LES

NATIONAL ENRICHMENT FACILITY

ENVIRONMENTAL REPORT

REVISION 10

LES building and operating the National Enrichment Facility
providing Energy Independence for America

urenco

1.0 INTRODUCTION OF THE ENVIRONMENTAL REPORT

This Environmental Report (ER) constitutes one portion of an application submitted by Louisiana Energy Services (LES) to the Nuclear Regulatory Commission (NRC) for a license to construct and operate a gas centrifuge uranium enrichment facility. The proposed facility, the National Enrichment Facility (NEF) will be located near Eunice, New Mexico, in Lea County. The ER for this proposed facility serves two primary purposes. First, it provides information that is specifically required by the NRC to assist it in meeting its obligations under the National Environmental Policy Act (NEPA) of 1969 (Pub. Law 91-190, 83 Stat. 852) (USC, 2003a) and the agency's NEPA-implementing regulations. Second, it demonstrates that the environmental protection measures proposed by LES are adequate to protect both the environment and the health and safety of the public.

LES has prepared this ER to meet the requirements specified in 10 CFR 51, Subpart A, particularly those requirements set forth in 10 CFR 51.45(b)-(e) (CFR, 2003a). The organization of this ER is generally consistent with the format for environmental reports recommended in NUREG-1748, Environmental Review Guidance for Licensing Actions Associated with NMSS Programs~~, Final Report August 2003 (NRC, 2003a)~~. LBDCR-07-0022

This ER evaluates the environmental impacts of the LES proposed facility. Accordingly, this document discusses the proposed action, the need for and purposes of the proposed action, and applicable regulatory requirements, permits, and required consultations (ER Chapter 1, Introduction of the Environmental Report); considers reasonable alternatives to the proposed action (Chapter 2, Alternatives); describes the proposed NEF and the environment potentially affected by the proposed action (Chapter 3, Description of the Affected Environment); presents and compares the potential impacts resulting from the proposed action and its alternatives (Chapter 4, Environmental Impacts); identifies mitigation measures that could eliminate or lessen the potential environmental impacts of the proposed action (Chapter 5, Mitigation Measures); describes environmental measurements and monitoring programs (Chapter 6, Environmental Measurements and Monitoring Programs); provides a cost benefit analysis (Chapter 7, Cost Benefit Analysis); and summarizes potential environmental consequences (Chapter 8, Summary of Environmental Consequences). A list of references and preparers is also provided in Chapter 9, References, and Chapter 10 List of Preparers, respectively.

<u>It is not practical to refer to a specific edition of each code, standard, NRC document, etc throughout the text of this document. Instead, the approved edition of each reference that is applicable to the applicable to the design, construction, or operation of the NEF is listed in ISAS Table 3.0-1.</u> LBDCR-07-0022

The effective date of this ER is December 2003.

<u>The LES Partnership</u>

Louisiana Energy Services (LES), L.P. is a Delaware limited partnership. It has been formed solely to provide uranium enrichment services for commercial nuclear power plants. LES has one, 100% owned subsidiary, operating as a limited liability company, formed for the purpose of purchasing Industrial Revenue Bonds and no divisions. The general partner is as follows:

Urenco Investments, Inc. (a Delaware corporation and wholly-owned subsidiary of Urenco Limited, a corporation formed under the laws of the United Kingdom ("Urenco") and 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, which is wholly-owned by the Government of the United Kingdom; UCN is 99% owned by the Government of the Netherlands, with the remaining 1% owned collectively by the Royal Dutch Shell Group, DSM, Koninklijke Philips Electronics N.V. and Stork N.V.; Uranit is owned by Eon Kernkraft GmbH (50%) and RWE Power AG (50%), which are corporations formed under laws of the Federal Republic of Germany).

The name and address of the responsible official for the general partner is as follows:

Urenco Investments, Inc.
Charles W. Pryor, President and CEO
1560 Wilson Blvd., Suite 300
Arlington, VA 22209-2463

Dr. Pryor is a citizen of the United States of America.

The limited partners are as follows:

A. Urenco Deelnemingen B.V. (a Netherlands corporation and wholly-owned subsidiary of Urenco Nederlands B.V. (UNL));

B. Urenco Investments, Inc. (a Delaware corporation and wholly-owned subsidiary of Urenco Limited);

Urenco owns 100% of LES.

The President of LES is Reinhard Hinterreither. ~~The Chief Nuclear Officer and Vice President - Operations is John Swailes.~~ The Vice President - Operations is the primary regulatory contact and is responsible for the safe operation of the National Enrichment Facility. LES' principal location for business is Albuquerque, NM. The facility will be located in Lea County near Eunice, New Mexico. No other companies will be present or operating on the NEF site other than services specifically contracted by LES. LBDCR-07-0017

Foreign Ownership, Control and Influence (FOCI) of LES is addressed in the NEF Standard Practice Procedures for the Protection of Classified Matter, Appendix 1 – FOCI Package. The NRC in their letter dated, March 24, 2003, has stated "...that while the mere presence of foreign ownership would not preclude grant of the application, any foreign relationship must be examined to determine whether it is inimical to the common defense and security [of the United States]". (NRC, 2003b) The FOCI Package mentioned above provides sufficient information for this examination to be conducted.

1.1.2 Market Analysis of Enriched Uranium Supply and Requirements

Consistent with the guidance contained in NUREG-1520 ~~(NRC, 2002b)~~ concerning the need for and purpose of the proposed action, this section sets forth information on the quantities of enriched uranium used for domestic benefit, domestic and foreign requirements for enrichment services, and potential alternative sources of supply for the NEF's proposed services for the period 2002 to 2020. ER Section 1.1.2.1, Forecast of Installation Nuclear Power Generating Capacity, presents a forecast of installed nuclear power generating capacity during the specified period: ER Section 1.1.2.2, Uranium Enrichment Requirements Forecast, presents a forecast of uranium enrichment requirements; ER Section 1.1.2.3, Current and Potential Future Sources of Uranium Enrichment Services, discusses current and potential future sources of uranium enrichment services throughout the world; ER Section 1.1.2.4, Market Analysis of Supply and Requirements, discusses market supply and requirements under alternative scenarios and ER Section 1.1.2.5, Commercial Considerations and Other Implications of Each Scenario, discusses various commercial considerations and other implications associated with each scenario. LBDCR-07-0022

1.1.2.1 Forecast of Installation Nuclear Power Generating Capacity

LES has prepared forecasts of installed nuclear power generating capacity by country and categorized them into the following five world regions: (i) U.S., (ii) Western Europe, (iii) Commonwealth of Independent States (CIS) and Eastern Europe, (iv) East Asia, and (v) remaining countries are grouped as Other.

Eastern Europe consists of the following emerging market economy countries that were in the past classified as Communist Bloc countries and are operating nuclear power plants: Bulgaria, the Czech Republic, Slovakia, Hungary, Lithuania, and Romania. Of the 12 CIS countries that were part of the former Soviet Union (FSU), the three with nuclear power plants still operating are Russia, Ukraine and Armenia.

East Asia includes Japan, the Republic of Korea (South Korea), Taiwan, the People's Republic of China (PRC) and North Korea. It is the only region forecast to increase nuclear power capacity significantly from current levels.

This forecast was based on LES's country-by-country and unit-by-unit review of current nuclear power programs and plans for the future. The resulting LES projections of future world nuclear generation capacity are dependent on the following factors:

- Nuclear generating units currently in operation and retirements among these units that occur during the forecast period;
- Capacity that is created by extending the operating lifetimes of units currently in operation beyond initial expectations through license renewal;
- Units under construction, already ordered, or firmly planned with likely near-term site approval; and
- Additional new capacity that will require site approval and will be ordered in the future.

The entire plant process gas system operates at sub-atmospheric pressure. This provides a high degree of safety but also means that the system is susceptible to in-leakage of air. Any in-leakage of air passes through the cascades and is preferentially directed into the product stream. A vent system is provided to remove hazardous contaminants from low levels of light gas (any gas lighter than UF_6) that arise on a regular basis from background in-leakage, routine venting of UF_6 cylinders, and purging of UF_6 lines.

Each Plant Module – consisting of two Cascade Halls - is provided with a cooling water system to remove excess heat at key positions on the centrifuges in order to maintain optimum temperatures within the centrifuges.

The centrifuges are driven by a medium frequency Alternating Current (AC) supply system. A converter produces the medium frequency supply from the AC main supply using high efficiency switching devices for both run-up and continuous operation.

In addition to operating the process at subatmospheric pressure, the other primary difference between the Louisiana Energy Services, Claiborne Enrichment Center, and the NEF cascade systems is that all assay units are now identical, whereas in the Claiborne Enrichment Center, one assay unit was designed to produce low assays - in the region of 2.5%. An additional change is the increase from seven cascades per cascade hall to eight cascades per cascade hall. Maximum cascade hall capacity has been increased to 545,000 SWU/yr.

1.2.3 Comparison of the NEF Design to the LES Claiborne Enrichment Center Design

While the design of the NEF is fundamentally the same as the Claiborne Enrichment Center design reviewed and approved by the NRC in the 1990s (NRC, 1994a), a number of improvements or enhancements have been made in the current design from an environmental and safety perspective. One of these changes is the increase from seven cascades per Assay Unit to eight cascades per Assay Unit. Maximum Assay Unit capacity has been increased from 280,000 SWU/yr to 545,000 SWU/yr.

There are two important differences in the UF_6 Feed System for the NEF as compared to the Claiborne Enrichment Center. First, the liquid UF_6 phase above atmospheric pressure has been eliminated. Sublimation from the solid phase directly to the gaseous phase below atmospheric pressure is the process to be used in the NEF. A sealed autoclave is replaced with a Solid Feed Station enclosure for heating the feed cylinder. A second major difference is the use of chilled air, rather than chilled water, to cool the feed purification cylinder.

The NEF “Product Take-Off System” uses a process similar to the Claiborne Enrichment Center, but there are certain differences. In the current system proposed for the NEF, there is only one product pumping stage, whereas the proposed Claiborne Enrichment Center system used two pumping stages to transport the product for desublimation. In the NEF system, pressures are controlled such that desublimation cannot occur in the piping, eliminating the need for heat tracing and valve hot boxes. In the Claiborne Enrichment Center, the product cylinder stations relied on common chillers to cool the stations, the current system, however, uses a dedicated chiller for each station. The cold traps used to desublime any UF_6 in the vent gases are smaller than those of the Claiborne Enrichment Center design and each is situated on load cells to allow continuous monitoring of accumulation (LES, 1991a).

The NEF "Product Liquid Sampling System" uses a process very similar to Claiborne Enrichment Center, but will have a permanent vent system, the Blending and Sampling Vent Subsystem, rather than a mobile unit as used in Claiborne Enrichment Center (LES, 1991a).

The NEF "Product Blending System" uses a process similar to the proposed Claiborne Enrichment Center. One major difference, however, is the use of Solid Feed Stations to heat the donor cylinders in the NEF. The Claiborne Enrichment Center design required the use of autoclaves to heat the donor cylinders in the Claiborne Enrichment Center. Other differences between the two designs include the use of only four receiver stations in the NEF process versus five in the Claiborne Enrichment Center and the use of a dedicated vacuum pump/trap set in the NEF design versus a mobile set in the Claiborne Enrichment Center (LES, 1991a).

The NEF "Tails Take-Off System" uses a process similar to that proposed for the Claiborne Enrichment Center, but there are certain differences. In the NEF system there is only one tails pumping stage, whereas the Claiborne Enrichment Center would have used two pumping stages to transport the tails for desublimation. UF_6 tails are desublimed in cylinders cooled with chilled air in the current system, the Claiborne Enrichment Center would have used chilled water to cool the cylinders. The Claiborne Enrichment Center design called for a total of ten UBCs in five double cooling stations for each Separation Plant Module (two Cascade Halls), but the NEF current system uses ten cylinders in single cooling stations for each Cascade Hall. Finally, the current system has a dedicated vacuum pump/trap set for venting and does not use the Feed Purification System like the Claiborne Enrichment Center (LES, 1991a).

The major structures and areas of the NEF are described below and shown in Figure 1.2-4, NEF Buildings.

The Security Building serves as the primary access control point for the facility. It also contains the necessary space and provisions for an alternate Emergency Operations Center (EOC) should the primary facility become unusable.

The Separations Building houses three, essentially identical, plant process units. Each Separations Building Module is comprised of a UF_6 Handling Area, two Cascade Halls, and a Process Services Area. UF_6 is fed into the Cascade Halls and enriched UF_6 and depleted UF_6 are removed. The Cylinder Receipt and Dispatch Building (CRDB) is located between Separations Building Modules.

The Centrifuge Assembly Building (CAB) is used to assemble centrifuges before the centrifuges are moved to the Separations Building and installed in the cascades.

The Technical Services Building (TSB) contains various laboratories and maintenance facilities necessary to safely operate and maintain the facility. The TSB also includes a Medical Room and the Control Room. In an emergency, the Control Room serves as the primary Emergency Operations Center (EOC) for the facility. Most site infrastructure facilities (i.e., laboratories for sample analysis) are located in the TSB.

The Central Utilities Building (CUB) provides a central location for the utility services for the process buildings. The CUB also contains the two standby diesel powered electric generators that provide power to protect selected equipment in the unlikely event of loss of offsite supplied power. The building also contains electrical rooms, an air compression room, ~~a boiler room,~~ and cooling water facility. LBDCR-07-0053

1.3 APPLICABLE REGULATORY REQUIREMENTS, PERMITS AND REQUIRED CONSULTATIONS

In addition to the NRC licensing and regulatory requirements, a variety of environmental regulations apply to the NEF during the site assessment, construction, and operation phases. Some of these regulations require permits from, consultations with, or approvals by, other governing or regulatory agencies. Some apply only during certain phases of NEF development, rather than over to the entire life of the facility. Federal, state and local statutes and regulations (non-nuclear) have been reviewed to determine their applicability to the site assessment, construction, and operation phases or the proposed site.

Following is a list of federal, state, and local agencies with whom consultations have been conducted. Table 1.3-1, Regulatory Compliance Status, summarizes the status of the permits and approvals required to construct and operate NEF.

1.3.1 Federal Agencies

Nuclear Regulatory Commission (NRC)

The Atomic Energy Act of 1954, as amended, gives the NRC regulatory jurisdiction over the design, construction, operation, and decommissioning of the NEF facility specifically with regard to assurance of public health and safety in 10 CFR 70 and 40 (CFR, 2003b; CFR, 2003d), which are applicable to uranium enrichment facilities. The NRC performs periodic surveillance of construction, operation and maintenance of the facility. The NRC, in accordance with 10 CFR 51 (CFR, 2003a), also assesses the potential environmental impacts of the proposed plant.

NRC establishes standards for protection against radiation hazards arising out of licensed activities. The NRC licenses are issued pursuant to the Atomic Energy Act of 1954, as amended, and the Energy Organization Act of 1974. The regulations apply to all persons who receive, possess, use or transfer licensed materials.

Domestic Licensing of Source Material (10 CFR 40) (CFR, 2003d) establishes the procedures and criteria for the issuance of licenses to receive, possess, use, transfer, or deliver source material.

Rule of General Applicability to Domestic Licensing of Byproduct Material (10 CFR 30) (CFR, 2003c) establishes the procedure and criteria for the issuance of licenses to receive, possess, use, transfer, or deliver byproduct material.

Packaging and Transportation of Radioactive Material (10 CFR 71) (CFR, 2003e) regulates shipping containers and the safe packaging and transportation of radioactive materials under authority of the NRC and DOT.

U.S. Environmental Protection Agency, (EPA)

The EPA has primary authority relating to compliance with the Clean Air Act (CAA), Clean Water Act (CWA), Safe Drinking Water Act (SDWA), and Resource Conservation and Recovery Act (RCRA). However, EPA Region 6 has delegated regulatory jurisdiction to the New Mexico Environment Department (NMED) for nearly all aspects of permitting, monitoring, and reporting activities relating to these statutes and associated programs. Applicable state requirements, permits, and approvals are described in Section 1.3.2, State Agencies.

Environmental Standards for the Uranium Fuel Cycle (40 CFR 190 Subpart B) (CFR, 2003f) establishes the maximum doses to the body organs resulting from operational normal releases and received by members of the public.

The Safe Drinking Water Act (SDWA) provides for protection of public water supply systems and underground sources of drinking water. 40 CFR 141.2 (CFR, 2003h) defines public water supply systems as systems that provide water for human consumption to at least 25 people or at least 15 connections. Underground sources of drinking water are also protected from contaminated releases and spills by this act. NEF is not using site groundwater or surface water supplies. NEF will obtain potable water from the nearby municipal water supply systems (cities of Eunice and Hobbs, New Mexico). LBDCR-07-0005

The Emergency Planning and Community Right-to-Know Act of 1986 (40 CFR 350 to 372) (CFR, 2003i) 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 help 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.

National Pollutant Discharge Elimination System (NPDES) General Permit for Industrial Stormwater: This permit is required for point source discharge of stormwater runoff from industrial or commercial facilities to the waters of the state. All new and existing point source industrial stormwater discharges associated with industrial activity require a NPDES Stormwater Permit from the EPA Region 6 and an oversight review by the New Mexico Water Quality Bureau. The NEF is eligible to claim the "No Exposure" exclusion for industrial activity of the NPDES stormwater Phase II regulations. As such, the LES would submit a No Exposure Certification immediately prior to initiating operational activities at the NEF site. LES also has the option of filing for coverage under the Multi-Section General Permit (MSGP) because the NEF is one of the 11 eligible industry categories. If this option is chosen, LES will file a Notice of Intent (NOI) with the EPA, Washington, D.C., at least two days prior to the initiation of NEF operations. A decision regarding which option is appropriate for the NEF will be made in the future.

1.3.2 State Agencies

The New Mexico Environment Department (NMED) is charged with responsibility to manage and protect human health and the environment in the state of New Mexico. The NMED consists of several divisions that have responsibility for various permits and environmental programs. LES has consulted with NMED regarding NMED permit requirements. The general and specific NMED permits and permit requirements are discussed below by the NMED Bureau that has responsibility for reviewing and approving the permitting action:

New Mexico Air Quality Bureau (NMED/AQB):

The Air Quality Bureau (AQB) Permitting Section processes permit applications for industries that emit pollutants to the air. The Permitting Section consists of two groups: New Source Review and Title V. New Source Review (NSR) is responsible for issuing Construction Permits, Technical and Administrative Revisions or Modifications to existing permits, Notices of Intent (NOIs) for smaller industrial operations, and No Permit Required (NPR) determinations. The two types of Permits issued for larger industrial facilities are (NMAC, ~~2002a~~ 20.2.78): LBDCR-07-0022

Construction Permits are required for any person constructing a stationary source which has a potential emission rate greater than 4.5 kg (10 lbs) per hour or 22.7 MT (25 tons) per year of any regulated air contaminant for which there is a National or New Mexico Ambient Air Quality Standard. If the specified threshold in this subsection is exceeded for any one regulated air contaminant, all regulated air contaminants with National or New Mexico Ambient Air Quality Standards emitted are subject to permit review. Within this subsection, the potential emission rate for nitrogen dioxide shall be based on total oxides of nitrogen; all sources with the potential emission rate greater than 4.5 kg (10 lbs) per hour, or 22.7 MT (25 tons) per year, of criteria pollutants (such as nitrogen oxides and carbon monoxide). Air quality permits must be obtained for new or modified sources.

Operating Permits (under Title V) are required for major sources that have a potential to emit more than 4.5 kg (10 lbs) per hour or 91 MT (100 tons) per year for criteria pollutants, or for landfills greater than 2.5 million m^3 (88 million ft3). In addition, major sources also include facilities that have the potential to emit greater than 9.1 MT (10 tons) per year of a single Hazardous Air Pollutant, or 22.7 MT (25 tons) per year of any combination of Hazardous Air Pollutants.

Generally, mobile sources are not required to obtain an operating permit from AQB; however, there are provisions for inspection and maintenance of mobile sources in certain non-attainment areas. Lea County, New Mexico is not located in a non-attainment area.

The NEF will emit levels of air pollution below the conditions of 20.2.72 NMAC, Operating Permits, which would require an air quality permit. The NEF, however, will have a potential emission rate for non-exempt equipment greater than 9.1 MT (10 tons) per year and thus be subject to 20.2.73 NMAC, Notice of Intent, for which LES submitted an application to the AQB by letter dated April 20, 2004.

By letter dated May 27, 2004, the AQB acknowledged receipt of the NOI application and notified LES that the application will serve as the Notice of Intent in accordance with 20.2.73 NMAC (AQB, 2004). The AQB 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 (NSPS) and National Emissions Standards for Hazardous Air Pollutants (NESHAPS) do not apply to the NEF as well. Lastly, the AQB stated that operation of the two emergency diesel generators and surface coating activities are exempt from permitting requirements, provided all requirements specified in 20.2.72.202.B (3) and 20.2.72.202.B (6) NMAC, respectively, are met.

New Mexico Water Quality Bureau (NMED/WQB)

National Pollutant Discharge Elimination System (NPDES) General Permit for Industrial Stormwater: This permit is required for point source discharge of stormwater runoff from industrial or commercial facilities to the waters of the state. All new and existing point source industrial stormwater discharges associated with industrial activity require a NPDES Stormwater Permit from the EPA Region 6 and an oversight review by the New Mexico Water Quality Bureau. The NEF is eligible to claim the "No Exposure" exclusion for industrial activity of the NPDES stormwater Phase II regulations. As such, the LES would submit a No Exposure Certification immediately prior to initiating operational activities at the NEF site. LES also has the option of filing for coverage under the Multi-Section General Permit (MSGP) because the NEF is one of the 11 eligible industry categories. If this option is chosen, LES will file a Notice of Intent (NOI) with the EPA, Washington, D.C., at least two days prior to the initiation of NEF operations. A decision regarding which option is appropriate for the NEF will be made in the future.

NPDES General Permit for Construction Stormwater: Construction of the NEF will involve the grubbing, clearing, grading or excavation of 0.4 or more ha (1 or more acres) of land coverage and must receive a NPDES Construction General Permit from the EPA Region 6 and an oversight review by the New Mexico Water Quality Bureau. Various land clearing activities such as offsite borrow pits for fill material have also been covered under this general permit. Construction activities, including permanent plant structures and temporary construction facilities, could potentially disturb or impact the entire 543 acre site. LES will develop a Storm Water Pollution Prevention Plan (SWPPP) and file a Notice of Intent (NOI) with the EPA, Washington, D.C., at least two days prior to the commencement of construction activities.

Groundwater Discharge Permit/Plan: The New Mexico Water Quality Bureau requires that facilities that discharge an aggregate waste water of more than 7.6 m^3 (2,000 gal) per day to surface impoundments or septic systems apply for and submit a groundwater discharge permit and plan. This requirement is based on the assumption that these discharges have the potential of affecting groundwater. NEF will discharge treated process water, stormwater and cooling tower blow-down water to surface impoundments, as well as domestic septic wastes. The groundwater discharge permit/plan will be required under New Mexico Administrative Codes (NMAC) 20.6.2.3104 NMAC. Section 20.6.2.3104 NMAC of the New Mexico Water Quality Control Commission Regulations (20.6.2 NMAC) ~~(NMAC, 2002b)~~ requires that any person proposing to discharge effluent or leachate so that it may move directly or indirectly into groundwater must have an approved discharge permit, unless a specific exemption is provided for in the Regulations. Pursuant to Regulation 20.6.2.3108 NMAC, NMED will, within 30 days of deeming the application administratively complete, publish a public notice and allow 30 days for public comment. By letter dated May 17, 2004 (NMED, 2004a), and subsequent letter dated July 9, 2004 (NMED, 2004c), the NMED notified LES that the Ground Water Discharge Permit Application received by NMED on April 28, 2004, was determined to be administratively complete. Following completion of the public notice process, the NMED will issue a draft permit for review and comment. A public hearing will be held if NMED determines that there is significant public interest. It takes approximately 180 days to process a complete application and issue a discharge permit if no public hearing is held. LBDCR-07-0022

Section 401 Certification: Under Section 401 of the federal Clean Water Act, states can review and approve, condition, or deny all federal permits or licenses that might result in a discharge to State waters, including wetlands. A 401 certification confirms compliance with the State water quality standards. Activities that require a 401 certification include Section 404 permits issued by the USACE. The State of New Mexico has a cooperative agreement and joint application process with the USACE relating to 404 permits and 401 certifications. By letter dated March 17, 2004, the USACE notified LES of its determination that there are no USACE jurisdictional waters at the NEF site and for this reason the project does not require a 404 permit (USACE, 2004). As a result, a Section 401 certification is not required.

<u>New Mexico Hazardous Waste Bureau (NMED/HWB)</u>

The New Mexico Hazardous Waste Bureaus (HWB) mission is to provide regulatory oversight and technical guidance to New Mexico hazardous waste generators and treatment, storage, and disposal facilities as required by the New Mexico Hazardous Waste Act [HWA; Chapter 74, Article 4 NMSA 1978] (NMAC~~, 2000~~ <u>20.4.1</u>) and regulations promulgated under the Act. The bureau issues hazardous waste permits for all phases, quantities and degrees of hazardous waste management including treating, storing and disposing of listed or hazardous materials. LBDCR-07-0022

Hazardous Waste Permits: These permits are required for the treating, storing or disposing of hazardous wastes. The level of permit and associated monitoring requirements depend on the volume and type of waste generated and whether or not the waste is treated or just stored for offsite disposal. Any person owning or operating a new or existing facility that treats, stores, or disposes of a hazardous waste must obtain a hazardous waste permit from the New Mexico Hazardous Waste Bureau. It is anticipated that small to medium volumes of hazardous waste will be stored at the facility for eventual offsite disposal. The NEF will generate small quantities of hazardous waste that are expected to be greater than 100 kg (220 lbs) per month and is not planning to store these wastes in excess of 90 days (see ER Section 3.12, Waste Management). Thus, the NEF will qualify as a small quantity hazardous waste generator in accordance with 20.4.1 NMAC ~~(NMAC, 2000)~~. As a result, NEF will not require a hazardous waste permit, but instead must file a US EPA Form 8700-12, Notification of Regulated Waste Activity. LBDCR-07-0022

The NEF is committed to pollution prevention and waste minimization practices and will incorporate RCRA pollution prevention goals, as identified in 40 CFR 261 (CFR, 2003p). A Pollution Prevention Waste Minimization Plan will be developed to meet the waste minimization criteria of NRC, EPA and state regulations. The Pollution Prevention Waste Minimization Plan will describe how the NEF design procedures for operation will minimize (to the extent practicable) the generation of radioactive, mixed, hazardous, and nonhazardous solid waste.

<u>New Mexico State Land Office (NMSLO):</u>

Right–of-Entry Permit: Surface Resources section of the NMSLO administers renewable resources and sustainable activities on state trust land and works to enhance environmental quality of the lands. Also, it manages the biological, archeological, and paleontological resources. Surface Resources administers agriculture leases, rights of way, and special access permits. It is responsible for mapping, surveying, geographic information systems, and records management. LES applied for and received a Right-of-Entry Permit early in the license application preparation phase so that they could conduct environmental surveys on Section 32 prior to the land being transferred, or an easement granted, to LES.

<u>New Mexico Department of Game and Fish (NMDGF):</u>

Rare, Threatened and Endangered Species Survey: The NMDGF mission is to assist all New Mexico wildlife in need. The program funds four general categories: research, public education, habitat protection, and wildlife rehabilitation, including rare threatened and endangered species. LES conducted a rare, threatened and endangered (RTE) survey for both plants and animals. RTE species were not identified on the NEF site.

New Mexico Radiological Control Bureau (NMED/RCB):

(X-Ray) Radiation Machine Registration: Radiation machine is defined by the New Mexico Radiation Protection Regulations (NMRPR) as any device capable of producing radiation except those which produce radiation only from radioactive material. Examples include medical x-ray machines, particle accelerators, and x-ray radiography machines used for non-destructive testing of materials. The bureau regulates the machines and their usage in accordance with the requirements of the NMRPR (20.3 NMAC) ~~(NMAC, 2001a)~~. Registrants are required to maintain hardcopies of pertinent parts of the regulations. Mandatory parts include 20.3.2, 20.3.4 (except appendices), and 20.3.10. Other parts apply as applicable for the type of use. LES plans to use non-destructive (x-ray) inspection systems for package security requirement. If the output at 0.3 m (1 ft) from the unit exceeds 1.29E-07 C/kg/hr (0.5 mR/hr), than the x-ray unit must be registered with the State Radiological Control Bureau under section 20.3.11 of NMAC. LES has notified the NMED/RCB (LES, 2004) that they will register NEF X-Ray equipment prior to use when the equipment specifications become available. LBDCR-07-0022

New Mexico State Historic Preservation Office (NMSHPO) (NMAC, 2001b):

Class III Cultural Survey: Cultural properties, including prehistoric and historic archaeological sites, historic buildings and other structures, and traditional cultural properties located on state land in New Mexico are protected by the Cultural Properties Act. It is unlawful for any person to excavate, injure, destroy, or remove any cultural property or artifact on state land without a permit. It is also unlawful for any person to intentionally excavate any unmarked human burial, and any material object or artifact interred with the remains, located on any non-federal or non-Indian land in New Mexico without a permit. LES retained a subcontractor that obtained a permit to conduct an archaeological survey. The survey was conducted during September and October of 2003.

A Class III Cultural Resource Inventory and Palentological Survey was conducted on the site. The survey for the cultural resources (archaeological, historical and palentological) consisted of the following: 1) File search and records check; 2) Class III field inventory; and 3) Class III inventory report for the project. The tasks described in this scope are those necessary to complete a Class III survey and National Register of Historic Places evaluations of all cultural resources within the project area and approval by the New Mexico State Historic Preservation Office. Results of the survey are provided in ER Section 3.8, Historic and Cultural Resources, and Section 4.8, Historic and Cultural Resource Impacts.

1.3.3 Local Agencies

Plans for construction and operation of the proposed NEF are being communicated to and coordinated with local organizations. Officials in Lea and Andrews Counties have been contacted regarding the locations of roads and water lines which traverse the site. The Eunice and Hobbs municipal water system operators have been contacted to obtain compliance information for the potable water supplies received from these cities.

2.1.2.2 Applicant for the Proposed Action

Louisiana Energy Services (LES), L.P. is a Delaware limited partnership. It has been formed solely to provide uranium enrichment services for commercial nuclear power plants. LES has one, 100% owned subsidiary, operating as a limited liability company, formed for the purpose of purchasing Industrial Revenue Bonds and no divisions. The general partner is as follows:

Urenco Investment, Inc. (a Delaware corporation and wholly-owned subsidiary of Urenco Limited, a corporation formed under the laws of the United Kingdom ("Urenco") and 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, which is wholly-owned by the Government of the United Kingdom; UCN is 99% owned by the Government of the Netherlands, with the remaining 1% owned collectively by the Royal Dutch Shell Group, DSM, Koninklijke Philips Electronics N.V. and Stork N.V.; Uranit is owned by Eon Kernkraft GmbH (50%) and RWE Power AG (50%), which are corporations formed under laws of the Federal Republic of Germany).

The name and address of the responsible official for the general partner is as follows:

Urenco Investments, Inc.
Charles W. Pryor, President and CEO
1560 Wilson Blvd., Suite 300
Arlington, VA 22209-2464

Dr. Pryor is a citizen of the United States of America.

The limited partners are as follows:

A. Urenco Deelnemingen B.V. (a Netherlands corporation and wholly-owned subsidiary of Urenco Nederlands B.V. (UNL));

B. Urenco Investments, Inc. (a Delaware corporation and wholly-owned subsidiary of Urenco Limited);

Urenco owns 100% of LES.

The President of LES is Reinhard Hinterreither. ~~The Chief Nuclear Officer and Vice President - Operations is John Swailes.~~ The Vice President - Operations is the primary regulatory contact and is responsible for the safe operation of the National Enrichment Facility. LES' principal location for business is Albuquerque, NM. The facility will be located in Lea County near Eunice, New Mexico. No other companies will be present or operating on the NEF site other than services specifically contracted by LES. LBDCR-07-0017

LES has presented to Lea County, New Mexico a proposal to develop the NEF. Lea County would issue its Industrial Revenue Bond (National Enrichment Facility Project) Series 2004 in the maximum aggregate principal amount of $1,800,000,000 to accomplish the acquisition, construction and installation of the project pursuant to the County Industrial Revenue Bond Act, Chapter 4, Article 59 NMSA 1978 Compilation, as amended. The Project is comprised of the land, buildings, and equipment.

Flatbed trucks move the cylinders from the CRDB to the UBC Storage Pad, where cranes remove the cylinders from the trucks and place them on the UBC Storage Pad.

The UBC Storage Pad will be developed in sections over the life of the facility.

2.1.2.3.7 Administration Building

The Administration Building is near the TSB. It contains general office areas and the Entry Exit Control Point (EECP) for the facility. All personnel access to the plant occurs at this location. Vehicular traffic passes through a security checkpoint before being allowed to park. Parking is located outside of the Controlled Access Area (CAA) security fence. Personnel enter the Administration Building and general office areas via the main lobby.

Personnel requiring access to facility areas or the CAA must pass through the EECP. The EECP is designed to facilitate and control the passage of authorized facility personnel and visitors.

Entry to the plant area from the Administration Building is only possible through the EECP. Approximately 50 work locations are provided for the plant office staff. The office environment consists of private, semiprivate, and open office space. It also contains a kitchen, break room, conference rooms, building service facilities such as the janitor's closet and public telephone, and a mechanical equipment room.

2.1.2.3.8 Central Utilities Building (CUB)

The Central Utilities Building is located near the TSB. It houses two diesel generators, which provide the site with standby power. The building also contains day tanks, switchgear, control panels, and building heating, ventilating, and air conditioning (HVAC) equipment. The rooms housing the diesels are constructed independent of each other with adequate provisions made for maintenance, as well as equipment removal and equipment replacement ~~via roll-up and access doors~~. LBDCR-07-0053

The diesel fuel unloading area provides tanker truck access to the two above ground tanks, which provide diesel fuel storage. Secondary containment (berms) will be provided to contain spills or leaks from the two above ground diesel fuel tanks. The above ground diesel storage tank area will be included in the site Spill Prevention Control and Countermeasures (SPCC) plan.

The CUB also houses the cooling water chillers and pumps, ~~boiler room~~ and air compressors. LBDCR-07-0053

2.1.2.3.9 Security Building

The main Security Building is located at the entrance to the plant. It functions as a security checkpoint for all incoming and outgoing traffic. Employees, visitors and trucks that have access approval will be screened at the main Security Building. A smaller security station has been placed at the secondary entrance to the site. All vehicle traffic including common carriers, such as mail delivery trucks, will be screened at this location.

2.1.2.3.10 Visitor Center

A Visitor Center is located outside the security fence area.

2.1.2.4.7 Centrifuge Test and Post Mortem Facilities Exhaust Filtration System

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

The ductwork is connected to one filter station and vents through either of two 100% fans. Both the filter station and either of the fans can handle 100% of the effluent. One of the fans will normally be in standby. Operations that require the Centrifuge Test and Post Mortem Facilities Exhaust Filtration System to be operational are manually shut down if the system shuts down. After filtration, the clean gases pass through a fan, which maintains the negative pressure upstream of the filter station. The clean gases are then discharged through the monitored (alpha and HF) stack on the Centrifuge Assembly Building.

2.1.2.5 Site and Nearby Utilities

The ~~cities~~ city of Eunice ~~and Hobbs~~, New Mexico will provide water to the site. Water consumption for the NEF is calculated to be ~~240 m^3/day (63,423 gal/d)~~ 168.5 m^3/day (44,500 gal/d) to meet potable and process consumption needs. Peak water usage for fire protection is ~~33 L/s (521 gal/min)~~ 23.3 L/s (369 gal/min). ~~The natural gas requirements of the plant are 354 m^3/hr (12,500 ft3/hr).~~ Electrical service to the site will be provided by Xcel Energy. The projected demand is approximately 30 MW. Six septic tanks, each with one or more leach fields, will be installed onsite for the collection of sanitary and non-contaminated liquid waste.

LBDCR-07-0005
LBDCR-08-0004
LBDCR-07-0011

Identified, onsite pipelines include a 25.4-cm (10-in) diameter, underground carbon dioxide pipeline that runs southeast-northwest. This pipeline is owned by Trinity Pipeline LLC. A

40.6-cm (16-in) diameter, underground natural gas pipeline, owned by the Sid Richardson Energy Services Company, is located along the south property line, paralleling New Mexico Highway 234. A parallel 35.6-cm (14-in) diameter gas pipeline is not in use. There are no known onsite underground storage tanks, wells, or sewer systems.

Detailed information concerning water resources and the use of potable water supplies is discussed in ER Section 3.4, Water Resources, and the impacts from these water resources are discussed in ER Section 4.4, Water Resources Impacts. A discussion of impacts related to utilities that will be provided is included in ER Section 4.1, Land Use Impacts.

2.1.2.6 Chemicals Used at NEF

The NEF uses various types and quantities of non-hazardous and hazardous chemical materials. Table 2.1-1, Chemicals and Their Properties, lists the chemicals associated with the NEF operation and their associated hazards. Tables 2.1-2 through 2.1-5 summarize the chemicals in use and storage, categorized by building. These tables also include the physical state and the expected quantity of chemical materials.

2.1.2.7 Monitoring Stations

The NEF will monitor both non-radiological and radiological parameters. Descriptions of the monitoring stations and the parameters measured are described in other sections of this ER as follows:

- Meteorology (ER Chapter 3, Section 3.6)
- Water Resources (ER Chapter 3, Section 3.4)
- Radiological Effluents (ER Chapter 6, Section 6.1)
- Physiochemical (ER Chapter 6, Section 6.2)
- Ecological (ER Chapter 6, Section 6.3)

2.1.2.8 Summary of Potential Environmental Impacts

Following is a summary of impacts from undertaking the proposed action and measures used to mitigate impacts. Table 2.1-6, Summary of Environmental Impacts for the Proposed Action, summarizes the impact by environment resource and provides a pointer to the corresponding section in ER Chapter 4, Environmental Impacts, that includes a detailed description of the impact. Detailed discussions of proposed mitigation measures and environmental monitoring programs are provided in ER Chapter 5, Mitigation Measures and Chapter 6, Environmental Measurements And Monitoring Programs, respectively.

Operation of the NEF would result in the production of gaseous, liquid, and solid waste streams. Each stream could contain small amounts of hazardous and radioactive compounds either alone or in a mixed form.

Gaseous effluents for both non-radiological and radiological sources will be below regulatory limits as specified in permits issued by the New Mexico Air Quality Bureau (NMAQB) and release limits by NRC (CFR, 2003q; NMAC~~, 2002a~~ 20.2.78). This will result in minimal potential impacts to members of the public and workers. LBDCR-07-0022

Liquid effluents include stormwater runoff, sanitary waste water, cooling tower blowdown water, heating boiler blowdown and treated liquid effluents. All proposed liquid effluents, except sanitary waste water, will be discharged onsite to evaporative detention or retention basins. General site stormwater runoff is collected and released untreated to a site stormwater detention basin. A single-lined retention basin will collect stormwater runoff from the Uranium Byproduct Cylinder (UBC) Storage Pad, cooling tower blowdown water and heating boiler blowdown water. All stormwater discharges will be regulated, as required, by a National Pollutant Discharge Elimination System (NPDES) Stormwater Permit. LES will also need to obtain a New Mexico Groundwater Quality Bureau (WQB) Groundwater Discharge Permit/Plan prior to operation for its onsite discharges of stormwater, treated effluent water, cooling tower blowdown water, heating boiler blowdown water and sanitary water. Approximately 174,100 m^3 (46 million gal) of stormwater from the site is expected to be released annually to the onsite retention/detention basins.

NEF liquid effluent discharge rates are relatively low, for example, NEF process waste water flow rate from all sources is expected to be about 28,900 m^3/yr (7.64 million gal/yr). This includes waste water from the liquid effluent treatment system, domestic sewerage, cooling tower blowdown water and heating boiler blowdown water . Only the former source can be expected to contain minute amounts of uranic material. The liquid effluent treatment system and shower/hand wash/laundry effluents will be discharged onsite to a double-lined evaporative basin; whereas the cooling tower blowdown water, heating boiler blowdown water and UBC pad stormwater run-off will be discharged onsite to a single-lined retention basin. Domestic sewerage will be discharged to onsite septic tanks and leach fields.

The NEF water supply will be obtained from the city of Eunice, Mew Mexico~~ and the city of Hobbs, New Mexico~~. Current capacities for the Eunice~~ and Hobbs~~, New Mexico municipal water supply system~~s~~ ~~are~~ is 16,350 m^3/day (4.32 million gpd) ~~and 75,700 m^3/day (20 million gpd), respectively~~ and current usage~~s~~ ~~are~~ is 5,600 m^3/day (1.48 million gpd)~~ and 23,450 m^3/day (6.2 million gpd), respectively~~. Average and peak potable water requirements for operation of the NEF are expected to be approximately ~~240 m^3/day (63,423 gpd)~~168.5 m^3/day (44,500 gpd) and ~~85 m^3/hr (378 gpm)~~87.7 m^3/hr (386 gpm), respectively. These usage rates are well within the ~~capacities~~ capacity of ~~both~~ the water system~~s~~. LBDCR-07-0005 LBDCR-08-0004

Solid waste that will be generated at the NEF, which falls into the non-hazardous, radioactive, hazardous, and mixed waste categories, will be collected and transferred to authorized treatment or disposal facilities offsite as follows. All solid radioactive waste generated will be Class A low-level waste as defined in 10 CFR 61 (CFR, 2003r). Approximately 86,950 kg (191,800 lbs) of low-level waste will be generated annually. In addition, annual hazardous and mixed wastes generated are expected to be about 1,770 kg (3,930 lbs) and 50 kg (110 lbs), respectively. As a result, the NEF will be a small quantity generator (SQG) of hazardous waste and dispose of the waste by licensed contractors. LES does not plan to treat hazardous waste or store quantities longer than 90 days. Non-hazardous waste, expected to be approximately 172,500 kg (380,400 lbs) annually, will be collected and disposed of by a County licensed solid waste disposal contractor. The non-hazardous wastes will be disposed of in the new Lea Country landfill which has more than adequate capacity to accept NEF non-hazardous wastes for the life of the facility.

No communities or habitats defined as rare or unique, or that support threatened and endangered species, have been identified as occurring on the NEF site. Thus, no proposed activities are expected to impact communities or habitats defined as rare or unique, or that support threatened and endangered species, within the 220-ha (543-acre) site.

Noise generated by the operation of the NEF will be primarily limited to truck movements on the road. The noise at the nearest residence will probably increase; however, it may not be noticeable. While the incremental increases in noise level are small, some residents may experience some disturbance for a short period of time as they adjust to these slight increases.

The results of the economic analysis show that the greatest fiscal impact (i.e., 66% of total value impacts) will derive from the 8-year construction period associated with the proposed facility. The largest impact on local business revenues stems from local construction expenditures, while the most significant impact in household earnings and jobs is associated with construction payroll and employment projected during the 8-year construction period.

3.2 TRANSPORTATION

This section describes transportation facilities at or near the NEF site. The section provides input to various other sections such as 3.11, Public And Occupational Health and 3.12, Waste Management, and includes information on access to and from the plant, proposed transportation routes, and applicable restrictions.

3.2.1 Transportation of Access

The proposed NEF is located in southeastern New Mexico near the New Mexico/Texas state line in Lea County, New Mexico. The site lies along the north side of New Mexico Highway 234, which is a two-lane highway with 3.7-m (12-ft) driving lanes, 2.4-mm (8-ft) shoulders and a 61-m (200-ft) right-of-way easement on either side. New Mexico Highway 234 provides direct access to the site. To the north, U.S. Highway 62/180 intersects New Mexico Highway 18 providing access from the city of Hobbs south to New Mexico Highway 234. New Mexico Highway 18 is a four-lane divided highway which was rehabilitated within the last four to six years north of its intersection with New Mexico Highway 234. It was recently improved south of its intersection with New Mexico Highway 234. To the east in Texas, U.S. Highway 385 intersects Texas Highway 176 providing access from the town of Andrews west to New Mexico Highway 234. To the south in Texas, Interstate 20 intersects Texas Highway 18 which becomes New Mexico Highway 18. West of the site, New Mexico Highway 8 provides access from the city of Eunice east to New Mexico Highway 234. Refer to Figure 2.1-1, 80-Kilometer (50-Mile) Radius With Cities and Roads. Additional information regarding corridor dimensions, corridor uses, and traffic patterns and volumes is provided in ER Section 4.2, Transportation Impacts.

The nearest active rail transportation (the Texas-New Mexico Railroad) is in Eunice, New Mexico to the west about 5.8 km (3.6 mi) from the site. This rail line is used mainly by the local oil and gas industry for freight transport. A train may travel on the rail once a day. There is an active rail spur along the north property line of the site that is owned by the neighboring property to the east (Waste Control Specialists LLC). On average, a train consisting of five to six cars may travel on the rail spur once a week. The speed limit for the rail spur is 16 km (10 mi) per hour.

The nearest airport is in Eunice approximately 16 km (10 mi) west of the site. The airport is used by privately-owned planes.

3.2.2 Transportation Routes

3.2.2.1 Plant Construction Phase

The transportation route for conveying construction material to the site is New Mexico Highway 234, which leads directly into the site. The mode of transportation will consist of over-the-road trucks, ranging from heavy-duty 18-wheeled delivery trucks, concrete mixing trucks and dump trucks, to box and flatbed type light-duty delivery trucks.

3.2.2.2 Plant Operation Phase

All radioactive material shipments will be transported in packages that meet the requirements of 10 CFR 71 (CFR, 2003e) and 49 CFR 171-173 (CFR, 2003k; CFR, 2003l). Uranium feed, product and associated low-level waste (LLW) will be transported to and from the NEF. The following distinguishes each of these conveyances and associated routes.

Uranium Feed

The uranium feed for the NEF is natural uranium in the form of uranium hexafluoride (UF_6). The UF_6 is transported to the facility in 48Y or 48X cylinders. These cylinders are designed, fabricated and shipped in accordance with American National Standard Institute N14.1, Uranium Hexafluoride - Packaging for Transport ~~(ANSI, applicable version)~~. Feed cylinders are transported to the site by 18-wheeled trucks, one per truck (48Y) or two per truck (48X). In the future, rail transport may also be used to bring uranium feed to the site. Since the NEF has an operational capacity of 690 feed cylinders per year (type 48Y and 48X), between 345 and 690 shipments of feed cylinders per year will arrive at the site. LBDCR-07-0022

Uranium Product

The product of the NEF is transported in 30B cylinders. These cylinders are designed, fabricated and shipped in accordance with ANSI N14.1, Uranium Hexafluoride - Packaging for Transport ~~(ANSI, applicable version)~~. Product cylinders are transported from the site to fuel fabrication facilities by modified flat bed truck - typically two per truck although up to five product cylinders could be transported on the same truck. In the future, rail transport may be used to ship product cylinders from the site. A maximum of 11,500 kg (25,353 lbs) (2,300 kg (5,071 lbs) per cylinder) of enriched uranium could be transported per shipment. There will be approximately 350 product cylinders shipped per year, which would typically result in a shipment frequency of one shipment per three days (122 shipments per year). LBDCR-07-0022

Uranium Wastes

Waste materials are transported in packages by truck via highway in accordance with 10 CFR 71 and 49 CFR 171-173 (CFR, 2003e; CFR, 2003k; CFR 2003l). Detailed descriptions of radioactive waste materials which will be shipped from the NEF facility for disposal are presented in ER Section 3.12, Waste Management. Table 3.12-1, Estimated Annual Radiological and Mixed Wastes, presents a summary of these waste materials. Based on the expected generation rate of low-level waste (see Table 3.12-1), an estimated 477 fifty-five gallon drums of solid waste are expected annually. Using a nominal 60 drums per radwaste truck shipment, approximately 8 low level waste shipments per year are anticipated.

Depleted Uranium

Depleted uranium in UBCs will be shipped to conversion or storage facilities via truck in 48Y cylinders similar to feed cylinders. These cylinders are designed, fabricated and shipped in accordance with ANSI N14.1, Uranium Hexafluoride – Packaging for Transport ~~(ANSI, applicable version)~~. UBCs will be transported from the site by 18-wheeled trucks, one per truck (48Y). In the future, rail transport may also be used for ship UBCs from the site. Since the NEF has an operational capacity of approximately 625 UBCs per year (type 48Y), approximately 625 shipments of UBCs per year will leave the site. At present, UBCs will be temporarily stored onsite until conversion or storage facilities are available. LBDCR-07-0022

3.3 GEOLOGY AND SOILS

This section identifies the geological, seismological, and geotechnical characteristics of the National Enrichment Facility (NEF) site and its vicinity. Some areas immediately adjacent to the site have been thoroughly studied in recent years in preparation for construction of other facilities including the Waste Control Specialists (WCS) site and the former Atomic Vapor Laser Isotope Separation (AVLIS) site. Data remain available from these investigations in the form of reports (WBG, 1998; TTU, 2000). These documents and related materials provide a significant description of geological conditions for the NEF site. In addition, Louisiana Energy Services (LES) performed field investigations, where necessary, to confirm site-specific conditions.

The NEF site is located in New Mexico west of the Texas border about 48 km (30 mi) from the southeast corner of the state and about 90 km (56 mi) east of the Pecos River. The east edge of the site is 0.8 km (0.5 mi) from the Lea County, New Mexico – Andrews County, Texas border. The site is contained in the Eunice New Mexico, Texas-New Mexico USGS topographic quadrangle (USGS, 1979).

Figure 3.3-1, Regional Physiography, (Raisz, 1957) shows the 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. The boundary between the two sections is the Mescalero Escarpment, locally referred to as Mescalero Ridge. That ridge abruptly terminates at the far eastern edge of the Pecos Plains. The ridge is an irregular erosional topographic feature in southern Lea County where it exhibits relief of about 9 to 15 m (30 to 50 ft) compared with a nearly vertical cliff and relief of approximately 45 m (150 ft) in northwestern Lea County. The lower relief of the ridge in southeastern Lea County is due to partial cover by wind deposited sand (WBG, 1998). The NEF is located about 6.2 to 9.3 km (10 to 15 mi) southeast of the Mescalero Escarpment (CJI, 2004).

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

The dominant geologic feature of this region is the Permian Basin. The NEF site is located within the Central Basin Platform area (Figure 3.3-2, Regional Geology of the Permian Basin). This platform occurs between the Midland and Delaware Basins, which comprises the Permian Basin. The basin, a 250 million-year-old feature, is the source of the region's prolific oil and gas reserves. The late Cretaceous to the early Tertiary periods (65 to 70 million years ago) marked the beginning of the Laramide Orogeny, which formed the Cordilleran Range to the west of the Permian Basin. That orogeny uplifted the region to its present elevation.

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 which uniformly slopes to the southeast. In contrast, the Pecos Plains section is characterized by its more irregular erosional topographic expression (WBG, 1998). Topographic relief on the site is generally subdued. NEF site elevations range between about +1,0303 and +1,05345 m (+3,3890 and +3,45530 ft), mean sea level (msl). Finished site grade will be about +1,041 m (+3,415 ft), msl (Figure 3.3-3, Site Topography). The NEF site itself encompasses approximately 220 ha (543 acres), of which approximately 73 ha (180 acres) will be developed. Small-scale topographic features within the boundary of the proposed NEF site include a closed depression evident at the northern center of the site, the result of eolian processes, and a topographic high at the southwest corner of the site that was created by dune sand. In general the site slopes from northeast to southwest with a general overall slope of about 0.5%. Red Bed Ridge (TTU, 2000) is an escarpment of about 15 m (50 ft) in height that occurs just north and northeast of the NEF site. It is a prominent buried ridge developed on the upper surface of the Triassic Dockum Group "red beds" (Rainwater, 1996). The crest of the buried Red Bed Ridge is approximately 1.6 km (1 mi) or so in width and extends for at least 160.9 km (100 mi) in length from northern Lea County, New Mexico, through western Andrews County, Texas, and southward into Winkler and Ector Counties in Texas. The Red Bed Ridge runs from the northwest to the southeast, just north and northeast of the NEF site through the adjacent Wallach Quarry and Waste Control Specialists (WCS) properties (TTU, 2000). The Red Bed Ridge origin appears to be the result of the relative resistant character of the claystone of the Chinle Formation and to caliche deposits that cap the ridge.

LBDCR-07-0053

Although the Mescalero Escarpment and the Red Bed Ridge are likely to have originated due to similar geomorphological processes, as both appear to be remnant erosional features, they are not associated with each other.

Geologically the 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 (NMIMT, 2003). Figure 3.3-4, Surficial Geologic Map of the NEF Site Area is a portion of the Surficial Geologic Map of Southeast New Mexico (NMIMT, 1977), which includes the area of the NEF site. The surficial unit shown on this map at the NEF site is described as a sandy alluvium with subordinate amounts of gravel, silt and clay. Figure 3.3-4 also describes other surficial units in the site vicinity including caliche, a partly indurated zone of calcium carbonate accumulation formed in the upper layers of surficial deposits including tough slabby surface layers and subsurface nodules, fibers and veinlets; loose sand deposits, some gypsiferous, and subject to wind erosion. Other surficial deposits in the site area include floodplain channel deposits along dry channels and playa sands.

Recent deposits of dune sands are derived from Permian and Triassic rocks. These so-called Mescalero Sands (also known as the Blackwater Draw Formation) occur over 80% of Lea County and are generally described as fine to medium-grained and reddish brown in color. The USDA Soil Survey of Lea County identifies the dune sands at the site as the Brownsfield¬-Springer Association of reddish brown fine to loamy fine sands (USDA, 1974).

Figure 3.3-5, Preliminary Site Boring Plan and Profile, includes the preliminary NEF site borings, adjacent site borings and a geologic profile from the immediately adjacent parcel to the east that provides a representation of site geology. The profile shows alluvial deposits about 9 to 15 m (30 to 60 ft) thick, cemented by a soft caliche layer of 1 to 4 m (3 to 13 ft) that occurs at the top of the alluvium. Locally on the site, dune sand overlies both these deposits. The alluvium rests on the red beds of the Chinle Formation, a silty clay with lenses of sandy clay or claystone and siltstone. Information from ~~recent~~ borings initiated by LES on the NEF site in September 2003 is consistent with the data shown on the profile in Figure 3.3-5 as discussed in ER Section 3.3.1, Stratigraphy and Structures. LBDCR-07-0053 LBDCR-07-0053

Borings on the NEF site depicted on Figure 3.3-5 include:

- Three borings/monitoring wells (MW-1, MW-2, and MW-3)
- Nine site groundwater exploration borings (B-1 through B-9)
- Five geotechnical borings (B-1 through B-5).

Other borings depicted on Figure 3.3-5, not on the NEF site, were performed by others.

Detailed information about soil composition across the NEF site, which was taken from a larger number of geotechnical boring, can be found in Appendices A and C of the Geotechnical Report (NTS Report 114489-G-01, Rev. 00). LBDCR-07-0053

The Southeast New Mexico-West Texas area presently is structurally stable. The Permian Basin has subsided slightly since the Laramide Orogeny. This is believed to be a result of dissolution of the Permian evaporite layers by groundwater infiltration and possibly from oil and gas extraction (WBG, 1998).

The NEF site lies within the Landreth-Monument Draw Watershed. Site drainage is to the southwest with runoff not able to reach any water body before it evaporates. The only major regional drainage feature is Monument Draw, which is located just over 4 km (2.5 mi) west of the site, between the proposed NEF site and the city of Eunice, New Mexico (USDA, 1974). The draw begins with a southeasterly course to a point north of Eunice where it turns south and becomes a well defined cut approximately 9 m (30 ft) in depth and 550 to 610 m (1,800 to 2,000 ft) in width. The draw does not have through-going drainage and is partially filled with dune sand and alluvium.

Along Red Bed Ridge (TTU, 2000), approximately 1.6 km (1 mi) northeast of the NEF site is Baker Spring (Figure 3.3-5, Preliminary Site Boring Plan and Profile). The depression contains water only intermittently (see ER Section 3.4.1.1, Major Surface and Subsurface Hydrological Systems). No defined drainage features are present at the site. Rainfall on the site will be collected in detention/retention basins. Rainfall that is not collected is expected to infiltrate, or evaporate without creating any runoff that flows beyond site boundaries. LBDCR-07-0053

Within Lea County, New Mexico and Andrews County, Texas there are water-bearing strata used for water production. North and east of the NEF site, beneath the High Plains, the Ogallala Aquifer is the most productive of these regional aquifers. West of the site, in the alluvial deposits of Monument Draw, subsurface flow is also locally used as a minor aquifer. Lastly, the Santa Rosa Formation of the Lower Dockum Group and sandy lenses in the Upper Dockum Chinle formation are occasionally used as aquifers on a regional basis.

The most shallow strata to produce measurable quantities of water is an undifferentiated siltstone seam of the Chinle encountered at approximately 65 to 68 m (214 to 222 ft) below ground surface (WBG, 1998). There is also a 30.5-meter (100-foot) thick water-bearing sandstone layer at about 183 m (600 ft) below ground surface. However, the uppermost aquifer capable of producing significant volumes of water is the Santa Rosa Formation located approximately 340 m (1,115 ft) below ground surface (CJI, 2004).

With respect to the environment, geologic conditions at the NEF site will not be significantly affected by construction or operation of the NEF. (See ER Section 4.3, Geology and Soils Impact.)

3.3.1 Stratigraphy and Structures

The Permian Basin, a massive subsurface bedrock structure, is a downward flexure of a large thickness of originally flat-lying, bedded, sedimentary rock. It dominates the geologic structure of the region. It extends to 4,880 meters (16,000 feet) below msl. The NEF site is located above the Central Basin Platform that divides the Permian Basin into the Midland and Delaware sub-basins, as shown in Figure 3.3-2, Regional Geology of the Permian Basin. The base of the Permian basin sediments extends about 1,525 m (5,000 ft) deep beneath the NEF site.

The top of the Permian deposits are approximately 434 m (1,425 ft) below ground surface. Overlying the Permian are the sedimentary rocks of the Triassic Age Dockum Group. The upper formation of the Dockum Group is the Chinle. Locally, the Chinle Formation consists of red, purple and greenish micaceous claystone and siltstone with interbedded fine-grained sandstone. The Chinle is regionally extensive with outcrops as far away as the Grand Canyon region in Arizona (WBG, 1998). Locally overlying the Chinle Formation in the Permian Basin is either the Tertiary Ogallala, Gatuña or Antlers Formations, or Quaternary alluvium. The Tertiary Ogallala Formation underlies all of the High Plains (to the east) and mantles several ridges in Lea County. Unconsolidated sediments northeast of the NEF site are recognized as the Ogallala and deposits west of the NEF site are mapped as the Gatuña or Antlers Formations. This sediment is described as alluvium (WBG, 1998) and is mined as sand and gravel in the NEF site area.

As shown in Table 3.3-1, Geological Units Exposed At, Near, or Underlying the Site, the uppermost 340 m (1,115 ft) of the subsurface in the NEF site vicinity can include up to 0.6 m (2 ft) of silty fine sand, about 3 m (10 ft) of dune sand, 6 m (20 ft) of caliche, and 16 m (54 ft) of alluvium overlying the Chinle Formation of the Triassic Age Dockum Group. The Chinle Formation is predominately red to purple moderately indurated claystone, which is highly impermeable (WBG, 1998). Red Bed Ridge is a significant topographic feature in this regional plain that is just north and northeast of the NEF site, and is capped by relatively resistant caliche. Ground surface elevation increases about 15 m (50 ft) from +1,045 m (+3,430 ft) to +1,059 m (+3,475 ft) across the ridge.

Recent deposits at the site and in the site area are primarily dune sands derived from Permian and Triassic rocks of the Permian Basin. These so-called Mescalero Sands cover approximately 80% of Lea County, locally as active sand dunes.

Information from borings initiated by LES on the NEF site in September 2003~~recent borings done on the NEF site~~ is consistent with the data shown on the profile in Figure 3.3-5, Preliminary Site Boring Plan and Profile. This includes a thin layer of loose sand at the surface; about 12 m (40 ft) of high blow count alluvial silty sand and sand and gravel locally cemented with caliche; and the Chinle clay at a depth of about 12 m (40 ft) below the ground surface. No sandy clay layers were reported in the clay. LBDCR-07-0053

The boring logs for the preliminary set of NEF site geotechnical borings (Borings B-1 through B-5) are provided in the Integrated Safety Analysis Summary Figures 3.2-10 through 3.2-15. LBDCR-07-0053

The boring logs for the detailed set of NEF site geotechnical borings can be found in Appendix A of the Geotechnical Report (NTS Report No. 114489-G-01, Rev. 00), and the drawing in Appendix C of the Geotechnical Report shows the locations of these borings. LBDCR-07-0053

Two types of faulting were associated with early Permian deformation. Most of the faults were long, high-angle reverse faults with well over a hundred meters (several hundred 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 (miles), are found. The closest fault to the site as defined by the New Mexico Bureau of Geology and Mineral Resources (NMIMT, 2003) is over 161 km (100 mi) to the west and is associated with the deeper portions of the Permian Basin (Machette, 1998).

The large structural features of the Permian Basin are reflected only indirectly in the Mesozoic and Cenozoic rocks, as there has been virtually no tectonic movement within the basin since the Permian period. Figure 3.3-2, Regional Geology of the Permian Basin, shows the structure that

causes the draping of the Permian sediments over the Central Basin Platform structure, located approximately 2,134 m (7,000 ft) beneath the present land surface. The faults that uplifted the platform do not appear to have displaced the younger Permian sediments.

In addition to the lack of regional information indicating the presence of post-Permian faulting, the local information does not indicate Holocene displacement of faults near the proposed NEF site. Site investigations carried out for the WCS site provide an indication that faulting is absent in the subsurface beneath that site. The majority of Quaternary age faults within New Mexico are mapped along the north-south trending Rio Grande Rift located approximately 290 km (180 mi) west of the site.

According to Machette et al. (Machette, 1998), Quaternary age faults are not identified in New Mexico within 161 km (100 mi) of the site. Quaternary age faults designated as capable within 240 km (150 mi) of the site include the Guadalupe fault, located approximately 191 km (119 mi) west of the site in New Mexico, and in Texas, the West Delaware Mountains fault zone, East Sierra Diablo fault, and East Flat Top Mountain fault, located 185 km (115 mi) southwest, 196 km (122 mi) southwest, and 200 km (124 mi) west-southwest, respectively. The East Baylor Mountain-Carrizo Mountain fault is considered a possible, capable fault located 201 km (125 mi) southwest of the NEF site, but movement within the last 35,000 years has not been demonstrated (DOE, 2003d; Machette, 2000; USGS, 2004).

3.3.1.1 Potential Mineral Resources at the Site

No significant non-petroleum mineral deposits are known to exist in the vicinity of the NEF site. The surface cover of silty sand and gravel overlies a claystone of no economic value. No mineral operations are noted in Lea County by the New Mexico Bureau of Mines Inspection (NMBMI, 2001). Mining and potential mining of potash, a commonly extracted mineral in New Mexico, is followed by the New Mexico Energy, Minerals and Natural Resources Department, which maintains a map of areas with potash mines and mining potential (NMEMNRD, 2003). Those data indicate neither mining nor potential for mining of potash in the site area.

The topographic quadrangle map that contains the site (USGS, 1979) contains 10 locations where sand and gravel have been mined from surface deposits, spread across the quadrangle, an area about 12 by 14 km (7.5 by 8.9 mi), suggesting that suitable surficial deposits for borrow material are widespread.

Exploratory drill holes for oil and gas are absent from the site area and its vicinity, but are common 8 km (5 mi) west in and around the city of Eunice, New Mexico. See ER Figure 3.4-7, Water and Oil Wells in the Vicinity of the NEF Site, for nearby well locations. That distribution and the time period of exploration since the inception of exploration for this area suggest that the potential for productive oil drilling at the NEF site is not significant.

3.3.1.2 Volcanism

No volcanic activity exists in the NEF site region.

3.3.2 Site Soils

Soil development in the region is generally limited due to its semi-arid climate. The site has a minor thickness of silty fine sand soil (generally less than 0.4 m (1.4 ft)) developed from subaerial weathering. Caliche deposits are common in the near-surface soils. A small deposit of active dune sand is present at the southwest corner of the site.

The U. S. Department of Agriculture soil survey for Lea County, New Mexico (USDA, 1974) categorizes site soils as hummocky loamy (silty) fine sand. Near-surface caliche deposits may locally limit (limiting soil porosity) or enhance (fractured caliche) surface drainage. Figure 3.3-6, Site Soils Map Per USDA Data, shows the soil map for the NEF site (USDA, 1974). The legend for that map lists each of the soils present at the NEF site, describing them and citing their Unified Soil Classification designations (ASTM, 1993).

Detailed information about soil composition across the NEF site can be found in Appendices A and C of the Geotechnical Report (NTS Report No. 114489-G-01, Rev. 00). LBDCR-07-0053

Eight surface soil samples were collected and analyzed for both radiological and non-radiological chemical analyses. Refer to ER Section 3.11.1.1 for a discussion of the radiological analyses results for these eight samples as well as for ten surface soil samples that were previously collected for initial radiological characterization of the NEF site.

The non-radiological chemical analyses included volatiles, semi-volatiles, 8 Resource Conservation and Recovery Act (RCRA) metals, organochlorine pesticides, organophosphorous compounds, chlorinated herbicides and fluoride. Six of the additional eight soil sample locations were selected to represent background conditions at proposed plant structures. The other two sample locations are representative of up-gradient, on-site locations. Table 3.3-8, NEF Site Soil Sample Locations, provides descriptions and the latitude and longitude of the soil samples locations. The approximate locations of the soil samples are shown on Figure 3.3-12, Soil Sample Locations.

The non-radiological analytical results for the eight soil samples are provided in Table 3.3-9, Non-Radiological Chemical Analyses of NEF Site Soil. Barium, chromium and lead were detected above laboratory reporting limits in all eight soil samples. However, their detected levels are below State of New Mexico Soil Screening Levels as developed by the New Mexico Environment Department (NMED, 2004b). Other non-radiological parameters were not detected at levels above the laboratory reporting limits.

3.3.2.1 Geotechnical Investigations

Previously completed geotechnical investigations on property near the NEF site provide the following subsurface information.

The granular soils in the uppermost 12 m (40 ft) 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 founded in the Chinle Formation which has an unconfined compressive strength of over 195,000 kg/m2 (20 ton/ft2) (WBG, 1998).

Topsoil occurs as 0.3 m (1 ft) or less of brown organic silty sand that overlies a formation of white or tan caliche. The caliche consists of very hard to friable cemented sand, conglomerate limestone rock, silty sand and gravel. A sand and gravel layer varying from 0 to 6 m (0 to 20 ft) in thickness occurs at the bottom of the caliche strata. Below the caliche is a reddish brown silt clay that extends to the termination of the preliminary borings, 30 to 91 m (100 to 300 ft) below grade. The red beds consist of a highly consolidated, impervious clay: LBDCR-07-0053

- mottled reddish brown-gray clay;
- purple-gray silty clay;
- yellowish brown-gray silty clay; and
- siltstones and sandstone layers found at various depths with varying thicknesses

The depth to the top of the red beds in preliminary borings done for engineering purposes ranged from about 3.6 to 9.1 m (12 to 30 ft). LBDCR-07-0053

~~The dry density of the clay ranges from 1.86 to 2.32 g/cm3 (116 to 145 lbs/ft3), averaging 2.11 g/cm3 (132 lbs/ft3). The red, reddish-brown or purple silty clays range in moisture content from 2.5% to 25%, averaging 8% to 12% for most samples. Liquid limits for the clays range from 35% to 55% with plasticity indices ranging from 24 to 38. Percent passing the #200 sieve for the clays ranges from 87% to 99.8%.~~ LBDCR-07-0053

Permeabilities were measured for the reddish brown silty clays, sandstones and siltstones. Ranges were determined as shown in Table 3.3-2, Measured Permeabilities Near the NEF Site. The values for the clay indicate that it is highly impervious. Siltstones are slightly more permeable, but still having relatively poor permeability.

Unconfined compressive tests on the clay during the September 2003 geotechnical investigation resulted in values from 136,000 kg/m2 to 485,000 kg/m2 (13.9 to 49.7 tons/ft2) with an average value of 293,000 kg/m2 (30 tons/ft2). LBDCR-07-0053

Given a depth to groundwater of at least 65 to 68 m (214 to 222 ft), there is no potential for liquefaction at the site. According to the Geotechnical Report (NTS Report No. 114489-G-01, Rev. 00), there is no potential for liquefaction at the site.

A geotechnical investigation of the site conducted in September 2003 consisted of 5 widely-spaced test borings that extended to depths of about 12 to 30.5 m (40 to 100 ft) using a hollow-stem auger and split-spoon sampling. Based on the boring results, up to 0.6 m (2 ft) of loose eolian sand underlain by dense to very dense, fine- to medium-grained sand and silty sand of the Gatuña/Antlers Formation was encountered. These sands are locally cemented with caliche deposits. Beneath the Gatuña/Antlers Formation is the Chinle claystone, a very hard highly plastic clay, which was encountered at depths of about 10.7 to 12.2 m (35 to 40 ft). One boring extended to 30.5 m (100 ft) deep and ended in the Chinle Formation. Blow count N-values for about the top 7.6 m (25 ft) of sand and gravel ranged from about 20 to 76. Beneath that horizon the unit becomes denser or contains gravel to the extent that useful blow counts are not obtained. Where caliche cements the sand and gravel, N-values of over 60 are typical. LBDCR-07-0053 Standard N-values were not available for samples in the underlying clay due to its hardness causing blow counts to range upwards of 100. Detailed information about soil composition across the NEF site, including N-values, can be found in Appendices A and C of the Geotechnical Report (NTS Report No. 114489-G-01, Rev. 00). Allowable bearing pressures can be found in Table 5.8-2 and Figures 5.8-1 and 5.8-2 of the Geotechnical Report, and these values are based on the assumptions in Section 5.8 of the report. The California Bearing Ratio (CBR) test results can be found in Section 5.6.1 of the report. Table 5.9-4 of the report gives the maximum dry density values. A discussion of the soil's Young's modulus and a plot of the soil's Young's modulus can be found in Section 5.9.3 and Figure 5.9-4 of the report, respectively. Information on Atterberg limits can be found in Table 2-2 and Figure 2-5 of the report. A graph of the percentage of soil particles passing No. 200 sieve size vs. elevation is given in Figure 2-3 of the report.

For samples from the shallow sand and gravel unit, California Bearing Ratio values of 10.5 and 34.4 were obtained along with a maximum dry density value of 1.97 g/cm3 (123 lbs/ft3). Fines in this material were generally non-plastic with 17% to 31% of samples finer than 200 sieve size. Clay samples had relatively high liquid limits of 50% to 60% and plastic limits of 18% to 23%, suggesting high silt content.

Footings bearing in the firm and dense sandy soils below the upper loose eolian soils are estimated to have an allowable bearing pressure of 34,177 kg/m2 (7,000 lbs/ft2).

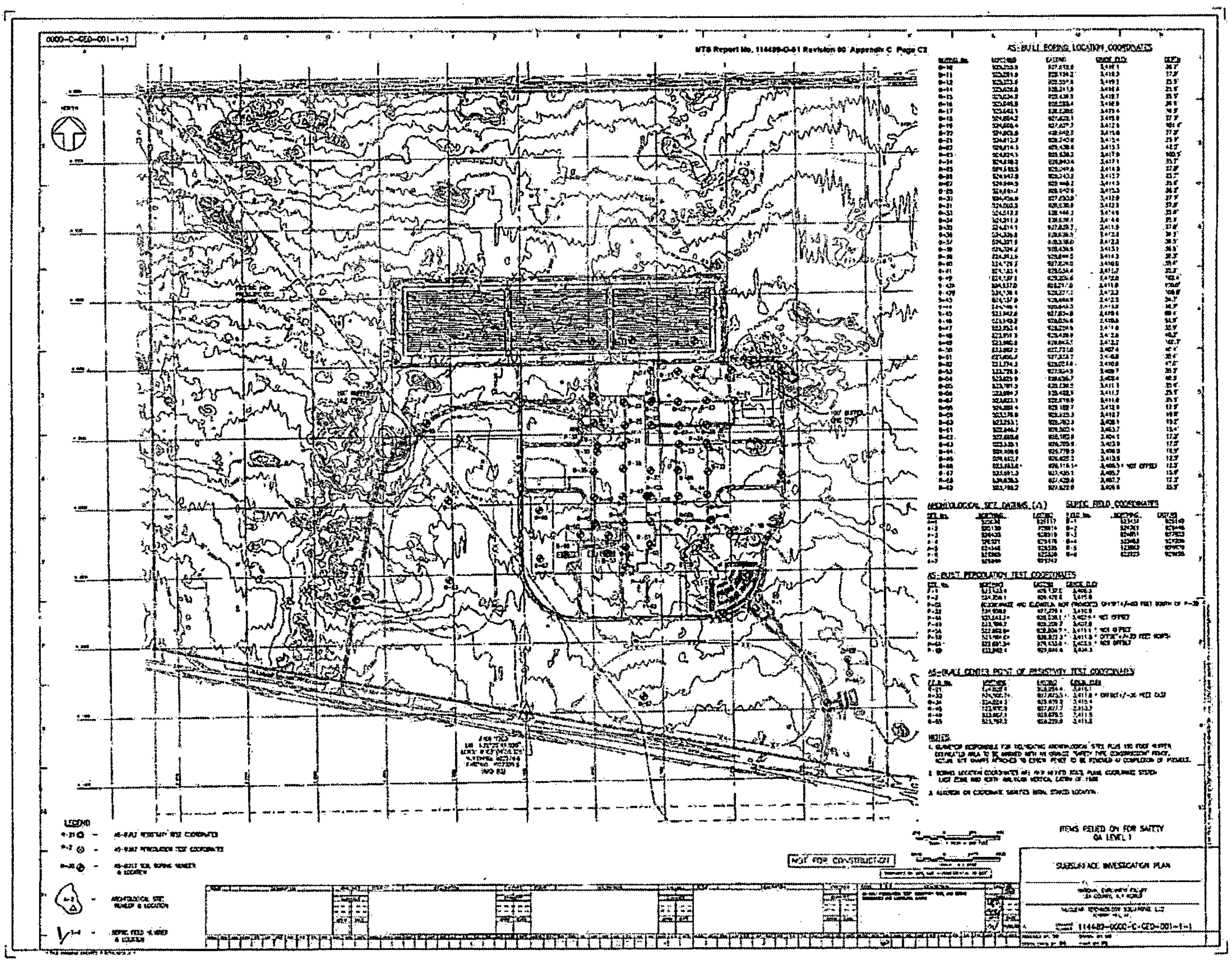

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Figure 3.3-3 Site Topography

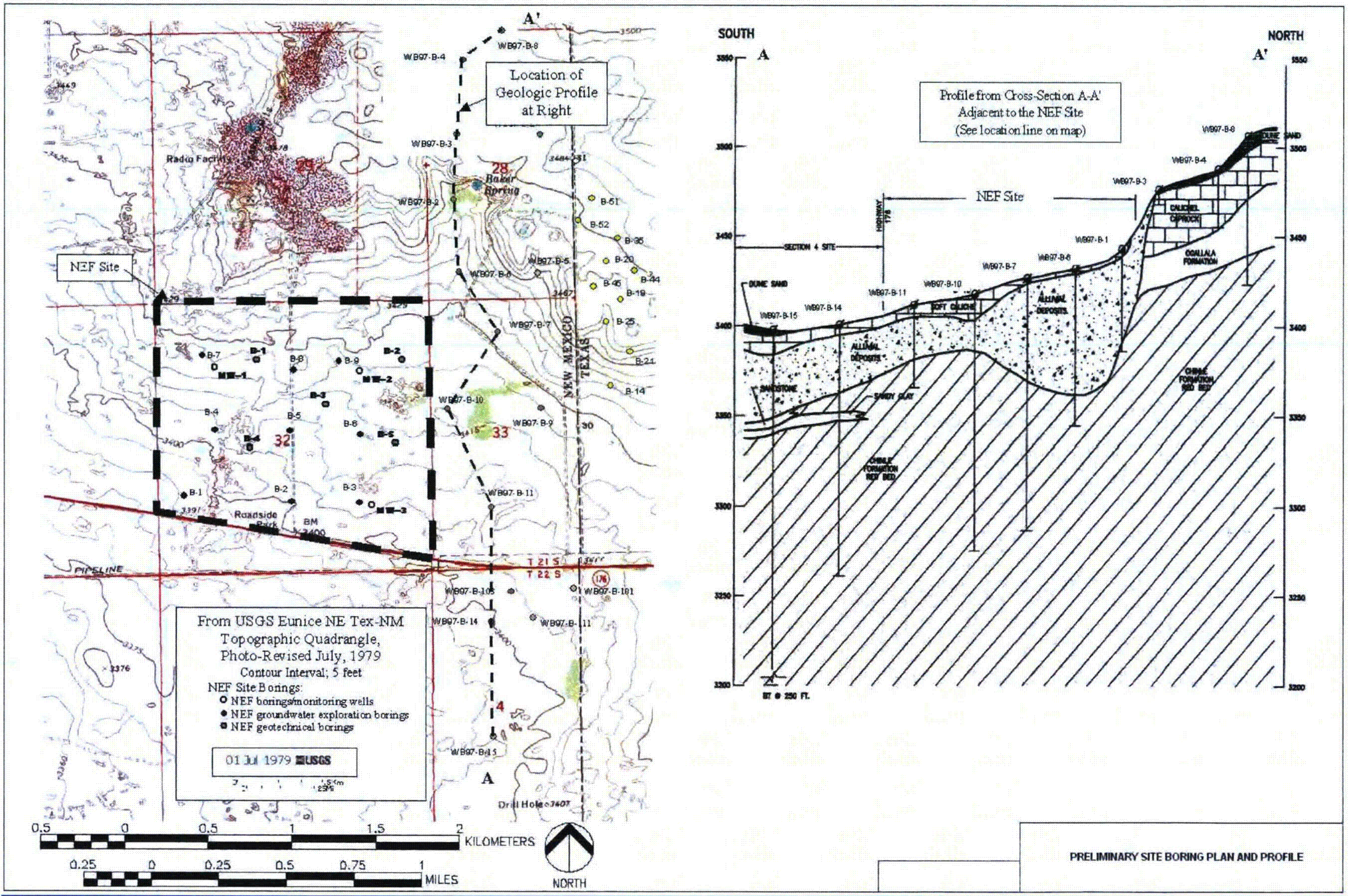

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Figure 3.3-5 Preliminary Site Boring Plan and Profile

3.4 WATER RESOURCES

This section describes the National Enrichment Facility (NEF) site's surface water and groundwater resources. Data are provided for the NEF site and its general area, and the regional associations of those natural water systems are described. This information provides the basis for evaluation of any potential facility impacts on surface water, groundwaters, aquifiers, water use and water quality. Subsections address surface hydrology, water quality, pre-existing environmental conditions, water rights and resources, water use, contamination sources, and groundwater characteristics.

The information included in this section was largely obtained from prior site studies including extensive subsurface investigations for a nearby facility, Waste Control Specialists (WCS) located about 1.6 km (1 mi) to the east of the NEF site. In addition, literature searches were conducted to obtain additional reference material. Some of the WCS data has been collected on Section 33 located immediately east of the NEF site. These data are being supplemented by a groundwater exploration and sampling program on Section 32 initiated by LES in September 2003.

The NEF will make no use of either surface water or groundwater from the site. The collection and storage of runoff from specific site areas will be controlled. No significant adverse changes are expected in site hydrology as a result of construction or operation of the NEF. ER Section 4.4.7, Control of Impacts to Water Quality, addresses potential for impacts onsite water resources as a result of activities on the NEF site including runoff and infiltration changes due to plant construction and fill placement.

3.4.1 Surface Hydrology

The NEF site itself contains no surface water bodies or surface drainage features. Essentially all the precipitation that occurs at the site is subject to infiltration and/or evapotranspiration. More information on the movement and fate of surface water and groundwater at the site is provided in ER Section 3.4.1.1, Major Surface and Subsurface Hydrological Systems. Regional and local hydrologic features are shown on Figure 3.4-1, Local Hydrologic Features and Figure 3.4-2, Regional Hydrologic Features, respectively. These features are discussed in the following sections. These features include Baker Spring, Monument Draw and several ponds on the adjacent Wallach Concrete, Inc. property. There are also several intermittent surface features in the vicinity of the NEF site that may collect water for short periods of times following heavy rainfall events.

3.4.1.1 Major Surface and Subsurface Hydrological Systems

The climate in southeast New Mexico is semi-arid. Precipitation in the NEF area averages only 33 to 38 cm/yr (13 to 15 in/yr). Evaporation and transpiration rates are high. This results in minimal, if any, surface water occurrence or groundwater recharge.

The NEF site contains no surface drainage features. The site topography is relatively flat, with the average slope only 0.0064 m/m (0.0064 ft/ft). Some localized depressions exist, due to eolian processes, but the size of these features is too small to be of significance with respect to surface water collection.

Most precipitation is contained onsite due to infiltration and/or evapotranspiration. The vegetation on the site is primarily shrubs and native grasses. The surface soils are predominantly of an alluvial or eolian origin. The texture of the surface soils is generally silt to silty sands. Therefore, the surface soils are relatively low in permeability, and would 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. Nine preliminary subsurface borings were (LBDCR-07-0053) drilled at the site during September 2003. Only one of the borings produced cuttings that were slightly moist at 1.8 to 4.2 m (6 to 14 ft) below ground surface; other cuttings were very dry. Also, ground water was not encountered during drilling at any of the additional 59 NEF site borings, which are documented in Appendices A and C of the Geotechnical Report (NTS Report No. 114489-G-01, Rev. 00) and some were drilled as deep as 30.5 m (100 ft) below grade. (LBDCR-07-0053) Evapotranspiration processes are significant enough to short-circuit any potential groundwater recharge.

There is some evidence for shallow (near-surface groundwater occurrence in areas to the north and east of the site. These conditions are intermittent and limited. A quarry operated by Wallach Concrete, Inc. is located just north of the NEF site. Wallach has extensively mined sand and gravel from the quarry. The typical geologic cross section at that site consists of a layer of caliche at the surface, referred to as the "caprock," underlain by a sand and gravel deposit, which in turn overlies a thick clay unit of the Dockum Group, referred to as red beds, and part of the Chinle Formation. Table 3.3-1, Geological Units Exposed At, Near, or Underlying the Site and Figure 3.3-5, Preliminary Site Boring Plan and Profile depict this (LBDCR-07-0053) stratigraphy. Figure 3.4-3, View of a Pit Wall in a Wallach Sand & Gravel Excavation to the North of the NEF Site, shows a pit wall in one of Wallach's excavations, where the caprock (caliche) overlies sand and gravel, with the red bed clay Chinle Formation at the base of the pit. In some areas the caprock is missing and the sand and gravel is exposed at the surface. The caprock is generally fractured and, following precipitation events may allow infiltration that quickly bypasses any roots from surface vegetation. In addition, the areas where the sand and gravel outcrop may allow rapid infiltration of precipitation. These conditions have led to instances of minor amounts of perched groundwater at the base of the sand and gravel unit, atop the red bed Chinle Formation. The Chinle red bed clay has a very low permeability, about 1×10^{-8} cm/s (4×10^{-9} in/s) (Rainwater, 1996), and serves as a confining unit arresting downward percolation of localized recharge.

Figure 3.4-4, Groundwater Seep at the Base of a Wallach Sand & Gravel Excavation to the North of the NEF Site, shows a shallow surface depression filled with water in the base of one of Wallach's gravel pits. The water is present perennially due to a seep at the base of the sand and gravel unit at the top of the Chinle clay. Occasionally the water is pumped out of this depression for use on site. The rate of replenishment has not been quantified, but it is relatively slow. The amount of water in the pit is insufficient to fully supply the quarry operations. This shallow perched zone is not likely to be pervasive throughout the area; not all of Wallach's excavations encounter this horizon. It is not considered to be an aquifer.

Conditions at the NEF site are different than at the Wallach site. Two conditions are of particular importance. First, the caprock is not present at the NEF site. Therefore, rapid infiltration through fractured caliche does not contribute to localized recharge at the NEF site. Second, the surface soils at the NEF site are finer-grained than the sand and gravel at the Wallach site. There is a thin layer of sand and gravel just above the red bed Chinle clay unit on the NEF site, but based on recent investigations, it is not saturated. Further, that horizon at the NEF site is very dry or at a residual saturation level based on information from the nine recent soil borings.

A third instance of localized shallow groundwater occurrence exists to the east of the NEF site where several windmills on the WCS property were used to supply water for stock tanks; they are no longer in use. These windmills tap small saturated lenses above the Chinle Formation red beds. The amount of groundwater in these zones is limited. The source of recharge for these localized perched zones is likely to be "buffalo wallows," (playas) depressions 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. WCS has drilled monitoring wells in these areas to characterize the nature and extent of the saturated conditions. Some of these wells are dry, owing to the localized nature of the perched conditions. When water is encountered in the sand and gravel above the Chinle Formation red beds its level is slow to recover following sampling events, due to the low permeability of the perched saturated zones. The discontinuity of this saturated zone and its low permeability argue against its definition an aquifer. No buffalo wallows or related groundwater conditions occur on or near the NEF site.

The NEF is located in an area with little to no surface water or runoff. Monument Draw is an intermittent stream and the closest surface water conveyance feature. Flow data are presented in ER Section 3.4.12.9, Design-Basis Flood Elevation.

Walvoord et al,. 2002 (Walvoord, 2002) best describes the hydrologic conditions that occur in the shallow surface regime at the NEF site. This reference uses field investigations including geochemical and soil-physics based techniques, as well as computer modeling, to show that there is no recharge occurring in thick, desert vadose zones with desert vegetation. Precipitation that infiltrates into the subsurface is efficiently transpired by the native vegetation. Vapor-phase movement of soil-moisture may occur, but it is also intercepted by the vegetation. In a thick vadose zone, such as at the NEF site, the deeper part of that zone has a natural thermal gradient that induces upward vapor diffusion. As a result, a small flux of water vapor rises from depth to the base of the root zone, and any infiltration coming from the land surface is captured by the roots of the plants within the top several meters (feet) of the profile. Effectively there is a maximum 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. These deep desert soil systems have functioned in this manner for thousands of years, essentially since the time of the last glacial period when precipitation rates fell dramatically. It is expected that these conditions will remain for several thousand more years (until the next glacial period), unless the hydrology and vegetation is altered dramatically.

3.4.1.1.1 Site Groundwater Investigations

A subsurface investigation was initiated at the NEF site in September 2003 to delineate specific hydrologic conditions. Figure 3.3-5, Preliminary Site Boring Plan and Profile and Figure 3.4-6, Dockum Group (Chinle Formation) Surface Contour, show the locations of the preliminary subsurface borings and the monitoring wells. LBDCR-07-0053

The WCS facility is located directly to the east of the NEF site in Texas. It has had numerous subsurface investigations performed for the purpose of delineating and monitoring site subsurface hydrogeologic conditions. Much of this information is directly pertinent to the NEF site. The WCS hydrogeologic data was used in planning the recent NEF site investigations. A recent evaluation of potential groundwater impacts in the area provides a good overview of the investigations performed for the WCS facility (Rainwater, 1996).

The NEF site investigation initiated in September 2003 had two main objectives: 1) delineate the depth to the top of the Chinle Formation red beds to assess the potential for saturated conditions above the red beds, and 2) complete three monitoring wells in the siltstone layer beneath the red beds to monitor water level and water quality within this thin horizon of perched intermittent saturation.

Nine preliminary boreholes oriented on a three-by-three grid were drilled to the top of the Chinle red beds (Figure 3.4-6). Only one of the borings produced cuttings that were slightly moist at 1.8 to 4.2 m (6 to 14 ft) below ground surface; other cuttings were very dry. Left open for at least a day, no groundwater was observed to enter any of these holes. ~~No samples could be collected for water quality analysis at the time of well construction. One groundwater sample has since been collected due to limited water occurrence, as discussed in ER Section 3.4.15.6, Interactions Among Different Aquifers.~~Also, ground water was not encountered during drilling in any of the additional 59 NEF site borings, which are documented in Appendices A and C of the Geotechnical Report (NTS Report No. 114489-G-01, Rev. 00) and some of which were drilled as deep as 30.5 m (100 ft) below grade. LBDCR-07-0053 LBDCR-07-0053

The land surface elevation was surveyed at each of the nine borehole locations and the elevation of the top of the red beds was computed. This information was combined with similar information from the WCS facility to produce an elevation map of the top of the red beds (see Figure 3.4-6). The dry nature of the soils from each of these borings supports a conclusion that there is no recharge from the ground surface at the site (Walvoord, 2002).

The three monitoring wells were installed at the end of September 2003 (Figures 3.3-5 and 3.4-6). Through the first month of monitoring only one well, MW-2, located at the northeast corner of the site, produced water. Several water samples have been taken from that well. It is anticipated that the other two wells may provide water over lengthy time periods, based on information from the WCS site. Groundwater quality is discussed in ER Section 3.4.2, Water Quality Characteristics.

Another factor to consider relative to hydrologic conditions at the NEF site is the presence of the Triassic Chinle Formation red bed clay. This clay unit is approximately 323 to 333 m (1,060 to 1,092 ft) thick beneath the site. With an estimated hydraulic conductivity on the order of $2x10^{-8}$ cm/s ($7.9x10^{-9}$ in/s), the unit is very tight (Table 3.3-2, Measured Permeabilities on the NEF Site). This permeability is of the same order prescribed for engineered landfill liner materials. One would expect vertical travel times through this clay unit to be on the order of thousands of years, based on this permeability and the thickness of the unit.

The first presence of saturated porous media beneath the site appears to be within the Chinle red bed clay where there exists a low-permeability silty sandstone or siltstone. Borings and monitor wells at the WCS facility directly to the east of the NEF site have encountered this zone approximately 61 to 91 m (200 to 300 ft) below land surface. Wells completed in this unit are very slow to produce water. This makes sampling quite difficult. It is arguable whether this zone constitutes an aquifer, given the low permeability of the unit. Similarly, there is a 30.5 meter (100-foot) thick water-bearing layer at about 183 m (600 ft) below ground surface (CJI, 2004). As discussed above, three monitoring wells were installed on the NEF site in September 2003 with screened intervals within this siltstone unit. These wells are approximately 73 m (240 ft) deep.

The first occurrence of a well-defined aquifer is approximately 340 m (1,115 ft) below land surface, within the Santa Rosa formation (CJI, 2004). Because of the depth below land surface to this unit, and the fact that the thick Chinle clay unit would limit any potential migration to depth, this aquifer has not been investigated. No impacts are expected to the Santa Rosa aquifer.

Figure 3.4-7, Water and Oil Wells in the Vicinity of the NEF Site, is a map of wells and surface water features in the vicinity of the NEF plant site. The figure also includes oil wells. No water wells are located within 1.6 km (1 mi) of the site boundary.

3.4.1.2 Facility Withdrawals and/or Discharges to Hydrologic Systems

The NEF plant will receive its water supply from one or more municipal water systems and thus no water will be drawn from either surface water or groundwater sources at the NEF site. Supply of nearby groundwater users will thus not be affected by operation of the NEF. NEF water supply requirements are discussed in ER Section 4.4, Water Resources Impact.

The NEF design precludes operational process discharges from the plant to surface or groundwater at the site other than into engineered basins. Discharge of routine plant liquid effluents will be to the Treated Effluent Evaporative Basin on the site. The Treated Effluent Evaporative Basin is utilized for the collection and containment of waste water discharge from the Liquid Effluent Collection and Treatment System. The ultimate disposal of waste water will be through evaporation of water and impoundment of the residual dry solids byproduct of evaporation. Total annual discharge to that basin will be approximately 2,535 m^3 per year (669,844 gal/yr). The location of the basin is shown in Figure 4.12-2, Site Layout for NEF. Evaporation will provide the only means of liquid disposal from this basin. The Treated Effluent Evaporative Basin will include a double membrane liner and a leak detection system. A summary of liquid wastes volumes accumulated at the NEF is provided in Table 3.4-1, Summary of Potentially Contaminated Liquid Wastes for the NEF. Of the wastes listed in Table 3.4-1, only uncontaminated liquid wastes are released to the Treated Effluent Evaporative Basin for evaporation without treatment. Contaminated liquid waste is neutralized and treated for removal of uranium, as required. Effluents unsuitable for the evaporative disposal will be removed off-site by a licensed contractor in accordance with US EPA and State of New Mexico regulatory requirements. The State of New Mexico has adopted the US EPA hazardous waste regulations (40 CFR Parts 260 through 266, 268 and 270) (CFR, 2003cc; CFR, 2003p; CFR, 2003dd; CFR, 2003ee; CFR, 2003v; CFR, 2003ff; CFR, 2003gg; CFR, 2003hh; CFR, 2003ii) governing the generation, handling, storage, transportation, and disposal of hazardous materials. These regulations are found in 20.4.1 NMAC, "Hazardous Waste Management" ~~(NMAC, 2000)~~. LBDCR-07-0022

Stormwater from parts of the site will be collected in a retention or detention basin. The design for this system includes two basins as shown in Figure 4.12-2, Site Layout for NEF. The Site Stormwater Detention Basin at the south side of the site will collect runoff from various developed parts of the site including roads, parking areas and building roofs. It is unlined and will have an outlet structure to control discharges above the design level. The normal discharge will be through evaporation/infiltration into the ground. The basin is designed to contain runoff for a volume equal to that for the 24-hour, 100-year return frequency storm, a 15.2 cm (6.0 in) rainfall. The basin will have approximately 123,350 m^3 (100 acre-ft) of storage capacity. Area served includes about 39 ha (96 acres) with the majority of that area being the developed portion of the 220 ha (543 acres) NEF site. In addition, the basin has 0.6 m (2 ft) of freeboard beyond the design capacity. It will also be designed to discharge post-construction peak flow runoff rates from the outfall that are equal to or less than the pre-construction runoff rates from the site area.

The Uranium Byproduct Cylinder (UBC) Storage Pad Stormwater Retention Basin is utilized for the collection and containment of water discharges from three sources: (1) cooling tower blowdown discharges, (2) heating boiler blowdown discharges and (3) stormwater runoff from the UBC Storage Pad. The ultimate disposal of basin water will be through evaporation of water and impoundment of the residual dry solids after evaporation. It is designed to contain runoff for a volume equal to twice that for the 24-hour, 100-year return frequency storm, a 15.2-cm (6.0-in) rainfall plus an allowance for cooling tower blowdown water and heating boiler blowdown water. The UBC Storage Pad Stormwater Retention Basin is designed to contain a volume of approximately 77,700 m^3 (63 acre-ft). Area served by the basin includes 9.2 ha (22.8 acres), the total area of the UBC Storage Pad. This basin is designed with a membrane lining to minimize any infiltration into the ground.

A standard septic system is planned to dispose of sanitary wastes at the site, as described in ER Section 4.1.2, Utilities Impacts.

3.4.2 Water Quality Characteristics

As discussed in ER Section 3.4.1.1, Major Surface and Subsurface Hydrological Systems, water resources in the area of the NEF site are minimal. Runoff from precipitation at the site is effectively collected and contained by detention/retention basins and through evapotranspiration. It is highly unlikely that any groundwater recharge occurs at the site.

The first occurrence of groundwater beneath the NEF site is in a silty sandstone or siltstone horizon in the Chinle Formation, approximately 67 m (220 ft) below the surface. This unit is low in permeability and does not yield water readily. Groundwater quality in monitoring wells in the Chinle Formation, the most shallow saturated zone, is poor due to natural conditions. Samples from monitoring wells within this horizon on the WCS facility have routinely been analyzed with Total Dissolved Solids (TDS) concentrations between about 2,880 and 6,650 mg/L.

Table 3.4-2, Groundwater Chemistry, contains a summary of metal analyses from four background monitoring wells at the WCS site for 1997-2000. Essentially all results are below maximum contaminant limits (MCL) for EPA drinking water standards. The tightness of the formation, the limited thickness of saturation, and the poor water quality, support the argument that this zone does not constitute an aquifer.

Three monitoring wells have been drilled and installed on the NEF site, i.e., MW-1, MW-2, and MW-3 shown on Figure 3.3-5, Preliminary Site Boring Plan and Profile and Figure 3.4-6, Dockum Group (Chinle Formation) Surface Contour, and yield several water quality samples. The results of the water quality analyses are summarized in Table 3.4-3, Chemical Analyses of NEF Site Groundwater. Water quality characteristics are similar to those for WCS site samples. No local groundwater well sites and, as a result, groundwater data are available with the exception of groundwater well sites on the WCS site and those that have been installed on the NEF site. Additional groundwater sampling and analysis of the onsite monitoring wells will be conducted on a frequency needed to establish a baseline. LBDCR-07-0053

Table 3.4-3 presents a summary of results from analyses of a groundwater sample from NEF monitoring well MW-2 which is adjacent to the location of NEF groundwater exploration of boring B-9 on the NEF site (Figure 3.4-6). Standard protocols (ASTM, 1992) were used for sampling.

The data listed for ^{238}U and below in Table 3.4-3 is from the analysis of site ground water for radionuclides. Some of the radionuclide results given in Table 3.4-3 are negative. It is possible to calculate radioanalytical results that are less than zero, although negative radioactivity is physically impossible. This result typically occurs when activity is not present in a sample or is present near background levels. Laboratories sometimes choose not to report negative results or results that are near zero. The EPA does not recommend such censoring of results (EPA, 1980).

The laboratory performing the radioanalytical services for the NEF site follows the recommendations given by the EPA in the report "Upgrading Environmental Radiation Data; Health Physics Society Committee Report HPSR-1" (EPA, 1980). This report recommends that all results, whether positive, negative, or zero, should be reported as obtained.

Groundwater analyses included routine groundwater including: standard inorganic components, Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SOCs), pesticides, PCB and radiological constituents. The table includes the parameter, NEF sample result, and two regulatory limits. The first limit is the New Mexico Water Quality Control Commission (NMWQCC) standard for discharges to surface and groundwater (NMWQCC, 2002). The second limit is the EPA Safe Drinking Water Act (SDWA) maximum contaminate levels (MCLs) for potable water supplies. These MCLs include both the Primary and Secondary Drinking Water Standards (CFR, 2003h). In general, the water is of low quality compared to drinking water standards. Total dissolved solids are 2,500 mg/L, higher than the New Mexico and EPA limits of 1,000 and 500 mg/L, respectively. Also high are chlorides at 1,600 mg/L compared to regulatory limits of 250 mg/L, and sulfate at 2,200 mg/L compared to regulatory limits of 250 to 600 mg/L. A very minor level of a pesticide was detected in the sample, likely due to field or laboratory contamination. Gross alpha activity was detected at a level just slightly above the screening level of 0.6 Bq/L (15 pCi/L).

3.4.3 Pre-Existing Environmental Conditions

There is no documented history of manufacturing, storage or significant use of hazardous chemicals on the NEF property. Historically the site has been used to graze cattle.

The WCS facility is a nearly 541-ha (1,338-acre) property located in Texas. WCS possesses a radioactive materials license from Texas, an NRC agreement state. The facility is licensed to treat and temporarily store low-level and mixed low-level radioactive waste. WCS is also permitted to treat and dispose of hazardous, toxic waste in landfills. While a potential source for release, this disposal site is also a well-monitored facility.

The DD Landfarm, a petroleum contaminated soil treatment facility is adjacent to the west. To the south, across New Mexico Highway 234, is the Lea County Landfill.

To the north of the NEF site about 0.5 km (0.3 mi) a series of man-made ponds contain water and sludge used by petroleum industry contractors to assist with oil and gas drilling and extraction. Unlined, these ponds have some potential for input of hydrocarbon chemicals to the subsurface, but due to the considerable depth to groundwater and the great thickness of the underlying and highly impermeable red bed clay of the Chinle Formation, this arrangement is not likely to impact any natural water systems. Analytes expected from such activities have not been detected during the analysis of groundwater samples taken from monitoring wells at the WCS facility or at the NEF.

3.4.4 Historical and Current Hydrological Data

The NEF is located in an area with little to no surface water or runoff. There are no rivers or streams in the area that would be impacted by the facility. The occurrence of groundwater is also limited at the site. Flow data for Monument Draw, an intermittent stream and the closest surface water conveyance feature are presented in ER Section 3.4.12.9.

3.4.5 Statistical Inferences

No statistical parameters are used to provide or interpret hydrologic data for the NEF.

3.4.6 Water Rights and Resources

The NEF site will obtain water for operational purposes from one or more municipal water systems. Memoranda of Understanding (see entry for HNM~~, 2003;~~ and LG~~, 2004~~ in ISAS Table 3.0-1) have been signed with the City of Eunice, New Mexico, and the City of Hobbs, New Mexico, for the supply of water to NEF. Any water rights potentially required for this arrangement will be negotiated with the municipalities. A description of the available municipal water supply systems, the source of plant water, is provided in ER Section 4.1.2. LBDCR-07-0022

3.4.7 Quantitative Description of Water Use

No subsurface or surface water use, such as withdrawals and consumption are made at the site by the NEF. All water used at the facility will be provided through the Eunice~~ and Hobbs~~ Municipal Water Supply System~~s~~, as described in ER Section 4.1.2. ~~Those~~ This system~~s~~ obtains water from groundwater sources in or near the city of Hobbs, approximately 32 km (20 mi) north of the site. Water use by the facility is shown in Table 3.4-4, Anticipated Normal Plant Water Consumption and Table 3.4-5, Anticipated Peak Plant Water Consumption. Water supply is sufficient for operation and maintenance of the NEF. See ER Section 4.4.5, Ground and Surface Water Use, for detailed information concerning the ~~capacities~~ capacity of the ~~Hobbs and~~ Eunice, New Mexico water supply system~~s~~ and the expected NEF average and peak usage. LBDCR-07-0005 LBDCR-07-0005

3.4.14.2 Reservoir Operating Rules

The NEF will not make use of any reservoir.

3.4.14.3 Annual Yield and Dependability

The NEF will not take or discharge process water from any local water body; thus it will not affect water availability for any water body.

3.4.14.4 Inflow/Outflow/Storage Variations

The NEF will not take or discharge process water to any local water body; thus it will not affect water storage in any water body.

3.4.14.5 Net Loss, Including Evaporation and Seepage

The NEF will not take or discharge process water from any local water body; thus it will not affect water flow or storage in any water body.

3.4.14.6 Current Patterns

The NEF will not take or discharge process water to any local water body; thus it will not affect current patterns in any water body.

3.4.14.7 Temperature Distribution

The NEF will not take or discharge process wastewater or non-contact cooling water to any local water body; thus it will not affect temperature in any water body.

3.4.15 Groundwater Characteristics

Groundwater resources at the proposed NEF site are limited. There are no major water-producing units beneath the site. The site is not located within the recharge area of any sole-source or major aquifer. In the near subsurface, the soils are dry due to low rainfall rates and a very effective evapotranspiration process by the native vegetation. Natural recharge to groundwater is not inferred to be taking place at the site. In the upper 0.3 to 17 m (1 to 55 ft), the soils are relatively fine grained, silts, sands and silty sands, grading to a sand and gravel base layer. The sand and gravel horizon overlays a thick clay formation. In areas to the north and east of the site, this sand and gravel layer has some localized saturation. The processes that lead to these localized saturated areas are not present at the NEF site (see discussion in ER Section 3.4.1.1, Major Surface and Subsurface Hydrological Systems). The soils above the Chinle Formation clay horizon are dry, and, under natural conditions, contain no saturated horizons.

The Chinle Formation consists of a thick expanse of clay beneath the site. It is part of the Triassic Dockum Group, and is 323 to 333 m (1,060 to 1,092 ft) thick. The hydraulic conductivity of the clay is on the order of 1×10^{-8} cm/s (3.9×10^{-9} in/s). Clay with this permeability is typically specified for engineered landfill liners. Ground-water travel times through a unit with this permeability and thickness would be on the order of thousands of years. It provides hydraulic isolation for groundwater at depth.

Within the Chinle at a depth of about 65 to 68 m (214 to 222 ft) below the surface is a small siltstone or silty sandstone unit that has some local saturation. This unit is the shallowest occurrence of groundwater beneath the site. The permeability of this unit is fairly low, and monitor wells completed in this unit at the NEF and at the WCS facilities to the east of the NEF site are slow to produce water. The water quality in this unit is poor, based on the sampling and analysis performed. TDS values typically range from 2,880 to 6,650 mg/L. Three monitor wells have been installed on the NEF site to monitor this unit. One well has been sampled and analyzed and the results are provided in Table 3.4-3, Chemical Analyses of NEF Site Groundwater. Due to the low permeability of this unit, and its limited ability to yield water, it is not considered to be an aquifer. This siltstone layer is hydraulically isolated from the near surface hydrologic conditions due to the presence of a thick clay sequence above it. There is also a 30.5-meter (100-foot) thick water-bearing layer at about 183 m (600 ft) below ground surface within the Chinle Formation clay.

The first occurrence of a defined aquifer beneath the site is the Triassic-aged Santa Rosa Formation, almost 340 m (1,115 ft) below the land surface at the NEF site. Given the depth to this formation, and the fact that the Chinle Formation clay separates it hydraulically from surface discharges at the site, and no potential for recharge from site basins, the Santa Rosa will not be investigated.

PreliminaryRecent NEF site groundwater investigations included nine soil borings and the installation of three monitoring wells. These have confirmed anticipated site stratigraphy and groundwater conditions. Borings done in the near-surface alluvial sand and gravel, above the red beds of the Chinle clay showed that no shallow groundwater occurs in that unit. During drilling, only one of the borings produced cuttings that were slightly moist at 1.8 to 4.2 m (6 to 14 ft) below ground surface; other cuttings were very dry. Also, ground water was not encountered during drilling in any of the addition 59 NEF site borings, which are documented in Appendices A and C of the Geotechnical Report (NTS Report No. 114489-G-01, Rev. 00) and some of which were drilled as deep as 30.5 m (100 ft) below grade. Based on this, it is concluded that a continuous groundwater aquifer does not exist in this layer under the NEF site. The lack of groundwater in this layer is supported by information from the adjacent WCS groundwater investigations. The top of the clay in site borings was found at depths from 7 to 17 m (23 to 55 ft) below the ground surface. LBDCR-07-0053 LBDCR-07-0053

Three monitoring wells were installed at the site (Figure 3.4-6). These three monitoring wells are designated MW-1 through MW-3. Screens for those wells were placed in a siltstone layer within the Chinle clay based on resistivity logs at depths of about 70 m (230 ft) below the ground surface. The water bearing zone, referred to as the 230-zone, is approximately 4.6 m (15 ft) thick and is encountered at depths ranging from 65 to 68 m (214 to 222 ft) below ground level. Only one well, MW-2, adjacent to B-9 and near the northeast corner of the site, has produced water. Measured head for groundwater in the well is at an approximate elevation of 1,009 m (3,311 ft) msl. Results of chemical and radiological analyses of water samples from that well are provided in Table 3.4-3, Chemical Analyses of NEF Site Groundwater.

Based on groundwater levels in MW-2 and data from the adjacent WCS site, a groundwater gradient of 0.011 m/m (0.011 ft/ft) was determined, generally sloping towards the south. Hydraulic conductivity of the saturated layer, based on slug tests is estimated to be approximately 3.7×10^{-6} cm/s (3.8 ft/yr). Based on the data collected at the NEF and WCS, the groundwater gradient in the siltstone unit at NEF is estimated to range from approximately 0.011 to 0.017 m/m (0.011 to 0.017 ft/ft).

3.4.15.5 Flow Travel Time: Groundwater Velocity

Groundwater flow velocities are dependent on the groundwater gradient and soil or bedrock permeabilities. WCS and NEF have wells in the saturated unit that constitutes the first occurrence of groundwater beneath the site. The groundwater velocity in this unit has been estimated to be very low, on the order of 0.002 m/yr (0.007 ft/yr). Based on the data collected at the NEF and WCS, the groundwater velocity at the NEF is estimated to range from approximately 0.002 to 0.09 m/yr (0.007 to 0.3 ft/yr).

3.4.15.6 Interactions Among Different Aquifers

As discussed in ER Section 3.4.1.1, there are occurrences of shallow groundwater in a thin saturated stratum just above the Chinle Formation red bed clays in various locations to the north and east of the NEF site. These localized zones of saturation are due to local infiltration mechanisms, such as fractures in the caprock caliche leading to underlying sand and gravel deposits, and infiltration through "buffalo wallow" depressions that pond surface water runoff. None of these shallow saturated unit occurrences are laterally continuous and none extend to the NEF site. Conditions at the NEF site are markedly different. It is probable that no recharge is actively occurring at the NEF site due to infiltration of precipitation. The native vegetation is quite efficient with evapotranspiration processes to intercept all infiltration before it gets to depth, a process that has probably been in progress for thousands of years. Therefore, no interaction exists between the shallow saturated units to the north and east of the site and the site itself.

The presence of the thick Chinle clay beneath the site essentially isolates the deep and shallow hydrologic systems. Groundwater occurring within the red bed clay occurs at three distinct and distant elevations. Approximately 65 to 68 m (214 to 222 ft) beneath the land surface, within the red bed unit, is a siltstone or silty sandstone unit with some saturation. It is a low permeability formation that does not yield groundwater very readily. It is not considered an aquifer. ER Figure 3.3-5, Preliminary Site Boring Plan and Profile shows the locations of three monitoring wells (MW-1, MW-2 and MW-3) installed at the NEF site in September 2003 with screens at the depth of this horizon. Two of these wells have yielded no water. Well MW-2 produced a minimal amount of water suitable for sampling purposes several weeks after installation. Based on this information and the lack of groundwater encountered in other site borings, this unit is not interpreted to meet the definition of an aquifier (Freeze, 1979) which requires that the unit be able to transmit "significant quantities of water under ordinary hydraulic gradients." LBDCR-07-0053

The next water bearing unit below the saturated siltstone horizon is a saturated 30.5-meter (100-foot) thick sandstone horizon approximately 183 m (600 ft) below land surface, overlying the Santa Rosa formation. The Santa Rosa formation, is the third water bearing unit and is located about 340 m (1,115 ft) below land surface. Between the siltstone and sandstone saturated horizons and the Santa Rosa formation lie a number of layers of sandstones, siltstones, and shales. Hydraulic connection between the siltstone and sandstone saturated horizons and the Santa Rosa formation is non-existent.

No withdrawals or injection of groundwater will be made as a result of operation of the NEF facility. Thus, there will be no affect on any inter-aquifer water flow.

Table 3.4-4 Anticipated Normal Plant Water Consumption

~~Potable Water/Sewer Average Consumption~~Bulding	**~~L/Day~~Total Personel**	**Usage Rage (GPD)**	**Daily Use (GPD)**	**~~Gal/Day~~Yearly Use (GPY)**
~~All Shifts – 210 People~~TSB (1500)	~~19,873~~95	35	3,325	~~5,250~~1,213,625
Admin. (1700)	137	25	3,425	1,250,125
~~Cooling Tower Water~~CUB (1600)	17	35	595	217,175
~~Process Cooler Drift~~CRDB (1100)	~~5,924~~17	35	595	~~1,565~~217,175
~~Process Cooler Evaporation~~CAB (1300)	~~59,677~~81	25	2,025	~~15,765~~739,125
~~Process Cooler Blowdown~~Guard House (2200)	~~22,379~~5	25	125	~~5,912~~45,625
~~HVAC Cooler Drift~~Security/Visitors (2000)	~~6,768~~48	25	1,200	~~1,788~~438,000
~~HVAC Cooler Evaporation~~Operations/Security Personnel not on Shift	~~80,035~~40	25	1,000	~~21,143~~365,000
~~HVAC Cooler Blowdown~~Total Personel Water Use	~~30,015~~440		12,290	~~7,929~~4,485,850

~~Total Cooling Water~~Additional Potable Water Use	~~213,263~~		Daily Use (GPD)	~~56,338~~Yearly Use (GPY)
AC Units Humidification	8 GPM	1 hr/day	480	175,200
~~**Summation of Liquid Effluents (excluding utilities)**~~Water Softener Backwash	45 GPM	10 min/day	450	164,250
~~Floor Washings, Misc. Condensates and Lab Effluent~~Misc. Minor Leaks	~~64~~		5	~~17~~1,825
~~Degreaser Washer~~Total Additional Usage	~~11~~		935	~~3~~341,275

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Table 3.4-4 Anticipated Normal Plant Water Consumption

~~Potable Water/Sewer Average Consumption~~Bulding	~~L/Day~~Total Personel	Usage Rage (GPD)	Daily Use (GPD)	~~Gal/Day~~Yearly Use (GPY)
~~Laundry~~Total Potable Water Useage ~~1,113~~			13,225	~~294~~4,827,125
		Safety Factor	1.25	~~1,520~~
~~Hand Wash and Shower Water~~ ~~5,754~~				
				~~1,836~~
			16,531	6,033,906

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Table 3.4-5 Anticipated Peak Plant Water Consumption

				Flow Rate	
Peak Potable Water Consumption	**No. of Fixtures**	**Fixture Units**	**Total Fixtures**	**gpm**	**L/s**
TSB Sinks	10	3	30		
TSB WC	10	4	40		
TSB Urinals	3	2	6		
TSB Showers	4	2	8		
TSB JC	1	3	3		
Admin Sinks	6	3	18		
Admin WC	7	4	28		
Admin Urinals	2	2	4		
Admin JC	1	3	3		
CAB Sinks	9	3	27		
CAB Urinals	2	2	4		
CAB JC	1	3	3		
CAB WC	8	4	32		
Fixture Subtotal			206	93	5.9
Safety Showers (estimated)				30	1.9
Total			206	123	8
Peak Process Water Consumption					
DI Water Makeup				30	1.9
Boiler Make-up				20	1.3
CH Water Make-up				20	1.3
Tower Water Make-Up				175	11.0
Laundry	1	3	3	10	0.6
HVAC Humidifiers				0	0
Total				255	16.1
Two 474 m^3 (125,000 Gal) Fire Water Tanks				520.8	32.9

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Table 3.4-5 Anticipated Peak Plant Water Consumption

Area/Usage	GPM
Domestic Water	290.0
Cooling Tower Make Up	56.2
Deionized Water Make Up	40.0
Fire Protection	375.0

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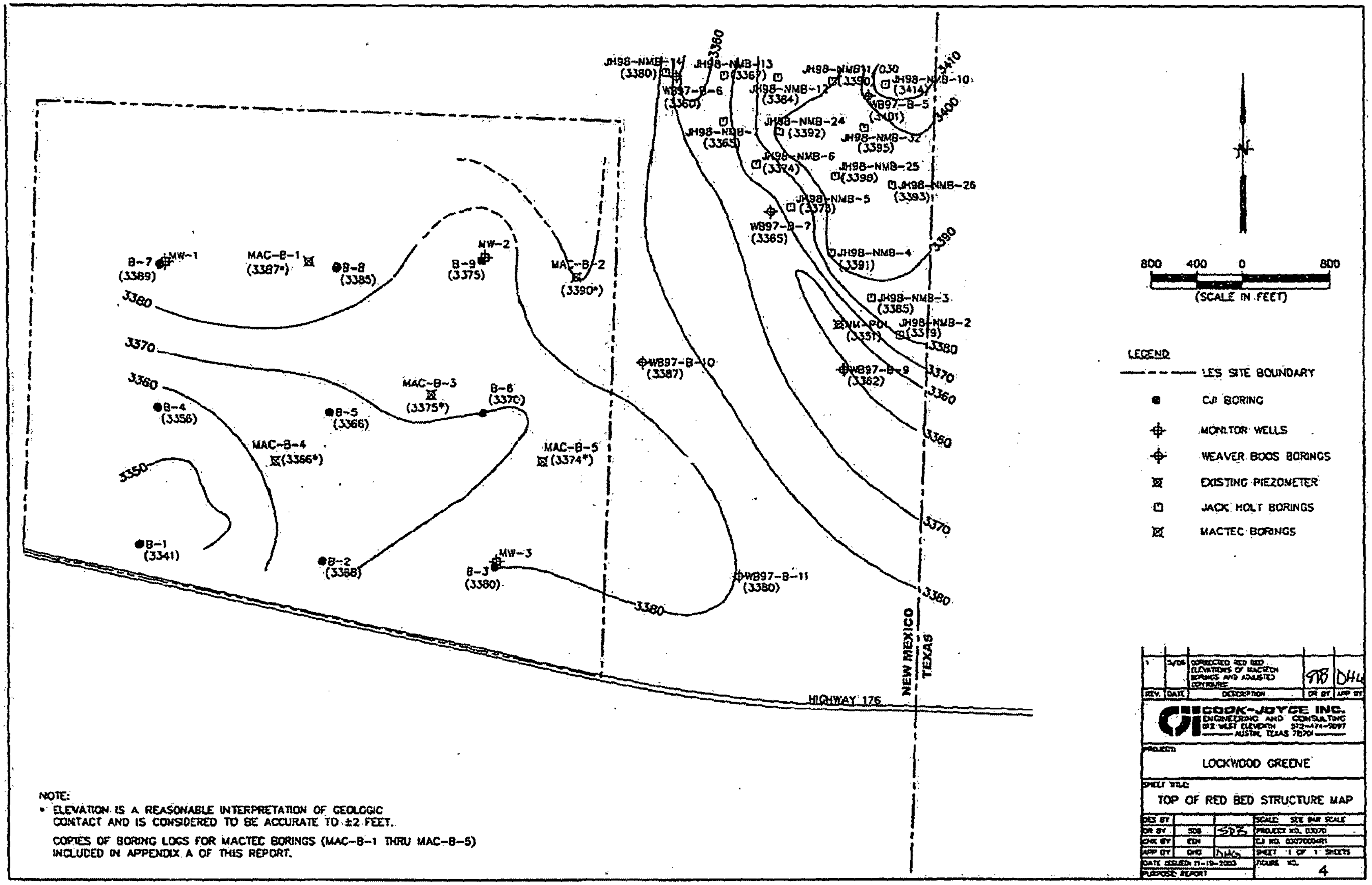

Figure 3.4-6 Dockum Group (Chinle Formation) Surface Contour

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3.7 NOISE

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

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

The dB scale is a logarithmic scale because the range of sound intensities is so great that it is convenient to compress the scale to encompass all the sound pressure levels that need to be measured. The sound pressure level is defined as 20 times the logarithm, to the base 10, of the ratio of the pressure of the sound measured to the reference pressure, which is 20 μPa (0.0002 dyne/cm2). In equation form, sound pressure level in units of dB is expressed as:

$$dB = 20 \, Log_{10} \frac{p}{p_r}$$

Where:

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

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

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

The rate at which a sound source vibrates determines its frequency. Frequency refers to the energy level of sound in cycles per second, designated by the unit of measurement Hertz (Hz). The human ear can recognize sounds within an approximate range of 16 Hz to 20,000 Hz, but the most readily predominant sounds that we hear are between 1,000 Hz and 6,000 Hz (~~EPA, 1974~~EPA/ONAC 550/9-74-004). To measure sound on a scale that approximates the way it is heard by people, more weight must be given to the frequencies that people hear more easily. The "A-weighted" sound scale is used as a method for weighting the frequency spectrum of sound pressure levels to mimic the human ear. A-weighting was recommended by the EPA to describe noise because of its convenience and accuracy, and it is used extensively throughout the world (~~EPA, 1974~~EPA/ONAC 550/9-74-004). For the purpose and scope of this report and sound level testing, all measurements will be in the A-weighted scale (dBA).

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3.7.1 Extent of Noise Analysis

Community noise levels are often measured by the Day-Night Average Sound Level (L_{dn}). The L_{dn} is the A-weighted equivalent sound level for a 24-hour period. Due to the potential for sleep disturbance, loud noises between 10 p.m. and 7 a.m. are normally considered more annoying than loud noises during the day. This is a psychoacoustic effect that can also contribute to communication interference, distraction, disruption of concentration and irritation. A 10 dB weighting factor is added to nighttime equivalent sound levels due to the sensitivity of people during nighttime hours (~~EPA, 1974~~EPA/ONAC 550/9-74-004). For example, a measured LBDCR-07-0022 nighttime (10 p.m. to 7 a.m.) equivalent sound level of 50 dBA can be said to have a weighted nighttime sound level of 60 dBA (50 + 10). For the purposes of this report, however, an Equivalent Sound Level (L_{eq}) is used to measure average noise levels during the daytime hours. The L_{eq} is a single value of sound level for any desired duration, which includes all of the time-varying sound energy in the measurement period. To further clarify the relationship between these two factors, the daytime sound level equivalent averaged with the nighttime sound level equivalent equals the Day-Night Average: L_{eq} (Day) averaged with L_{eq} (Night) = L_{dn}. Since the nighttime noise levels are significantly lower than the daytime noise levels, the daytime L_{eq} is used alone, without averaging the lower nighttime value, to provide a more conservative representation of the actual exposure.

3.7.2 Community Distribution

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

3.7.3 Background Noise Levels

Since there were no previous measurements performed for noise levels, background noise was surveyed at four locations near the site borders of the NEF on September 16-18, 2003, using a Bruel & Kjaer 2236D Integrating Sound Level Meter. The A-weighted decibel scale (dBA) was used to record and weigh noise that is audible to the human ear. All of the measurements were taken during the day between 7 a.m. and 5 p.m. Measurement locations are shown in Figure 3.7-1, Noise Measurement Locations. Average background noise levels ranged from 40.1 to 50.4 dBA (see Table 3.7-1, Background Noise Levels for the NEF Site). The four locations selected for the noise measurements represent the nearest receptor locations (NEF site fence) for the general public and the locations of expected highest noise levels when the plant is operational. These noise levels are considered moderate, and are below the average range of speech of 48 to 72 dBA (~~HUD, 1985~~HUD-953-CPD). See Figure 3.7-2, Sound Level Range LBDCR-07-0022 Examples.

3.7.5 Meteorological Conditions

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

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

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

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

3.7.6 Sound Level Standards

Agencies with applicable standards for community noise levels include the U.S. Department of Housing and Urban Development (~~HUD, 1985~~HUD-953-CPD) and the Environmental Protection Agency (EPA~~, 1973~~ 550/9). Both the Eunice City Manager and Lea County Manager have informed LES that there are no city, county, or New Mexico state ordinances or regulations governing environmental noise. In addition, there are no affected American Indian tribal agencies within the sensitive receptor distances from the site. Thus, the NEF site is not subject either to local, tribal, or state noise regulations. Nonetheless, anticipated NEF noise levels are expected to typically fall below the HUD and EPA standards and are not expected to be harmful to the public's health and safety, nor a disturbance of public peace and welfare. LBDCR-07-0022

The EPA has defined a goal of 55 dBA for Ldn in outdoor spaces, as described in the EPA Levels Document (EPA~~, 1973~~ 550/9). HUD has developed land use compatibility guidelines for acceptable noise versus the specific land use (see Table 3.7-2, U.S. Department of Housing and Urban Development Land Use Compatibility Guidelines). All the noise measurements shown in Table 3.7-1, Background Noise Levels for the NEF Site are below both criterion for a daytime period (as defined above). If the Table 3.7-1 measurements had been averaged to reflect nighttime levels, the average ambient noise levels would be even lower. LBDCR-07-0022

3.7.7 Section 3.7 Tables

Table 3.7-1 Background Noise Levels for the NEF Site

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

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

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

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

Source: (~~HUD, 1985~~HUD-953-CPD) LBDCR-07-0022

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

3.10.1 Population Characteristics

3.10.1.1 Population and Projected Growth

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

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

3.10.1.2 Minority Population

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

The term "minority population" is defined for the purposes of the U. S. Census to include the five racial categories of black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, and some other race. It also includes those individuals who declared two or more races, an option added as part of the 2000 census. The minority population, therefore, was calculated to be the total population less the white population. In contrast to U. S. Census data, NUREG-1748, Appendix C ~~(NRC, 2003a)~~ defines minority populations to include individuals of Hispanic or Latino origin. This results in a difference between the minority population data discussed here and presented in Table 3.10-2, and the data presented in ER Section 4.11, Environmental Justice. LBDCR-07-0022

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

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

3.10.2 Economic Characteristics

3.10.2.1 Employment, Jobs, and Occupational Patterns

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

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

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

3.12.1.3.4 Effluent Discharge

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

Decontamination, Laboratory and Miscellaneous Liquid Effluents are treated to meet the requirements of 10 CFR 20, Appendix B, Table 2 (CFR, 2003q) and the administrative levels recommended by Regulatory Guide 8.37~~(NRC, 1993)~~. The treated effluent is discharged to the double-lined Treated Effluent Evaporative Basin, which has leak detection. | LBDCR-07-0022

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

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

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

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

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

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

3.12.2 Solid Waste Management

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

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

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

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

3.12.2.1 Radioactive and Mixed Wastes

Solid radioactive wastes are produced in a number of plant activities and require a variety of methods for treatment and disposal. These wastes are categorized into wet solid waste and dry solid waste due to differences in storage and disposal requirements found in 40 CFR 264 (CFR, 2003v) and 10 CFR 61 (CFR, 2003r), respectively. ~~Dry wastes are defined as in 10CFR 61 (CFR, 2003r, Subpart 61.56 (a)(3)), containing "as little free standing and non-corrosive liquid as is reasonably achievable, but in no case shall the liquid exceed 1% of the volume." Wet wastes, for NEF, are defined as those that have as little free liquid as reasonably achievable but with no limit with respect to percent of volume.~~For disposal of solid waste (radioactive waste and mixed waste), 10 CFR 61.56(a)(3) (CFR, 2003a) requires: "Solid waste containing liquid shall contain as little free standing and noncorrosive liquid as reasonably achievable, but in no case shall the liquid exceed 1% of the volume." For this facility, dry solid waste is waste that meets the requirement in its as-generated form and wet solid waste is waste that requires treatment prior to disposal to meet this requirement. LBDCR-07-0021

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

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Table 3.12-4 Estimated Annual Liquid Effluent

Effluent	Typical Annual Quantities	Typical Uranic Content
Contaminated Liquid Process Effluents:	**m^3 (gal)**	**kg (lb)**
Laboratory Effluent/Floor Washings/Miscellaneous Condensates	23.14 (6,112)	16 (35)[1]
Degreaser Water	3.71 (980)	18.5 (41)[1]
Spent Citric Acid	2.72 (719)	22 (49)[1]
Laundry Effluent	405.8 (107,213)	0.2 (0.44)[2]
Hand Wash and Showers	2,100 (554,820)	None
Total Contaminated Effluent :	2,535 (669,884)	56.7 (125)[3]
Cooling Tower Blowdown:	19,123 (5,051,845)	None
Heating Boiler Blowdown:	138 (36,500)	None
Sanitary:	7,253 (1,916,250)	None
Stormwater Discharge:		
Gross Discharge[4]	174,100 (46 E+06)	None

1 Uranic quantities are before treatment, volumes for degreaser water and spent citric acid include process tank sludge.

2 Laundry uranic content is a conservative estimate.

3 Uranic quantity is before treatment. After treatment approximately 1% or 0.57 kg (1.26 lb) of uranic material is expected to be discharged into the Treated Effluent Evaporative Basin.

4 Maximum gross discharge is based on total annual rainfall on the site runoff areas, contributing runoff to the Site Stormwater Detention Basin and the UBC Storage Pad Stormwater Retention Basin, neglecting evaporation and infiltration.

Impacts to land and groundwater will be controlled during construction through compliance with the National Pollution Discharge Elimination System (NPDES) Construction General Permit obtained from Region 6 of the Environmental Protection Agency (EPA). A Spill Prevention, Control and Countermeasures (SPCC) plan will also be implemented during construction to minimize environmental impacts from potential spills and to ensure prompt and appropriate remediation. Potential spills during construction are likely to occur around vehicle maintenance and fueling locations, storage tanks, and painting operations. The SPCC plan will identify sources, locations and quantities of potential spills and response measures. The plan will also identify individuals and their responsibilities for implementation of the plan and provide for prompt notifications of state and local authorities, as required.

Waste management BMPs will be used to minimize solid waste and hazardous materials. These practices 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. Where practicable, materials suitable for recycling will be collected. If external washing of construction vehicles is necessary, no detergents will be used, and the runoff will be diverted to onsite retention basins. Adequately maintained sanitary facilities will be provided for construction crews.

4.1.2 Utilities Impacts

The NEF will require the installation of water, natural gas and electrical utility lines. In lieu of connecting to the local sewer system, six onsite underground septic tanks each with one or more leach fields will be installed for the treatment of sanitary wastes. Septic systems are described in Section 3.12.1.3.4, Effluent Discharge.

A new potable water supply line will be extended from the city of Eunice, New Mexico to the NEF site~~ and another potable water supply line will be extended from the city of Hobbs, New Mexico~~. The line from Eunice will be about 8 km (5 mi) in length. ~~The line from Hobbs will be about 32 km (20 mi) in length.~~ Placement of the new water supply lines along New Mexico Highways 18 and 234 would minimize impacts to vegetation and wildlife. (Refer to Figure 3.1-1, Land Use Map.) Since there are no bodies of water between the site and the city of Eunice, New Mexico, no waterways will be disturbed. ~~Likewise, there are no bodies of water between the site vicinity and the city of Hobbs.~~ However, as indicated in ER Section 3.2.1, Transportation Access, there is a 61-m (200-ft) right-of-way easement along both sides of New Mexico Highway 234. Therefore, an application for utility line installation within highway easements will be submitted to the New Mexico State Highway and Transportation Department. Utility line installation coordinated with state planned highway upgrades would minimize traffic impact on New Mexico Highway 234 between the site and the city of Eunice, New Mexico.

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The natural gas line feeding the site will connect to an existing, nearby line. This will minimize impacts of short-term disturbances related to the placement of the tie-in line.

4.2.6 Agency Consultations

Based on conversations with officials from the New Mexico State Highway and Transportation Department and the Texas Department of Transportation, except for potential weight, height and length restrictions placed on trucks traveling certain routes, there are no roadway restrictions. Should the decision be made to provide dedicated turning lanes for site access from New Mexico Highway 234, an application for a state highway access permit for highway modification will be submitted to the New Mexico State Highway and Transportation Department. Modifications would be coordinated with the planned upgrades to New Mexico Highway 234 by the state. Likewise, an application for the installation of utilities and other easement modifications along New Mexico Highway 234 will be submitted.

4.2.7 Radioactive Material Transportation

Radioactive material shipments will be transported in packages that meet the requirements of 10 CFR 71 and 49 CFR 173 (CFR, 2003e; CFR, 2003l). The Nuclear Regulatory Commission (NRC) has evaluated the environmental impacts resulting from the transport of nuclear materials in NUREG-0170, Final Environmental Statement on the Transportation of Radioactive Material By Air and Other Modes (NRC, 1977a), updated by NUREG/CR-4829, Shipping Container Response to Severe Highway and Railway Accident Conditions (NRC, 1987a). These references include accident scenarios related to the transportation of radioactive material. The NRC found that these accidents have no significant environmental impacts. The materials that will be transported to and from the NEF are within the scope of the environmental impacts previously evaluated by the NRC. Because these impacts have been addressed in a previous NRC environmental impact statement, these impacts do not require further evaluation in this report (NRC, 1977a).

The dose equivalent to the public and worker for incident-free transportation has been conservatively calculated to illustrate the relative impact resulting from transporting radioactive material. Uranium feed, product and associated low-level waste (LLW) will be transported to and from the NEF. The following sections describe each of these conveyances, associated routes, and the dose contribution to the public and worker.

4.2.7.1 Uranium Feed

The uranium feed for the NEF is natural uranium in the form of uranium hexafluoride (UF_6). No reprocessed uranium is used as feed material for the facility. The UF_6 is transported to the facility predominantly in 48Y cylinders; however, a small amount may be shipped in 48X cylinders. These cylinders are designed, fabricated and shipped in accordance with American National Standards Institute (ANSI) N14.1, Uranium Hexafluoride – Packaging for Transport ~~(ANSI, applicable version)~~. Feed cylinders are transported to the site by 18-wheeled trucks, one per truck (48Y) or two per truck (48X). Since the NEF has an operational capacity of 690 feed cylinders per year, it is anticipated that approximately 690 shipments of feed cylinders per year will arrive at the site per year. LBDCR-07-0022

4.2.7.2 Uranium Product

The product of the NEF is transported in 30B cylinders. These cylinders are designed, fabricated and shipped in accordance with the ANSI standard for packaging and transporting UF_6 cylinders, N14.1~~(ANSI, applicable version)~~. Product cylinders are transported from the site to fuel fabrication facilities by modified flat bed truck. A shipment frequency of one shipment per three days (122 per year) is typical, which equals approximately three cylinders per truck to meet the facility output of 350 cylinders per year. LBDCR-07-0022

4.2.7.3 Depleted Uranium and Uranium Wastes

Depleted uranium in UBCs will be shipped to conversion or storage facilities via truck in 48Y cylinders similar to feed cylinders. These cylinders are designed, fabricated and shipped in accordance with ANSI N14.1, Uranium Hexafluoride – Packaging for Transport~~(ANSI, applicable version)~~. UBCs will be transported from the site by 18-wheeled trucks, one per truck (48Y). In the future, rail transport may also be used for ship UBCs from the site. Since the NEF has an operational capacity of approximately 625 UBCs per year (type 48Y), approximately 625 shipments of UBCs per year will leave the site. At present, UBCs will be temporarily stored onsite until conversion or storage facilities are available. LBDCR-07-0022

Waste materials are transported in packages by truck via highway in accordance with 10 CFR 71 and 49 CFR 171-173 (CFR, 2003e; CFR, 2003k; CFR 2003l). Detailed descriptions of radioactive waste materials which will be shipped from the NEF facility for disposal are presented in ER Section 3.12, Waste Management. ER Table 3.12-1, Estimated Annual Radiological and Mixed Wastes, presents a summary of these waste materials. Based on the expected generation rate of low-level waste (see Table 3.12-1), an estimated 477 fifty-five gallon drums of solid waste are expected annually. Using a nominal 60 drums per radwaste truck shipment, approximately 8 low level waste shipments per year are anticipated.

4.2.7.4 Transportation Modes, Routes, and Distances

The feed and product materials of the facility will be transported by truck by way of highway travel only. However, the use of rail for feed and product shipments is being investigated. Feed material is obtainable from UF_6 conversion facilities near Port Hope, Ontario and Metropolis, IL. The product could be transported to fuel fabrication facilities near Hanford, WA, Columbia, SC, and Wilmington, NC. The designation of the supplier of UF_6 and the product receiver is the responsibility of the customer. Waste generated from the enrichment process may be shipped to a number of disposal sites or processors depending on the physical and chemical form of the waste. Potential disposal sites or processors are located near Barnwell, SC (if available to New Mexico), Clive, UT, Oak Ridge, TN, Paducah, KY and Portsmouth, OH. Refer to ER Section 3.12.2.1.2.9 for disposition option of other wastes

The primary transportation route between the site and the conversion, fuel fabrication and disposal facilities is via New Mexico Highway 234 to northbound New Mexico Highway 18. These two highways intersect one another a short distance west of the site. New Mexico Highway 18 is accessible from eastbound and westbound highways in the city of Hobbs, approximately 32 km (20 mi) north of the site. ER Table 4.2-1, Possible Radioactive Material Transportation Routes, lists the approximate highway distances from the NEF to the respective conversion facilities, fuel fabrication facilities, and radioactive waste disposal sites.

4.2.7.5 Radioactive Treatment and Packaging Procedure

There will be no treatment of hazardous materials or mixed waste at the NEF that would require a Resource Conservation and Recovery Act (RCRA) permit. Specific handling of radioactive and mixed wastes are discussed in detail in ER Section 3.12, Waste Management.

Packaging of product material, radioactive waste and mixed waste will be in accordance with plant implementation procedures that follow 10 CFR 71 (CFR, 2003e) and 49 CFR 171-173 (CFR, 2003k; CFR, 2003l). Product shipments will have additional packaging controls in accordance with ANSI N14.1, Uranium Hexafluoride - Packaging For Transport ~~(ANSI, applicable version)~~. Waste materials will have additional packaging controls in accordance with each respective disposal or processing site's acceptance criteria (CFR, 2003e; ANSI~~, 2001~~ N14.1). LBDCR-07-0022

4.2.7.6 Incident-Free Scenario Dose

The radiological dose equivalents from incident-free transportation for categories of shipping are presented in Table 4.2-2, Incident-Free Transportation Dose to the Public and Worker. Each shipment category represents the various material shipments to and from the NEF. Within each category, radioactive material may be shipped to different locations. For calculation purposes, the worst-case dose equivalent was calculated and showed minimal impact. The collective dose equivalent to the general public from the worst case (highest dose) route in each shipping category (feed, product, waste and depleted UF_6) totaled 2.33×10^{-6} person-Sv/year

(2.33×10^{-4} person-rem/year). Similarly, the dose equivalent to the onlooker, driver and worker were 1.05×10^{-3}, 9.49×10^{-2}, 6.98×10^{-4} person-Sv/year (1.05×10^{-1}, 9.49 and 6.98×10^{-2} person-rem/year), respectively.

The source of radiation is that from the uranium isotopes and their progeny in each of the following:

- Natural uranium (in the feed to the process)
- Enriched uranium (final product, at 5 wt % ^{235}U)
- Depleted uranium (at 0.34 wt % ^{235}U), and
- Solid waste (at 370 Bq (10 nanocuries) of natural uranium per gram of waste).

The cumulative dose equivalent to the general public from transportation of UF_6 and solid waste was based on the model in NUREG/CR-0130 (NRC, 1978), which in turn was based on WASH-1238 (NRC, 1972). NUREG/CR-0130 (NRC, 1978) defines the dose to the general public resulting from the transportation of radioactive materials as equal to 1.2×10^{-7} Person-Sieverts/km (1.9×10^{-5} Person-rem/mi), based on several demographic variables. This dose equivalent per distance was corrected for each route to or from the NEF. New 2000 census demographics information was proportioned to each route, resulting in a correlated dose equivalent to the general public, while still employing the same assumption in NUREG/CR-0130 (NRC, 1978) and WASH-1238 (NRC, 1972).

4.3 GEOLOGY AND SOIL IMPACTS

Site geology and soils, briefly summarized here, are fully described in ER Section 3.3, Geology and Soils. A physiographic summary for the site area is presented in Figure 3.3-1, Regional Physiography.

Subsurface geologic materials at the NEF site generally consist of competent clay red beds, a part of the Chinle Formation of the Triassic-aged Dockum Group. Bedrock is covered with about 6.7 to 16 m (22 to 54 ft) of silty sand, sand, and sand and gravel, an alluvium that is part of the Gatuña and/or Antlers Formation.

Foundation conditions at the site are generally good and no potential for mineral development exists or has been found at the site, as discussed in ER Section 3.4.1.1, Major Surface and Subsurface Hydrological Systems.

The site terrain currently ranges in elevation from +1,030~~3~~ to +1,053~~45~~ m (+3,38~~90~~ to +3,455~~30~~ ft) mean sea level (msl) (Figure 3.3-3, Site Topography). Because the NEF facility requires an area of flat terrain, cut and fill will be required for significant portions of the site to bring it to a final grade of +1,041 m (+3,415 ft) msl. Select engineered fill material may be brought onsite to achieve the backfill specifications for building footprints and some volume of native soil may be disposed of offsite to maintain a desirable soil stockpile balance. The resulting terrain change for the site from gently sloping to flat topography is not expected to cause significant environmental impact. Numerous such areas of flat terrain exist in the region due to natural erosion processes. Surface stormwater runoff for the permanent facility will be controlled by an engineered system described in ER Section 3.4.1.2, Facility Withdrawals and/or Discharges to Hydrologic Systems. Those controls will essentially eliminate any potential for discharge of runoff from the NEF site. LBDCR-07-0053

Construction activities may cause some short-term increases in soil erosion at the site, although rainfall in the region is limited. Erosional impacts due to site clearing and grading will be mitigated by utilization of construction and erosion control BMPs. (See ER Section 4.1, Land Use Impacts, for a discussion of construction BMPs.) Disturbed soils will be stabilized as part of construction work. Earth berms, dikes and sediment fences will be utilized as necessary during all phases of construction to limit runoff. Much of the excavated areas will be covered by structures or paved, limiting the creation of new dust sources. Watering will be used to control potentially fugitive construction dust. Water conservation will be considered when deciding how often dust suppression sprays will be applied. See ER Section 4.4.7, Control of Impacts for Water Quality, for a discussion of water conservation measures.

The Lea County Soils Survey (USDA, 1974) describes soils found at the NEF site (Figure 3.3-6, Site Soil Map Per USDA Data) as applicable for range, wildlife and recreation areas, and not for any standard agricultural activities. Construction and operation of the NEF plant are thus not anticipated to displace any potential agrarian use.

4.4 WATER RESOURCE IMPACTS

Water resources at the site are virtually nonexistent. There are no surface waters on the site and appreciable groundwater resources are only at depths greater than approximately 340 m (1,115 ft). The site region has semi-arid climate, with low precipitation rates and minimal surface water occurrence. Thus, the potential for negative impacts on those water resources are very low due to lack of water presence and formidable natural barriers to any surface or subsurface water occurrences. Groundwater at the site would not likely be impacted by any potential releases. The pathways for planned and potential releases are discussed below.

Permits related to water must be obtained for site construction and NEF operation are described in ER Section 1.3, Applicable Regulatory Requirements, Permits and Required Consultation. The purpose of these permits is to address the various potential impacts on water and provide mitigation as needed to maintain state water quality standards and avoid any degradation to water resources at or near the site. These include:

- *A National Pollutant Discharge Elimination System (NPDES) General Permit for Industrial Stormwater:* This permit is required for point source discharge of stormwater runoff from industrial or commercial facilities to the waters of the state. All new and existing point source industrial stormwater discharges associated with industrial activity require a NPDES Stormwater Permit from the EPA Region 6 and an oversight review by the New Mexico Water Quality Bureau (NMWQB). The NEF is eligible to claim the "No Exposure" exclusion for industrial activity of the NPDES storm water Phase II regulations. As such, the LES would submit a No Exposure Certification immediately prior to initiating operational activities at the NEF site. LES also has the option of filing for coverage under the Multi-Section General Permit (MSGP) because the NEF is one of the 11 eligible industry categories. If this option is chosen, LES will file a Notice of Intent (NOI) with the EPA, Washington, D.C., at least two days prior to the initiation of NEF operations. A decision regarding which option is appropriate for the NEF will be made in the future.
- *NPDES General Permit for Construction Stormwater:* Because construction of the NEF will involve the disturbance of more than 0.4 ha (1 acre) of land an NPDES Construction General Permit from the EPA Region 6 and an oversight review by the New Mexico Water Quality Bureau (NMWQB) are required. LES will develop a Storm Water Pollution Prevention Plan (SWPPP) and file a NOI with the EPA, Washington, D.C., at least two days prior to the commencement o construction activities.
- *Groundwater Discharge Permit/Plan:* The NMWQB requires that facilities that discharge an aggregate waste water of more than 7.6 m^3 (2,000 gal) per day to surface impoundments or septic systems apply for and submit a groundwater discharge permit and plan. This requirement is based on the assumption that these discharges have the potential of affecting groundwater. NEF will discharge treated process water, stormwater, cooling tower blowdown water and heating boiler blowdown water to surface impoundments, as well as domestic septic wastes. A groundwater discharge permit/plan will be required under 20.6.2.3104 NMAC ~~(NMAC, 2002a)~~. Section 20.6.2.3.3104 NMAC ~~(NMAC, 2002a)~~ of the New Mexico Water Quality Control Commission (NMWQCC) Regulations (20.6.2 NMAC) requires that any person proposing to discharge effluent or leachate so that it may move directly or indirectly into groundwater must have an approved discharge permit, unless a specific exemption is provided for in the Regulations. LBDCR-07-0022

The volume of water discharged into the ground from the Site Stormwater Detention Basin is expected to be minimal, as evapotranspiration is expected to be the dominant natural influence on standing water.

4.4.5 Ground and Surface Water Use

The NEF will not obtain any water from the site or have any planned surface discharges at the site other than to the retention and detention basins. All potable, process and fire water supply used at the NEF will be obtained from the Eunice~~ and/or Hobbs~~, New Mexico, municipal water systems~~s~~. Wells serving these systems are about 32 km (20 mi) from the site. Anticipated normal plant water consumption and peak plant water requirements are provided in Table 3.4-4, Anticipated Normal Plant Water Consumption, and Table 3.4-5, Anticipated Peak Plant Water Consumption, respectively. LBDCR-07-0005

Site groundwater will not be utilized for any reason, and therefore, should not be impacted by routine NEF operations. The NEF water supply will be obtained from the city of Eunice, New Mexico~~ and the city of Hobbs, New Mexico~~. Current capacities for the Eunice~~ and Hobbs~~, New Mexico municipal water supply system ~~are~~ is 16,350 m^3/day (4.32 million gpd) ~~and 75,700 m^3/day (20 million gpd), respectively~~ and current usages ~~are~~ is 5,600 m^3/day (1.48 million gpd) ~~and 23,450 m^3/day (6.2 million gpd), respectively~~. Average and peak potable water requirements for operation of the NEF are expected to be approximately 240 m^3/day (63,423 gpd) and 85 m^3/hr (378 gpm), respectively. These usage rates are well within the ~~capacities~~ capacity of ~~both~~ the water systems~~s~~. LBDCR-07-0005 LBDCR-07-0005

For both peak and the normal usage rates, the needs of the NEF facility should readily met by the municipal water systems. Impacts to water resources onsite and in the vicinity of the NEF are expected to be negligible.

4.4.6 Identification of Impacted Ground and Surface Water Users

Location of an intermittent surface water feature and groundwater users in the site vicinity including an area just beyond a 1.6-km (1-mi) radius of the site boundary are shown on Figure 3.4-7, Water and Oil Wells in the Vicinity of the NEF Site. These locations were provided by the Office of New Mexico State Engineer (NMSE) (NMSE, 2003), the Texas Water Development Board (TWDB) (TWDB, 2003) and the United States Geological Survey (USGS) (USGS, 2003b). No producing supply water wells are within 1.6 km (1 mi) of the boundaries of the NEF site as shown on Figure 3.4-7. However, nearby facilities do have groundwater monitoring wells within this region.

The absence of near-surface groundwater users within 1.6 km (1 mi) from the site and the absence of surface water on the NEF site will prevent any impact to local surface or groundwater users. Due to the lack of process water discharge from the facility to the environment, no impact is expected for these water users.

Effluent discharges will be controlled in a way that will also prevent any impacts. The locations of the closest municipal water systems for both Eunice and Hobbs are in Hobbs, New Mexico, 32 km (20 mi) north northwest of the site. There is no potential to impact these sources.

4.4.7 Control of Impacts to Water Quality

Site runoff water quality impacts will be controlled during construction by compliance with NPDES Construction General Permit requirements and BMPs will be described in a site Stormwater Pollution Prevention (SWPP) plan.

Wastes generated during site construction will be varied, depending on activities in progress. Any hazardous wastes from construction activities will be handled and disposed of in accordance with applicable state regulations. This includes proper labeling, recycling, controlling and protected storage and shipping offsite to approved disposal sites. Sanitary wastes generated at the site will be handled by portable systems until such time that the site septic systems are available for use.

The need to level the site for construction will require some soil excavation as well as soil fill. Fill placed on the site will provide the same characteristics as the existing natural soils thus providing the same runoff characteristics as currently exist due to the presence of natural soils on the site.

During operation, the NEF's stormwater runoff detention/retention system will provide a means to allow controlled release of site runoff from the Site Stormwater Detention Basin only. Stormwater discharge will be periodically monitored in accordance with state and/or federal permits. This system will also be used for routine sampling of runoff as described in ER Section 6.1.1.2, Liquid Effluent Monitoring. A Spill Prevention Control and Countermeasure (SPCC) plan will be implemented for the facility to identify potential spill substances, sources and responsibilities. A SWPP will also be implemented for the NEF to assure that runoff released to the environment will be of suitable quality. These plans are described in ER Section 4.1, Land Use Impacts.

Water discharged to the NEF site septic systems will meet required levels for all contaminants stipulated in any permit or license required for that activity, including the 10 CFR 20 (CFR, 2003q) and a Groundwater Discharge Permit/Plan. The facility's Liquid Effluent Collection and Treatment System provides a means to control liquid waste within the plant. The system provides for collection, treatment, analysis, and processing of liquid wastes for disposal. Effluents unsuitable for release to the Treated Effluent Evaporative Basin are processed onsite or disposed of offsite in a suitable manner in conformance with U.S. EPA and State of New Mexico regulatory requirements. The State of New Mexico has adopted the U.S. EPA hazardous water regulations (40 CFR Parts 260 through 266, 268 and 270) (CFR, 2003cc; CFR, 2003p; CFR, 2003dd; CFR, 2003ee; CFR, 2003v; CFR, 2003ff; CFR, 2003gg; CFR, 2003hh; CFR, 2003ii) governing the generation, handling, storage, transportation, and disposal of hazardous materials. These regulations are found in 20.4.I NMAC, "Hazardous Waste Management" ~~(NMAC, 2000)~~. LBDCR-07-0022

The UBC Storage Pad Stormwater Retention Basin, which exclusively serves the UBC Storage Pad, cooling tower blowdown water and heating boiler blowdown water discharges, is lined to prevent infiltration. It is designed to retain a volume slightly more than twice that for the 24-hour, 100-year frequency storm plus an allowance for cooling tower blowdown and heating boiler blowdown. Designed for sampling and radiological testing of the contained water and sediment, this basin has no flow outlet. All discharge is through evaporation.

4.5.11 Special Maintenance Practices

No important habitats (e.g.; marshes, natural areas, bogs) have been identified within the 220-ha (543-acre) NEF site. Therefore, no special maintenance practices are proposed.

4.5.12 Wildlife Management Practices

LES is proposing to incorporate several wildlife management practices in association with the NEF. These wildlife management practices include:

- Use of BMPs recommended by the State of New Mexico to minimize the construction footprint to the extent possible.
- The use of detention and retention ponds.
- Site stabilization practices to reduce the potential for erosion and sedimentation.

Proposed wildlife management practices include:

- The placement of a raptor perch in an unused open area.
- The use of bird feeders at the visitor's center.
- The placement of quail feeders in the unused open areas away from the NEF buildings.
- The use of native, low-water consumption landscaping in and around the stormwater retention/detention basins.
- The management of unused open areas (i.e. leave undisturbed), including areas of native grasses and shrubs for the benefit of wildlife.
- The use of native plant species to revegetate disturbed areas to enhance wildlife habitat.
- The use of netting or other suitable material to ensure migratory birds are excluded from evaporative ponds that do not meet New Mexico Water Quality Control Commission (NMWQCC) surface water standards for wildlife usage.
- The use of animal-friendly fencing around ponds or basins which may contain contaminated process water so that wildlife cannot be injured or entangled. LBDCR-08-0009
- During plant construction and relocation of the CO2 pipeline, minimize the amount of open trenches at any given time and keep trenching and backfilling crews close together.
- During plant construction and relocation of the CO2 pipeline, trench during the cooler months (when possible).
- During plant construction and relocation of the CO2 pipeline, avoid leaving trenches open overnight. Escape ramps will be constructed at least every 90 m (295 ft). The slope of the ramps will be less than 45 degrees. Trenches that are left open overnight will be inspected and animals removed prior to backfilling.

In addition to these proposed wildlife management practices, LES will consider all recommendations of appropriate state and federal agencies including the U.S. Fish and Wildlife Service (USFWS) and the New Mexico Department of Game and Fish.

Emissions were modeled in ISCST3 as a uniform area source with emissions occurring 10 hours per day, 5 days per week, and 50 weeks per year. The maximum predicted air concentrations at the site boundary for the various averaging periods predicted using five years (1987 to 1991) of hourly meteorological data from the Midland-Odessa, Texas, National Weather Service (NWS) station are presented in ER Table 4.6-2, Predicted Property Boundary Air Concentrations and Applicable NAAQS. These concentrations are compared to the appropriate National Ambient Air Quality Standard (NAAQS). No NAAQS has been set for hydrocarbons; however, the total annual emissions of hydrocarbons predicted from the site (approximately 4,535 kg (5 tons)) are well below the level of 36,287 kg (40 tons) that defines a significant source of volatile organic compounds (40 CFR 50.21) (CFR, 2003w). Air concentrations of the Criteria Pollutants predicted for vehicle emissions were all at least an order of magnitude below the NAAQS. PM10 emissions from fugitive dust were also below the NAAQS. The results of the fugitive dust estimates should be viewed in light of the fact that the peak anticipated fugitive emissions were assumed to occur throughout the year. These conservative assumptions will result in predicted air concentrations that tend to overestimate the potential impacts. ER Section 1.3.2, State Agencies, presents information regarding the status of all State of New Mexico permits.

Other onsite air quality impacts will occur due to the construction work, such as portable generator exhaust, air compressor exhaust, welding torch fumes, and paint fumes. Since the NEF will be constructed using a phased construction plan, some of the facility will be operational while construction continues. As such, other air quality impacts will occur due to the operation of boilers and emergency diesel generators. Construction emission types, source locations, and emission quantities are presented in Table 4.6-4, Construction Emission Types.

During the three-year period of site preparation and major building construction, offsite air quality will be impacted by passenger vehicles with construction workers commuting to the site and trucks delivering construction materials and removing construction wastes. Emission rates from passenger vehicle exhaust were estimated for a 64.4-km (40-mi) roundtrip commute for 800 vehicles per workday. No credit was taken fr the use of car pools. Emission rates from delivery trucks were estimated for a 322-km (200-mi) roundtrip for 14 vehicles per workday. It was assumed that there are 250 workdays per year (five-day work week and fifty-week work year). Emission factors are based on AP-42. The resulting emission factors, tons of daily emissions, number of vehicles and heavy duty engines are provided in Table 4.6-5, Offsite Vehicle Air Emissions During Construction.

The construction estimates for daily emissions are based on the average number of trucks per day. There will be peak days, such as when large concrete pours are executed, where there will be more than the average number of trucks per day. This peak daily value of truck trips is not available at this time. It is estimated, however, that the daily emission values presented in Table 4.6-5, that are based on the average number of trucks could be about an order of magnitude higher on the peak days.

4.6.2 Air Quality Impacts From Operation

Onsite air quality will be impacted during operation due to the operation of boilers and emergency diesel generators. Operation emission types, source locations, and emission quantities are presented in Table 4.6-6, Air Emissions During Operations.

During operation, offsite air quality will be impacted by passenger vehicles with NEF workers commuting to the site, delivery trucks, UF_6 cylinder shipment trucks, and waste removal trucks. Emission rates from passenger vehicle exhaust were estimated for a 64.4-km (40-mi) roundtrip commute for 210 vehicles per workday. No credit was taken for the use of car pools. Emission rates from trucks were estimated for an average distance of 805-km (500-mi) for 18 vehicles per workday. It was assumed that there are 250 workdays per year (five-day work week and fifty-week work year). Emission factors are based on AP-42. The resulting emission factors, tons of daily emissions, number of vehicles and heavy duty engines are provided in Table 4.6-7, Offsite Vehicle Air Emissions During Operations.

NUREG-1748 ~~(NRC, 2003a)~~ requires that atmospheric dispersion factors (X/Q's) be used to assess the environmental effects of normal plant operations and facility accidents. In the following subsections, information is presented about the gaseous effluents, the gaseous effluent control systems, and computer models and data used to calculate atmospheric dispersion and deposition factors. LBDCR-07-0022

4.6.2.1 Description of Gaseous Effluents

Uranium hexafluoride (UF_6) will be the radioactive effluent for gaseous pathways. Average source term releases to the atmosphere are estimated to be 8.9 MBq (240 μCi) per year for the purposes of bounding routine operational impats. Urenco's experience in Europe indicates that uranium discharges from gaseous effluent vent systems are less than 10 g (0.35 ounces) per year. Therefore, 8.9 MBq (240 μCi) is a very conservative estimate and is based upon an NRC estimate (NRC, 1994a) for a 1.5 million SWU plant that LES has doubled for the 3 million SWU NEF.

Nonradioactive gaseous effluents include hydrogen fluoride (HF), ethanol and methylene chloride. HF releases are estimated to be about 1.0 kg (2.2 lbs) each year. Approximately 40 L (10.6 gal) and 610 L (161 gal) of ethanol and methylene chloride, respectively, are estimated to be released each year. Two natural gas-fired boilers (one in operation, one spare) will be used to provide hot water for the plant heating system. These boilers will be located in the Central Utilities Building (CUB). Emission data provided by the vendor for the boilers indicate that they will not emit more than 90,700 kg (100 tons) per year of any regulated air pollutant. At 100% power, each boiler will emit 499 kg (0.55 tons) per year of Carbon Monoxide (CO), 5,008 kg (5.52 tons) per year of Nitrogen Oxides (NOx) and 798 kg (0.88 tons) per year of volatile organic compounds (VOC). The boilers will not require an air quality permit from the State of New Mexico (AQB, 2004)

In addition, there will be two diesel generators onsite for use as emergency power sources. However, the use of these diesel generators will be administratively controlled (i.e., only run a limited number of hours per year) and are exempt from air permitting requirements of the State of New Mexico.

Other smaller standby diesel generators may also be used to provide backup power to some specific systems. The number and size of these other diesel generators are not defined at this time.

4.6.2.2 Description of Gaseous Effluent Vent System

The principal function of the gaseous effluent vent system (GEVS) is to protect both the operator during the connection/disconnection of uranium hexafluoride (UF_6) process equipment, and the environment, by collecting and cleaning all potentially hazardous gases from the plant prior to release to the atmosphere. Releases to the atmosphere will be in compliance with regulatory limits.

The stream of air and water vapor drawn into the GEVS can have suspended within it uranium hexafluoride (UF_6), hydrogen fluoride (HF), oil and uranium particulates (mainly UO_2F_2). Online instrument measurements will provide a continuous indication to the operator of the quantity of radioactive material and HF in the emission stream. This will enable rapid corrective action to be taken in the event of any deviation from the normal operating conditions.

There are two Gaseous Effluent Vent Systems for the plant: (1) the Separations Building Gaseous Effluent Vent System and (2) the Technical Services Building (TSB) Gaseous Effluent Vent System. In addition, the Centrifuge Test and Post Mortem Facilities have an exhaust filtration system that serves the same purpose as the GEVS. The Technical Services Building (TSB) heating, ventilation and air conditioning (HVAC) system performs a confinement ventilation function for potentially contaminated areas in the TSB.

The Separations Building GEVS sub-atmospheric duct system transports potentially contaminated gases to a set of redundant filters (pre-filter, high efficiency particulate air filter, potassium carbonate impregnated activated charcoal filter) and fans. The cleaned gases are discharged via rooftop stacks to the atmosphere. The fan will maintain an almost constant sub-atmospheric pressure in front of the filter section by means of a differential pressure controller.

The TSB GEVS is the same as the Separations Building GEVS except that it has one set of filters and a single fan. The GEVS and TSB HVAC exhaust points are on the roof of the TSB. The Centrifuge Test and Post Mortem Exhaust Filtration System ~~is similar to the Separations Building GEVS except that it has one set of filters and two redundant fans.~~ Consists of a filter and fan with the ~~This system~~ exhausts point on the roof of the Centrifuge Assembly Building (CAB). LBDCR-07-0022

Instrumentation is provided to detect and signal via alarm all non-routine process conditions so that the process can be returned to normal by local operator actions. Trip actions from the same instrumentation automatically put the system into a safe condition.

4.6.2.3 Calculation of Atmospheric Dispersion and Deposition Factors

NUREG-1748 requires that atmospheric dispersion factors (X/Q's) be used to assess the environmental effects of normal plant operations and facility accidents. In the absence of onsite meteorological data, the analysis may be conducted using data from 5-year NWS summaries, provided applicability of these data to the proposed site is established. The X/Q's have been calculated using meteorological data from Midland-Odessa, Texas (1987 to 1991) and the XOQDOQ dispersion computer program listed in NUREG/CR-2919. Use of the Midland-Odessa data for predicting the dispersion of gaseous effluents was deemed appropriate. Midland-Odessa, Texas is the closest first-order NWS station to the NEF site and both Midland-Odessa and the NEF site have similar climates. A first-order weather data source is one that is a major weather station staffed by NWS personnel.

The Nuclear Regulatory Commission (NRC) computer program XOQDOQ is intended to provide estimates of atmospheric transport and dispersion of gaseous effluents in routine releases from nuclear facilities. XOQDOQ implements NRC Regulatory Guide 1.111 ~~(NRC, 1977b)~~ and has been used by the NRC staff in their independent meteorological evaluation of routine airborne radionuclide releases. LBDCR-07-0022

XOQDOQ is based on the theory that material released to the atmosphere will be normally distributed (Gaussian distribution) about the plume centerline. In predicting concentrations for longer time periods, the horizontal plume distribution is assumed to be evenly distributed within the directional sector, the so-called sector average model. A straight-line trajectory is assumed between the point of release and all receptors.

The meteorological data used were discussed in ER Section 3.6. XOQDOQ requires the meteorological data to be in the form of a joint frequency distribution (either number of hours or percent). The Midland-Odessa, Texas data, obtained from the EPA Support Center for Regulatory Air Models, were converted into joint frequency distributions.

The EPA computer program STAR (STability ARray) was used to produce joint frequency distributions. The STAR program processes NWS meteorological data to generate joint frequencies of six wind speeds, sixteen wind directions, and six stability categories (Pasquill – Gifford stability classes A through F) for the station and time period provided as input, one year at a time.

Distances to the site boundary were determined using guidance from NRC Regulatory Guide 1.145 (NRC, 1982b). The distance to the nearest resident was determined using global positioning system (GPS) measurements.

Annual average atmospheric dispersion and deposition factors for the site boundary, nearest resident, and nearest business and school are presented in Table 4.6-3A, Annual Average Atmospheric Dispersion and Deposition Factors from NWS (1987 to 1991) Data. The highest site boundary χ/Q was 1.0×10^{-5} s/m^3 at a distance of 17 km (1,368 ft) in the south sector. The nearest resident χ/Q was 2.0×10^{-7} s/m^3 at a distance of 4.3 km (2.63 mi) in the west sector. Tables 4.6-3B through 4.6-3D present atmospheric dispersion and deposition factors out to 80 km (50 mi).

4.6.3 Visibility Impacts

Visibility impacts from construction will be limited to fugitive dust emissions. Fugitive dust will originate predominantly from vehicle traffic on unpaved surfaces, earth moving, excavating and bulldozing, and to a lesser extent from wind erosion. The only potential visibility impacts from operation of the NEF is from the cooling towers. The cooling towers that NEF will use at the site combine adiabatic and evaporative heat transfer processes to significantly reduce visible plumes. Therefore, LES has concluded that any visibility impacts from cooling tower plumes will be minimal. Visibility impacts from decommissioning will be limited to fugitive dust. Fugitive dust will originate predominately from building demolition bulldozing, and vehicle traffic on unpaved surfaces.

The highest noise levels during construction are predicted to be within the range of 84 to 96 dBA at the south fence line during construction of the Site Stormwater Detention Basin and between 72 to 84 dBA at the east fence line when the Visitor Center is built. Noise levels in the predicted ranges at the south and east fence lines would only be for a short duration and only during construction of the portions of both structures closest to the fences. The south fence line is about 38.1 meters (125 feet) from New Mexico Highway 234 and the east fence line is adjacent to vacant land.

Since there is already substantial truck traffic using New Mexico Highway 234 and New Mexico Highway 18, the temporarily increased noise levels due to construction activities are not expected to adversely affect nearby residents. ER Section 4.2, Transportation Impacts, includes further discussion of vehicular traffic.

Due to the temporary and episodic nature of construction, and because of the significant distance to the nearest residence 4.3 km (2.63 mi), and since construction activities largely would be during weekday daylight hours, actual construction noise at the site is not expected to have a significant effect on nearby residents. Vehicle traffic will be the most noticeable cause of construction noise. Receptors located closest to the intersection of New Mexico Highway 18 and New Mexico Highway 234 will be the most aware of the increase in traffic due to proximity to the source.

4.7.1.2 Operational Impacts

The development of the NEF would generally increase noise levels, although the amount of the increase would depend on many factors, including the number of employees, and the amount of increased vehicular traffic. Vehicular traffic will be increased on New Mexico Highway 234 and New Mexico Highway 18 during operation, but due to the considerable truck traffic already present, noise levels should not increase significantly.

An operational noise survey was performed at the Almelo Enrichment Plant in Almelo, Netherlands, at the border of the site boundary during a 24-hour period. The noise results obtained during the survey ranged from 30 to 47 dBA, with an average of 39.7 dBA. The main sources of operational noise are from the cascade halls, the cooling fans, and the cooling towers. The Almelo Enrichment Plant design is comparable to the design of the NEF and sound level intensities outside both facilities are expected to vary no more than 4 dB based on the Almelo Enrichment Plant operating experience. The Almelo survey indicates that the majority of the noise sources were vehicle traffic from adjacent roadways, rather than operational noise from the plant itself. Sound contour maps for the Almelo facility are not available because they were not developed as part of the study. Furthermore, the contours would not be applicable to the NEF because the site building layouts are different. These results were expected and strongly suggest that NEF will be in complete compliance with the U.S. Department of Housing and Urban Development (HUD) guidelines and the Environmental Protection Agency (EPA) criteria (65 dBA and 55 dBA, respectively). Although the noise from the plant and the additional traffic would generally be noticeable, the operational noise from the plant is not expected to have significant impact on nearby residents (~~HUD, 1985~~HUD-953-CPD; EPA~~, 1973~~ 550/9). For this particular application (land use), the HUD guidelines are more appropriate since the NEF site is industrial with no nearby residents. LBDCR-07-0022

If the highest sound level reading (47 dBA) from the operational survey performed at the Almelo Enrichment Plant is used to calculate the effective exposure to the nearest residence located west of the NEF site at a distance of approximately 4.3 km (2.63 mi), the resultant sound level exposure would be below the perception of the human ear. This is because a source of 47 dBA over such a great distance will be dispersed in air and absorbed by natural landscape, vegetation, and buildings to the point of being masked by background ambient noise at the receptor. This is not meant to be a blanket statement to imply that residents will never be able to distinguish any operational noise emanating from the NEF. Certain phases of operation, weather, time of day, wind direction, traffic patterns, season, and the location of the receptor will all impact perceived operational noise levels. It should be noted that the Almelo survey data support previous assumptions that traffic noise will be the main noise contributor to nearby residences. Although the noise from the plant and the additional traffic would generally be noticeable, the operational noise from the plant is not expected to have a significant impact on nearby residents.

4.7.2 Noise Sources

Noise point sources for the plant during operation will include: cascade halls, boilers, coolers, rooftop fans, air conditioners, transformers, and traffic from delivery trucks, employee and site vehicles. Noise line sources for the plant during operation will consist only of site vehicular traffic entering and leaving the site. Ambient background noise sources in the area include vehicular traffic along New Mexico Highway 234, the concrete quarry to the north of the site, the landfill to the south of the site, the waste facility to the east of the site, train traffic along the tracks located on the north border, low flying aircraft traffic from Eunice Airport, birds, cattle and wind gusts.

4.7.3 Sound Level Standards

HUD guidelines, as detailed in Table 3.7-2, set the acceptable Day-Night Average Sound Level (Ldn) for areas of industrial, manufacturing, and utilities at 80 dBA as acceptable. Additionally, under these guidelines, construction and operation of the facility should not cause the Ldn at a nearby residence to exceed 65 dBA (~~HUD, 1985~~HUD-953-CPD). The EPA has set a goal of 55 dBA for Ldn in outdoor spaces, as detailed in the EPA Levels Document (EPA~~, 1973~~ 550/9). Background measurements and those performed at the Almelo facility were consistent with the guidance in American Society of Testing and Materials (ASTM) Standard Guide E-1686~~-02~~ ~~(ASTM, 2002)~~. As indicated in ER Section 4.7.1, Predicted Noise Levels, background noise levels, calculated construction noise levels, and operational noise levels should typically be well below both the HUD and EPA guidelines. Both the Eunice City Manager and Lea County Manager have informed LES that there are no city, county or New Mexico state ordinances or regulations governing environmental noise. Thus, the NEF site is not subject either to local or state noise regulation. Nonetheless, anticipated NEF noise levels are expected to typically be below the applicable HUD guidelines and EPA guidelines and are not expected to be harmful to the public's life and health, nor a disturbance of public peace and welfare.

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4.7.4 Potential Impacts to Sensitive Receptors

Potential impacts to local schools, churches, hospitals, and residences are not expected to be significant, as supported by the information presented in ER Section 4.7.1. The nearest home is located west of the site at a distance of approximately 4.3 km (2.63 mi) and due to its proximity is not expected to perceive an increase in noise levels due to operational noise levels. The nearest school, hospital, church and other sensitive noise receptors are beyond this distance, thereby allowing the noise to dissipate and be absorbed, helping decrease the sound levels even further. Homes located near the construction traffic at the intersection of New Mexico Highway 234 and New Mexico Highway 18 will be affected by the vehicle noise, but due to existing heavy tractor trailer vehicle traffic, the change should be minimal. No schools or hospitals are located at this intersection.

4.7.5 Mitigation

Mitigation of operational noise sources will occur primarily from the plant design, as cooling systems, valves, transformers, pumps, generators, and other facility equipment, will generally be located inside plant structures. The buildings themselves will absorb the majority of the noise generated within. Natural land contours, vegetation (such as scrub brush and trees), and site buildings and structures will mitigate noise from other equipment located outside of site structures. Distance from the noise source is also a key factor in the control of noise levels to area receptors. It is generally true that the sound pressure level from an outdoor noise source decreases 6 dB per doubling of distance (Cowan, 1994). Thus, a noise that measures 80 dB at 15.2 m (50 ft) away from the source will measure 74 dB at 30.5 m (100 ft), 68 dB at 61 m (200 ft), and 62 dB at 122 m (400 ft). Noise from construction activities will have the highest sound levels, occasionally peaking at 99 dBA at 9.1 m (30 ft) from the source, which would be equivalent to 69 dBA at 305 m (1,000 ft) (Cowan, 1994). As noted above, the nearest home is located west of the site at a distance of approximately 4.3 km (2.63 miles).However, heavy truck and earth moving equipment usage will be restricted after twilight and during early morning hours. All noise suppression systems on construction vehicles shall be kept in proper operation.

4.7.6 Cumulative Impacts

Cumulative impacts from all site noise sources should typically remain at or below HUD guidelines of 65 dBA Ldn and the EPA guidelines of 55 dBA Ldn (EPA~~, 1973~~ 550/9) during NEF construction and operation. Residences closest to the site boundary will experience only minor impacts from construction noise, with the majority of the noise sources being from additional construction vehicle traffic. Since phases of construction include a variety of activities, there may be short-term occasions when higher noise levels will be present; examples include the use of backhoes and large generators. LBDCR-07-0022

The level of noise anticipated offsite is comparable to noise levels near a busy road and less than noise levels found in most city neighborhoods. Expected noise levels will mostly affect a 1.6-km (1-mi) radius. The cumulative noise of all site activities should have a minor impact and only those receptors closest to the site boundary.

4.11 ENVIRONMENTAL JUSTICE

This section examines whether there are disproportionately high minority or low-income populations residing within a 6.4-km (4-mi) radius of the NEF for which further examination of environmental impacts, to determine the potential for environmental justice concerns, is warranted. The evaluation was performed using the most recent population and economic data available from the U. S. Census Bureau for that area, and was done in accordance with the procedures contained in NUREG-1748 ~~(NRC, 2003a)~~. This guidance was endorsed by the NRC's recently issued draft Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions (FR, 2003). As discussed below, no minority or low-income populations were identified that would require further analysis of environmental justice concerns under the criteria established by the NRC. LBDCR-07-0022

4.11.1 Procedure and Evaluation Criteria

The determination of whether the potential for environmental justice concerns exists was made in accordance with the detailed procedures set forth in Appendix C to NUREG-1748 ~~(NRC, 2003a)~~. Census data from the 2000 decennial census were obtained from the U. S. Census Bureau on the minority and low-income populations residing within a 6.4-km (4-mi) radius (i.e., 130 km^2 or 50 mi^2) of the center of the NEF site. These data were obtained by census block group (CBG), and include (for minority populations) percentage totals within each census block group for both each individual minority population group (i.e., African-American, Hispanic, Native American) and for the aggregate minority population. For low-income households (defined in NUREG-1748 as those households falling below the U.S. Census Bureau-specified poverty level), only the total percentage of such households within each CBG was obtained. The low income household data used in the evaluation was for 1999. In examining alternative sites for the NEF, LES considered environmental justice as part of the overall site selection process. However, it did not conduct as detailed an analyses for those sites not selected as that performed for the Lea County site. LBDCR-07-0022

Once collected, the above-described minority and low-income population percentage data were then compared to their counterparts for their respective county and state. These comparisons were made pursuant to the "20%" and "50%" criteria contained in Appendix C to NUREG-1748, to determine (1) if any individual CBG contained a minority population group, aggregate minority population, or low-income household percentage that exceeded its county or state counterparts by more than 20 percentage points; and (2) if any CBG was comprised of more than 50% minorities (either by individual group or in the aggregate) or low-income households.

Based on its comparison of the relevant CBG data to their county and state counterparts, as discussed below, LES determined that no further evaluation of potential environmental justice concerns is necessary, as no CBG within the 6.4-km (4-mi) radius of the NEF site contained a minority or low-income population exceeding the NUREG-1748 "20%" or "50%" criteria ~~(NRC, 2003a)~~. LBDCR-07-0022

4.11.2 Results

The 130-km^2 (50-mi^2) area around the proposed NEF site includes parts of both Lea County, New Mexico and Andrews County, Texas (Figure 4.11-1, 130-km^2 (50-mi^2) Area Around Proposed NEF). Within that area, there are two census tracts (one in each county and one census block group (CBG) in each census tract).

The minority population for each of the individual CBGs, as well as the total corresponding minority population for Lea and Andrews Counties, the states of New Mexico and Texas and the 130 km^2 (50 mi^2) area around the proposed NEF site are enumerated in Table 4.11-1, Minority Population, 2000. The table also lists the percent make up of each minority and the percentage difference between the CBG and the 130-km^2 (50-mi^2) area around the NEF with the parent state and county. Since the 130-km^2 (50-mi^2) area around the NEF covers both states, the comparisons were made to each state and the two counties (Lea County, New Mexico and Andrews County, Texas). A positive difference value means the CBG has a higher percentage of the minority population; a negative difference value means the CBG or the 130-km^2 (50-mi^2) area around the NEF has a lower percentage of the minority population.

As shown in Table 4.11-1, the largest minority group is Hispanic or Latino, accounting for 42.1% of the total population in New Mexico and 32.0% in Texas. In Lea County, New Mexico, the highest percentage of a minority population, at 39.6%, is also Hispanic or Latino. In Andrews County, Texas, Hispanic or Latino is the largest minority group as well at 40.0%..

Table 4.11-1 demonstrates that no individual CBG and the 130-km^2 (50-mi^2) area around the NEF are comprised of more than 50% of any minority population. With respect to the Hispanic or Latino population, the largest minority population in both census tracts, the percentages are as follows: Census Tract 8, CGB 2 – 24.8%; Census Tract 9501, CBG 4 – 19.8%. The largest minority group in the 130-km^2 (50-mi^2) area around the NEF is Hispanic or Latino, accounting for 11.7%. Moreover, none of these percentages exceeds the applicable State or County percentages for this minority population by more than 20 percentage points.

Table 4.11-2, Low Income (Poverty) Population, 1999, demonstrates that no individual CBG is comprised of more than 50% of low-income households. The percentages are as follows: Tract 8, CBG 2 –3.6%; Tract 9501, CBG 4- 9.9%. Neither of these percentages exceeds 50 percent; moreover, neither of these populations significantly exceeds the percentage of low-income households in the applicable State or County. Low income (poverty) data is only compiled down to the CBG level and, therefore, data is not available for only the 130-km^2 (50-mi^2) area around the NEF.

Based on this analysis of the above-described data, performed in accordance with the criteria, guidelines and procedures set forth in NUREG-1748, LES has concluded that no disproportionately high minority or low-income populations exist that would warrant further examination of environmental impacts upon such populations ~~(NRC, 2003a)~~. LBDCR-07-0022

4.11.3 Comparative Environmental Justice Impacts of No Action Alternative Scenarios

ER Chapter 2, Alternatives, provides a discussion of possible alternatives to the construction and operation of the NEF, including an alternative of "no action," i.e., not building the NEF. The following information provides comparative conclusions specific to the concerns addressed in this subsection for each of the three "no action" alternative scenarios addressed in ER Section 2.4, Table 2.4-2, Comparison of Environmental Impacts for the Proposed Action and the No-Action Alternative Scenarios.

Alternative Scenario B – No NEF; USEC deploys a centrifuge plant and continues to operate the Paducah gaseous diffusion plant (GDP): The environmental justice impact is the same since it is assumed there are no disproportionate impacts associated with the alternative scenario.

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4.12.2.1 Pathway Assessment

4.12.2.1.1 Routine Gaseous Effluent

Most of the airborne uranium is removed through filtration prior to the discharge of gaseous effluent to the atmosphere. However, the release of uranium in extremely low concentrations is expected and raises the potential for radiological impacts to the general public and the environment. The total annual discharge of uranium in routine gaseous effluent from a similar designed 1.5 million SWU uranium enrichment facility (half the size of the NEF) was estimated to be less than 30 g (1.1 oz) (NRC, 1994a). The uranium source term applied in the assessment of radiological impacts for routine gaseous effluent from that plant was 4.4x10^{6} Bq (120 µCi) per year. It was noted that actual uranium discharges in gaseous effluent for European facilities with similar design and throughput are significantly lower (i.e., < 1x10^{6} Bq (28 µCi) per year) (NRC, 1994a). In contrast, the NEF is a 3 million SWU facility. The annual discharge of uranium in routine gaseous effluent discharged from the NEF is expected to be less than 10 g (0.35 ounces) (URENCO, 2000; URENCO, 2001, URENCO, 2002a). As a conservative assumption for assessment of potential radiological impacts to the general public, the uranium source term used in the assessment of radiological impacts for routine gaseous effluent releases from the NEF was taken as 8.9 MBq (240 µCi) per year, which is equal to twice the source term applied to the 1.5 million SWU plant described in NUREG-1484 (NRC, 1994a). In comparison, the operating history of gaseous emissions from the Urenco Capenhurst facility in the United Kingdom averaged over a four-year period (1999 to 2002) indicates an average annual release to the atmosphere of uranium of about only 0.1 MBq (2.8 µCi) (URENCO, 2001; URENCO, 2002a). Since the Capenhurst facility is less than half the size of the NEF, scaling their annual release by a conservative factor of 3 suggests that the expected annual releases could be about 0.31 MBq (8.4 Ci) of uranium, or about 28 times smaller than the 8.9 MBq (240 µCi) bounding condition that is used in this assessment.

There are three primary exposure pathways associated with plant effluent: (1) direct radiation due to deposited radioactivity on the ground surface (ground plane exposure), (2) inhalation of airborne radioactivity in a passing effluent plume, and (3) ingestion of food that was contaminated by plant effluent radioactivity. Of these three exposure pathways, inhalation exposures are expected to be the predominant pathways at site boundary locations and also at offsite locations that are relatively close to the site boundary. The reason for this is that the discharge point for gaseous effluent, roof-top stacks, result in ground level effluent plumes. For ground level plume, the airborne concentration(s) within the plume decrease with the distance from the discharge point. Consequently, for gaseous effluent from the NEF, the highest offsite airborne concentrations (and, hence, the greatest radiological impacts) are expected at locations close to the site boundary. Beyond those locations, the concentrations of airborne radioactive material decreases continually as it is transported because of dispersion and depletion processes. For example, based on a comparison of the atmospheric dispersion factors for a ground level effluent release from the NEF calculated for the site boundary, 769 m (2,522 ft), and for the 1.6-km (1-mi) distance in the west sector, the concentration at the 1.6 km (1.0-mi) distance is approximately 3.6 times lower than at the site boundary. Although radiological impacts via the ingestion exposure pathways come into play for distances beyond the site boundary, the concentrations of radioactive material will have been greatly reduced by the time effluent plumes reach those locations.

The radiological impacts from routine gaseous effluents were estimated for four exposure pathways which included inhalation and immersion in the effluent plume, direct dose from ground plane deposition, and ingestion of food products (stored and fresh vegetables, milk and meat) assumed to be grown or raised at the nearest resident location. For both the inhalation and ingestion exposure pathways, the Exposure-to-Dose conversion factors (DCF) were taken from Federal Guidance Report 11 (EPA~~, 1988~~ 520/1-88-020) and were applied for both the committed organ equivalent dose and the committed effective equivalent dose. No assumption on the chemical form of the uranic material deposited in the environment is made due to the extended time that effluents will persist in the open environment and the unknown change in chemical form that might take place over time. As a consequence, the most restrictive clearance class for inhalation and fractional uptake condition for ingestion is assumed (for conservatism) in the selection of dose factors from Federal Guidance Report 11 (EPA~~, 1988~~ 520/1-88-020). For ingestion and inhalation pathways, dose equivalent were calculated for seven organs (gonads, breast, lung, red bone marrow, bone surface, thyroid, and a remainder for all other organs) as well as effective dose equivalent.

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For direct dose from material deposited on the ground plane or from the passing cloud, the DCF from Federal Guidance Report No. 12 (EPA, 1993a) have been applied. For ground plane exposures, it is assumed that the material deposited from the passing cloud remains on the ground surface as an infinite source plane (i.e., no mixing with any soil depth). This provides the most conservative assumption for direct ground plane exposure. The dose from ground plane deposition was evaluated after 30 years (end of expected license period) to account for the maximum buildup of released activity, including the in-growth of radionuclide progeny from the primary uranium isotopes that make up the expected release from the plant. This provides the upper bound on any single year of projected plant impacts. For external exposures from plume immersion and ground plane exposure, the skin is added to those organs that were evaluated for internal exposures (inhalation and ingestion).

The dose factors in the Federal Guidance Report (FGR)-11 (EPA~~, 1988~~ 520/1-88-020) are derived for adults. In order to estimate the impact to other age groups, the doses calculated to adults were adjusted for difference in food consumption or inhalation rates as taken from NRC Regulatory Guide 1.109~~ (NRC, 1977c)~~ and then multiplied by the relative age dependent dose factor for the effective dose equivalent as found for the different ages in the International Commission of Radiological Protection (ICRP) Report No. 72 (ICRP, 1995). With respect to the DCF's for adults, the relative ingestion dose commitment multiplier by age group for the four isotopes of uranium of concern averaged 1.0 (adults), 1.5 (teens), 1.8 (children) and 7.5 (infants). For the inhalation pathway, these relative dose commitment multipliers are 1.0 (adult), 1.2 (teens), 2.02 (children) and 4.25 (infants).

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The ingestion pathway models for locally grown or raised food products were taken from NRC Regulatory Guide 1.109~~ (NRC, 1977c)~~. The models projected isotopic concentrations in vegetation, milk and meat products based on the annual quantity of uranium material assumed to be released to the air and the atmospheric dispersion and deposition factors at key receptor locations of interest. These food product concentrations were then used to determine the ingestion committed effective dose equivalent and organ doses by multiplying the individual organ and effective dose conversion factors by the food product concentrations and the annual individual usage factors from the NRC Regulatory Guide 1.109~~ (NRC, 1977c)~~.

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The key receptor locations (critical populations) for determining dose impacts included the nearest public access point to the site boundary with the most restrictive atmospheric dispersion factors as well as boundary locations where direct doses from fixed sources are predicted to be the highest. Also included as key locations of interest are nearby private businesses and the location of the nearest resident. Figure 4.12-1, Nearest Resident, indicates the location of the nearest resident.

The atmospheric dispersion factors used in the radiological impacts assessment were calculated as described in ER Section 4.6, Air Quality Impacts and are provided in Table 4.6-3A, Annual Average Atmospheric Dispersion and Deposition Factors from NWS (1987-1991) Data. The meteorological data was taken from the National Weather Service station for Midland – Odessa, Texas covering the years from 1987 through 1991.

Three groups of individuals (members of the public) or exposure scenarios were evaluated for both potential and real receptors located at or beyond the site boundary. For the first group, the dose impact to the nearest (and highest potentially impacted) residence was evaluated for all exposure pathways (inhalation and plume immersion, direct dose from ground plane deposition, and ingestion of food products which include fresh and stored vegetables, milk and meat postulated to be grown or raised at this location). The analysis included dose equivalent assessments for all four age groups (adults, teens, children and infants) for these pathways. The location of this residence is identified to be approximately 4.3 km (2.63 mi) west of the NEF site in the W sector as measured from the main plant vent systems situated on top of the TSB (see Figures 4.12-1 and 6.1-2). The occupancy time was assumed to be continuous for a full year, along with a residential shielding factor of 0.7 (~~NRC, 1977c~~Regulatory Guide 1.109). This location provides for an assessment of doses to real members of the public. LBDCR-07-0022

The second group of individuals (critical populations) are those associated with local businesses situated near the plant site in the SE and N-NNW sectors about the plant (see Figure 6.1-2, Modified Site Features With Proposed Sampling Stations and Monitoring Locations). Two locations were evaluated for impact assessment based on the most limiting offsite atmospheric dispersion factors, or where the combination of direct dose from fixed sources and plant effluents would maximize the projected total dose. The location of most limiting dispersion is for a small landfill site situated 0.93 km (0.57 mile) from the TSB in the SE sector. The second business location is a quarry operation located approximately 1.8 km (1.1 mi) in the N-NNW sectors around the NEF. The combination of effluents and direct (including scatter) dose from fixed sources is potentially highest here for actually occupied locations. Since these two locations reflect outdoor businesses, the annual occupancy time is taken as the standard 2,000 hours for work environments. Also, the residential shielding factor of 0.7 was replaced with 1.0 (no shielding credit) since the nature of both operations is mainly outdoor work. In addition, only the inhalation and plume immersion pathways along with direct dose equivalent from ground plane deposition are applied since no food products (gardens or animals) are associated with these types of businesses. As these are work locations, the age group of interest, adults (>17 years), is the only significant group assumed to spend substantial time at these places.

Table 4.12-1, Direct Radiation Annual Dose Equivalent by Source, summarizes the annual dose equivalents by source (UBC Storage Pad and CRDB) at different locations.

4.12.2.1.4 Population Dose Equivalents

The local area population distribution was derived from U.S. Census Bureau 2000 data for counties in New Mexico and Texas (DOC, 2000a; DOC, 2000b; DOC, 2000c; DOC, 2000d) that fall all or in part of a 80-km (50-mi) radius of the NEF site. A standard 16-sector compass rose was centered on the NEF site and divided into annular rings at selected distances. Population counts from census data that located significant population groups for towns or cities within the 80-km (50-mi) area were then distributed into those sectors that covered the groupings. After accounting for these significant population locations, the balance of the population for the different counties persons per square kilometer (square mile) was distributed by equal area allocation based on the land area in the sector. For the first 8 km (5 mi), site area observations provided information on the nearest resident within 8 km (5 mi) in all sectors, which indicated that most of the 16 sectors had no resident population near the site. The resulting population for the 2000 is shown on Table 4.12-2, Population Data for the Year 2000. Census data for the year 2000 also provided information on the breakdown of the seven counties within 80 km (50 mi) by age (DOC, 2000d). From this data, age groups as a fraction of the total population were determined for infants under one year of age (1.54%), children ages 1-11 (17.90%), teens ages 12 –17 (10.93%) and adults ages greater than 17 (69.64%). This breakdown was applied to the total population distribution for all exposure pathways including the determination of annual committed dose equivalent from ingestion and inhalation where age also affects the amount of annual intake (air and food).

The collective dose equivalent from gaseous effluents from the Separations Building GEVS, the TSB GEVS and the Centrifuge Test and Post Mortem Facilities Exhaust Filtration System, along with resuspended airborne particles from dried liquid waste deposits on the bottom of the Treated Effluent Evaporative Basin (assuming 30-years of buildup of waste inventory) are calculated for the 80-km (50-mi) population based on all pathways calculated for the nearest resident applying to the general population. For the ingestion of food products, it was assumed that the area produced sufficient volume to supply the entire population with their needs. Annual average usage factors for the general population (~~NRC, 1977c~~Regulatory Guide 1.109) were used as the individual consumption rates. Individual total effective dose equivalents were calculated for each age group by sector and then multiplied by the estimated age-dependent population for that sector to get the collective dose equivalent. The collective dose equivalents for each age group were then added to provide the total population collective dose equivalents. Table 4.12-3, Collective Dose Equivalents to All Ages Population (Person-Seiverts) and Table 4.12-4, Collective Dose Equivalents to All Ages Population (Person-rem) indicate the total collective dose for the entire population within the 80-km (50-mi) radius of the NEF site in units of Person-Sieverts and Person-rem, respectively. LBDCR-07-0022

4.13.3.1.2 Mitigation for Depleted UF_6 Storage

Since UF_6 is a solid at ambient temperatures and pressures, it is not readily released from a cylinder following a leak or breach. When a cylinder is breached, moist air reacts with the exposed UF_6 solid and iron, resulting in the formation of a dense plug of solid uranium and iron compounds and a small amount of HF gas. This "self-healing" plug limits the amount of material released from a breached cylinder. When a cylinder breach is identified, the cylinder is typically repaired or its contents are transferred to a new cylinder.

LES will maintain an active cylinder management program to maintain optimum storage conditions in the cylinder yard, to monitor cylinder integrity by conducting routine inspections for breaches, and to perform cylinder maintenance and repairs to cylinders and the storage yard, as needed. The following handling and storage procedures and practices shall be adopted at the NEF to mitigate adverse events, by either reducing the probability of an adverse event or reducing the consequence should an adverse event occur (LES, 1991b).

- All filled UBCs will be stored in designated areas of the storage yard on concrete saddles (or saddles comprised of other material) that do not cause cylinder corrosion. These saddles shall be placed on a stable concrete surface.
- The storage array shall permit easy visual inspection of all cylinders.
- The UBCs shall be surveyed for external contamination (wipe tested) prior to being placed on the UBC Storage Pad or transported offsite. The maximum level of removable surface contamination allowed on the external surface of the cylinder shall be no greater than 0.4 Bq/cm^2 (22 dpm/cm2) (beta, gamma, alpha) on accessible surfaces averaged over 300 cm^2.
- UBC valves shall be fitted with valve guards to protect the cylinder valve during transfer and storage.
- Provisions are in place to ensure that UBCs do not have the defective valves (identified in NRC Bulletin 2003-03, "Potentially Defective 1-Inch Valves for Uranium Hexafluoride Cylinders" ~~(NRC, 2003e)~~ installed. LBDCR-07-0022
- All UBCs shall be abrasive-blasted and coated with a minimum of one coat of zinc chromate primer plus one zinc-rich topcoat or equivalent anti-corrosion treatment.
- Only designated vehicles with less than 280 L (74 gal) of fuel shall be allowed in the UBC Storage Pad area.
- Only trained and qualified personnel shall be allowed to operate vehicles on the UBC Storage Pad area.
- UBCs shall be inspected for damage prior to placing a filled cylinder on the Storage Pad.
- UBCs shall be re-inspected annually for damage or surface coating defects. These inspections shall verify that:
  - Lifting points are free from distortion and cracking.
  - Cylinder skirts and stiffener rings are free from distortion and cracking.
  - Cylinder surfaces are free from bulges, dents, gouges, cracks, or significant corrosion.

4.13.3.1.6 Costs Associated with Depleted UF_6 Conversion and Disposal

This section presents cost estimates for the conversion of depleted uranium hexafluoride (depleted UF_6) and the disposal of the depleted triuranium octoxide (depleted U_3O_8) produced during deconversion. It also presents cost estimates for the associated transportation of depleted UF_6 to the conversion plant and the transportation of depleted U_3O_8 to the disposal site. The cost estimates were obtained from analyses of four sources: a 1997 study by the Lawrence Livermore National Laboratory (LLNL), the Uranium Disposition Services, LLC (UDS) contract with the Department of Energy (DOE) dated August 29, 2002, information from Urenco related to depleted UF_6 disposition costs including conversion, and the costs submitted to the Nuclear Regulatory Commission (NRC) by LES as part of the Claiborne Energy Center (CEC) license application in the early 1990s (LES, 1993). The estimated cost to dispose of depleted U_3O_8 in an exhausted uranium mine was also assessed.

This section reviews cost estimates developed by LLNL for the interim storage of the current very large United States (U.S.) inventory of depleted UF_6 at DOE conversion facilities, the DOE preferred option of conversion of depleted UF_6 to depleted U_3O_8 at DOE facilities, the ultimate disposal of depleted U_3O_8 at DOE sites, and the transportation of depleted UF_6 and depleted U_3O_8 (LLNL, 1997a). While cost estimates for other disposition alternatives (e.g. conversion to uranium oxide (UO_2)) were reviewed they are not addressed in this section since they were not considered as being applicable to LES. It is noted that the LLNL study estimates are reported in 1996 discounted dollars.

This section reviews the UDS-DOE contract since it is regarded as being more credible than an estimate because it represents actual U.S. cost data (DOE, 2002b). Unfortunately the UDS contract does not provide a breakdown of the conversion and disposal cost components.

This section also reflects information on depleted UF_6 disposition cost by European fuel cycle supplier, Urenco. The disposal costs submitted to the NRC in support of the Claiborne Energy Center license application to the NRC in the early 1990s were also reviewed (LES, 1993).

This section is based on an analysis of reports and literature in the public domain as well as information provided by Urenco and the experience of expert consultants.

In August 2001 the DOE reported that it had an inventory of depleted UF_6 enrichment tails material amounting to 55,000 (60,627), 193,000 (212,746) and 449,000 (494,938) metric tons (tons) stored at its enrichment sites at Oak Ridge in Tennessee, at Portsmouth in Ohio, and at Paducah in Kentucky, respectively (DOE, 2001d). This total of approximately 700,000 MT (771,617 tons) of depleted UF_6 corresponds to about 470,000 MT (518,086 tons) of uranium (MTU) as UF_6, a figure that is obtained by multiplying the mass of depleted UF_6 by the mass fraction of U to UF_6; i.e., 0.676. The depleted UF_6 is stored in approximately 60,000 steel cylinders, some dating back to about 1947 (DOE, 2001e). On October 31, 2000, the DOE issued a Request for Proposal (RFP) to construct depleted UF_6 to depleted U_3O_8 conversion facilities at the Portsmouth and Paducah sites in order to begin management and disposition of the UBCs accumulated at its three sites (DOE, 2000a). The DOE plans to ship the depleted UF_6 stored at the East Tennessee Technology Park (ETTP) at Oak Ridge to Portsmouth for conversion.

Since the 1950s, the government has stored depleted UF_6 in an array of large steel cylinders at Oak Ridge, Paducah, and Portsmouth. Several different cylinder types, including 137 nominal 19-ton cylinders (Paducah) made of former UF_6 gaseous diffusion conversion shells, are in use, although the vast majority of cylinders have a 12 MT (14 ton) capacity. The cylinders are typically 3.7 m (12 ft) long by 1.2 m (4 ft) in diameter, with most having a thin wall thickness of 0.79 cm (5/16 in) of steel. Similar but smaller cylinders are also in use. Thick-walled cylinders, 48Ys that have a 1.6 cm (5/8 in) wall thickness, will be used by LES for storage and transport. The cylinders managed by DOE at the three sites are typically stacked two cylinders high in large areas called yards.

The DOE and USEC Inc. cylinders considered acceptable for UF_6 handling and shipping are referred to as conforming cylinders in the LLNL study. LLNL notes that the old or corroded cylinders that will not meet the American National Standards Institute (ANSI) specifications (ANSI~~, applicable version~~ N14.1), non-conforming cylinders, will require either special handling and special over-packs or transfer of contents to approved cylinders, and approval by regulatory agencies such as the Department of Transportation (DOE, 2001d). The LLNL report estimated high costs for the management and transporting of 29,083 non-conforming cylinders in the study's reference case, approximately 63% of the total of 46,422 cylinders in the study. There are approximately 4,683 cylinders at the Oak Ridge ETTP that the DOE has determined should be transported to the Portsmouth site for disposition. The LLNL report estimated that the life-cycle cost of developing special over-packs and constructing and operating a transfer facility for the DOE's non-conforming cylinders could be as much as $604 million, in discounted 1996 dollars (LLNL, 1997a). LBDCR-07-0022

On August 29, 2002, the DOE announced the competitive selection of UDS to design, construct, and operate conversion facilities near the Paducah and Portsmouth gaseous diffusion plants. UDS will operate these facilities for the first five years, beginning in 2005. The UDS contract runs from August 29, 2002 to August 3, 2010. UDS will also be responsible for maintaining the depleted uranium and product inventories and transporting depleted uranium from ETTP to the Portsmouth for conversion. The DOE-UDS contract scope includes packaging, transporting and disposing of the conversion product depleted U_3O_8 at a government waste disposal site such as the Nevada Test Site (NTS) (DOE, 2002b).

UDS is a consortium formed by Framatome ANP, Inc., Duratek Federal Services, Inc., and Burns and Roe Enterprises, Inc. The estimated value of the cost reimbursement contract is $558 million (DOE, 2002c). Design, construction and operation of the facilities will be subject to appropriations of funds from Congress. On December 19, 2002, the White House confirmed that funding for both conversion facilities will be included in President Bush's 2004 budget. President Bush signed the Energy and Water Appropriations Bill on December 1, 2003 which included funding for both conversion facilities.

The NEF UBCs will all be thick-walled conforming 48Y cylinders. The 48Y cylinders have a gross weight of about 14.9 MT (16.4 tons), and when filled, will normally contain 12.5 MT (13.8 tons) of UF_6 or about 8.5 MTU (9.4 tons). The management and transporting of the LES UBCs will not involve unusual costs such as those that will be required for the majority of the DOE-managed cylinders currently stored at the three government sites.

Based on information from corresponding vendors, the value of $5.50 per kgU (2002 dollars), which is equal to $5.70 per kgU when escalated to 2004 dollars, was revised in December 2004 to $4.68 per kgU (2004 dollars). The value of $4.68 per kgU was derived from the estimates of costs from the three components that make up the total disposition cost of DUF6 (i.e., deconversion, disposal, and transportation). The estimate of $4.68 per kgU supports the Preferred Plausible Strategy of U.S. Private Sector Conversion and Disposal identified in section 4.13.3.1.3 of the ER as Option 1. In addition, $0.60 per kgU has been added to this estimate to cover the cost of managing the empty UBCs once the DUF6 has been removed for conversion.

In support of the Option 2 Plausible Strategy identified in Section 4.13.3.1.3 of the ER, "DOE Conversion and Disposal," considered the backup option, LES requested a cost estimate from the Department of Energy (DOE). On March 1, 2005, DOE provided a cost estimate to LES for the components that make up the total disposition cost (i.e., deconversion, disposal, and transportation, excluding the cost of loading the UBCs at the NEF site) (DOE, 2005). This estimate, which was based upon an independent analysis undertaken by DOE's consultant, LMI Government Consulting, estimated the cost of disposition to total approximately $4.91 per kgU (2004 dollars). This estimate was subsequently corrected to $4.68 per kgU (2004 dollars) and no additional amounts were added to account for UBC loading at the NEF site since this cost is minimal and the DOE transportation estimate is highly conservative. The Department's cost estimate for deconversion, storage, and disposal of the DU is consistent with the contract between UDS and DOE. The cost estimate does not assume any resale or reuse of any products resulting from the conversion process.

For purposes of determining the total tails disposition funding requirement and the amount of financial assurance required for this purpose, the value of $5.28 per kgU (based upon the cost estimate for the Preferred Plausible Strategy) was selected. Furthermore, this financial assurance will always cover the backup DOE option cost estimate, plus a 25% contingency, via the periodic update mechanism. See Safety Analysis Report Table 10.1-14, Total Decommissioning Costs, for the total tails disposition funding cost.

4.13.3.2 Water Quality Limits

All plant effluents are contained on the NEF site. A series of evaporation retention/detention basins, and septic systems are used to contain the plant effluents. There will be no discharges to a Publicly Owned Treatment Works (POTW). Contaminated water is treated to the limits in 10 CFR 20, Appendix B, Table 2 and to administrative levels recommended by Regulatory Guide 8.37 (CFR, 2003q; ~~NRC, 1993~~). Refer to ER Section 4.4, Water Resource Impacts, for additional water quality standards and permits for the NEF. ER Section 3.12, Waste Management, also contains information on the NEF systems and procedures to ensure water quality. LBDCR-07-0022

With respect to the transport of radioactive materials, no substantive impacts exist as related to the following activities:

- Transportation mode (i.e., truck), and routes from originating site to the destination
- Estimated transportation distance from the originating site to the destination
- Treatment and packaging procedure for radioactive wastes
- Radiological dose equivalents for incident-free scenarios to public and workers
- Impacts of operating transportation vehicles on the environment (e.g., fire from equipment sparking).

Impacts related to the transport of radioactive material are addressed in ER Section 4.2.7, Radioactive Material Transportation. The materials that will be transported to and from the NEF

are well within the scope of the environmental impacts previously evaluated by the Nuclear Regulatory Commission (NRC). Because these impacts have been addressed in a previous NRC environmental impact statement (NUREG/CR-0170) (NRC, 1977a), no additional mitigation measures are proposed in ER Section 5.2.2, Transportation.

5.1.3 Geology and Soils

The potential impacts to the geology and soils have been characterized in ER Section 4.3, Geology and Soils Impact. No substantive impacts exist as related to the following activities:

- Soil resuspension, erosion, and disruption of natural drainage
- Excavations to be conducted during construction.

Impacts to geology and soils will be limited to surface runoff due to routine operation. Construction activities may cause some short-term increases in soil erosion at the site. Mitigation measures associated with these impacts are listed in ER Section 5.2.3, Geology and Soils.

5.1.4 Water Resources

The potential impacts to the water resources have been characterized in ER Section 4.4, Water Resources Impacts. No substantive impacts exists as related to the following:

- Impacts on surface water and groundwater quality

- Impacts of consumptive water uses (e.g., groundwater depletion) on other water users and adverse impacts on surface-oriented water users resulting from facility activities. Site groundwater will not be utilized for any reason, and therefore, should not be impacted by routine NEF operations. The NEF water supply will be obtained from the town of Eunice, New Mexico~~ and the city of Hobbs, New Mexico~~. Current ~~capacities~~ capacity for the Eunice ~~and Hobbs, New Mexico~~ municipal water supply systems ~~are~~ is 16,350 m^3/day (4.32 million gpd)~~ and 75,700 m^3/day (20 million gpd)~~, respectively and current usages ~~are~~ is 5,600 m^3/day (1.48 million gpd)~~ and 23,450 m^3/day (6.2 million gpd), respectively~~. Average and peak potable water requirements for operation of the NEF are expected to be approximately 240 m^3/day (63,423 gpd) and 85 m^3/hour (378 gpm), respectively. These usage rates are well within the ~~capacities~~ capacity of ~~both~~ the water systems. For both peak and the normal usage rates, the needs of the NEF facility should readily be met by the municipal water systems. Impacts to water resources on site and in the vicinity of NEF are expected to be negligible. LBDCR-07-0005 LBDCR-07-0005 LBDCR-07-0005
- Hydrological system alterations or impacts
- Withdrawals and returns of ground and surface water
- Cumulative effects on water resources.

The NEF will not obtain any water from onsite surface or groundwater resources. Process effluents will be discharged to the double-lined Treated Effluent Evaporative Basin with leak detection. Sanitary waste water discharges will be made through site septic systems. Stormwater from developed portions of the site will be collected in retention/detention basins, as described in ER Section 3.4, Water Resources. These include the Site Stormwater Detention Basin and the UBC Storage Pad Stormwater Retention Basin. Minor impacts to water resources are discussed in ER Section 4.4. Mitigation measures associated with these impacts are listed in ER Section 5.2.4, Water Resources.

5.1.5 Ecological Resources

The potential impacts to the ecological resources have been characterized in ER Section 4.5, Ecological Resources Impacts. No substantive impacts exists as related to the following:

- Total area of land to be disturbed
- Area of disturbance for each habitat type
- Use of chemical herbicides, roadway maintenance, and mechanical clearing
- Areas to be used on a short-term basis during construction
- Communities or habitats that have been defined as rare or unique or that support threatened and endangered species
- Impacts of elevated construction equipment or structures on species (e.g., bird collisions, nesting areas)
- Impact on important biota.

Impacts to ecological resources will be minimal. Mitigation measures associated with these impacts are listed in ER Section 5.2.5, Ecological Resources.

5.1.9 Visual/Scenic Resources

The potential impacts to visual/scenic resources have been characterized in ER Section 4.9, Visual/Scenic Resources Impacts. No substantive negative impacts exists as related to the following:

- The aesthetic and scenic quality of the site
- Impacts from physical structures
- Impacts on historical, archaeological or cultural properties of the site
- Impacts on the character of the site setting.

Visual/scenic impacts due to the development of the NEF result from visual intrusions in the existing landscape character. Except possibly for a section of the proposed, westernmost access road, no structures are proposed that may require the removal of natural or built barriers, screens or buffers. Mitigation measures associated with these impacts are listed in ER Section 5.2.9, Visual/Scenic Resources.

5.1.10 Socioeconomic

The potential socioeconomic impacts to the community have been characterized in ER Section 4.10, Socioeconomic Impacts. No substantive negative impacts exist as related to the following:

- Impacts to population characteristics (e.g., ethnic groups, and population density)
- Impacts to housing, health and social services, or educational and transportation resources
- Impacts to area's tax structure and distribution.

The anticipated cumulative socioeconomic negative impacts of the proposed operation of NEF are expected to be insignificant. The positive socioeconomic impacts are substantial (see ER Section 7.1, Economic Cost-Benefits, Plant Construction and Operation). See ER Section 4.10, Socioeconomic Impacts, for a detailed discussion on socioeconomic impacts.

5.1.11 Environmental Justice

The potential impacts with respect to environmental justice have been characterized in ER Section 4.11, Environmental Justice. No substantive impacts exist as related to the following:

- Disproportionate impact to minority or low-income population.

Based on the data analyzed and the NUREG-1748 ~~(NRC, 2003a)~~ guidance by which that analysis was conducted, LES determined that no further evaluation of potential Environmental Justice concerns was necessary, as no Census Block Group within the 6.4-km (4-mi) radius, i.e., 128 km^2 (50 mi^2), of the NEF site contained a minority or low-income population exceeding the NUREG-1748 "20%" or "50%" criteria. See ER Section 4.11, Environmental Justice. LBDCR-07-0022

5.1.12 Public and Occupational Health

This section describes public and occupational health impacts from both nonradiological and radiological sources.

- Localized floor washing using mops and self-contained cleaning machines reduces water usage compared to conventional washing with a hose twice per week.
- The use of high efficiency washing machines compared to standard machines reduces water usage.
- The use of high efficiency closed cell cooling towers (water/air cooling) versus open cell design reduces water usage.
- Closed-loop cooling systems have been incorporated to reduce water usage.

The UBC Storage Pad Stormwater Retention Basin, which exclusively serves the UBC Storage Pad and cooling tower blowdown water and heating boiler blowdown water discharges, is lined to prevent infiltration. It is designed to retain a volume slightly more than twice that for the 24-hour, 100-year frequency storm and an allowance for the cooling tower blowdown water and heating boiler blowdown water. Designed for sampling and radiological testing of the contained water and sediment, this basin has no flow outlet. All discharge is through evaporation.

The Site Stormwater Detention Basin is designed with an outlet structure for drainage. Local terrain serves as the receiving area for this basin.

Discharge of operations-generated potentially contaminated waste water is made exclusively to the Treated Effluent Evaporative Basin. Only liquids meeting site administrative limits (based on prescribed standards) and discharged to this basin. The basin is double-lined, open to allow evaporation, has no flow outlet and has leak detection.

5.2.5 5.2.5 Ecological Resources

Mitigation measures will be in place to minimize potential impact on ecological resources. These include the following items:

- Use of BMPs recommended by the State of New Mexico to minimize the construction footprint to the extent possible
- The use of detention and retention ponds
- Site stabilization practices to reduce the potential for erosion and sedimentation.
- Proposed wildlife management practices include:
- The placement of a raptor perch in an unused open area.
- The use of bird feeders at the visitor's center.
- The placement of quail feeders in the unused open areas away from the NEF buildings.
- The management of unused open areas (i.e. leave undisturbed), including areas of native grasses and shrubs for the benefit of wildlife.
- The use of native plant species (i.e., low-water consuming plants) to revegetate disturbed areas to enhance wildlife habitat.
- The use of netting, or other suitable material, to ensure migratory birds are excluded from evaporative ponds that do not meet New Mexico Water Quality Control Commission (~~NMWQCC, 2002~~NMAC 20.6.4) surface water standards for wildlife usage. LBDCR-07-0022

- The use of animal-friendly fencing around ponds or basins which may contain contaminated process water so that wildlife cannot be injured or entangled. LBDCR-08-0009
- Minimize the amount of open trenches at any given time and keep trenching and backfilling crews close together.
- Trench during the cooler months (when possible).
- Avoid leaving trenches open overnight. Escape ramps will be constructed at least every 90 m (295 ft). The slope of the ramps will be less than 45 degrees. Trenches that are left open overnight will be inspected and animals removed prior to backfilling.

In addition to proposed wildlife management practices above, LES will consider all recommendations of appropriate state and federal agencies, including the United States Fish and Wildlife Service and the New Mexico Department of Game and Fish.

5.2.6 Air Quality

Mitigation measures will be in place to minimize potential impact on air quality. These include the following items:

- The design of the NEF cooling towers combines adiabatic and evaporative heat transfer processes to significantly reduce visible plumes.
- The TSB and Separations Building Gaseous Effluent Vent Systems (GEVS) are designed to collect and clean potentially hazardous gases from the plant prior to release into the atmosphere. Instrumentation is provided to detect and signal via alarm, all non-routine process conditions, including the presence of radionuclides or hydrogen fluoride in the exhaust stream, that will trip the system to a safe condition, in the event of effluent detection beyond routine operational limits.
- The Centrifuge Test and Post Mortem Facilities Exhaust Filtration System is designed to collect and clean all potentially hazardous gases from the serviced areas in the CAB prior to release into the atmosphere. Instrumentation is provided to detect and signal the Control Room via alarm, all non-routine process conditions, including the presence of radionuclides or hydrogen fluoride in the exhaust stream. Operators will then take appropriate actions to mitigate the release.
- Construction BMPs will be applied as described previously to minimize fugitive dusts.
- Air concentrations of the Criteria Pollutants for vehicle emissions and fugitive dust will be below the National Ambient Air Quality Standards (NAAQS) (CFR, 2003w) and thus will not require further mitigation measures.

5.2.7 Noise

Mitigation of the operational noise sources will occur primarily from the plant design, whereby cooling systems, valves, transformers, pumps, generators, and other facility equipment, will mostly reside inside plant structures. The buildings themselves will absorb the majority of the noise located within. Natural land contours, vegetation (such as scrub brush), and site buildings and structures will mitigate the impact of other equipment located outside of structures that contribute to site noise levels.

With mitigation, the dose consequences to the public for these accident sequences, have been reduced to a level below that considered "intermediate consequences", as that term is defined in (10 CFR 70.61(c)) (CFR, 2003b). See ER Section 4.12.3, Environmental Effects of Accidents.

5.2.13 Waste Management

Mitigation measures will be in place to minimize both the generation and impact of facility wastes. Solid and liquid wastes and liquid and gaseous effluents will be controlled in accordance with regulatory limits. Mitigation measures include:

- System design features are in place to minimize the generation of solid waste, liquid waste, liquid effluents, and gaseous effluent. Liquid and gaseous effluent design features were previously described in ER Section 5.2.12, Public and Occupational Health.
- There will be no onsite disposal of waste at the NEF. Waste will be stored in designated areas of the plant, until an administrative limit is reached. When the administrative limit is reached, the waste will then be shipped offsite to a licensed disposal facility.
- All radioactive and mixed wastes will be disposed of at offsite, licensed facilities.
- Mitigation measures associated with UBC storage are as follows:
- LES will maintain a cylinder management program to monitor storage conditions on the UBC Storage Pad to monitor cylinder integrity by conducting routine inspections for breaches, and to perform cylinder maintenance and repairs as needed.
- All UBCs filled with depleted uranium hexafluoride (UF_6) will be stored on concrete (or other material) saddles that do not cause corrosion of the cylinders. These saddles shall be placed on a concrete pad.
- The storage pad areas shall be segregated from the rest of the enrichment facility by barriers (e.g., vehicle guard rails).
- UBCs shall be double stacked on the storage pad. The storage array shall permit easy visual inspection of all cylinders.
- UBCs shall be surveyed for external contamination (wipe tested), prior to being placed on the UBC Storage Pad or transported offsite.
- UBC valves shall be fitted with valve guards to protect the cylinder valve during transfer and storage.
- Provisions are in place to ensure that UBCs do not have the defective valves (identified in NRC Bulletin 2003-03, "Potentially Defective 1-Inch Valves for Uranium Hexafluoride Cylinders") ~~(NRC, 2003e)~~ installed. LBDCR-07-0022
- All UF_6 cylinders are abrasive blasted and coated with anti-corrosion primer/paint when manufactured (as required by specification). Touch-up application of coating will be performed on UBCs if coating damage is discovered during inspection.
- Only designated vehicles with less than 0.3 m^3 (74 gal) of fuel shall be allowed on the UBC Storage Pad.

6.0 ENVIRONMENTAL MEASUREMENTS AND MONITORING PROGRAMS

6.1 RADIOLOGICAL MONITORING

6.1.1 Effluent Monitoring Program

The Nuclear Regulatory Commission (NRC) requires, pursuant to 10 CFR 20 (CFR, 2003q) that licensees conduct surveys necessary to demonstrate compliance with these regulations and to demonstrate that the amount of radioactive material present in effluent from the facility has been kept as low as reasonably achievable (ALARA). In addition, the NRC requires pursuant to 10 CFR 70 (CFR, 2003b), that licensees submit semiannual reports, specifying the quantities of the principal radionuclides released to unrestricted areas and other information needed to estimate the annual radiation dose to the public from effluent discharges. The NRC has also issued Regulatory Guide 4.15 – Quality Assurance for Radiological Monitoring Programs (Normal Operations) – Effluent Streams and the Environment ~~(NRC, 1979)~~ and Regulatory Guide 4.16 – LBDCR-07-0022 Monitoring and Reporting Radioactivity in Releases of Radioactive Materials in Liquid and Gaseous Effluent from Nuclear Fuel Processing and Fabrication Plants and Uranium Hexafluoride Production Plants ~~(NRC, 1985)~~ that reiterate that concentrations of hazardous LBDCR-07-0022 materials in effluent must be controlled and that licensees must adhere to the ALARA principal such that there is no undue risk to the public health and safety at or beyond the site boundary.

Refer to Figure 6.1-1, Effluent Release Points and Meteorological Tower, and Figure 6.1-2, Modified Site Features With Proposed Sampling Stations and Monitoring Locations. Effluents are sampled as shown in Table 6.1-1, Effluent Sampling Program. For gaseous effluents, continuous air sampler filters are analyzed for gross alpha and beta each week. The filters are composited quarterly and an isotopic analysis is performed. For liquids, a grab sample is taken for isotopic analysis post-treatment prior to discharge to the Treated Effluent Evaporative Basin.

Public exposure to radiation from routine operations at the National Enrichment Facility (NEF) may occur as the result of discharge of liquid and gaseous effluents, including controlled releases from the uranium enrichment process lines during decontamination and maintenance of equipment. In addition, radiation exposure to the public may result from the transportation and storage of uranium hexafluoride (UF_6) feed cylinders, product cylinders, and Uranium Byproduct Cylinders (UBCs). Of these potential pathways, discharge of gaseous effluent has the highest possibility of introducing facility-related uranium into the environment. The plant's procedures and facilities for solid waste and liquid effluent handling, storage and monitoring result in safe storage and timely disposition of the material. ER Section 1.3, Applicable Regulatory Requirements and Required Consultations, accurately describes all applicable Federal and New Mexico State standards for discharges, as well as required permits issued by local, New Mexico and Federal governments.

Compliance with 10 CFR 20.1301 (CFR, 2003q) is demonstrated using a calculation of the total effective dose equivalent (TEDE) to the individual who is likely to receive the highest dose in accordance with 10 CFR 20.1302(b)(1) (CFR, 2003q). The determination of the TEDE by pathway analysis is supported by appropriate models, codes, and assumptions that accurately represent the facility, site, and the surrounding area. The assumptions are reasonably conservative, input data is accurate, and all applicable pathways are considered. ER Section 4.12, Public and Occupational Health Impacts, presents the details of these determinations.

The computer codes used to calculate dose associated with potential gaseous and liquid effluent from the plant follow the methodology, for pathway modeling, described in Regulatory Guide 1.109 (NRC, 1977c), and have undergone validation and verification. The dose conversion factors used are those presented in Federal Guidance Reports Numbers 11 (EPA, 1988 520/1-88-020) and 12 (EPA, 1993a). LBDCR-07-0022

Administrative action levels are established for effluent samples and monitoring instrumentation as an additional step in the effluent control process. All action levels are sufficiently low so as to permit implementation of corrective actions before regulatory limits are exceeded. Effluent samples that exceed the action level are cause for an investigation into the source of elevated radioactivity. Radiological analyses will be performed more frequently on ventilation air filters if there is a significant increase in gross radioactivity or when a process change or other circumstances cause significant changes in radioactivity concentrations. Additional corrective actions will be implemented based on the level, automatic shutdown programming, and operating procedures to be developed in the detailed alarm design. Under routine operating conditions, radioactive material in effluent discharged from the facility complies with regulatory release criteria.

Compliance is demonstrated through effluent and environmental sampling data. If an accidental release of uranium should occur, then routine operational effluent data and environmental data will be used to assess the extent of the release. Processes are designed to include, when practical, provision for automatic shutdown in the event action levels are exceeded. Appropriate action levels and actions to be taken are specified for liquid effluents and gaseous releases. Data analysis methods and criteria used in evaluating and reporting environmental sample results are appropriate and will indicate when an action level is being approached in time to take corrective actions.

The effluent monitoring program falls under the oversight of the NEF Quality Assurance (QA) program. Therefore, it is subject to periodic audits conducted by the facility QA personnel. Written procedures will be in place to ensure the collection of representative samples, use of appropriate sampling methods and equipment, proper locations for sampling points, and proper handling, storage, transport, and analyses of effluent samples. In addition, the plant's written procedures also ensure that sampling and measuring equipment, including ancillary equipment such as airflow meters, are properly maintained and calibrated at regular intervals. Moreover, the effluent monitoring program procedures include functional testing and routine checks to demonstrate that monitoring and measuring instruments are in working condition. Employees involved in implementation of this program are trained in the program procedures.

The NEF will ensure, when sampling particulate matter within ducts with moving air streams, that sampling conditions within the sample probe are maintained to simulate as closely as possible the conditions in the duct. This will be accomplished by implementing the following criteria: 1) calibrating air sampling equipment so that the sample is representative of the effluent being sampled in the duct; 2) maintaining the axis of the sampling probe head parallel to the air stream flow lines in the ductwork; 3) sampling (if possible) at least ten duct diameters downstream from a bend or obstruction in the duct; and 4) using shrouded-head air sampling probes when they are available in the size appropriate to the air sampling situation. Particle size distributions will be determined from process knowledge or measured to estimate and compensate for sample line losses and momentary conditions not reflective of airflow conditions in the duct.

The NEF will ensure that sampling equipment (pumps, pressure gages and air flow calibrators) are calibrated by qualified individuals. All air flow and pressure drop calibration devices (e.g., rotometers) will be calibrated periodically using primary or secondary air flow calibrators (wet test meters, dry gas meters or displacement bellows). Secondary air flow calibrators will be calibrated annually by the manufacturer(s). Air sampling train flow rates will be verified and/or calibrated each time a filter is replaced or a sampling train component is replaced or modified. Sampling equipment and lines will be inspected for defects, obstructions and cleanliness. Calibration intervals will be developed based on applicable industry standards.

6.1.1.1 Gaseous Effluent Monitoring

As a matter of compliance with regulatory requirements, all potentially radioactive effluent from the facility is discharged only through monitored pathways. See ER Section 4.12.2.1, Routine Gaseous Effluent, for a discussion of pathway assessment. The effluent sampling program for the NEF is designed to determine the quantities and concentrations of radionuclides discharged to the environment. The uranium isotopes ^{238}U, ^{236}U, ^{235}U and ^{234}U are expected to be the prominent radionuclides in the gaseous effluent. The annual uranium source term for routine gaseous effluent releases from the plant has been conservatively assumed to be 8.9 MBq (240 Ci) per year, which is equal to twice the source term applied to the 1.5 million SWU plant described in NUREG-1484 (NRC, 1994a). This is a very conservative annual release estimate used for bounding analyses. Additional details regarding source term are provided in ER Section 4.12, Public and Occupational Health Impacts. Representative samples are collected from each release point of the facility. Because uranium in gaseous effluent may exist in a variety of compounds (e.g., depleted hexavalent uranium, triuranium octoxide, and uranyl fluoride), effluent data will be maintained, reviewed, and assessed by the facility's Radiation Protection Manager, to assure that gaseous effluent discharges comply with regulatory release criteria for uranium. Table 6.1-1, Effluent Sampling Program, presents an overview of the effluent sampling program.

The gaseous effluent monitoring program for the NEF is designed to determine the quantities and concentrations of gaseous discharges to the environment.

Gaseous effluent from the NEF, which has the potential for airborne radioactivity (albeit in very low concentrations) will be discharged through the Separations Building Gaseous Effluent Vent System (GEVS), the Technical Services Building (TSB) GEVS, the Centrifuge Test and Post Mortem Facilities Exhaust Filtration System, and portions of the TSB Heating Ventilating and Air Conditioning (HVAC) System that provide the confinement ventilation function for areas of the TSB with the potential for contamination (Decontamination Workshop, Cylinder Preparation Room and the Ventilated Room). Monitoring for each of these systems is as follows:

- Separations Building GEVS: This system discharges to a stack on the TSB roof. The Separations Building GEVS provides for continuous monitoring and periodic sampling of the gaseous effluent in the exhaust stack in accordance with the guidance in NRC Regulatory Guide 4.16 ~~(NRC, 1985)~~. The GEVS stack sampling system provides the required samples. LBDCR-07-0022 The exhaust stack is equipped with monitors for alpha radiation and HF.
- TSB GEVS: This system discharges to an exhaust stack on the TSB roof. The TSB GEVS provides for continuous monitoring and periodic sampling of the gaseous effluent in the exhaust stack in accordance with the guidance in NRC Regulatory Guide 4.16 ~~(NRC, 1985)~~. LBDCR-07-0022 The TSB GEVS stack sampling system provides the required samples. The exhaust stack contains monitors for alpha radiation and HF.

- The Centrifuge Test and Post Mortem Facilities Exhaust Filtration System: This system discharges through a stack on the Centrifuge Assembly Building (CAB). The Centrifuge Test and Post Mortem Facilities Exhaust Filtration stack sampling system provides for continuous monitoring and periodic sampling of the gaseous effluent in the exhaust stack in accordance with the guidance in NRC Regulatory Guide 4.16 ~~(NRC, 1985)~~. The exhaust stack is provided with an alpha radiation monitor and an HF monitor. LBDCR-07-0022
- TSB HVAC System (confinement ventilation function portions): This system maintains the room temperature in various areas of the TSB, including some potentially contaminated areas. For the potentially contaminated areas (Ventilated Room, Decontamination Workshop and Cylinder Preparation Room), the confinement ventilation function of the TSB HVAC system maintains a negative pressure in these rooms and discharges the gaseous effluent to an exhaust stack on the TSB roof. The stack sampling system provides for continuous monitoring and periodic sampling of the gaseous effluent from the rooms served by the TSB HVAC confinement ventilation function in accordance with the guidance in NRC Regulatory Guide 4.16 ~~(NRC, 1985)~~. LBDCR-07-0022

The gaseous effluent sampling program supports the determination of quantity and concentration of radionuclides discharged from the facility and supports the collection of other information required in reports to be submitted to the NRC. The MDCs for analyses of gaseous effluent are presented in Table 6.1-2, Required Lower Level of Detection for Effluent Sample Analyses.

6.1.1.2 Liquid Effluent Monitoring

Liquid effluents containing low concentrations of radioactive material, consisting mainly of spent decontamination solutions, floor washings, liquid from the laundry, and evaporator flushes, is expected to be generated by the NEF. Table 6.1-3, Estimated Uranium in Pre-Treated Liquid Waste from Various Sources, provides estimates of the annual volume and radioactive material content in liquid effluent by source prior to processing. Uranium is the only radioactive material expected in these wastes. Potentially contaminated liquid effluent is routed to the Liquid Effluent Collection and Treatment System for treatment. Most of the radioactive material is removed from waste water in the Liquid Effluent Collection and Treatment System through a combination of clean-up processes that includes precipitation, evaporation, and ion exchange. Post-treatment liquid waste water is sampled and undergoes isotopic analysis prior to discharge to assure that the released concentrations are below the concentration limits established in Table 2 of Appendix B to 10 CFR 20 (CFR, 2003q).

After treatment, the effluent is released to the double-lined Treated Effluent Evaporative Basin, which includes leak detection monitoring. Concentrated radioactive solids generated by the liquid treatment processes at the facility are handled and disposed of as low-level radioactive waste.

The design basis uranium source term for routine liquid effluent discharge to the Treated Effluent Evaporative Basin has been conservatively estimated to be 14.4 MBq (390 μCi) per year. There is no offsite release of liquid effluents to unrestricted areas. ER Section 4.12, Public and Occupational Health Impacts, provides additional details regarding effluent source terms.

Representative sampling is required for all batch liquid effluent releases. Liquid samples are collected from each liquid batch and analyzed prior to any transfer. Isotopic analysis is performed prior to discharge. The MDC for analysis of liquid effluent are presented in Table 6.1-2, Required Lower Level of Detection for Effluent Sample Analyses. The liquid effluent sampling program supports the determination of quantities and concentrations of radionuclides discharged to the Treated Effluent Evaporative Basin and supports the collection of other information required in reports submitted to the NRC.

Periodic sampling of liquid effluent is required since these effluents are treated in batches. Representative sampling is assured through the use of tank agitators and recirculation lines. All collection tanks are sampled before the contents are sent through any treatment process. Treated water is collected in Monitor Tanks, which are sampled before discharge to the Treated Effluent Evaporative Basin.

NRC Information Notice 94-07 (NRC, 1994b) describes the method for determining solubility of discharged radioactive materials. Note that liquid effluents at the NEF are treated such that insoluble uranium is removed as part of the treatment process. Releases are in accordance with the ALARA principle.

General site stormwater runoff is routed to the Site Stormwater Detention Basin. The UBC Storage Pad Stormwater Retention Basin collects rainwater from the UBC Storage Pad as well as cooling tower blowdown water and heating boiler blowdown water. Approximately 174,100 m^3 (46 million gal) of stormwater are expected to be collected each year by the two basins. Both of these basins will be included in the site Radiological Environmental Monitoring Program. See ER Section 6.1.2.

6.1.2 Radiological Environmental Monitoring Program

The Radiological Environmental Monitoring Program (REMP) at the NEF is a major part of the effluent compliance program. It provides a supplementary check of containment and effluent controls, establishes a process for collecting data for assessing radiological impacts on the environs and estimating the potential impacts on the public, and supports the demonstration of compliance with applicable radiation protection standards and guidelines.

The primary objective of the REMP is to provide verification that the operations at the facility do not result in detrimental radiological impacts on the environment. Through its implementation, the REMP provides data to confirm the effectiveness of effluent controls and the effluent monitoring program. In order to meet program objectives, representative samples from various environmental media are collected and analyzed for the presence of plant-related radioactivity. The types and frequency of sampling and analyses are summarized in Table 6.1-4, Radiological Environmental Monitoring Program. Environmental media identified for sampling consist of ambient air, groundwater, soil/sediment, and vegetation. All environmental samples will be analyzed onsite. However, samples may also be shipped to a qualified independent laboratory for analyses. The MDCs for gross alpha (assumed to be uranium) in various environmental media are shown in Table 6.1-5, Required MDC for Environmental Sample Analyses. Monitoring and sampling activities, laboratory analyses, and reporting of facility-related radioactivity in the environment will be conducted in accordance with industry-accepted and regulatory-approved methodologies.

The Quality Control (QC) procedures used by the laboratories performing the plant's REMP will be adequate to validate the analytical results and will conform with the guidance in Regulatory Guide 4.15 ~~(NRC, 1979)~~. These QC procedures include the use of established standards such as those provided by the National Institute of Standards and Technology (NIST), as well as standard analytical procedures such as those established by the National Environmental Laboratory Accreditation Conference (NELAC). LBDCR-07-0022

Monitoring procedures will employ well-known acceptable analytical methods and instrumentation. The instrument maintenance and calibration program will be appropriate to the given instrumentation, in accordance with manufacturers' recommendations.

The NEF will ensure that the onsite laboratory and any contractor laboratory used to analyze NEF samples participates in third-party laboratory intercomparison programs appropriate to the media and analytes being measured. Examples of these third-party programs are: 1) Mixed Analyte Performance Evaluation Program (MAPEP) and the DOE Quality Assurance Program (DOEQAP) that are administered by the Department of Energy; and 2) Analytics Inc, Environmental Radiochemistry Cross-Check Program. The NEF will require that all radiological and non-radiological laboratory vendors are certified by the National Environmental Laboratory Accreditation Program (NELAP) or an equivalent state laboratory accreditation agency for the analytes being tested.

Reporting procedures will comply with the requirements of 10 CFR 70.59 (CFR, 2003b) and the guidance specified in Regulatory Guide 4.16 ~~(NRC, 1985)~~. Reports of the concentrations of principal radionuclides released to unrestricted areas in effluents will be provided and will include the Minimum Detectable Concentration (MDC) for the analysis and the error for each data point. LBDCR-07-0022

The REMP includes the collection of data during pre-operational years in order to establish baseline radiological information that will be used in determining and evaluating impacts from operations at the plant on the local environment. The REMP will be initiated at least 2 years prior to plant operations in order to develop a sufficient database. The early initiation of the REMP provides assurance that a sufficient environmental baseline has been established for the plant before the arrival of the first uranium hexafluoride shipment. Radionuclides in environmental media will be identified using technically appropriate, accurate, and sensitive analytical instruments. Data collected during the operational years will be compared to the baseline generated by the pre-operational data. Such comparisons provide a means of assessing the magnitude of potential radiological impacts on members of the public and in demonstrating compliance with applicable radiation protection standards.

During the course of facility operations, revisions to the REMP may be necessary and appropriate to assure reliable sampling and collection of environmental data. The rationale and actions behind such revisions to the program will be documented and reported to the appropriate regulatory agency, as required. REMP sampling focuses on locations within 4.8 km (3 mi) of the facility, but may also include distant locations as control sites. REMP sampling locations have been determined based on NRC guidance found in the document, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors" (NRC, 1991), meteorological information, and current land use. The sampling locations may be subject to change as determined from the results of periodic review of land use.

Atmospheric radioactivity monitoring is based on plant design data, demographic and geologic data, meteorological data, and land use data. Because operational releases are anticipated to be very low and subject to rapid dilution via dispersion, distinguishing plant-related uranium from background uranium already present in the site environment is a major challenge of the REMP. The gaseous effluent is released from roof-top discharge points, or resuspension of particles from the Treated Effluent Evaporative Basin, which will result in ground-level releases. A characteristic of ground-level plumes is that plume concentrations decrease continually as the distance from the release point increases. It logically follows that the impact at locations close to the release point is greater than at more distant locations. The concentrations of radioactive material in gaseous effluent from the NEF are expected to be very low concentrations of uranium because of process and effluent controls. Consequently, air samples collected at locations that are close to the plant would provide the best opportunity to detect and identify plant-related radioactivity in the ambient air. Therefore, air-monitoring activities will concentrate on collection of data from locations that are relatively close to the plant, such as the plant perimeter fence or the plant property line. Air monitoring stations will be situated along the site boundary locations of highest predicted atmospheric deposition, and at special interest locations, such as a nearby residential area and business. In addition, an air monitoring station will be located next to the Treated Effluent Evaporative Basin in order to measure for particulate radioactivity that may be being resuspended into the air from sediment layers when the basin is dry.

A control sample location will be established beyond 8 km (5 mi) in an upwind sector (the sector with least prevalent wind direction). Refer to ER Sections 3.6, Meteorology, Climatology and Air Quality and 4.6, Air Quality Impacts, for information on meteorology and atmospheric dispersion. All environmental air samplers operate on a continuous basis with sample retrieval for a gross alpha and beta analysis occurring on a biweekly basis (or as required by dust loads).

Vegetation and soil samples, both from on and offsite locations will be collected on a quarterly basis in each sector during the pre-operational REMP. This is to assure the development of a sound baseline. During the operational years, vegetation and soil sampling will be performed semiannually in eight sectors, including three with the highest predicted atmospheric deposition. Vegetation samples may include vegetables and grass, depending on availability. Soil samples will be collected in the same vicinity as the vegetation samples.

Groundwater samples from onsite monitoring well(s) will be collected semiannually for radiological analysis. The locations of the groundwater sampling (monitoring) wells are shown on Figure 6.1-2, Modified Site Features with Proposed Sampling Stations and Monitoring Locations. The rationale for the locations is based on the slope of the red bed surface at the base of the shallow sand and gravel layer and the groundwater gradient in the 70 m (230 ft) groundwater zone to the south under the NEF site and proximity to key site structures. Two monitoring wells will be located down-gradient of the site basins, two will be located down-gradient of the UBC Storage Pad and one will be located up-gradient of the UBC Storage Pad and all site facilities.

The background monitoring well, located in the NNW sector of the NEF site, is also shown on Figure 6.1-2. This background monitoring well is located up-gradient of the NEF and cross-gradient from the WCS facility. This location is intended to avoid potential contamination from both facilities, i.e., NEF and/or WCS. Monitoring at this location will occur in both the shallow sand and gravel layer on top of the red bed and in the 70-m (230-ft) groundwater zone. Groundwater in the sand and gravel layer was not encountered at the NEF site during groundwater investigations. Although not an aquifer, it will be monitored since it is the shallowest layer under the NEF site. The 70-m (230 ft) zone contains the first occurrence of groundwater beneath the NEF. Although not strictly meeting the definition of an aquifer, which requires that the unit be able to transit "significant quantities of water under ordinary hydraulic gradients," this layer will also be monitored.

Due to the potential interference with construction of the UBC Storage Page Storm Water Retention Basin and the UBC Storage Pad, the three monitoring wells located down-gradient of these structures will not be installed until after the structures are built. The monitor well located down-gradient of the Site Storm Water Detention Basin, the background monitoring well and at least three additional monitor wells will be installed during the pre-operational monitoring period. CC-EV-2006-0008

Other surrounding industrial activities, the Wallach Quarry and the Sundance Services "produced water" lagoons north of the NEF site have some potential to introduce contaminants that could reach the background monitoring well. The contaminants of concern for those facilities should be readily differentiated from potential contaminants from the NEF.

Sediment samples will be collected semiannually from both of the stormwater runoff retention/detention basins onsite to look for any buildup of uranic material being deposited. With respect to the Treated Effluent Evaporative Basin, measurements of the expected accumulation of uranic material into the sediment layer will be evaluated along with nearby air monitoring data to assess any observed resuspension of particles into the air.

The site septic systems will receive only typical sanitary wastes. No plant process related effluents will be introduced into the septic systems. Each septic tank will, however, be periodically sampled (prior to pumping) and analyzed for isotopic Uranium. The septic tanks are upstream of the leach fields. Any Uranium that is in the system that could reach the leach fields would be detected in the septic tanks. Therefore, no sampling will be performed at the leach fields.

Direct radiation in offsite areas from processes inside the facility building is expected to be minimal because the low-energy radiation associated with the uranium will be shielded by the process piping, equipment, and cylinders to be used at the NEF. However, the Uranium Byproduct Cylinders (UBCs) stored on the UBC Storage Pad may have an impact in some offsite locations due to direct and scatter (skyshine) radiation. The offsite impact from the UBC storage has been evaluated and is discussed in ER Section 4.12, Public and Occupational Health Impacts.

The conservative evaluation showed that an annual dose equivalent of < 0.2 mSv (20 mrem) is expected at the highest impacted area at the plant perimeter fence.

Because the offsite dose equivalent rate from stored UBCs is expected to be very low and difficult to distinguish from the variance in normal background radiation beyond the site boundary, demonstration of compliance will rely on a system that combines direct dose equivalent measurements and computer modeling to extrapolate the measurements. Environmental thermoluminescent dosimeters (TLDs) placed at the plant perimeter fence line or other location(s) close to the UBCs will provide quarterly direct dose equivalent information. The direct dose equivalent at offsite locations will be estimated through extrapolation of the quarterly TLD data using the Monte Carlo N-Particle (MCNP) computer program (ORNL, 2000a) or a similar computer program.

Figure 6.1-2, Modified Site Features With Proposed Sampling Stations and Monitoring Stations, indicates the location of REMP sampling locations.

The REMP may be enhanced during the operation of the facility as necessary to maintain the collection and reliability of environmental data based on changes to regulatory requirements or facility operations. The REMP includes administrative action levels (requiring further analysis) and reporting levels for radioactivity in environmental samples.

The REMP falls under the oversight of the facility's Quality Assurance (QA) program. Therefore, written procedures to ensure representative sampling, proper use of appropriate sampling methods and equipment, proper locations for sampling points, and proper handling, storage, transport, and analyses of effluent samples will be a key part of the program. In addition, written procedures ensure that sampling and measuring equipment, including ancillary equipment such as airflow meters, are properly maintained and calibrated at regular intervals. Moreover, the REMP implementing procedures will include functional testing and routine checks to demonstrate that monitoring and measuring instruments are in working condition.

The design status of leak detection (and mitigation procedures) for ponds and tanks has not yet progressed to final design. The NEF will conform with leak detection recommendations required in NUREG-1520 ~~(NRC, 2002b)~~. LBDCR-07-0022

Each year, the NEF will submit a summary report of the environmental sampling program to the NRC, including all associated data as required by 10 CFR 70 (CFR, 2003b). The report will include the types, numbers, and frequencies of environmental measurements and the identities and activity concentrations of facility-related nuclides found in environmental samples, in addition to the MDC for the analyses and the error associated with each data point. Significant positive trends in activities will also be noted in the report, along with any adjustment to the program, unavailable samples, and deviation to the sampling program.

The maximum annual dose equivalent due to external radiation from the UBC Storage Pad and all other feed, product and byproduct cylinders on the NEF property (skyshine and direct) is estimated to be less than 2.0 x 10^{-1} mSv (20 mrem) to the maximally exposed person at the nearest point on the site boundary (2,000 hrs/yr) and 8 x 10^{-12} mSv/yr (8 x 10^{-10} mrem/yr) to the maximally exposed resident (8,760 hrs/yr) located at 4.3 km (2.63 mi) west of the NEF. Given the conservative assumptions used in estimating these values, these concentrations and resulting dose equivalents are insignificant and their potential impacts on the environment and health are inconsequential.

These dose equivalents due to normal operations are small fractions of the normal background radiation range of 2.0 to 3.0 mSv (200 to 300 mrem) dose equivalent that an average individual receives in the US, and within regulatory limits. .

7.2.2.7 Other Impacts of Plant Operation

NEF water will be obtained from the ~~Hobbs and~~ Eunice, New Mexico municipal water systems, and routine liquid effluent will be treated and discharged to evaporative pond(s), whereas sanitary wastes will be discharged to onsite septic systems. Facility water requirements are relatively low and well within the ~~capacities~~ capacity of the ~~Hobbs and~~ Eunice water ~~utilities~~utility. The current capacity for the Eunice Potable water supply system is 16,350 m^3/day (4.3 million gpd), and current usage is 5,600 m^3/day (1.48 million gal/d). ~~The Hobbs water system capacity is 75,700 m^3/day (20 million gal/d) whereas its usage is 23,450 m^3/day (6.2 million gal/d).~~ Requirements for operation of the NEF are expected to be 240 m^3/day (63,423 gal/d), a volume well within the capacity of the supply systems. Non-hazardous and non-radioactive solid waste is expected to be approximately 172,500 kg (380,400 lbs) annually. It will be shipped offsite to a licensed landfill. The local Lea County landfill capacity is more than adequate to accept the non-hazardous waste.

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7.2.2.8 Decommissioning

The plan for decommissioning is to decontaminate or remove all materials promptly from the site that prevent release of the facility for unrestricted use. This approach avoids the need for long-term storage and monitoring of wastes on site. Only building shells and the site infrastructure will remain. All remaining facilities, including site basins, will be decontaminated where needed to acceptable levels for unrestricted use. Excavations and berms will be leveled to restore the land to a natural contour.

Depleted UF_6 , if not already sold or otherwise disposed of prior to decommissioning, will be disposed of in accordance with regulatory requirements. Radioactive wastes will be disposed of in licensed low-level radioactive waste disposal sites. Hazardous wastes will be treated or disposed of in licensed hazardous waste facilities. Neither conversion (if done), nor disposal of radioactive or hazardous material will occur at the plant site, but at licensed facilities located elsewhere.

Following decommissioning, all parts of the plant and site will be unrestricted to any specific type of use.

8.0 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

8.1 INTRODUCTION

This Environmental Report (ER) was prepared by Louisiana Energy Services (LES) to assess the potential environmental impacts of licensing the construction and operation of a uranium enrichment facility to be located in Lea County, near the city of Eunice, New Mexico (the proposed action). The proposed facility will use the centrifuge enrichment process, which is an energy-efficient, proven advanced technology. The National Enrichment Facility (NEF) will be owned and operated by LES, as described in Safety Analysis Report (SAR) Chapter 1, General Information, which is a Delaware limited partnership company. LES prepared this ER in accordance with 10 CFR 51 (CFR, 2003a), which implements the requirements of the National Environmental Policy Act of 1969 (NEPA), as amended (USC, 2003a). This ER also reflects the applicable elements of the Nuclear Regulatory Commission (NRC) guidance, including format, in NUREG-1748, "Environmental Review Guidelines for Licensing Actions Associated with NMSS Programs," ~~Final Report (NRC, 2003a)~~. This ER analyzes the potential environmental impacts of the proposed action and eventual Decontamination and Decommissioning (D&D) of the facility, and discusses the effluent and environmental monitoring programs proposed to assess the potential environmental impacts of facility construction and operation. The ER also considers a no-action alternative. LBDCR-07-0022

8.2 PROPOSED ACTION

The proposed action is to license the construction and operation of the NEF uranium enrichment facility in Lea County, near the city of Eunice, New Mexico. The NEF will use the gas centrifuge enrichment process to separate natural uranium hexafluoride UF_6 feed material containing 0.711 $^{w}/_{o}$ ^{235}U into a product stream enriched up to 5.0 $^{w}/_{o}$ ^{235}U and a depleted stream containing approximately 0.32 $^{w}/_{o}$ ^{235}U. Production capacity at design throughput is approximately 3.0 million separative work units (SWU) per year. Facility construction is expected to require eight years. Construction would be conducted in six phases. Operation would commence after the completion of the first cascade in the first phase. The facility is licensed for 30 years. Decontamination and Decommissioning (D&D) is projected to take approximately nine years. LES estimates the cost of the plant to be approximately $1.2 billion (in 2002 dollars) excluding escalation, contingency, interest, tails disposition, decommissioning, and any replacement equipment required during the operational life of the facility.

8.4 NO-ACTION ALTERNATIVE

Under the no-action alternative, the NRC would not approve the license application to construct and operate the proposed National Enrichment Facility (NEF). As a result, the additional domestic source and supply of enrichment services that would result from the issuance of the license to LES would not become available to utility customers. These potential LES utility customers would be required to fill their enrichment needs through existing suppliers, with USEC's Paducah plant being the only domestic facility available to serve this purpose. Thus, under the no-action alternative, a decision not to approve the license application would result in only one domestic source of enrichment services, a source that employs a high-cost, inefficient technology – a situation that the DOE has indicated could lead to "serious domestic energy consequences." (DOE, 2002a). ER Section 2.4, Comparison of the Predicted Environmental Impacts, describes the environmental impacts of the no-action alternative scenarios and compares them to the proposed action. Table 2.4-1, Comparison of Potential Impacts for the Proposed Action and the No-Action Alternative Scenarios and Table 2.4-2, Comparison of Environmental Impacts for the Proposed Action and the No-Action Alternative Scenarios, which summarizes that comparison in tabular form for thirteen environmental categories, are described in detail in Chapter 4, Environmental Impacts. In summary, LES anticipates that the effects to the environment of all no-action alternative scenarios to be greater than the proposed action in both the short and long term. There are potentially lesser impacts in some environmental categories, but this is based on an unproven commercially demonstrated technology. In addition, the important objective of security of supply is delayed.

The following types of impacts would be avoided in Lea County, New Mexico and the surrounding area by the no-action alternative (see ER Table 2.4-2). During construction, the potential, short-term impacts are soil erosion and fugitive emissions from dust and construction equipment; minor disruption to ecological habitats and cultural resources, noise from equipment; and traffic from worker transportation and supply deliveries. These impacts, as discussed in Chapter 4, are temporary and limited in scope due to construction best management practices (BMPs). During operation, the no-action alternative would avoid increased traffic due to feed/product deliveries and shipments, and worker transportation; increased demand on utility and waste services; and public and occupational exposure from effluent releases. These impacts, however, will be minimal because the local roadway (New Mexico Highway 234) already has significant traffic of similar nature; there is sufficient capacity of utility and waste services in the region; and effluent releases will be strictly controlled, monitored, and maintained below regulatory limits (CFR, 2003q; CFR, 2003w; CFR, 2003o; NMAC~~, 2002a~~ 20.2.78). LBDCR-07-0022

While the no-action alternative would have no impact on the socioeconomic structure of the Lea County, New Mexico area, the proposed action would have moderate to significant beneficial effects (see Table 7.1-2, Annual Impact of Construction Payroll, Table 7.1-3, Total Impact of Local Spending for Construction Goods and Services, Table 7.1-4, Annual Impact of Operations Payroll, and Table 7.1-5, Annual Impact of NEF Purchases). The results of the economic analysis show that the greatest fiscal impacts (i.e., 63% of total present value impacts) will derive from the eight-year construction period associated with the proposed facility. The largest impact on local business revenues stems from local construction expenditures, while the most significant impact on household earnings and jobs is associated with construction payroll and employment projected during the eight-year construction period. Operation of the facility will also have a net positive impact on the eight-county area and will help diversify the regional economy and provide some additional insulation from the volatility of the oil and gas dependent economy of the region.

8.8 NONRADIOLOGICAL IMPACTS

Numerous design features and administrative procedures are employed to minimize gaseous and liquid effluent releases and keep them within regulatory limits. Potential nonradiological impacts of operation of the NEF include releases of inorganic and organic chemicals to the atmosphere and surface water impoundments during normal operations Other potential impacts involve land use, transportation, soils, water resources, ecological resources, air quality, historic and cultural resources, socioeconomic and public health. Impacts from hazardous, radiological and mixed wastes and radiological effluents have been discussed earlier.

The other potential nonradiological impacts from the construction and operation of NEF are discussed below:

Land-Use Impacts:

The anticipated effects on the soil during construction activities are limited to a potential short-term increase in soil erosion. However, this will be mitigated by proper construction best management practices (BMPs). These practices include minimizing the construction footprint to the extent possible, limiting site slopes, using a sedimentation detention basin, protecting undisturbed areas with silt fencing and straw bales as appropriate, and employing site stabilization practices such as placing crushed stone on top of disturbed soil in areas of concentrated runoff. In addition onsite construction roads will be periodically watered when required, to control fugitive dust emissions. Water conservation will be considered when deciding how often dust suppression sprays will be applied. After construction is complete, the site will be stabilized with natural, low-water maintenance landscaping and pavement.

A Spill Prevention, Control and Countermeasures (SPCC) plan will also be implemented during construction to minimize environmental impacts from potential spills and ensure prompt and appropriate remediation. Spills during construction are likely to occur around vehicle maintenance and fueling locations, storage tanks, and painting operations. The SPCC plan will identify sources, locations and quantities of potential spills and response measures. The plan will also identify individuals and their responsibilities for implementation of the plan and provide for prompt notification of state and local authorities, as required.

Waste management BMPs will be used to minimize solid waste and hazardous materials. These practices 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. Where practicable, materials suitable for recycling will be collected. If external washing of construction vehicles is necessary, no detergents will be used, and the runoff will be diverted to onsite retention basins. Water conservation measures will be considered to minimize water use. Adequately maintained sanitary facilities will be provided for construction crews.

The NEF facility will require the installation of water~~, natural gas~~ and electrical utility lines. In lieu of connecting to the local sewer system, six onsite underground septic tanks each with one or more leach fields will be installed for the treatment of sanitary wastes. LBDCR-07-0011

A new potable water supply line will be extended from the city of Eunice to the NEF site~~and another potable water supply line will be extended from the city of Hobbs~~. The line from Eunice will be about 8 km (5 mi) in length. ~~The line from Hobbs will be about 32 km (20 mi) in length.~~ Placement of the new water supply lines along New Mexico Highways 18 and 234 would minimize impacts to vegetation and wildlife. Since there are no bodies of water between the site and the city of Eunice, no waterways will be disturbed. ~~Likewise, based on site visits, there are no bodies of water between the site vicinity and the city of Hobbs. The natural gas line feeding the site will connect to an existing, nearby line. This will minimize impacts of short-term disturbances related to the placement of the tie-in line.~~ LBDCR-07-0005 LBDCR-07-0005 LBDCR-07-0011

Two new electrical transmission lines on a large loop system are proposed for providing electrical service to the NEF. These lines would tie into a trunk line about 13 km (8 mi) to the west. Similar to the new water supply lines, land use impacts would be minimized by placing associated support structures along New Mexico Highway 234. An application for highway easement modification will be submitted to the state. There are currently several power poles along the highway in front of the adjacent, vacant parcel east of the site. In conjunction with the new electrical lines serving the site, the local company providing electrical service, Xcel Energy, will install two onsite transformers for redundant service assurance.

Six underground septic tanks will be installed onsite. The combined leach fields will require about 975 m (3,200 ft) of percolation drain field. The drain field will either be placed below grade or buried in a mound consisting of sand, aggregate and soil.

Overall land use impacts to the site and vicinity will be minimal considering that the majority of the site will remain undeveloped, the current industrial activity on neighboring properties, the nearby, expansive oil and gas well fields, and the placement of most utility installations along highway easements.

Transportation Impacts:

Impacts from construction and operation on transportation will include the generation of fugitive dust, changes in scenic quality, added environmental noise and small radiation dose to the public from the transport of UF_6 feed and product cylinders, as well as low-level radioactive waste.

Dust will be generated to some degree during the various stages of construction activity. The amount of dust emissions will vary according to the types of activity. LES estimated that fugitive dust are expected to be well below the National Ambient Air Quality Standards (CFR, 2003w).

Although site construction will significantly alter its natural state, and considering that there are no high quality viewing areas and the industrial development of surrounding properties, impacts to the scenic quality of the site are not considered to be significant. Also, construction vehicles will be comparable to trucks servicing neighboring facilities. Construction worker and worker during operation transportation impacts are not considered to be significant.

The temporary increase in noise levels along New Mexico Highways 18 and 234 and Texas Highway 176 due to construction vehicles are not expected to impact nearby receptors significantly, due to substantial truck traffic currently using these roadways, and the large distance between the nearest receptors and the site, i.e., 4.3 km (2.63 mi). See the environmental noise discussion below concerning noise levels due to traffic during operations.

Water Resources:

Site groundwater will not be utilized for any reason, and therefore, should not be impacted by routine NEF operations. The NEF water supply will be obtained from the ~~cities~~ city of Eunice, New Mexico~~, and Hobbs, New Mexico~~. The ~~C~~current ~~capacities~~ capacity for the Eunice ~~and Hobbs~~, New Mexico municipal water supply system ~~are~~ is 16,350 m^3/day (4.32 million gpd) ~~and 75,700 m^3/day (20 million gpd), respectively~~ and current usages ~~are~~ is 5,600 m^3/day (1.48 million gpd) ~~and 23,450 m^3/day (6.2 million gpd), respectively~~. Average and peak potable water requirements for operation of the NEF are expected to be approximately 240 m^3/day (63,423 gpd) and 85 m^3/hr (378 gpm), respectively. These usage rates are well within the ~~capacities~~ capacity of ~~both~~ the water system~~s~~.

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Liquid effluents include stormwater runoff, sanitary waste water, cooling tower blowdown water, heating boiler blowdown water and treated contaminated process water. All liquid effluents, with the exception of sanitary waste water, are discharged to one of three onsite basins.

Stormwater from the site will be diverted and collected in the Site Stormwater Detention Basin. This basin collects runoff from various developed parts of the site. It is unlined and will have an outlet structure to control discharges above the design level. The normal discharge will be through evaporation and infiltration into the ground. The basin is designed to contain runoff for a volume equal to that for the 24-hour, 100-year return frequency storm, a 15.2-cm (6.0-in) rainfall. It will have approximately 123,350 m^3 (100-acre-ft) of storage capacity. In addition, the basin has 0.6 m (2 ft) of free-board beyond the design capacity. It will also be designed to discharge post-construction peak flow runoff rates from the outfall that are equal to or less than the pre-construction runoff rates from the area.

Cooling tower blowdown water, heating boiler blowdown water and stormwater runoff from the UBC Storage Pad are discharged to the UBC Storage Pad Stormwater Retention Basin. The ultimate disposition of this water will be through evaporation along with permanent impoundment of the residual dry solids byproduct of evaporation. It is designed to contain runoff for a volume equal to twice that for the 24-hour, 100-year return frequency storm, a 15.2-cm (6.0-in) rainfall and an allowance for cooling tower blowdown water and heating boiler blowdown water. The UBC Storage Pad Stormwater Retention Basin is designed to contain a volume of approximately 77,700 m^3 (63 acre-ft). This basin is designed with a synthetic membrane lining to minimize any infiltration into the ground.

Discharge of treated contaminated plant process water will be to the onsite Treated Effluent Evaporative Basin. The Treated Effluent Evaporative Basin is utilized for the collection and containment of liquid effluent from the Liquid Effluent Collection and Treatment System. The ultimate disposal the liquid effluent will be through evaporation of water and permanent impoundment of the residual dry solids. Total annual discharge to that basin will be approximately 2,535 m^3/yr (669,844 gal/yr). The basin will be designed for double that volume. Evaporation will provide the only means of liquid disposal from this basin. The basin will include a double-layer membrane liner with a leak detection system to prevent infiltration of basin water into the ground.

Ecological Resources:

No communities or habitats that have been defined as rare or unique or that support threatened and endangered species have been identified as occurring on the 220-ha (543-acre) NEF site. Thus, no proposed activities are expected to impact communities or habitats defined as rare or unique or that support threatened and endangered species within the site area. Field surveys that were performed in September and October 2003, and April 2004, for the lesser prairie chicken, the sand dune lizard, and the black-tailed prairie dog determined that these species were not present at the NEF site. Another survey for the sand dune lizard was conducted in June 2004 and confirmed there were no sand dune lizards at the NEF site.

Several practices and procedures have been designed to minimize adverse impacts to the ecological resources of the NEF site. These practices and procedures include the use of BMPs, i.e., minimizing the construction footprint to the extent possible, channeling site stormwater to temporary detention basins during construction, the protection of all unused naturalized areas, and site stabilization practices to reduce the potential for erosion and sedimentation.

Historic and Cultural Resources:

A pedestrian cultural resource survey of the 220-ha (543-acre) NEF site identified seven prehistoric archaeological sites; three of these sites are located in the Area of Potential Effect (APE). Based on its survey findings and consultations with the New Mexico State Historic Preservation Officer (SHPO), LES is developing a treatment/mitigation plan to recover any significant information from the identified archaeological sites.

Given the small number of potential archaeological sites and isolated occurrences located on the site, and LES's ability to avoid or mitigate impacts to those sites, the NEF project will not have a significant impact on historic and cultural resources. (See ER Section 4.8.6, Minimizing Adverse Impacts.)

Environmental Noise:

Noise generated by the operation of NEF will be primarily limited to truck movements on the road. Potential impacts to local schools, churches, hospitals, and residences are expected to be insignificant because of the large distance to the nearest sensitive receptors. The nearest home is located west of the site at a distance of approximately 4.3 km (2.63 mi) and is not expected to perceive operational noise levels from the plant. The nearest school, hospital, church and other sensitive noise receptors are beyond this distance, thus the noise will be dissipated and attenuated, helping decrease the sound levels even further. Homes located near the construction traffic at the intersection of New Mexico Highway 234 and New Mexico Highway 18 will be affected by the vehicle noise, but due to existing heavy tractor trailer vehicle traffic, the change should be minimal. No schools, hospitals, or any other sensitive receptors are located at this intersection. Expected noise levels will mostly affect a 1.6-km (1-mi) radius and due to the large size of the site, sound levels resulting from the cumulative noise of all site activities will not have a significant impact on even those receptors closest to the site boundary.

Socioeconomics:

LES has estimated the economic impacts to the local economy during the 8-year construction period and 30-year license period of the NEF. This includes a five and one-half year period when both construction and operation are ongoing simultaneously. The analysis traces the economic impact of the proposed NEF, identifying the direct impacts of the plant on revenues of local businesses on incomes accruing to households, on employment, and on the revenues of the state and local government. The analysis also explores the indirect impacts of the NEF within a 80-km (50-mi) radius of the NEF. Details of the analysis are provided in ER Section 7.1, Economic Cost-Benefits, Plant Construction and Operation, and are summarized below.

LES estimates that construction payroll will total $122.2 million with an additional $21 million expended for employment benefits over the eight-year construction period. Construction services purchased from third party firms within the region will add $265 million in direct benefits to the local economy during NEF's construction. See ER Section 7.1, Economic Cost-Benefits, Plant Construction and Operation.

LES anticipates annual payroll to be $10.5 million with an additional $3.2 million expenditure in employee benefits once the plant is operational. Approximately $9.5 million will be spent annually on local goods and services required for operation of the NEF.

The tax revenue to the State of New Mexico and Lea County resulting from the construction and operation of the NEF is estimated to range from $177 million up to $212 million. Refer to Tables 4.10-2, Estimated Tax Revenue, and 4.10-3, Estimated Tax Revenue Allocations, for further details.

The Regional Input-Output Modeling System (RIMS) II allows estimation of various indirect impacts associated with each of the expenditures listed above. According to the RIMS II analysis, the region's residents can anticipate an annual total of $53 million in increased economic activity, $38 million in increased earnings by households, and an annual average of 1,102 new jobs during the eight-year construction period. Over the anticipated thirty-year license period of the NEF, residents can anticipate an annual total of $15 million in increased economic activity, $23 million in increased earnings by households and an annual average of 782 new jobs directly or indirectly relating to the NEF. Table 8.8-1, Estimated Annual Economic Impacts from the National Enrichment Facility, summarizes the impact economic by the facility on Lea County and the surrounding area. A more detailed discussion of the RIMS II methodology and results is found in ER Section 7.1.

The major impact of facility construction on human activities is expected to be a result of the influx of labor into the area on a daily or semi-permanent basis. LES estimates that approximately 15% of the construction work force (120 workers) is expected to move into the vicinity as new residents. Previous experience regarding construction for the nuclear industry projects suggests that of those who move, approximately 65% will bring their families, which on average consist of the worker, a spouse, and one school-aged child. The likely increase in area population during peak construction, therefore, will total 360. This is less than 1% of the total Lea, New Mexico-Andrews, Texas Counties' 2000 population. For additional information, refer to ER Section 4.10.

The increase in jobs and population would lead to a need for additional housing and an increased level of community services, such as schools, fire and police protection, and medical services. However, since the growth in jobs and population would occur over a period of several years, providers of these services should be able to accommodate the growth. For example, the estimated peak increase in school-age children is 120, or less than 1% of the total Lea, New Mexico-Andrews, Texas Counties' 2000 enrollment. Based on the local area teacher-student ratio of approximately 1:17 and assuming an even distribution of students among all grade levels, the increase in students represents seven classrooms. This impact should be manageable, however, considering that Lea County has experienced a far greater temporary population growth due to petroleum industry work in the mid-1980s.

Similarly, an estimated 120 housing units would be needed to accommodate the new NEF construction workforce. The percentage of vacant housing units in the Lea, New Mexico-Andrews, Texas County area in 2000 was about 16% and 15%, respectively, meaning that more than 4,000 housing units were available. Accordingly, there should be no measurable impact related to the need for additional housing.

While some additional investment in facilities and equipment may be necessary, local government revenues would also increase (see ER Section 7.1 and discussion above

concerning LES' anticipated payments to the State of New Mexico and to Lea County, New Mexico under the Lea County Industrial Revenue Bond business incentive program during the construction and operation of the facility). These benefits and payments will provide the source for additional government investment in facilities and equipment. That revenue increase may lag somewhat behind the need for new investment more easily, but the incremental nature of the growth should allow local governments to more easily accommodate the increase. Consequently, insignificant negative impacts on community services would be expected.

Public Health Impacts:

Trace quantities of hydrogen fluoride (HF) are released to the atmosphere during normal separation operations. The annual HF release rate is estimated as less than 1 kg (< 2.2 lb). The HF emissions from the plant will not exceed the strictest of regulatory limits at the point of release. Standard dispersion modeling techniques estimated the HF concentration at the nearest fence boundary to be 3.2×10^{-4} $\mu g/m^3$ and the concentration at the nearest residence located west of the site at a distance of 4.3 km (2.63 mi) as 6.4×10^{-6} $\mu g/m^3$. Both of these concentrations are several orders of magnitude below the strictest HF exposure standards in use today (see ER Section 4.12.1.1, Routine Gaseous Effluent).

Radiological public health impacts were summarized previously in ER Section 8.7, Radiological Impacts.

Methylene chloride is used in small bench-top quantities to clean certain components. All chemicals at NEF will be used in accordance with the manufacturer's recommendations. All chemicals are used in quantities that are considered deminimus with respect to air emissions outside the NEF. Its use and the resulting emissions have been evaluated and determined to pose minimal or no public risk. All regulated gaseous effluents will be below regulatory limits as specified in permits issued by the New Mexico Air Quality Bureau (NMAC, 2002a 20.2.78). LES has concluded that the public health impacts from radiological and nonradiological constituents used within NEF are minimal and well below regulatory limits at the point of discharge. All hazardous materials and waste streams will be managed and disposed of in accordance with the permit requirements issued by the EPA Region 6 and the New Mexico Environment Department. LBDCR-07-0022

8.11 ENVIRONMENTAL JUSTICE

An analysis of census block groups (CGBs) within a 6.4-km (4-mi) radius of the site was conducted in accordance with NRC guidance in NUREG-1748 ~~(NRC, 2003a)~~ to assess whether any disproportionately large minority or low-income populations were present that warranted further analysis of the potential for disproportionately high and adverse environmental impacts upon those populations. LBDCR-07-0022

The LES environmental justice analysis demonstrates that no individual CBG and the 130-km^2 (50-mi^2) area around the NEF are comprised of more than 50% of any minority population. With respect to the Hispanic or Latino population, the largest minority population in both census tracts, the percentages are as follows: Census Tract 8, CGB 2 – 24.8%; Census Tract 9501, CBG 4 – 19.8%. The largest minority group in the 130-km^2 (50-mi^2) area around the NEF is Hispanic or Latino, accounting for 11.7%. Moreover, none of these percentages exceeds the applicable State or County percentages for this minority population by more than 20 percentage points.

In addition, the LES analysis demonstrates that no individual CBG is comprised of more than 50% of low-income households. The percentages are as follows: Tract 8, CBG 2 –3.6%; Tract 9501, CBG 4- 9.9%. Neither of these percentages exceeds 50 percent; moreover, neither of these populations significantly exceeds the percentage of low-income households in the applicable State or County.

Based on this analysis, LES has concluded that no disproportionately high minority or low-income populations exist that would warrant further examination of disproportionately high and adverse environmental impacts upon such populations.

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