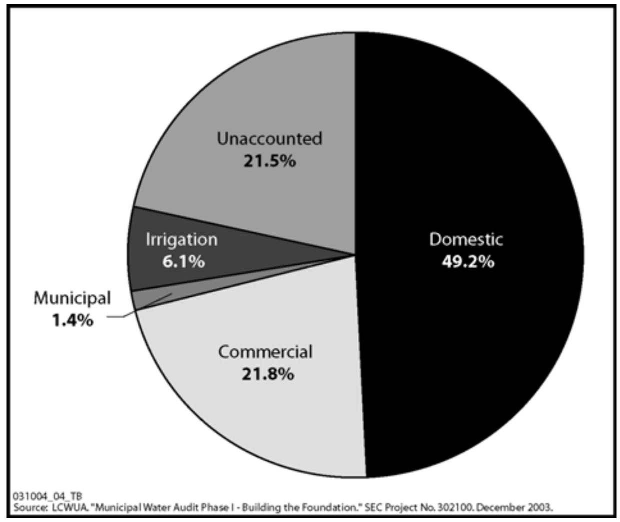

Figure 3-26 Hobbs, New Mexico, Average Water Use for 2000-2002 (LCWUA, 2003)

3.8.3 Ground-Water Quality

The waters of the Ogallala Aquifer, while very hard with a total dissolved solid content of less than 500 milligrams per liter, are consistently good quality and can be used for a variety of activities including public supply and irrigation (RRAT, 2004). The water in the southernmost region of the aquifer, mostly in Texas, is characterized by having higher levels of total dissolved solids that would exceed 1,000 milligrams per liter and in certain areas might reach 3,000 milligrams per liter. In this region, highly mineralized water in underlying rocks of marine origin seem to have invaded the aquifer. Increases of sodium and total dissolved solids contents may also be due to increased local industrial and irrigation practices (RRAT, 2004).

Table 3-10 lists recent water-quality testing results of local (Hobbs and Eunice) public water systems that obtain water from the Ogallala Aquifer. Total dissolved solids concentrations of 415 milligrams per liter are high but acceptable for various uses. Fluoride concentrations of 1.1 milligrams per liter are also high but acceptable. Chloride concentrations are moderate with concentrations up to 114 milligrams per liter, and sulfates are low ranging locally from 67 to 113 milligrams per liter (LCWUA, 2000).

The proposed NEF site has historically been used for cattle grazing. There is no documented history of manufacturing, storage, or significant use of hazardous chemicals on the property; therefore, there are no known previous activities that could have contributed to degradation of groundwater quality. The operations at the surrounding facilities (DD Landfarm, Lea County Landfill, Sundance Services, Inc., Wallach Concrete, Inc., and WCS) have not affected groundwater quality at the proposed NEF site. Ground water from WCS would be transported to the southeast away from the proposed NEF site. Sundance Services, Inc., is located between Wallach Concrete, Inc., and the proposed NEF site. While Sundance Services, Inc. uses ponds to recover oil, there are over 100 monitoring wells along the southern property of Sundance Services, Inc., that have not detected contamination from the property. Neither the DD Landfarm nor the Lea County Landfill are expected to affect the proposed NEF site because they are down-gradient.

Table 3-10 Ogallala Aquifer Annual Water Quality Averages for Hobbs and Eunice, New Mexico

Parameter	Units	Hobbs	Eunice	EPA Maximum Contaminant Levels[*]
Alkalinity—Total	mg/l	163[a]	186.5	N/A
Color		not detected	0.25	250[g]
Specific Conductivity	:mhos/cm	839.9	716.8	N/A
Hardness	mg/l	293.3	248	N/A
pH	standard	7.5	7.2	6.5 - 8.5
Turbidity	NTU	not detected	1.0	N/A
Total Dissolved Solids	mg/l	410.0	415.7	500[g]
Arsenic	mg/l	0.008	0.008[d]	0.01 (as of 1/3/06)
Calcium	mg/l	80.7	80.5	N/A
Chloride	mg/l	114.0	63.4	250[g]
Fluoride	mg/l	1.1	1.0[e]	4.0
Iron	mg/l	0.05	<0.25[f]	0.3
Magnesium	mg/l	44.4	11.5	4.0
Mercury	mg/l	not detected	<0.0002[d]	N/A
Nitrate	mg/l	3.8	2.6	10
Potassium	mg/l	3.4[a]	4.8	
Sodium	mg/l	38.0	42.6	N/A
Sulfate	mg/l	113.1[b]	67.2	
Gross Alpha	pCi/l	3.1 ± 0.9 to 16.6 ± 2.9[c]	2.8 ± 1 to 6.6 ± 1[c]	15

[*]EPA, 2004b.
N/A - not applicable; mg/l - milligrams per liter; NTU - Nephelometric Turbidity Units; pCi/l - picocuries per liter; :mhos/cm - micromhos per centimeter.
[a] Sampled at entry point, August 23, 2004.
[b] Sampled at entry point, February 1996.
[c] Range in concentration, low and high; sampled from 1994 through 1997.
[d] Sampled at entry point, March 1995.
[e] Sampled at entry point, March 1996.
[f] Samples taken from 1975 to 1979.
[g] Results are either annual averages for all wells in a system, at the entry point of a system, or averages of all wells in a system for a particular sampling date.
Source: LCWUA, 2000.

To confirm this, LES installed nine soil boreholes and three monitoring wells as part of its groundwater investigation of the site. Of the three groundwater-monitoring wells installed on the site, only one has produced sufficient water to sample. This groundwater, the first encountered below the site surface, was approximately 67 meters (220 feet) deep within a siltstone layer imbedded in the Chinle Formation clay. The groundwater from this well was analyzed for standard inorganic compounds, volatile organic compounds, semivolatile organic compounds, pesticides, polychlorinated biphenyls, and radiological constituents.

Table 3-11 presents the results of the groundwater-quality sampling and testing program. Almost all of the elements tested were within the New Mexico regulatory limits and EPA maximum contaminant levels. Measurements of those elements which did not meet one standard or the other are highlighted in the table.

Table 3-11 Chemical Analyses of Proposed NEF Site Ground Water

			Existing Regulatory Standards*	
Parameter	**Units**	**NEF Sample**	**New Mexico**	**EPA Maximum Contaminant Levels**
General Properties				
Total Dissolved Solids	mg/l	2,500[e]	1,000	500[a]
Total Suspended Solids	mg/l	6.2	NS	NS
Specific Conductivity	:mhos/L	6,800	NS	NS
Inorganic Constituents				
Aluminum	mg/l	0.480[c]	5.0[d]	0.05 – 0.2[a]
Antimony	mg/l	<0.0036	NS	0.006
Arsenic	mg/l	<0.0049	0.1	0.01 (as of 1/3/06)
Barium	mg/l	0.021	1	2
Beryllium	mg/l	<0.00041	NS	0.004
Boron	mg/l	1.6	0.75[d]	NS
Cadmium	mg/l	<0.00027	0.01	0.005
Chloride	mg/l	1600	250	250[a]
Chromium	mg/l	0.043	0.05	0.1
Cobalt	mg/l	<0.00067	0.05[d]	NS
Copper	mg/l	0.0086	1.0	1.3[b]
Cyanide	mg/l	<0.0039	0.2	0.2
Fluoride	mg/l	<0.5	1.6	4
Iron	mg/l	0.51	1	0.3[a]
Lead	mg/l	<0.0021	0.05	0.015[b]
Manganese	mg/l	1.0	0.2	0.05[a]
Mercury	mg/l	<0.000054	0.002	0.002
Molybdenum	mg/l	0.04	1.0[d]	NS
Nickel	mg/l	0.034	0.2[d]	0.1
Nitrate	mg/l	<0.25	10	10
Nitrite	mg/l	<1	NS	1

Parameter	Units	NEF Sample	Existing Regulatory Standards* New Mexico	EPA Maximum Contaminant Levels
Selenium	mg/l	<0.0046	0.05	0.05
Silver	mg/l	<0.0007	0.05	0.05
Sulfate	mg/l	2,200	600[a]	250[a]
Thallium	mg/l	<0.0081[f]	NS	0.002
Zinc	mg/l	0.016	10	5[a]
Radioactive Constituents				
Gross Alpha*	Bq/l pCi/L	0.6 15.1	NS	0.6 15
Gross Beta	Bq/L pCi/L	1.2 31.4	NS	4 (mrem/yr)
Uranium	pCi/L mg/L	5.97 0.00873	0.030	0.030
U-234	pCi/L mg/L	4.75 0.00695		
U-235	pCi/L mg/L	0.158 0.000231		
U-238	pCi/L mg/L	1.06 0.001551		

* The proposed standard excludes ^{222}Rn, ^{226}Ra, and uranium activity; New Mexico Standards (NMWQCC, 2002); EPA Maximum Contaminant Levels (EPA, 2004b).
Highlighted values exceed a regulatory standard.
NS - No standard or goal has been defined; mg/l - milligrams per liter; pCi/l - picocuries per liter; :mhos/cm - micromhos per centimeter; Bq/L - becquerels per liter.
[a]EPA Secondary Drinking Water Standard (EPA, 2004c).
[b]Action Level requiring treatment.
[c]Results of laboratory or field-contaminated sample.
[d]Crop irrigation standard.
[e]Likely inaccurate. Subsequent measurements indicate concentrations in the range of 6,000-6,400 mg/L.
[f]The minimum detection limit (0.0081) for thallium is greater than the EPA maximum contaminant level of 0.002.
Source: LES, 2005a.

3.9 Ecological Resources

This section describes the terrestrial and aquatic communities of the proposed NEF site and the associated plant and animal species. The interrelationships of these species are also discussed along with habitat requirements, life history, and population dynamics.

Ecological field surveys at the proposed NEF site were conducted in September 2003 (LES, 2005a), October 2003 (Sias, 2003), April 2004 (EEI, 2004a; LES, 2005a), May 2004 (EEI, 2004b), and June 2004 (Sias, 2004). These surveys focused on established empirical data for vegetation cover, mammals, birds, reptiles, and amphibians. A trapping or capture-and-release survey was not used during these initial surveys. Emphasis was placed on determining the habitats of candidate species that would occur at the proposed NEF site. In addition, Lea County conducted surveys in 1997 that covered the 350-acre (142-hectare) Lea County Landfill located across from the proposed NEF site (LCSWA, 1998).

Due to the lack of suitable water-related habitat at the proposed NEF site, no waterfowl or water birds are currently found at the proposed NEF site. The lack of permanent water bodies at the site also results in the presence of few associated amphibian species. Therefore, no aquatic environment discussion is presented in this EIS.

3.9.1 Fauna in the Vicinity of the Proposed Site

The proposed NEF site is located in an extensive deep sand environment. 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. It is dominated by deep-sand-tolerant or deep-sand-adapted plant species and is unique due to the dominance of the shinnery oak community.

The Plains Sand Scrub vegetation community at the proposed NEF site has remained stable since the introduction of domestic livestock grazing in the area by Spanish settlers. The site has not been impacted by farming or oil and gas development that is prevalent in the region.

The species composition of the wildlife at the site is reflective of the type, quality, and quantity of habitat present. Wildlife species at the proposed NEF site are those typical of species that occur in grassland and desert habitats. Table 3-12 lists the mammalian, bird, and amphibian/reptile species likely to be present at the site and vicinity, and presents information regarding their preferred habitats and probable distribution and abundance.

Table 3-12 Mammals, Birds, and Amphibians/Reptiles Potentially Inhabiting the Proposed NEF Site and Vicinity, and Their Habitat and Seasonal Preferences

Common Name	Scientific Name	
Mammals		***Preferred Habitat***
Black-Tailed Jackrabbit	*Lepus californicus*	Grasslands and open areas.
Black-Tailed Prairie Dog	*Cynomys ludovicianus*	Short grass prairie.
Cactus Mouse	*Peromyscus eremicus*	Grasslands, prairies, and mixed vegetation.
Collared Peccary	*Dicotyles tajacu*	Brushy, semi-desert, chaparral, mesquite, and oaks.
Coyote	*Canis latrans*	Open space, grasslands, and brush country.
Deer Mouse	*Peromyscus maniculatus*	Grasslands, prairies, and mixed vegetation.
Desert Cottontail	*Sylvilagus audubonii*	Arid lowlands, brushy cover, and valleys.
Mule Deer	*Odocoileus hemionus*	Desert shrubs, chaparral, and rocky uplands.
Ord's Kangaroo Rat	*Dipodomys ordii*	Hard desert soils.
Plains Pocket Gopher	*Geomys bursarius*	Deep soils of the plains.
Pronghorn Antelope	*Antilocapra americana*	Sagebrush flats, plains, and deserts.
Raccoon	*Procyon lotor*	Brushy, semi-desert, chaparral, and mesquite.
Southern Plains Woodrat	*Neotoma micropus*	Grasslands, prairies, and mixed vegetation.
Spotted Ground Squirrel	*Spermophilus spilosoma*	Brushy, semi-desert, chaparral, mesquite, and oaks.

Common Name	Scientific Name	
Striped Skunk	*Mephitis mephitis*	All land habitats.
Swift Fox	*Vulpes velox*	Rangeland with short grasses and low shrub density.
White-Throated Woodrat	*Neotoma albigula*	Grasslands, prairies, and mixed vegetation.
Yellow-Faced Pocket Gopher	*Pappogeomys castanops*	Deep soils of the plains.
Birds		***Seasonal Preference***
American Kestrel[*+]	*Falco sparverius*	Summer.
Ash-Throated Flycatcher[*+]	*Myiarchus cinerascens*	Summer.
Bewick's Wren[+]	*Thyromanes bewickii*	Spring.
Black-Chinned Hummingbird	*Archilochus alexandri*	Year round.
Blue Grosbeak[+]	*Guiraca caerulea*	Summer and winter.
Bullock's Oriole[+]	*Icterus bullockii*	Summer.
Cassin's Sparrow[+]	*Aimophila cassinii*	Spring.
Cactus Wren[+]	*Campylorhynchus brunneicapillus*	Spring.
Chihuahuan Raven[*+]	*Corvus cryptoleucus*	Rare.
Common Raven	*Corvus corax*	Summer and winter.
Crissal Thrasher[+]	*Toxostoma dorsale*	Summer and winter.
Eastern Meadowlark[+]	*Sturnella magna*	Spring.
European Starling[+]	*Sturnus vulgaris*	Spring.
Gambel's Quail	*Lophortyx gambelii*	Rare.
Great-Tailed Grackle[+]	*Quiscalus mexicanus*	Spring.
Green-Tailed Towhee	*Pipilo chlorurus*	Migrant.
House Finch[*+]	*Carpodacus mexicanus*	Summer and winter.
Killdeer[+]	*Charadrius vociferus*	Year round.
Lark Bunting[+]	*Calamospiza melanocorys*	Winter.
Lark Sparrow[+]	*Chondestes grammacus*	Summer.
Lesser Prairie Chicken	*Tympanuchus pallidicintus*	Rare
Loggerhead Shrike[*+]	*Lanius ludovicianus*	Uncommon.
Long-Eared Owl	*Asio otus*	Summer and winter.
Mallard[+]	*Anas platyrhynchos*	Summer.
Mourning Dove[*+]	*Zenaida macroura*	Summer and winter.
Nighthawk[+]	*Chordeiles minor*	Summer and winter.
Northern Mockingbird[*+]	*Mimus polyglottos*	Summer.
Northern Bobwhite[+]	*Colinus virginianus*	Summer and winter.

Common Name	Scientific Name	
Pyrrhuloxia[+]	*Cardinalis sinuatus*	Uncommon.
Red-Tailed Hawk	*Buteo jamaicensis*	Summer and winter.
Red-Winged Blackbird[+]	*Agelaius phoeniceus*	Spring.
Roadrunner	*Geococcyx californianus*	Summer and winter.
Sage Sparrow	*Amphispiza belli*	Summer and winter.
Scaled Quail[*+]	*Callipepla squamata*	Summer and winter.
Scissor-Tailed Flycatcher[+]	*Tyrannus forficatus*	Migrant.
Scott's Oriole	*Icterus parisorum*	Summer and winter.
Swainson's Hawk[*+]	*Buteo swainsoni*	Summer.
Turkey Vulture	*Cathartes aura*	Winter migrant.
Vermilion Flycatcher	*Pyrocephalus rubinus*	Winter migrant.
Vesper Sparrow[+]	*Pooecetes gramineus*	Spring.
Western Burrowing Owl	*Athene cunicularia hypugea*	Uncommon
Western Kingbird[+]	*Tyrannus verticalis*	Summer.
Amphibians/Reptiles		***Preferred Habitat***
Coachwhip	*Masticophis flagellum*	Mixed grass prairie and desert grasslands.
Collared Lizard	*Crotaphytus collaris*	Desert grasslands.
Eastern Fence Lizard	*Sceloporus undulates*	Mixed grass prairie and desert grasslands.
Garter Snake	*Thamnophis Sp.*	Desert grasslands.
Ground Snake	*Sonora semiannulata*	Desert grasslands.
Longnose Leopard Lizard	*Gambelia wislizenii*	Mixed grass prairie and desert grasslands.
Lesser Earless Lizard	*Holbrookia maculata*	Mixed grass prairie and desert grasslands.
Longnosed Snake	*Rhinocheilus lecontei*	Desert grasslands.
Ornate Box Turtle	*Terrapene ornata*	Desert grasslands and short grass prairie.
Pine-Gopher Snake	*Pituophis melanoleucus*	Short grass prairie and desert grasslands.
Plains Blackhead Snake	*Tantilla nigriceps*	Short grass prairie and desert grasslands.
Plains Spadefoot Toad	*Spea bombifrons*	Shallow to standing pools of water.
Rattlesnakes	*Crotalus Sp.*	Short grass prairie and desert grasslands.
Sand Dune Lizard	*Sceloporus arenicolus*	Open sand and takes refuge under shinnery oak.
Six-Lined Racerunner	*Cnemidophorus sexlineatus*	Mixed grass prairie and desert grasslands.
Tiger Salamander	*Ambystoma tigrinum*	Tall-grass and mixed prairie.
Texas Horned Lizard	*Phrynosoma cornutum*	Desert grasslands.
Western Whiptail Lizard	*Cnemidophorus tigris*	Mixed grass prairie and desert grasslands.

[*] Species detected during the April 2004 survey (EEI, 2004a).
[+] Species detected during the May 2004 survey (EEI, 2004b).
Sources: LES, 2005a; EEI, 2004a; EEI, 2004b; LCSWA, 1998; WCS, 2004c.

3.9.1.1 Endangered and Threatened Species

The U.S. Fish and Wildlife Service (FWS) provided a list of endangered and threatened species, candidate species, and species of concern for Lea County (FWS, 2004a). Endangered species are any species which are in danger of extinction throughout all or a significant portion of its range. Threatened species are any species which are likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. For Lea County, the black-footed ferret and northern aplomado falcon are listed as endangered, and the bald eagle is listed as threatened. Surveys did not identify these animals at or near the proposed NEF site.

3.9.1.2 Candidate Species

Candidate species are those that the FWS has sufficient information to propose that they be added to the Federal list of threatened and endangered species. Three of the species that are likely to occur at the proposed NEF site are on the candidate list: the lesser prairie chicken (*Tympanuchus pallidicintus*), the sand dune lizard (*Sceloporus arenicolus*), and the black-tailed prairie dog (*Cynomys ludovicianus*).

The State of New Mexico has listed the sand dune lizard as a threatened species in Lea County (NMDGF, 2000). The black-tailed prairie dog and the lesser prairie chicken were listed as sensitive taxa in Lea County.

The three candidate species are described below.

<u>Lesser Prairie Chicken</u>

In the area of the proposed NEF site, the presence of a sand shinnery oak habitat would meet the requirements for suitable habitat for the lesser prairie chicken (NRCS, 2004). Figure 3-27 shows the male lesser prairie chicken. The area consists of prairie mixed shrub lands suitable for cover, food, water, and breeding areas (known as booming grounds or leks). Two areas within Lea County have been nominated as an area of critical environmental concern for the lesser prairie chicken. One of these sites is located about 48 kilometers (30 miles) northwest of the site, and one is located further north. The nominations are under evaluation by the BLM (Johnson, 2000). The BLM plans to address this issue through an amendment to the Resource Management Plan (BLM, 2004).

Figure 3-27 Male Lesser Prairie Chicken (FWS, 2004b)

The nearest known lek site (i.e., breeding area) for the lesser prairie chicken is located about 6.4 kilometers (4 miles) north of the site (LES, 2005a). A field survey conducted in the fall of 2003 at the proposed NEF site did not locate any lesser prairie chickens (LES, 2005a). A subsequent field survey in the spring of 2004 confirmed that the lesser prairie chicken habitat at the proposed site is of moderate quality and is limited to a small area. The study highlighted the fact that the eastern portion of the site harbors dense mesquite, and the western portion is dominated by shinnery oak-grassland communities and short grass prairie that provide unfavorable habitats to the lesser prairie chicken. The proposed NEF site contains suitable food sources, but there are no permanent water sources onsite (Johnson, 2000).

The nearest known lek site (i.e., breeding area) for the lesser prairie chicken is located about 6.4 kilometers (4 miles) north of the site (LES, 2005a). A field survey conducted in the fall of 2003 at the proposed NEF site did not locate any lesser prairie chickens (LES, 2005a). A subsequent field survey in the spring of 2004 confirmed that the lesser prairie chicken habitat at the proposed site is of moderate quality and is limited to a small area. The study highlighted the fact that the eastern portion of the site harbors dense mesquite, and the western portion is dominated by shinnery oak-grassland communities and short grass prairie that provide unfavorable habitats to the lesser prairie chicken. The proposed NEF site contains suitable food sources, but there are no permanent water sources onsite (Johnson, 2000).

Sand Dune Lizard

Sand dune lizards (Figure 3-28) only occur in areas with open sand, but they forage and take refuge under shinnery oak (NMDGF, 1996). They are restricted to areas where sand dune blowouts, topographic relief, and shinnery oak occur. They are seldom more than 1.2 to 1.8 meters (4 to 6 feet) from the nearest plant. The sand dune lizard feeds on invertebrates such as ants, crickets, grasshoppers, beetles, spiders, ticks, and other arthropods. Feeding appears to take place within or immediately adjacent to patches of vegetation.

Figure 3-28 Sand Dune Lizard (CBD, 2003)

The proposed 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. Two surveys of the site did not identify favorable sand dune lizard habitats (Sias, 2003; Sias, 2004). The surveys indicated that the vegetation substrate at the proposed NEF site reflects conditions that would not support sand dune lizards. The dominance of the mesquite and grassland combinations at the site are not conducive environmental conditions for this species. The closest sand dune lizard population occurs about 5 kilometers (3 miles) north of the proposed NEF site (Sias, 2004).

Black-Tailed Prairie Dog

The black-tailed prairie dog (Figure 3-29) is a close cousin of the ground squirrel. A heavy-bodied rodent with a black-tipped tail, the black-tailed prairie dog is native to short-grass prairie habitats of western North America where they play an important role in the prairie ecosystem. They serve as a food source for many predators and leave vacant burrows for the burrowing owl, the black-footed ferret, the Texas horned lizard, rabbits, hares, and even rattlesnakes. Black-tailed prairie dogs avoid brush and tall-grass areas due to the reduced visibility these habitats impose. In Texas, they may be found in western portions of the State and in the Panhandle.

At one time, Texas reported huge prairie dog towns, such as one that covered 25,000 square miles and supported a population of about 400 million prairie dogs. Although prairie dog towns are still present in Texas, their current populations has been significantly reduced due to extensive loss of habitat during the last century.

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. Plains-mesa sand scrub, the predominant vegetation type on the proposed NEF site, is not optimal black-tailed prairie dog habitat due to the high density of shrubs (LES, 2005a). There have been no sightings of black-tailed prairie dogs, no active or inactive prairie dog mounds/burrows, or any other evidence of prairie dogs at the proposed NEF site.

Figure 3-29 Black-Tailed Prairie Dog (USGS, 2004c)

3.9.1.3 Species of Concern

The proposed site was also examined for suitable habitats that would be attractive to the listed Species of Concern in the State of New Mexico (FWS, 2004a). Species of concern are species for which further biological research and field study are needed to resolve their conservation status or which are considered sensitive, rare, or declining on lists maintained by Natural Heritage Programs, State wildlife agencies, other Federal agencies, or professional/academic scientific societies. The Species of Concern for the proposed NEF site are the swift fox (*Vulpes velox*), the American peregrine falcon (*Falco peregrinus anatum*), the arctic peregrine falcon (*Falco peregrinus tundrius*), the Baird's sparrow (*Ammodramus bairdii*), the Bell's vireo (*Vireo bellii*), the western burrowing owl (*Athene cunicularia hypugea*), and the yellow-billed cuckoo (*Coccyzus americanus*). The swift fox is a species of concern for Lea County under the Federal listing and is listed as a sensitive species under the State of New Mexico classification (FWS, 2004b; NMDGF, 2000).

The examination of the habitats indicates the proposed NEF site has the potential to attract the swift fox and the western burrowing owl. Given the availability of neighboring open land in the immediate area of the proposed NEF site and the low population density of the swift fox, the proposed NEF site is marginally attractive to the swift fox. However, species such as the swift fox are relatively more susceptible to population-level effects of cumulative habitat loss, and the ultimate effect of this habitat loss is reduced carrying capacity and wildlife population levels. The western burrowing owl requires burrows (natural or human-constructed) for nesting such as the rip raps lining ditches and ponds. If there are burrowing mammals such as prairie dogs (which are not likely to occur) or badgers in the area, then it is likely that the area may be attractive to burrowing owls.

3.9.2 Flora in the Vicinity of the Proposed Site

The vegetation community on the proposed NEF site is classified as plains sand scrub. The dominant shrub species associated with this classification is Shinoak (*Quercus havardii*) with lesser amounts of sand sage (*Artemesia filifolia*), honey mesquite (*Prosopis glandulosa*), and soapweed yucca (*Yucca* *glauca*). 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 (NRCS, 1978).

The dominant perennial grass species is red lovegrass (*Eragrostis oxylepis*). Other grasses include dropseed (*Sporobolus Sp.*) and purple three awn (*Aristida purpurea*), which are present in a lesser degree.

The total vegetative cover for the proposed NEF site is approximately 26.5 percent. Herbaceous plants cover about 16.7 percent of the total ground area, and shrubs cover approximately 9.6 percent of the total ground area. Perennial grasses account for 63.1 percent of the relative cover, shrubs account for 36.1 percent, and forbs account for 0.8 percent. The relative cover is the fraction of total vegetative cover that is composed of a certain species or category of plants.

Total shrub density for the proposed NEF site is 16,660 individuals per hectare (6,748 individuals per acre). The most abundant shrubs are shinoak with 14,040 individuals per hectare (5,688 individuals per acre), followed by the soapweed yucca with 1,497 individuals per hectare (606 individuals per acre), and then the sand sage with 842 individuals per hectare (341 individuals per acre).

3.9.3 Pre-Existing Environmental Stresses

There are no onsite important ecological systems that are 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 candidate species or species of concern. The candidate species that have the potential to be present at the site are all highly mobile with the exception of the sand dune lizard. Ecological studies indicate, however, the absence of habitats for these species at the proposed NEF site (LES, 2005a; LES, 2005b; EEI, 2004a; EEI, 2004b; Sias, 2003; Sias, 2004). The vegetation type covering the proposed NEF site is not unique to that site and covers thousands of acres in southeastern New Mexico.

Past and present cattle grazing, fencing, and the maintenance of access roads and pipeline right-of-ways represent the primary preexisting environmental stress on the wildlife community of the site. The colonization of the disturbed areas by local plant species has alleviated the impact of pipeline installation and maintenance of pipeline right-of-ways. Disturbed areas immediately adjacent to the road, however, are being invaded by weeds. The proposed 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. Changes in local climatic and precipitation patterns are also an environmental stress for the southeastern New Mexico area.

Past and current uses of the proposed NEF site have most likely resulted in a shift from wildlife species associated with mature desert grassland to those associated with grassland shrub communities. Examples of this include a decrease in the pronghorn antelope, a species requiring large, open prairie areas, and an increase in species that thrive in a midsuccessional plant community like the black-tailed jackrabbit and the mule deer. Other environmental stresses on the terrestrial wildlife community, such as disease and chemical pollutants, have not been identified at the proposed NEF site.

3.10 Socioeconomic and Local Community Services

The socioeconomic characteristics for the 120-kilometer (75-mile) region of influence surrounding the proposed NEF site include Lea County, New Mexico, and Andrews County and Gaines County, Texas, as well as portions of Eddy County, New Mexico, and Ector, Loving, Winkler, and Yoakum Counties, Texas.

Established in March 1917, Lea County covers approximately 11,378 square kilometers (4,393 square miles). Its county seat, Lovington, is located 64 kilometers (39 miles) north-northwest of the proposed NEF site. The largest city in the county is Hobbs, and it is situated 32 kilometers (20 miles) to the north. Other incorporated communities in Lea County are Jal, 37 kilometers (23 miles) to the south; Eunice, 8 kilometers (5 miles) to the west; and Tatum, 72 kilometers (45 miles) to the north-northwest.

Due east of the proposed NEF site is Andrews County, Texas. Organized in 1910, Andrews County has a land area of 3,895 square kilometers (1,504 square miles). The county seat, city of Andrews, is 51 kilometers (32 miles) east-southeast of the proposed NEF site and is the only incorporated community in the county. There are no other major communities in Andrews County.

Northeast of the proposed NEF site is Gaines County, Texas, which was organized in 1905. Gaines County is approximately the same size as Andrews County (3,892 square kilometers (1,503 square miles). The county seat is Seminole, and it is located 51 kilometers (32 miles) to the northeast (Coward, 1974).

The majority of the impacts are expected to occur in Lea County, given its larger population and workers living in closer proximity to the proposed NEF site and, to a lesser extent, in Andrews and Gaines Counties, Texas. Portions of Eddy County, New Mexico, and Ector, Loving, Winkler, and Yoakum Counties, Texas, are within the region of influence but are not expected to be impacted to any great extent. Figure 3-30 shows the population density surrounding the proposed NEF site.

Figure 3-1 shows the major communities and transportation routes in the region of influence. The remainder of this section presents information and data for population, housing, and education; employment and income; community services, infrastructure, and finances; utilities; waste disposal; and tax structure and distribution.

3.10.1 Population, Housing, and Education

In 2000, the population of Lea County was approximately 55,511 with slightly more than half (28,660) living in Hobbs. The county seat, Lovington, had a population of 9,470. The other three incorporated communities in the county had a combined population of 5,240. About 22 percent of the county population lives in the unincorporated areas. Overall, the county has a population density of 4.9 people per square kilometer (12.76 square miles) (USCB, 2004). As shown in Table 3-13, the population of Lea County declined by about 1 percent between 1980 and 2000. This decline is in sharp contrast to the State of New Mexico, whose population increased by more than a half million people—or by nearly 40 percent—over the same period. Table 3-13 does not show the rapid increase in population that occurred in the early 1980's followed by a more gradual decrease during the remainder of the decade because the table presents an average over the decade and not annual changes. Beginning in the late 1970's, the population of Lea County expanded by 10,000 residents reaching a peak of more than 66,000 by the end of 1983. This population growth and decline was due to the expansion and contraction of the oil industry. From 1985 to 1990, the county lost population as oil prices stabilized and subsequently fell.

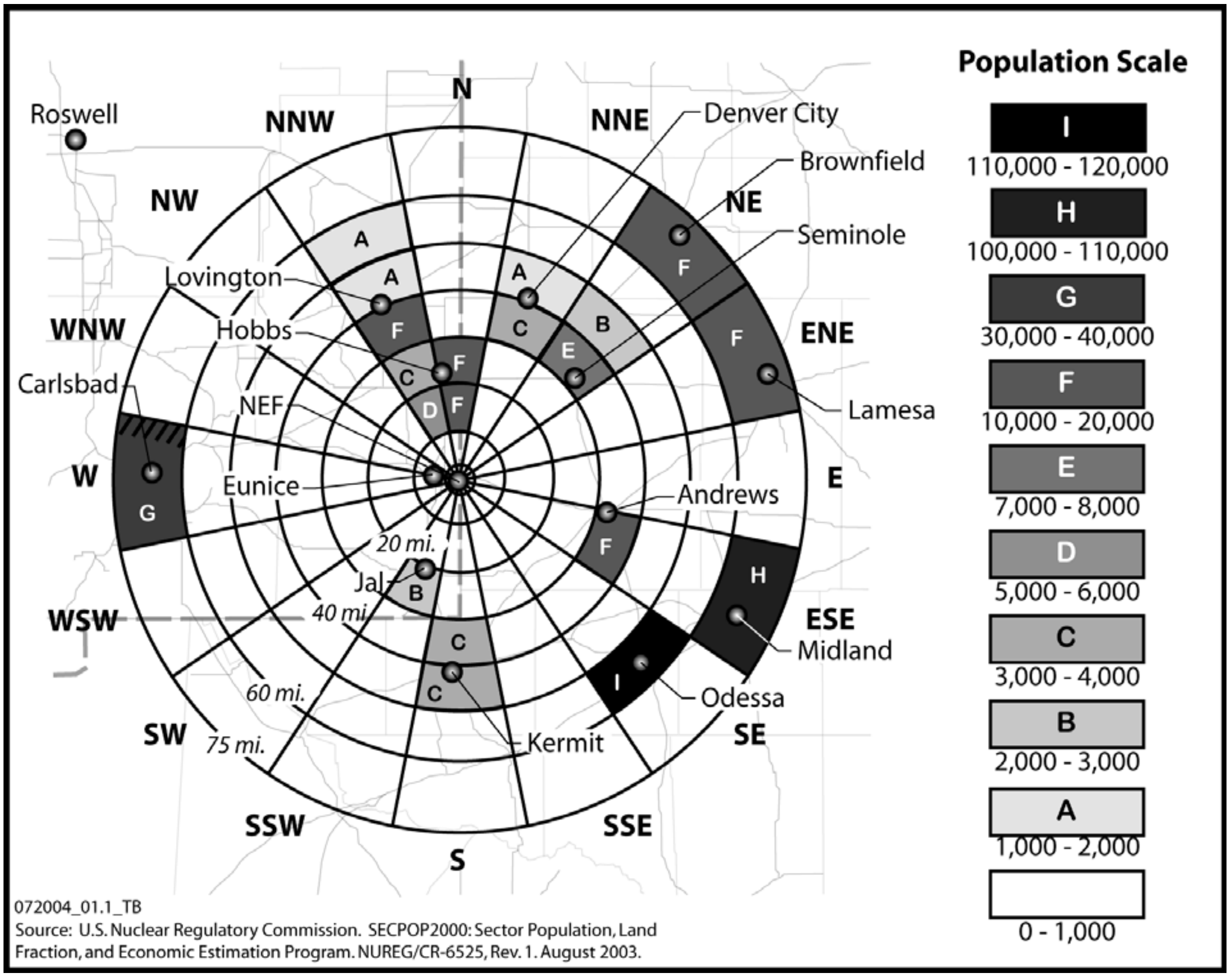

Figure 3-30 Population Density Surrounding the Proposed NEF Site (NRC, 2003a)

Andrews County is the 151st largest of the 254 counties in Texas. According to the U.S. Census Bureau, the population of Andrews County was 13,004 in 2000 with a population density of 3.3 people per square kilometer (8.7 square miles) (USCB, 2004). Its population experienced a similar growth/decline pattern as that of Lea County. The population of Gaines County in 2000 was 14,467. Unlike in Andrews County, the population of Gaines County was relatively stable during the 1990's. The total population of the three principal counties in the region of influence was nearly 83,000 in 2000. The area did not experience the population increases that occurred in other areas of New Mexico and Texas.

Table 3-13 shows that population growth in Lea County is projected to decline through the remainder of the decade (BBER, 2002). This is in contrast to Andrews County and Gaines County, where the population is expected to increase by 8.3 and 12.5 percent, respectively, between 2000 and 2010 (WSG, 2004). For the region of influence as a whole, the population is projected to remain stable throughout the decade. Both New Mexico and Texas are expected to continue to experience high population growth rates. As shown earlier, there are no significant populations within 24 kilometers (15 miles) of the proposed NEF with the exception of the city of Eunice 8 kilometers (5 miles) due west. Figure 3-1 shows the town of Hobbs due north of the site and Lovington further away in the north-northwestern direction. Between 24 and 48 kilometers (15 and 30 miles) south-southwest of the proposed site is a concentration of about 2,000-3,000 people that includes the community of Jal. East-southeast between 48 and 80 kilometers (30 and 50 miles) away from the proposed NEF is the city of Andrews and surrounding area with a population concentration of 12,000 to 14,000 people. The two major population concentrations in Gaines County—Seminole and Denver City—are northeast of the proposed NEF site.

Table 3-14 shows that the housing density in Lea County is 2.0 units per square kilometer (5.3 units per square mile), and the median cost of a home is $50,100. The New Mexico State average housing density is 2.5 units per square kilometer (6.4 units per square mile), and the median cost of a home is $108,000. In Andrews and Gaines counties, the housing units density is 1.4 units per square kilometer (3.6 units per square mile). The median cost of a home in Andrews and Gaines Counties is $42,500 and $48,000, respectively. The Texas State average housing density is 12 units per square kilometer (31.2 units per square mile), and the median cost of a home is $82,500. The variation in housing between the counties and the State averages is reflective of the rural nature of the county areas. The percentage of vacant housing units is 15.8 percent for Lea County, 14.8 percent for Andrews County, and 13.5 percent for Gaines County. This compares to a housing vacancy of 13.1 percent in New Mexico and 9.4 percent in Texas.

Table 3-13 Baseline Values for Population and Growth in the Region of Influence

County	Population					
	1980	1990	2000	2010	2020	2030
Lea County, New Mexico	55,993	55,765	55,511	54,551	52,556	49,417
Andrews County, Texas	13,323	14,338	13,004	14,083	14,704	14,923
Gaines County, Texas	13,150	14,123	14,467	16,273	17,852	18,894
Region of Influence	82,466	84,226	82,982	84,907	85,112	83,234
New Mexico Total	1,303,303	1,515,069	1,819,046	2,112,957	2,382,999	2,626,333
Texas Total	14,225,512	16,986,335	20,851,820	24,395,179	27,917,492	31,197,014
County	**Percent Decade Change**					
		1980-1990	**1990-2000**	**2000-2010**	**2010-2020**	**2020-2030**
Lea County, New Mexico	--	-0.4	-0.5	-1.7	-3.7	-6.0
Andrews County, Texas	--	7.6	-9.3	8.3	4.4	1.5
Gaines County, Texas	--	7.4	2.4	12.5	9.7	5.8
Region of Influence	--	1.1	-2.3	0.2	-2.0	-4.3
New Mexico Total	--	16.3	20.1	16.2	12.8	10.2
Texas Total	--	19.4	22.8	17.0	14.4	11.7

Sources: USCB, 2002a; USCB, 2002b; BBER, 2002; Fedstats, 2004; WSG, 2004.

The population surrounding the proposed NEF site generally has a lower level of educational attainment than the State averages. Table 3-14 summarizes the school enrollment and educational attainment data for the three principal counties. These counties have approximately the same proportion of their residents in primary and secondary grades, and a significantly smaller proportion attending college than averages for New Mexico and Texas (WSG, 2004).

3.10.2 Employment and Income

In 2000, the labor force was nearly 33,573 (Lea County – 22,286, Andrews County – 5,511, and Gaines County – 5,776). The unemployment rate was 9.1 percent in Lea County and 8.1 percent in Andrews County. In Gaines County, the unemployment rate was less at 5.5 percent. For these counties, unemployment was higher than their State averages.

Table 3-14 Demographic, Housing, and Education Characteristics in the Region of Influence

Subject	Lea County	Andrews County	Gaines County	Region of Influence	New Mexico Total	Texas Total
Demographics (Year 2000)						
Total Population	55,511	13,004	14,467	82,982	1,819,046	20,851,820
Housing Characteristics (Year 2000)						
Total Housing Units	23,405	5,400	5,410	34,215	780,579	8,157,575
Occupied Units	19,699	4,601	4,681	28,981	677,971	7,393,354
Land Area	4,383	1,501	1,503	7,387	121,356	261,797
Housing Density (units per square mile)	5.3	3.6	3.6	4.6	6.4	31.2
Median Value (Year 2000 $)	$50,100	$42,500	$48,000	$48,570	$108,100	$82,500
Educational Characteristics (Year 2000)						
School Enrollment	16,534	3,864	4,369	24,767	533,786	5,948,260
Grades <8	48.4%	51.0%	57.8%	50.4%	55.2%	58.0%
Grades 9-12	25.5%	30.3%	25.1%	26.2%	22.3%	21.9%
College	16.7%	8.6%	6.1%	13.6%	22.5%	20.2%
Educational Attainment (>25 years age)	33,291	7,815	8,006	49,112	1,134,801	12,790,893
High School Graduate	67.1%	68.0%	56.2%	65.4%	78.9%	75.7%
Bachelor’s Degree or Higher	11.6%	12.4%	10.5%	11.6%	23.5%	23.2%

Sources: USCB, 2002a; USCB, 2002b.

Table 3-15 shows the employment and income for the region of influence. Petroleum production, processing, and distribution (which falls under Agriculture, Forestry, Fishing, and Mining in Table 3-15) and agriculture are the dominant industries in the surrounding area. Associated with this sector are various support services including machining and tooling, chemical production, specialty construction, metal fabrication, and transportation and handling. Approximately 21.5 percent of the jobs are classified in these industries. This percentage compares to 4 percent and 2.7 percent in New Mexico and Texas, respectively. The percentage of the labor force in professional, scientific, and management-related occupations in these counties is about half of the labor force for New Mexico and Texas. Other sectors are similar to State averages.

In the early 1980's, the median household incomes for Lea County, Andrews County, and Gaines County exceeded the median income for New Mexico and Texas as a whole. Since then, the median household income in both counties has fallen considerably below that of the State averages. The decline in income to levels below State averages is due to a shift in employment from relatively high-paying jobs in the oil and gas industry to lower paying jobs in the service sector. In 2000, per capita income ranged from $13,088 in Gaines County to $15,916 in Andrews County. Per capita income is about $3,100 per year less than the State average in Lea County and $3,700 per year less in Andrews County. In Gaines County, the per capita income is more than $6,500 lower than the State average. The median household income is $29,799 for Lea County, $34,036 for Andrews County, and $30,432 for Gaines County—well below their respective State averages.

Table 3-15 Employment and Income in the Region of Influence

Subject	Lea County, New Mexico	Andrews County, Texas	Gaines County, Texas	Region of Influence	New Mexico Total	Texas Total
Employment (Year 2000)						
In-Labor Force	22,286	5,511	5,776	33,573	823,440	9,830,559
Employed	20,254	5,064	5,460	30,778	763,116	9,234,372
Unemployed	2,032	447	316	2,795	60,324	596,187
Unemployment Rate	9.1%	8.1%	5.5%	8.3%	7.3%	6.1%
Industry			**Share of Total Employment**			
Agriculture, Forestry, Fishing, and Mining	20.7%	21.0%	25.0%	21.5%	4.0%	2.7%
Construction	6.3%	5.1%	7.3%	6.2%	7.9%	8.1%
Manufacturing	3.5%	8.6%	5.3%	4.7%	6.5%	11.8%
Trade (wholesale and retail)	15.2%	13.9%	14.5%	14.8%	14.9%	15.9%
Transportation and Utilities	6.7%	4.1%	7.4%	6.4%	4.7%	5.8%
Information	1.1%	1.8%	1.3%	1.3%	2.4%	3.1%
Finance, Insurance, and Real Estate	3.2%	3.5%	3.7%	3.3%	5.5%	6.8%
Professional, Scientific, Management, Administration, and Waste Management	4.5%	4.6%	1.5%	4.0%	9.4%	9.5%
Educational, Health, and Social Services	20.6%	24.6%	20.2%	21.2%	21.7%	19.3%

Subject	Lea County, New Mexico	Andrews County, Texas	Gaines County, Texas	Region of Influence	New Mexico Total	Texas Total
Arts, Entertainment, Recreation, etc.	6.6%	5.2%	4.7%	6.0%	9.8%	7.3%
Other Services	6.6%	4.5%	6.6%	6.3%	5.1%	5.2%
Public Administration	5.1%	3.2%	2.7%	4.4%	8.0%	4.5%
Income						
Median Household Income ($)	29,799	34,036	30,432	30,572	34,133	39,927
Per Capita Income ($)	14,184	15,916	13,088	14,264	17,261	19,617

Sources: USCB, 2002a; USCB, 2002b.

3.10.3 Community Services, Infrastructure, and Finances

There are four schools located within an 8-kilometer (5-mile) radius of the proposed NEF site. These include an elementary school, a middle school, a high school, and a private K-12 school. The school system in Hobbs, New Mexico, includes a special education facility, 12 elementary schools, 3 junior high schools, and a high school that serves grades 10 through 12. There are also two private schools, a community vocational college (New Mexico Junior College), and a four-year college (College of the Southwest). The closest schools in Texas are located about 50 kilometers (32 miles) away from the proposed site.

The nearest hospital to the site is the Lea Regional Medical Center. It is located about 32 kilometers (20 miles) north of the proposed NEF site in Hobbs. It has 250 beds and handles both acute and stable chronic-care patients. Nursing or retirement homes are also located in Hobbs. The next closest hospital, Nor-Lea Hospital, is located in Lovington, about 64 kilometers (39 miles) north-northwest of the proposed NEF. It is a full-service hospital with 27 beds. The Eunice Medical Clinic is the closest medical clinic to the proposed NEF.

Public safety within the vicinity of the site includes fire support provided by the Eunice Fire and Rescue Service (with a full-time Fire Chief and 34 volunteers) and the Eunice Police Department (with 5 full-time officers). Mutual-aid agreements also exist with all of the county fire and police departments. If additional fire or police services are required, nearby counties can provide additional response services. In particular, members of the proposed NEF Emergency Response Organization can provide information and assistance in instances where radioactive/hazardous materials are involved. Table 3-16 describes the available fire and rescue equipment.

The main highway in the county is U.S. Highway 62-180, which runs east-west through Hobbs. It is designated as a primary feeder to the interstate highway system. The community of Eunice lies near the junction of New Mexico Highways 207 and 234. New Mexico Highways 234 (east-west) and 18 (north-south) are the major transportation routes near the proposed NEF site and intersect about 6.4 kilometers (4 miles) west. The nearest residences are located along the west side of New Mexico Highway 18, just south of its intersection with New Mexico Highway 234.

An active railroad line operated by the Texas-New Mexico Railroad runs parallel to New Mexico Highway 18 and is located just east of Eunice. There is also an active private railroad spur line that runs from the Texas-New Mexico Railroad along the north boundary of the proposed NEF site and terminates at the WCS facility just across the New Mexico-Texas border. Section 3.13.2 of this Chapter provides additional information on this railroad.

The nearest airport is about 24 kilometers (15 miles) west from the site. It is maintained by Lea County and is used primarily by privately owned planes. The airport has two runways that are 1,000 meters (3,280 feet) and 780 meters (2,550 feet) in length. There is neither a control tower nor commercial air carrier flights at this airport. Lea County Regional Airport is the nearest commercial carrier airport located 40 kilometers (25 miles) north in Hobbs, New Mexico (LES, 2005a). Section 3.13.3 of this Chapter provides additional information on the airports within the region of influence.

Table 3-16 Eunice Fire and Rescue Equipment in the Vicinity of the Proposed NEF Site

Type of Equipment	Quantity	Description
Ambulance	3	None
Pumper Fire Trucks	3	340 m^3/hr (1,500 gpm) pump; 3,785 L (1,000 gal) water capacity
		227 m^3/hr (1,000 gpm) pump; 1,893 L (500 gal) water capacity
		284 m^3/hr (1,250 gpm) pump; 2,839 L (750 gal) water capacity
Water Truck	1	114 m^3/hr (500 gpm) pump; 22,700 L (6,000 gal) water capacity
Grass Fire Truck	3	68 m^3/hr (300 gpm) pump; 3,785 L (1,000 gal) water capacity
		34 m^3/hr (150 gpm) pump; 1,136 L (300 gal) water capacity
		34 m^3/hr (150 gpm) pump; 946 L (250 gal) water capacity
Rescue Truck	1	45 m^3/hr (200 gpm) pump; 379 L (100 gal) water capacity

m^3/hr - cubic meters per hour.
gpm - gallons per minutes.
L - liters; gal - gallons.
Source: LES, 2005a.

3.10.4 Utilities

3.10.4.1 Electric Power Services

Southwestern Public Service Company, now operating as Xcel Energy, provides electricity to the area surrounding the proposed NEF (EDCLC, 2004). The electrical power for the proposed NEF would be derived by means of two synchronized 115-kilovolt overhead transmission lines from a substation east of the site. The Xcel Energy service territory encompasses about 134,700 square kilometers (52,000 square miles). Large commercial and industrial users are provided service under contract. There is a demand charge of $1,654 for the first 200 kilowatts that increases by $7.76 for each additional kilowatt. Energy rates are $0.02505 per kilowatt-hour for the first 230 kilowatt-hour per month-kilowatt or the first 120,000 kilowatts. Energy rates decline slightly for additional usage. Power-factor adjustments may apply to large users, and fuel-cost adjustments may be imposed on all customers.

3.10.4.2 Natural Gas Services

The Public Service Company of New Mexico provides natural gas services to the Eunice area (EDCLC, 2004). As with electricity service, natural gas is relatively inexpensive. The average cost of gas is about $2.51 per thousand cubic feet for all customer classes and is significantly below national averages.

3.10.4.3 Domestic Water Supply

Lea County municipal water comes from wells that tap the Ogallala Aquifer (EDCLC, 2004). In Eunice, water is pumped from a well field located near Hobbs and transported south in two parallel cross-country mains (LCWUA, 2003). The pumping depth is about 15 meters (50 feet). The water quality is good, and disinfection is the only treatment performed prior to delivery. Currently, Eunice is pumping about 2.04 million cubic meters (1654 acre-feet) annually with a difference between base winter demand and summer peak demand of nearly 240 percent (EDCLC, 2004).

3.10.4.4 Waste Disposal

In Eunice and Hobbs, solid-waste-disposal pickup is contracted to Waste Management, Inc. Pickups are offered once or twice a week. Solid wastes are disposed of in the Lea County Landfill located about 8 kilometers (5 miles) east of Eunice just across from the proposed NEF site. The landfill accepts all types of residential, commercial, special wastes, and sludges (EDCLC, 2004).

3.10.5 Tax Structure and Distribution

Property taxes in New Mexico are among the lowest in the United States. Four governmental entities within New Mexico are authorized to tax—the State, counties, municipalities, and school districts. Property assessment rates are 33-1/3 percent of value. The tax applied is a composite of State, county, municipal, and school district levies. The Lea County tax rate for nonresidential property outside the city limits of Eunice is $18.126 per $1,000 of net taxable value of a property. Rates for nonresidential property are slightly higher within the city limits of Eunice. Residential property tax rates are somewhat lower for properties within and outside Eunice. For Hobbs, tax rates are somewhat higher.

New Mexico also imposes a gross receipts tax on producers and businesses. This tax is mostly passed onto the consumer. The State gross receipts tax rate is 5.00 percent, and local communities may also impose an additional 1.9375 percent.

In Texas, property taxes are based on the most current year's market value. Andrews County, Texas, has a county property tax rate (per $100 assessed value) of $0.539 per $100 assessment, a school district tax of $1.717 per $100 assessed value, and a municipal rate for the city of Andrews of $0.305 per $100 assessed value. The county tax rate for Gaines is $0.381, with municipal and school district rates for Seminole of $0.60 and $0.98, respectively. There is also a State sales tax of 6.25 percent and municipal sales tax of 1 percent.

3.11 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (59 FR 7629), directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. In December 1997, the Council on Environmental Quality released its guidance on environmental justice under NEPA (CEQ, 1997). Although an independent organization, NRC has committed to undertake environmental justice reviews.

The NRC Nuclear Material Safety and Safeguards (NMSS) environmental justice guidance is found in Appendix C to NUREG-1748 (NRC, 2003b).

This environmental justice review analyzes whether the proposed NEF has the potential for an environmental justice concern for low-income and minority populations resulting from the proposed action and its alternatives. The NRC staff analyzed demographic data to identify the minority and low-income groups within the area of environmental study. Next, the impacts from the proposed action and its alternatives were evaluated to determine if the impacts disproportionately affected minority and low-income groups in an adverse manner.

For the purpose of this procedure, minority is defined as individual(s) who are members of the following population groups: American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; African American (not of Hispanic or Latino origin); some other race; and Hispanic or Latino (of any race). In the States of New Mexico and Texas, it is likely that "some other race" mainly includes individuals who identified themselves on the 2000 Census in a Latino or Hispanic group under "race"(e.g., Mexican or Puerto Rican), even though Hispanic/Latino is not a Census racial category. The 2000 Census introduced the multiracial category. Anyone who identifies themselves as white and a minority is counted as that minority group. In the small number of cases where individuals identify themselves as more than one minority, the analysis counts that individual in a "Two or More Races" group.

To determine if environmental justice will have to be considered in greater detail, the NRC staff compares the percentage of minority and low-income populations in Census block groups in the area for assessment to the State and county percentages. If the minority or low-income population percentage in a block group exceeds 50 percent or is significantly greater than the State or county percentage, environmental justice will have to be considered in greater detail. Generally (and where appropriate), the NRC staff may consider differences greater than 20 percentage points to be significant. When determining the area for impact assessment for a facility located outside the city limits or in a rural area, a 6.4-kilometer (4-mile) radius (or 130-square kilometer [50-square mile]) could be used. A larger area should be considered if the potential impact area is larger. The staff also supplements the demographic analysis with scoping to identify low-income and minority populations (NRC, 2003b).

In the current situation, the States of New Mexico and Texas have very high percentages of minority populations, and rural areas in the State tend to have sparsely-populated large block groups (a block group is a cluster of census blocks that are normally comprised of up to several hundred people). As a result of the nature of the proposed action being examined and the rural nature of the area, the area for impact assessment was expanded to an 80-kilometer (50-mile) radius and includes an assessment along transportation routes. It is important to note that the expanded radius does not dilute the environmental justice impact of the proposed NEF because no averaging of environmental effects takes place; instead, each minority community is evaluated on its own. The criteria for identifying minority and low-income communities are not diluted by the wider radius because the demographic and income characteristics of each block group are individually compared against the States of New Mexico and Texas and the relevant counties. Rather, it simply expands the geographic area where additional minority and low-income block groups can be (and were) identified.

Usually, under NRC guidance, a minority population with environmental justice potential would be one with a minority percentage of at least 50 percent or at least 20 percentage points greater than the State and relevant counties. However, the State of New Mexico has a high Statewide minority population. Table 3-17 shows the Hispanic/Latino population in New Mexico is 42.1 percent and the total minority population is 55.3 percent, while the corresponding national percentages are 12.5 percent and 30.9

percent. A similar situation occurs in Texas, with an Hispanic/Latino population of 32.0 percent and a total minority population of 47.6 percent. Therefore, in both States, a census block group within the impact assessment area with a Hispanic/Latino population of at least 50 percent or with a minority population of at least 50 percent ordinarily would count as a minority population worthy of further study.

In view of the resulting anomalously high standard for designating minority populations in New Mexico and to better meet the spirit of the NRC guidance to identify minority and low-income populations, the NRC staff included Census block groups with a percentage of Hispanics and Latinos at least as great as the Statewide average. This more inclusive definition adds two additional minority block groups in Lea County and four in Andrews County. Each block group was compared to the corresponding State and county percentages for each individual racial category and the Hispanic/Latino category and for the sum of all minority categories taken together (all racial minorities, plus white Hispanic/Latinos) using the percentage criteria. Although New Mexico and Texas are both within the top 10 States for percentage of low-income individuals (with percentages of 18.4 and 15.4 percent, respectively) for the 80-kilometer (50-mile) region surrounding the proposed NEF, the percentage of low-income persons in almost all of the block groups is within 20 percentage points of the national average of 12.4 percent. The usual "50 percent or 20 percent greater than" standard based on the Statewide percentage appears adequate to identify the concentrations of low-income population.

In some cases, minority and low-income groups may rely on environmental resources for their subsistence and to support unique cultural practices. Therefore, NRC guidance specifies that the NRC staff review special resource uses or dependencies of identified minority and low-income populations including cultural practices and customs, previous environmental impacts, and features of previous and current health and economic status of the identified groups. In some circumstances, these groups could be unusually vulnerable to impacts from the proposed action.

Potential resource dependencies were sought in the course of public meetings and other information supplied by the Hispanic/Latino and African American/Black communities in meetings with the NRC staff. Letters were also sent to local Federally recognized Indian tribes to determine any potential resource dependencies. These letters described the construction and operation of the proposed NEF, solicited their concerns on the project, and inquired about whether the Indian tribes desired to participate in the Section 106 consultation process (see Appendix B). The Kiowa Tribe of Oklahoma, Comanche Tribe of Oklahoma, and Ysleta del Sur Pueblo and Mescalero Apache Tribe have indicated that there are no historic properties in the area of potential effects that could have cultural or religious significance to them. Currently, very few Indians live in the area. The NRC staff examined data provided by the States of New Mexico and Texas concerning the health status of the minority and low-income populations in Lea and Eddy Counties in New Mexico and Andrews County in Texas. The results are described in section 4.2.9 of this EIS.

The NRC staff examined the geographic distribution of minority and low-income populations within 80 kilometers (50 miles) of the proposed NEF site (see Appendix G). This data was based on 2000 U.S. Census information and supplemented by field inquiries by the NRC staff to the local planning departments in Lea, Eddy, and Andrews counties and to social service agencies in the two States. In addition, public comments during the scoping process were reviewed to see if any additional environmental justice populations could be identified.

Table 3-17 Percentage of Minority and Low-Income Census Block Groups Within 80 Kilometers (50 Miles) of the Proposed NEF Site

	Total Census Block Groups in County	Below Poverty Level	African American/ Black	Native American	Asian and Pacific Islander	Other Races	Two or More Races	Hispanic or Latino (All Races)	Minorities (Racial Minorities plus White Hispanics)	Total Minority Block Groups
State of New Mexico (%)	--	18.4	2.1	10.2	1.4	19.0	0.6	42.1	55.3	--
Threshold for EJ Concerns (%)	--	38.4	22.1	30.2	21.4	39.0	20.6	50.0/42.1	50.0	--
	Number of Block Groups Meeting Environmental Justice Criteria									
Eddy County	3	0	0	0	0	0	0	1	1	1
Lea County	63	8	1	0	0	15	0	28	29	31
New Mexico Counties	66	8	1	0	0	15	0	29	30	32
State of Texas (%)	--	15.4	11.7	0.9	3.0	13.0	0.4	32.0	47.6	--
Threshold for EJ Concerns (%)	--	35.4	31.7	20.9	23.0	33.0	20.4	50.0/32.0	50.0	--
Andrews County	15	0	0	0	0	1	0	11	6	11
Ector County	5	0	0	0	0	0	0	3	1	3
Gaines County	13	0	0	0	0	1	0	10	4	10
Loving County	1	0	0	0	0	0	0	0	0	0
Terry County	1	0	0	0	0	0	0	1	0	1
Winkler County	10	1	0	0	0	1	0	9	3	9
Yoakum County	6	0	0	0	0	1	0	6	2	6
Texas Counties	51	1	0	0	0	4	0	40	16	40
Grand Total	**117**	**9**	**1**	**0**	**0**	**19**	**0**	**69**	**46**	**72**

Sources: USCB, 2002a; USCB, 2002b.

3.11.1 Minority Populations

The significant minority populations near the proposed NEF are Hispanics/Latinos. Lea County had a 2000 Census population of 22,010 persons of Hispanic/Latino ethnicity out of a total resident population of 55,511 (39.6 percent). Figure 3-31 illustrates the minority population census block groups within 80 kilometers (50 miles) of the proposed NEF and shows the locations of the block groups that meet the minority criteria. Table 3-17 shows the number of minority populations and low-income census block groups within 80 kilometers (50 miles) that satisfy each criterion used for this analysis. Taken together, the criteria resulted in 72 minority block groups out of 117 total block groups within 80 kilometers (50 miles) of the proposed NEF. Of these, 69 were identified using the total minority criterion, and an additional 3 were identified from 1 of the individual minority categories. Many of the minority block groups satisfied one or more individual minority group criteria in addition to the total minority criterion.

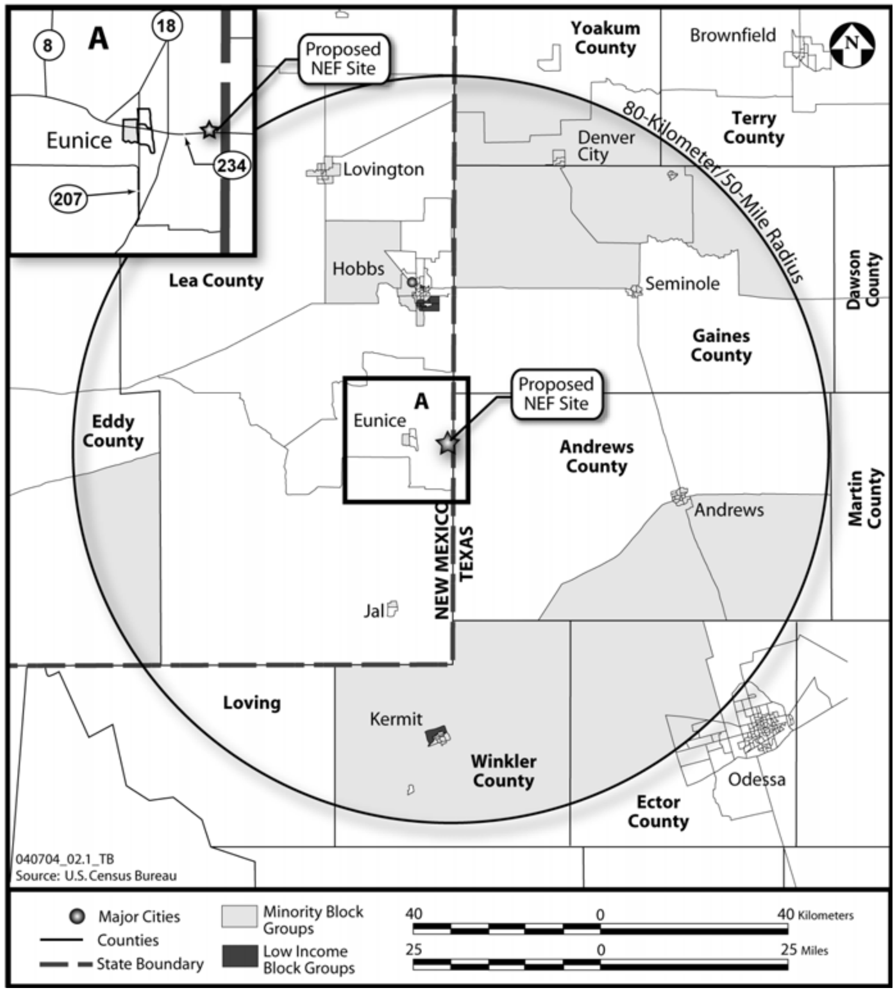

Figure 3-31 Geographic Distribution of Minority and Low-Income Census Block Groups within an 80–Kilometer (50-Mile) Radius of the Proposed NEF Site (USCB, 2003)

The minority and low-income percentages for each census block group within 80 kilometers (50 miles) of the proposed NEF are tabulated in Appendix G. In the table, the census block groups exceeding the 50 percent/20-percentage-point criterion are in boldface, while additional block groups with Hispanic/Latino populations at least as great as the Statewide percentage are shown in italics.

It should be noted that for this analysis, the State was used as the area of geographic comparison. That is, the minority and low-income populations were based on a comparison to the State averages. Using county averages instead made no difference in the minority and low-income block groups identified. There is a small African American/Black population in Lea County. One block group in Lea County has an elevated African American/Black population, but would have qualified as a minority block group because it has a Hispanic/Latino majority.

Hispanics/Latinos are Lea County's principal minority group with 22,010 individuals. There is a significant Hispanic community in all towns in the county. Also, there are concentrations of Hispanics in all seven Texas counties within 80 kilometers (50 miles) of the proposed NEF site. There are Hispanic/Latino block groups along all of the principal commuting and construction access routes to the proposed NEF site. The African-American/Black community on the south side of Hobbs, New Mexico also lies close to one of these routes. No other significant minority populations were identified in any census block group either close to the proposed NEF site or along the proposed transportation corridors into the site.

In summary, 72 census block groups within 80 kilometers (50 miles) of the proposed NEF site were identified as satisfying the criteria used in this analysis to consider environmental justice in greater detail based on their minority population. The minority population nearest to the proposed NEF site is the Hispanic/Latino population living on the west side of Eunice, New Mexico approximately 8 kilometers (5 miles) from the proposed NEF. Minority block groups also are located along the likeliest commuting and construction access routes. The staff supplemented the demographic analysis with scoping to identify minority populations.

The NRC scoping meeting was held at the Community Center in Eunice, New Mexico on March 4, 2004. The notice of the scoping meeting was published in local and regional newspapers. The fact sheet, meeting slides, agenda and meeting flyers were printed in Spanish. Spanish-language invitations were given to local government leaders and to the Hispanic Awareness Council for further distribution. In addition, the NRC staff held a meeting with persons considered knowledgeable about the concerns of the Hispanic Community in Lea County. This meeting took place on the morning of March 4, 2004, in Hobbs, New Mexico. Seven persons attended the meeting and all of them were from Hobbs, New Mexico, although they have broader contacts in the county. In the afternoon, the NRC staff met with two individuals, both from Hobbs, who were acquainted with issues in the African-American community. The issues raised by the members of the minority communities at these meetings have been addressed in the EIS.

3.11.2 Low-Income Populations

Figure 3-31 also shows the location of low-income populations for the environmental study area out to 80 kilometers (50 miles) from the proposed NEF site. Table 3-17 shows that a total of 9 block groups exceed the 20-percentage-point criterion. However, many other block groups in the area also have relatively high percentages of people living below the poverty line. Appendix G shows detailed information on individual block groups within 80 kilometers (50 miles) that satisfy the criteria used for this analysis. The nearest block groups meeting the NRC low-income criteria are on the south side of Hobbs. About 19,000 (20 percent) of the 96,300 people estimated to be living within 80 kilometers (50 miles) of the proposed site are low income. The main low-income areas within 80 kilometers (50 miles) of the proposed NEF are located, as shown in Figure 3-31, within a mile or two of the principal commuting and construction access routes.

3.11.3 Resource Dependencies and Vulnerabilities of the Minority/Low-Income Population

While people in the area of the proposed NEF site do depend on groundwater supplied from personal wells or public water utilities, inquiries to the minority and low-income community did not show any exceptional or disproportionate dependence on natural resources that might be affected by the proposed NEF.

Information from the New Mexico and Texas State Departments of Health was examined to see whether there were any exceptional patterns of diminished health status among residents of the area surrounding the proposed NEF site. In particular, this search was seeking any exceptional vulnerabilities among minority and low-income residents of the area. Tables 3-18 and 3-19, which summarize this information, show local populations that have lower cancer incidence than the Statewide averages and higher local crude (total, not age-adjusted) death rates from four other major groups of diseases (possibly due to differences in the age structure of the population in Lea and Andrews counties) (NMDH, 2003a; TDH, 2004; TDH, 2003). No unusual incidence of disease in the minority and low-income population was found in either county. Statewide data on crude death rates for both States do not show any unusual health vulnerabilities among minority populations (separate data on low-income residents were not available). Low crude death rates for Hispanics/Latinos in Texas appear to be the result of an exceptionally young Hispanics/Latino population in that State because age-specific death rates are more in line with those of the majority population (NMDH, 2003b; TDH, 2003).

Table 3-18 Selected Health Statistics for Counties Near the Proposed NEF Site

	Lea County	New Mexico	Andrews County	Texas
Cancer Incidence (Rate per 100,000 population)				
Male	456.5	468.7	496.4	537.9
Female	318.3	353.8	333.8	384.3
Age-Adjusted Cancer Deaths (Rate per 100,000 population)				
Male	251.9	210.8	238.0	260.8
Female	167.9	146.2	135.1	164.3
Leading Causes of Death 1996-2000 (Rate per 100,000 population)				
Diseases of Heart	231.2	184.6	286.4	218.8
Malignant Neoplasms	179.7	161.4	281.4	165.3
Cerebrovascular Diseases	61.1	46.4	72.6	51.8
Chronic Lower Respiratory Diseases	50.1	45.4	54.4	35.0

Sources: NMDH, 2003a; NMDH, 2004; TDH, 2004; TDH, 2003.

Interviews with members of the minority community during the scoping process did not turn up any additional minority or low-income populations not identified by the mapping shown in Figure 3-31. Although there were no specific environmental health concerns among minority and low-income populations mentioned in these interviews, two types of pre-existing health conditions were mentioned. One was a high rate of heart disease among African Americans/Blacks in Lea County, which was believed to be diet-related. The other was a high national rate of diabetes incidence among Hispanics that could also be true of the Lea County area although this could not be documented. The Statewide statistics for New Mexico and Texas shown in Table 3-19 tend to confirm possible high diabetes incidence with elevated rates of death from diabetes in New Mexico and Texas among minority populations. Heart disease death rates in Table 3-18 are higher locally in Lea and Andrews counties than Statewide in New Mexico and Texas although Statewide death rates among minority populations in Table 3-19 are lower than among non-Hispanic whites.

It was not possible to obtain comparative death rates or disease incidence rates for local ethnic groups. There were no other potential vulnerabilities identified for minority and low-income populations other than their geographic proximity to the proposed NEF site and potential transportation routes. The proximity of these populations means that there is a potential for environmental justice concerns. Section 4.2.9 evaluates the potential impact of construction and operation of the proposed NEF to determine whether there are likely to be any disproportionately high and adverse effects on the minority and low-income populations in the area.

Table 3-19 Incidence of Selected Causes of Death Among New Mexico and Texas Populations

	Annual Death Rates			
	White Non-Hispanics	**White Hispanics**	**Native Americans**	**African American / Black**
New Mexico	**(No. Per 1,000, 1998-2002)**			
Infant Mortality, All Causes	6.4	6.8	7.5	11.1
	(No. Per 100,000, 1998-2000)			
Diabetes Death	20.5	45.1	83.9	N/A
Influenza/ Pneumonia Death	20.0	21.6	41.7	N/A
Cancer Death	184.8	174.1	138.5	N/A
Heart Disease Death	221.6	194.4	185.6	N/A
Texas	**(No. Per 1,000, 1998-2000)**			
Infant Mortality All Causes	5.4	6.2	NA	11.3
	(No. Per 100,000, 1998-2000)			
Diabetes Death	22.9	25.4	NA	34.5
Influenza/ Pneumonia Death	27.0	9.1	NA	17.0
Cancer Death	207.6	73.8	NA	180.5
Heart Disease Death	275.3	93.1	NA	233.4

Sources: NMDH, 2003b; TDH, 2003.

3.12 Noise

The proposed NEF site is located in an unpopulated area of southeastern New Mexico that is used primarily for intermittent cattle grazing. The nearest commercial noise receptors are five businesses located between a 0.8-kilometer (0.5-mile) and 2.6-kilometer (1.6-mile) radius of the proposed site. These five businesses are WCS, located due east of the site over the Texas border; Lea County Landfill, located to the southeast; Sundance Services, Inc., and Wallach Concrete, Inc., located to the north; and DD Landfarm, located just west of the site. The nearest residential noise receptors are homes located approximately 4.3 kilometers (2.6 miles) to the west near the city of Eunice, New Mexico.

LES conducted a background noise-level survey at the four corners of the site boundary on September 16-18, 2003 (LES, 2005a). The measured background noise levels at the site boundaries, which ranged between 40.1 and 50.4 decibels A-weighted, represent the nearest receptor locations for the general public. These locations are anticipated to receive the highest noise levels during construction and when the plant is operational. Noise intensity can be affected by many factors including weather conditions, foliage density, temperature, and land contours.

There are no city, county, or New Mexico State ordinances and regulations governing noise. There are no affected Indian tribes within the sensitive receptor distances from the site; therefore, the proposed NEF site is not subject to Federal, State, tribal, or local noise regulations. The U.S. Department of Housing and Urban Development (HUD) and the EPA have standards for community noise levels. HUD has developed land use compatibility guidelines (HUD, 2002) for acceptable noise versus the specific land use. Table 3-20 shows these guidelines. The EPA has defined a goal of 55 decibels A-weighted for day-night sound level in outdoor spaces (EPA, 2002). The background noise levels measured for the proposed NEF site are below both criteria for a daytime period.

Table 3-20 HUD Land Use Compatibility Guidelines for Noise

	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

dBa = decibels A-weighted.
L_{dn} = day-night sound level.
Source: HUD, 2002.

3.13 Transportation

3.13.1 Local Roads and Highways

Figure 3-1 shows transportation routes near the proposed NEF site. An onsite, gravel-surfaced road bisects the site in an east-west direction. New Mexico Highway 234 is located along the south side of the site and provides direct access to the site. New Mexico Highway 234 is a two-lane highway with 3.7-meter (12-foot) driving lanes, 2.4-meter (8-foot) shoulders, and a 61-meter (200-foot) right-of-way easement on either side. According to the New Mexico Department of Transportation, there are no plans to upgrade New Mexico Highway 234. New Mexico Highway 234 requires maintenance on the road and shoulders, but it is not known when this would occur (NMDOT, 2005).

To the north of the site, U.S. Highway 62/180 intersects New Mexico Highway 18 and provides access from the city of Hobbs to New Mexico Highway 234. New Mexico Highway 18 is a four-lane divided highway that was rehabilitated within the last four to six years. To the east of the proposed site, U.S. Highway 385 intersects Texas Highway 176 and provides access from the town of Andrews, Texas, to New Mexico Highway 234. To the south of the proposed site and in the State of Texas, Interstate 20 intersects Texas Highway 18 in Texas, which becomes New Mexico Highway 18 when it enters the State of New Mexico. To the west, New Mexico Highway 8 provides access from the city of Eunice east to New Mexico Highway 234. Table 3-21 lists current traffic volume for the road systems in the vicinity of the proposed NEF site.

The State of New Mexico and the State of Texas have indicated that there are no known restrictions on the types of materials that may be transported along the important transportation corridors (NMDOT, 2004a; TDOT, 2004).

Table 3-21 Current Traffic Volume for the Road Systems In the Vicinity of the Proposed NEF Site

Road Name	Traffic Volume Per Day
New Mexico Highway 234 (between New Mexico Highway 18 and Texas border)	1,823
New Mexico Highway 18 (South of New Mexico Highway 234)	5,446
New Mexico Highway 18 (North of New Mexico Highway 207)	5,531
New Mexico Highway 18 (between New Mexico Highway 234 and New Mexico Highway 207)	5,446
Texas Highway 176 (near New Mexico/Texas border)	1,750

Source: NMDOT, 2004b.

3.13.2 Railroads

The Texas-New Mexico Railroad operates an active rail transportation line in Eunice, New Mexico, approximately 5.8 kilometers (3.6 miles) west of the proposed site. The rail line is predominately used for freight transport by the local oil and gas industry. Trains travel on this rail line at an average rate of one train per day. An active rail spur is located along the northern property line of the proposed site. The rail spur is owned by WCS, owner of the neighboring property to the east. Trains travel on this rail spur at an average rate of one train per week. The trains that travel on the spur typically consist of five to six cars. The rail spur has a speed limit of 16 kilometers (10 miles) per hour.

3.13.3 Other Transportation

The nearest commercial airport is the Lea County Regional Airport, located 40 kilometers (25 miles) northwest of the proposed NEF site near Hobbs, New Mexico. The nearest airport is located approximately 24 kilometers (15 miles) west of the site near Eunice. The airport is used by privately owned planes and has no control tower. The airport has two runways that are 1,000 meters (3,280 feet) and 780 meters (2,550 feet) in length. Four additional local airports are located within Lea County and adjacent Texas counties:

- Lea County/Jal Airport is located approximately 40 kilometers (25 miles) south-southwest of the proposed NEF.

- Andrews County Airport is located approximately 48 kilometers (30 miles) east of the proposed NEF.

- Gaines County Airport is located approximately 48 kilometers (30 miles) northeast of the proposed NEF.

- Seminole Spraying Services (a private airport) is located approximately 48 kilometers (30 miles) northeast of the proposed NEF.

Two major international airports are located within approximately 161 kilometers (100 miles) of the proposed NEF site. The nearest is the Midland International Airport (also known as the Midland/Odessa Airport). This four-runway airport is located in Texas about 103 kilometers (64 miles) southeast of the proposed site and is owned and operated by the city of Midland. The Midland/Odessa Airport is designated Foreign Trade Zone #165 (a Foreign-Trade Zone is a Federal program that designates an area within the United States that is considered outside of the U.S. Customs territory where certain types of merchandise can be imported without going through formal Customs entry procedures or paying import duties [FTZ, 2004]). The Grantee is the city of Midland (MIA, 2004). Lubbock International Airport, located along Interstate 27 in Texas (approximately 160 kilometers [100 miles] northeast of Eunice), can also serve the site. The Lubbock International Airport is a 3-runway airport and runs about 60 inbound and outbound flights daily (LIA, 2004).

3.14 Public and Occupational Health

This section describes the naturally occurring sources of radiation and chemicals and the levels of exposure that may be found at the proposed NEF site.

3.14.1 Background Radiological Exposure

Humans are exposed to ionizing radiation from many sources in the environment. Radioactivity from naturally occurring elements in the environment is present in soil, rocks, and in living organisms. A major proportion of natural background radiation comes from naturally occurring airborne sources such as radon. These natural radiation sources contribute approximately 3 millisieverts (300 millirem) per year to the radiation dose that everyone receives annually.

Manmade sources also contribute to the average amount of dose a member of the U.S. population receives. These sources include x rays for medical purposes (0.53 millisieverts [53 millirem] per year) and consumer products (0.1 millisieverts [10 mrem] per year) (e.g., smoke detectors). A person living in the United States receives an average dose of about 3.6 millisieverts (360 mrem) per year (NCRP, 1987). Figure 3-32 depicts the major sources and levels of background radiation in the United States that are expected to reflect the conditions near the proposed NEF.

The U.S. Department of Energy (DOE) established radiological monitoring programs in southeastern New Mexico prior to the Waste Isolation Pilot Plant project to determine the widespread impacts of nuclear testing at the Nevada Test Site on the background radiation. DOE estimated the annual dose of approximately 0.65 millisieverts (65 millirem) is received from atmospheric particulate matter, ambient radiation, soil, surface water and sediment, groundwater, and biota (DOE, 1997). These values fall within expected ranges and do not indicate any unexpected environmental concentrations. Lea County lies in an area that is characterized by radon concentrations of 2 to 4 picocuries per liter and is defined as of moderate radon potential (EPA, 2004b). In May 2004, direct background radiation was measured to be 8 to 10 microrad per hour (LES, 2005a), which corresponds to 0.70 to 0.88 millisieverts (70 to 88 mrem) per year. The measured range falls within the average annual direct background radiation for the United States shown in Figure 3-32.

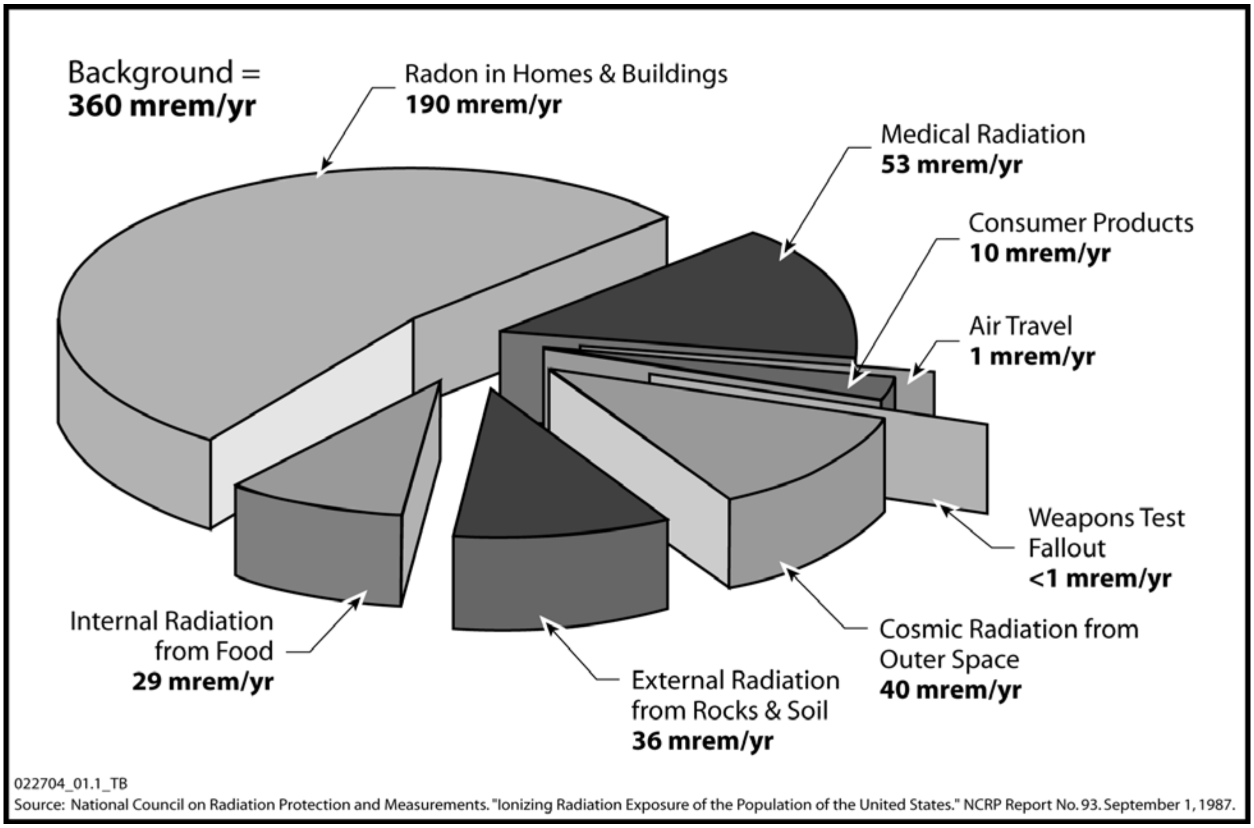

Figure 3-32 Major Sources and Levels of Background Radiation Exposure Expected in the Proposed NEF Vicinity Based on National Data (NCRP, 1987)

3.14.2 Background Chemical Characteristics

Eight soil samples taken at the proposed NEF site indicated only barium, chromium, and lead were detected above laboratory reporting limits. The concentrations of these elements in the soil were 23, 3.6, and 2.7 milligrams per kilogram, respectively (LES, 2005a). These concentrations are below health limits (NMEDHWB, 2004). Other nonradiological parameters were below the laboratory reporting limits.

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