APPENDIX J

FUNDING OPPORTUNITY ANNOUNCEMENT SITE SUMMARIES

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J.1 INTRODUCTION

Following the comment period on the Advance Notice of Intent (ANOI) (71 FR 14505), the U.S. Department of Energy (DOE) sought additional input from industry, both international and domestic, and potential hosting sites to obtain more information from which to determine the feasibility of the Global Nuclear Energy Partnership (GNEP) Program. On August 3, 2006, DOE announced a Funding Opportunity Announcement (FOA) of $20 million available for public or commercial entities to conduct detailed siting studies of potential sites for GNEP facilities (DOE 2006n). Applications for these financial assistance grants were received by DOE by September 7, 2006. DOE reviewed these applications and on January 30, 2007, issued financial assistance grants to 11 public and commercial entities to conduct detailed siting studies for hosting a nuclear fuel recycling center and/or an advanced recycling reactor (DOE 2007a). The consortia locations are: Atomic City (ID), Barnwell (SC), Morris (IL), Hanford (WA), Idaho National Laboratory (ID), Hobbs (NM), Oak Ridge Reservation (TN), Paducah (KY), Portsmouth (OH), Roswell (NM), and Savannah River Site (SC). Recipients completed these siting studies and submitted Site Characterization Reports (SCR 2007 a,b,c,d,e,f,g,h,i) to DOE by May 1, 2007 (DOE 2007b). The results of these site studies were reviewed by DOE and are included in the administrative record for this programmatic environmental impact statement (PEIS) to respond to public comment requesting information on the FOA responses. A summary of the information from those site studies is included here.

During public scoping, several additional sites were suggested by the public as suitable for locating a nuclear fuel recycling center and/or an advanced recycling reactor. No determination has been made regarding the sites suggested through the FOA and public scoping processes as potential locations for a nuclear fuel recycling center and/or an advanced recycling reactor. Because site selection will not be completed at this time, no sites have been eliminated from consideration for these two facilities.

J.2 ATOMIC CITY SITE

This section presents a summary of the affected environment for Atomic City Site. The information was summarized from the Site Characterization Report prepared by the Funding Opportunity Announcement (FOA) grant recipient (SCR 2007a).

J.2.1 Land Use

The Atomic City Site covers approximately 3,310 acres (1,340 ha) and is located in the arid, high desert rangeland of east-central Idaho in Bingham County. The entire Atomic City Site is currently zoned A-Agricultural, but could potentially be rezoned for heavy manufacturing according to the Bingham County Planning and Zoning Board. The Atomic City Site is bounded by undeveloped ranch land to the east, west, north and south, some of which is Bureau of Land Management (BLM) land. The U.S. Department of Energy (DOE)-managed Idaho National Laboratory (INL) is located north of the Atomic City Site.

J.2.2 Visual Resources

Currently there are no existing structures or facilities within the boundaries of the Atomic City Site. INL borders the site to north. Volcanic buttes near the northern boundary of the site can be seen from most locations on the site. The area surrounding the site consists of open desert land predominantly covered by big sagebrush and grasslands. Pasture and farmland border much of the site.

J.2.3 Site Infrastructure

Currently, there are no structures or facilities within the Atomic City Site and therefore no existing infrastructure within site boundaries.

U.S. Highway 26 is the closest highway and joins U.S. 20 seven miles (mi) (11.3 kilometers [km]) northwest from the Atomic City exit. The Union Pacific Railroad provides rail service near the site and crosses the southern boundary of the site.

J.2.4 Air Quality and Noise

The climate at the Atomic City Site and the surrounding region is characterized as that of a steppe (a vast semiarid grass-covered plain). The average annual precipitation is 8.7 in (22.1 cm), and prevailing winds are generally southwest or northeast. The average annual temperature at the Atomic City Site is about 42°F (20°C), and average monthly temperatures range from around negative 16°F (-8°C) in January to 68°F (20°C) in July. The annual average wind speed is 7.5 mph (12.1 km/hr).

Ambient air pollutant concentrations in the Atomic City Site region are monitored by DOE, the Idaho DEQ, and the National Park Service. None of the ambient air pollutant concentrations measured by the monitors cited in this section exceeded the state or national standards.

There are no current or existing facilities at the Atomic City Site to contribute to nonradiological or radiological pollutant emissions. There are no existing facilities or activities at the Atomic City Site, which result in elevated noise levels.

J.2.5 Water Resources

The nearest water course to the Atomic City Site is the Big Lost River. The Atomic City Site is located 9.5 mi (15.3 km) from the Big Lost River as it flows east of Arco and onto the INL. The USGS gaging station located near Arco has registered no flow in 12 of the past 22 years. The Atomic City Site is not connected to the Big Lost River by any developed drainage system. Based on this information, the Big Lost River would not be a reliable source of water for the Atomic City Site.

No drainage system connects the site to the Snake River, located 25 mi (40 km) to the southeast. A source of water supply for the Atomic City Site from the Snake River would require construction of a pipeline at least 25 mi (40 km) in length.

Existing contamination at the Atomic City Site, if present, would have no potential to impact the current quality of surface water in the area. The Atomic City Site is above the flood plain, with no water bodies within the 6 mi (10 km) radius.

Water is available from wells in the Snake River Plain Aquifer beneath the site. This aquifer has been designated a Sole Source Aquifer by EPA. Water storage in the aquifer is estimated at some 2 billion acre ft (2 trillion m^3), and irrigation wells can yield 7,000 gal/min (26,498 (L/min). The aquifer is composed of numerous relatively thin basalt flows with interbedded sediments extending to depths in excess of 3,500 ft (1,067 m) below land surface.

The two most likely sources of potential groundwater contamination at the Atomic City Site are agricultural contamination and groundwater contamination associated with facilities at the INL. No industrial facilities, fuel filling stations, or other commercial enterprises that are common sources of groundwater contamination exist within 5 mi (8 km) upgradient of the Atomic City Site.

As part of a 1984 settlement of a dispute between Idaho Power Company and the State of Idaho over Idaho Power Company's water rights for hydroelectric power, the entire Snake River Basin, which includes the Snake River and its tributaries, is undergoing water rights adjudication for both ground and surface water. The adjudication commenced in 1987 and is ongoing. The water right allows a diversion rate of 1.89 cubic feet per second (cfs) or volume of 483 acre ft/yr (595,775 m^3/yr). This is the only water right that has been identified for the Atomic City Site. There are no known future rights, including Native American tribal rights that would be claimed or would impact the existing water right for the property.

J.2.6 Geology and Soils

The Atomic City Site occupies a relatively flat area on the northwestern edge of the Eastern Snake River Plain, part of the Eastern Snake River Plain Physiographic Province. The area consists of a broad plain that has been built up from the eruptions of multiple flows of basaltic lava over the past 4 million years.

The upper 0.6 to 1.2 mi (1.0 to 1.9 km) of the crust beneath INL is composed of a sequence of Quaternary age (recent to 2 million years old) basalt lava flows and poorly consolidated sedimentary interbeds collectively called the Snake River Group. The lava flows at the surface range from 2,100 to 2 million years old. The sediments are composed of fine-grained silts that were deposited by wind; silts, sands, and gravels deposited by streams; and clays, silts, and sands deposited in lakes such as Mud Lake and its much larger ice-age predecessor, Lake Terreton. The accumulation of these materials in the Eastern Snake River Plain has resulted in the observed sequence of interlayered basalt lava flows and sedimentary interbeds (DOE 2005a).

The Arco Segment of the Lost River Fault is thought to terminate about 4.3 mi (6.9 km) from the Atomic City Site boundary. The Howe Segment of the Lemhi Fault terminates near the northwest boundary of INL (DOE 2005a). Both segments are considered capable or potentially active. A capable fault is one that has had movement at or near the ground surface at least once within the past 35,000 years, or recurrent movement within the past 500,000 years (10 CFR Part 100).

Based on the maximum considered earthquake ground motions, Atomic City is located in a broadly defined region of low and moderate to high seismicity. Ground motions in these regions are controlled by earthquake sources that are not well defined, with estimated maximum earthquake magnitudes having relatively long return periods.

Basaltic volcanic activity occurred from about 2,100 to 4 million years ago in the Atomic City Site area. Although no eruptions have occurred on the Eastern Snake River Plain during recorded history, lava flows of the Hell's Half Acre lava field erupted near the northern Atomic City boundary as recently as 5,400 years ago. The most recent eruptions within the area occurred about 2,100 years ago, 19 mi (31 km) southwest of the site at the Craters of the Moon Wilderness Area. The estimated recurrence interval for volcanism associated with the five identified volcanic zones ranges from 16,000 to 100,000 years (DOE 2005a).

J.2.7 Biological Resources

The project area occurs on nearly level flats or benchlands to rolling or broken foothills between outcrops of lava or as lava flows that are highly fractured and have vegetation growing where soil material has accumulated. Small lava outcrops may be scattered throughout the area and range from nearly level to about 30 percent slopes.

There are no riparian, wetlands, or aquatic habitats present within or directly adjacent to the Atomic City Site. Therefore, species associated with these habitat types are not anticipated to be found within the project area. None of the species identified for this area are critical to the structure and function of the ecosystem or provide a broader ecological perspective of the area primarily due to the small amount of native vegetation that remains on the site.

No aquatic, riparian, wetland areas or source water bodies capable of supporting fish or shellfish communities are present within the boundaries of the Atomic City Site, due to the dry climate and lack of perennial surface water.

The following are the special concern species:

- Sage grouse. The sagebrush habitat on the project area is limited to the southwest corner and the northern and western edges. Sage grouse were seen during the field survey, but the sagebrush is very fragmented and limited.
- Ferruginous hawk, Prairie falcon, and Townsend's big-eared bat. These species may use the area for foraging, but nesting and roosting habitat is not available on site. Ferruginous hawks were seen during the field survey hunting in the vicinity of the Atomic City Site.

J.2.8 Cultural and Paleontological Resources

A branch of the Oregon Trail, Goodale's Cutoff, is located within the current Atomic City Site. The route diverts from the main trail at Fort Hall and continues west past Big Southern Butte to Camas Prairie where it reconnects with the main Oregon Trail at Ditto Creek. The first Oregon-bound emigrants followed Goodale's Cutoff in 1852. The INL is located within the aboriginal territory of the Shoshone and Bannock people.

J.2.9 Socioeconomics

According to the U.S. Census Bureau, an estimated 26 people lived in Atomic City in 2005, and 27 are estimated to reside in the town in 2007 (SCR 2007a).

This area is sparsely populated and primarily relies on agriculture, food processing, and services to support its economy. The population density within a 50 mi (80 km) radius of the Atomic City Site is approximately 30 persons per square mile, with a population density of less than one person per square mile within 20 mi (32 km) of the Atomic City Site. The most populated areas are along the Interstate 15 corridor (SCR 2007a).

The county's growth rate is primarily the result of natural change, or the net change in population as the result of births and deaths in the region. Between 2000 and 2005, Bingham County population grew by 4.8 percent (2,004 persons) due to natural change, compared to a growth rate of 10.4 percent for the State of Idaho as a whole (SCR 2007a).

J.2.10 Environmental Justice

U.S. Census Bureau data were analyzed on the block group level to identify minority and low-income communities within the 50 mi (80 km) region of influence. In 2000, there were a total of 192 census block groups fully or partially within 50 miles of the Atomic City site. Block groups with a population of minority or low income residents that are 10 percent or more above the state average are considered minority or low income communities (SCR 2007a). In 2000, the average minority population in Idaho was 12 percent; therefore, block groups with a minority population of 22 percent or greater were considered minority areas. A total of 25 block groups within the 50-mile radius of the site are classified as minority communities based on 2000 census data.

Approximately 40,322 (or almost 19 percent) of residents within the 50 mi (80 km) radius classified themselves as belonging to a minority group or being one or more other race in the 2000 Census (SCR 2007a). The low-income population in Idaho based on the 2000 census was 11.8 percent; therefore, block groups with a low-income population of 21.8 percent or greater were considered low-income areas. The 2000 Census identified 28 low-income block groups within the 50 mi (80 km) radius (SCR 2007a).

J.2.11 Public and Worker Health and Safety

There are currently no existing facilities or structures on the Atomic City Site to contribute radiological or hazardous chemical contaminants to the environment. However, because the Atomic City Site is contiguous with the INL, major sources and levels of background radiation exposure to individuals in the vicinity of Atomic City would be similar to INL. These doses fall within the radiological limits given in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, and are much lower than those from background radiation (DOE O 5400.5).

Health impacts to the public may occur during normal operations at Atomic City via inhalation of air containing hazardous chemicals released to the atmosphere by operations in the area, predominantly from INL. Risks to public health from ingestion of contaminated drinking water or direct exposure are also potential pathways.

J.2.12 Transportation

Two interstate highways serve the Atomic City regional area. Interstate 15 is a north-south route that connects several cities along the Snake River. Interstate 86 intersects Interstate 15 south of the Atomic City Site and provides a primary linkage from Interstate 15 to points west. U.S. Highways 20 and 26 are the main access routes to the southern portion of the site. Rail transportation to the Atomic City Site is provided by the Union Pacific Railroad line at the southwest corner of the property. Since there are no existing facilities, a transportation network within the site would need to be developed.

J.2.13 Waste Management

INL is one potential provider of waste management services for the Atomic City Site. INL is located to the north of the Atomic City Site and generates various waste streams during ongoing activities including routine operations and cleanup action, and stores wastes generated by past activities. INL manages the following types of waste: high-level, low-level radioactive, mixed low-level radioactive, transuranic, hazardous, sanitary solid, wastewater, and sanitary sewage. The waste is managed using appropriate treatment, storage, and disposal technologies, and in compliance with all applicable Federal and state statutes and DOE orders.

EPA placed INL on the National Priorities List on December 21, 1989. In accordance with *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), DOE entered into a consent order with EPA and the state of Idaho to coordinate cleanup activities at INL under one comprehensive strategy (42 U.S.C 9610). This agreement integrates DOE's

CERCLA response obligations with *Resource Conservation and Recovery Act* (RCRA) corrective action obligations (40 CFR Parts 239-299).

There are currently no existing facilities or structures on the Atomic City Site; therefore, no waste is produced and no waste management services are provided.

J.3 BARNWELL SITE

This section presents a summary of the affected environment for the Barnwell Site. The information was summarized from the Site Characterization Report prepared by the Funding Opportunity Announcement (FOA) grant recipient (SCR 2007b).

J.3.1 Land Use

The Barnwell Site is located within Barnwell County, in the southwestern portion of South Carolina, close to the state border with Georgia. The proposed Barnwell Site is 970 acres (393 ha) of land within a 1,631 acre (660 ha) industrial park consisting of developed and undeveloped land.

The Barnwell Site is situated between two industrial parks and is partially located on one of these industrial parks, the South Carolina Advanced Technology Park (ATP). This site is located to the east of the Par Pond of the United States (U.S.) Department of Energy (DOE) Savannah River Site (SRS).

J.3.2 Visual Resources

The terrain surrounding the Barnwell Site is gently rolling, sloping upwards towards the northwest. There is a forest buffer along the north, west, and south of the site providing limited views from these directions. Par Pond located approximately 2 mi (3.2 km) to the west of the site, further obscures views of the Barnwell Site and its facilities.

J.3.3 Site Infrastructure

The Barnwell Site is surrounded by a system of well established transportation infrastructure. Major highways service the main entrance to ATP with several roads providing access to the proposed site.

Rail transportation is provided to the ATP by CSX Corporation.

South Carolina Electric and Gas (SCE&G) provides electrical and gas service to the ATP with an electrical substation located approximately 6 mi (10 km) from the ATP in the City of Barnwell.

SCE&G operates a 6 to 9 in (15 to 24 cm) natural gas pipeline at 45 psi of pressure along SC Highway 64.

J.3.4 Air Quality and Noise

The climate in the area is temperate. The proximity of the Appalachian Mountain chain to the northwest, and the Atlantic Ocean to the southeast, both provide a moderating influence on the climate. The site has a long-term annual average precipitation of 48.96 in (124.36 cm). Thunderstorms, tornadoes, and hurricanes provide occasional severe weather to South Carolina. The only hurricane-force winds measured at the SRS, bordering the Barnwell Site, were associated with Hurricane Gracie on September 29, 1959, when wind speeds of 75 mi/hr (120 km/hr) were measured.

The area in vicinity of Barnwell is considered within attainment. The Barnwell Site does not have any significant sources of regulated air pollutants, although the SRS site does. The SRS significant sources of regulated air pollutants include coal-fired boilers for steam production, diesel generators, chemical storage tanks, the Defense Waste Processing Facility (DWPF), groundwater air strippers, and various other process facilities.

The U.S. Environmental Protection Agency (EPA) annual effective dose equivalent limit of 10 millirem per year (mrem/yr) to members of the public for the atmospheric pathway is incorporated in DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (DOE O 5400.5). Process area stacks that release, or have the potential to release, radioactive materials are monitored continuously by applicable online monitoring and/or sampling systems. Tritium in elemental and oxide forms accounted for more than 99 percent of the total radioactivity released to the atmosphere from SRS operations. During 2005, about 40,800 curies (Ci) of tritium were released from SRS, compared to about 61,300 Ci in 2004. Most of the SRS radiological facilities release small quantities of radionuclides at concentrations below the DOE limits derived concentration guides (DCGs). The offsite dose from all atmospheric releases remained well below the DOE and EPA annual atmospheric pathway dose standard of 10 mrem.

Major noise sources at the Barnwell Site are primarily located in developed or active areas and include various industrial facilities, equipment, machines, and vehicles operating at the nearby industrial park or at the SRS. Most industrial facilities at SRS are at a sufficient distance from the Barnwell Site boundary that noise levels at the boundary from these sources would not be distinguishable from ambient background noise levels. Traffic from the Barnwell Site (SRS operations) is the primary contributor to noise levels emanating from the Barnwell Site.

J.3.5 Water Resources

The Barnwell Site is located almost entirely within the Lower Three Runs Creek watershed, with surface drainage primarily southward to Lower Three Runs Creek. The Site has very low relief, with drainage from the northwestern portion going directly to Par Pond. Some drainage from the extreme northeast corner of the Barnwell Site may flow eastward to a tributary of the Salkehatchie River. Surface waters on the Site include several minor natural and manmade drainage swales and one named pond, Beacon Pond. Highland Pond is another named feature on the Site near Beacon Pond and is associated with an isolated wetland complex. Due to its having received water from R-Reactor incidents, Par Pond's sediments are contaminated by the radionuclides cesium-137 (the largest component of the radioisotope inventory), cobalt-60, plutonium-238, and plutonium-239.

Floodplains within the 6 mi (9.7 km) radius of the Barnwell Site are primarily associated with Par Pond and Lower Three Runs Creek, located west of the Barnwell Site within SRS property. The Barnwell Site is not located within a floodplain.

Abundant groundwater resources exist at the Barnwell Site in over 1,000 ft (304.8 m) of four distinct aquifers. The confined aquifers are capable of sustained yields of over 2,000 gal/min (757.08 L/min) to production wells and provide more than adequate capacity for the end use of the nuclear fuel recycling center and the advanced recycling reactor. Water withdrawals in the Barnwell area are significantly below the capacity of the extensive aquifer system that underlies the area.

J.3.6 Geology and Soils

In general, the geology of the Barnwell Site and immediate vicinity is comprised of Coastal Plain clastics, clays, calcareous sediments, and conglomerates, that are approximately 1200 ft (400 m) thick beneath the ATP and overlie Paleozoic igneous and metamorphic rocks of the Appalachian orogen and Triassic sediments of the Dunbarton basin. The Site area is also characterized by geomorphic features known as Carolina Bays; shallow elliptical depressions with associated sand rims found on the surface of the coastal plain sediments. Within the SRS area the carbonate rich Tinker/Santee/Utley facies contain zones that offer lower resistance to drilling or Cone Penetration Tests (CPTs). These zones, depending on location, occur between approximately 100 to 180 ft (30 to 55 m) below ground surface.

Earthquakes located within 25 mi (40 km) of the Barnwell Site include approximately 24 from 1897 to 2002 with only 3 above MAG 3.0. Results of seismic studies show a peak horizontal ground acceleration of 0.28g (at 100 Hz) and peak spectral acceleration of about 0.8g (at 10 Hz). Faulting is present within the region of the Site. In addition, available literature, both deterministic and probabilistic studies, indicate that none of the faults in the vicinity of the Site are “capable” as defined by 10 CFR Part 100, or have been active within the past 35,000 years.

J.3.7 Biological Resources

The 970 acre (393 ha) Barnwell Site is dominated by five of the eight habitat types known to occur in the coastal plain ecoregion with the most prominent ones being pine woodlands and upland forest. The Barnwell Site also contains grassland and early successional habitats, stream bottomland (bottomland hardwood), ponds and depressions, and developed land. These habitats cover approximately 840 acres (340 ha) (87 percent) of the Barnwell Site. The U.S. Fish and Wildlife Service (USFWS) confirmed that there are no federally designated or proposed critical habitats, as defined in 50 CFR 17.95 (fish and wildlife) and 50 CFR 17.96 (plants) (50 CFR Part 17), in Barnwell County.

The Barnwell Site contains approximately 15 wetland areas, including Beacon Pond and Highland Pond. The United States Army Corps of Engineers (USACE) determined previously that the one bottomland hardwood wetland, which drains to Lower Three Runs Creek, is jurisdictional pursuant to the *Clean Water Act* (33 U.S.C. 1251 et seq.). The other wetlands on the Barnwell Site are isolated and not regulated by the USACE.

The American alligator is the only federally- or state-listed Threatened and Endangered (T & E) species known to occur at the Barnwell Site. A field reconnaissance conducted at the Barnwell Site in February 2007 confirmed that the Barnwell Site does not contain suitable habitat, other than occasional foraging or stopover habitat, for any federally- or state-listed T & E species other than the American Alligator, the Smooth Coneflower, and Harperella.

J.3.8 Cultural and Paleontological Resources

Previous investigations assessed the potential of the Barnwell Site to contain cultural resources and intensively surveyed approximately 300 acres (121 ha) for cultural resources. Four archaeological sites were identified within the Barnwell Site, of which none have been determined eligible for the National Register of Historic Places (NRHP). No aboveground historic sites have been identified within or near the Barnwell Site. There are no known historic properties within or near the Barnwell Site that may be affected by any future development or use.

J.3.9 Socioeconomics

The Barnwell Site is located in Barnwell County, in the southwestern portion of South Carolina. The area within a 5 mi (8 km) radius of the proposed Barnwell Site is a rural, agrarian setting. Within the 5 mi (8 km) radius, 100 percent of the population of 1,827 persons is classified as rural. This area had a year 2000 population density of 7.9 persons per square mile. The largest city in the county is Barnwell with a population of 23,478 persons.

Barnwell County's chronic high unemployment is linked to the decline in manufacturing, lack of growth in service jobs, low educational attainment of county residents, and lack of employment opportunities. Agriculture is a significant, but declining presence in the community. The average farm is 230 acres (93 ha) and generates about $19,102 in products. In excess of 92 percent of the farms are operated by a family or individuals. Irrigated croplands, vegetables and orchards, the products most likely to need seasonal help in harvesting, account for about 1,200 acres (485.6 ha) under cultivation.

J.3.10 Environmental Justice

The last U.S. census reported that the Barnwell County per capita income was $15,870. Approximately 20.9 percent of the Barnwell County's residents, 18.2 percent of families, were determined to be living in poverty. Approximately 27 percent of families with children were living in poverty. The per capita income in South Carolina was $18,795 in 2000 and 14.1 percent of South Carolina residents were living in poverty. In 2004, approximately 3,238 households out of a total of 9,021 in Barnwell County were receiving food stamps.

One-hundred-ninety-four block groups have a significant Black or African American minority population and 207 block groups have significant aggregate minority percentages. One census block group within the 50 mi (80 km) radius has a significant Hispanic ethnicity population.

Based on the "more than 20 percent" or the "exceeded 50 percent" criteria, no American Indian or Alaskan Native, Asian, Native Hawaiian or Other Pacific Islander, Some other race, or Multi-racial minority block groups exist in the geographic area

J.3.11 Public and Worker Health and Safety

An individual's radiation exposure in the vicinity of the Barnwell Site amounts to approximately 357 mrem, and is comprised of natural background radiation from cosmic, terrestrial, and internal body sources; radiation from medical diagnostic and therapeutic practices; weapons test fallout; consumer and industrial products, and nuclear facilities. Annual background radiation doses to individuals are expected to remain constant over time. Releases of radionuclides to the environment from SRS operations provide another source of radiation exposure to individuals in the vicinity of the Barnwell Site. These doses fall well below the 100 mrem/yr (10 mrem from air) radiological limits given in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, and are much lower than those from background radiation (DOE Order 5400.5), (WSRC 2005). The average radiation dose recorded for workers at SRS in 2005 is 51 mrem (WSRC 2005).

The South Carolina Department of Health and Environmental Control (SCDHEC) regulate both radioactive and non-radioactive criteria and toxic air pollutant emissions from the Barnwell Site sources. Major non-radiological emissions of concern from stacks at SRS facilities include sulfur dioxide, carbon monoxide, oxides of nitrogen, PM_{10}, volatile organic compounds (VOCs), and toxic air pollutants. All SRS permitted sources were found to be in compliance with their respective permit conditions and limits.

J.3.12 Transportation

The Barnwell Site is surrounded by a system of interstate highways, U.S. highways, state highways, and railroads. I-20 serves the northern region, providing the primary east-west corridor. I-520 provides a loop around Augusta, Georgia. Truck shipments to (or from) the Barnwell Site in the west normally enter the region from the west on I-20. In Augusta, Georgia, the trucks typically take I-520 to the Georgia/South Carolina border where U.S. 278 takes them into Barnwell. From the south, Barnwell is accessed by way of U.S. Route 301. From the north, Barnwell is accessed by way of either U.S. Route 301 or U.S. Route 321. From the east, Barnwell is accessed by way of U.S. Route 78.

The Barnwell Site does not have direct rail access. The closest line passes 30 mi (48 km) to the south through the town of Allendale and 15 mi (24 km) to the east going through the town of Denmark.

J.3.13 Waste Management

The Barnwell Site has existing waste storage facilities, previously existing waste facilities that have been dismantled, and land area that is available for development of additional waste storage capacity. For dry fuel storage, a large, concrete paved area is located within the fuel storage building. The currently developed area could provide storage for an estimated 5,000 metric ton unit (MTU) dry fuel. The AGNS facility had established infrastructure for liquid waste. The facility had three 500,000 gal (1,892,700 L) double-walled stainless steel tanks for storage of high level waste. The final component is storage appropriate for low-level waste. Low-level waste storage requirements for operating nuclear facilities is typically in the range of several thousand cubic feet per year and the Barnwell Site has ample space for construction of a facility of this size.

J.4 MORRIS SITE

This section presents a summary of the affected environment for the Morris Site, which is owned by General Electric. The information was summarized from the Site Characterization Report prepared by the Funding Opportunity Announcement (FOA) grant recipient (SCR 2007c).

J.4.1 Land Use

The Morris Site encompasses 889 acres (360 ha) of land located in northeast Illinois, approximately 50 mi (80 km) southwest of Chicago, in Goose Lake Township, Grundy County. The Dresden Power Station is adjacent to the Morris Site.

The Morris operations are comprised of facilities to support the storage of spent nuclear fuel. The site uses approximately 15 acres (6 ha) of the 889 acres (360 ha) proposed by Morris. Historically, much of the area surrounding the Morris Site was mined for coal, clay, and building stone. The area surrounding the Morris Site is crossed by three major rivers: the Des Plaines, Kankakee, and Illinois Rivers. The site is located 1 mi (2 km) to the southwest of the convergence of these three rivers. Immediately to the northeast of the Morris Site is the Dresden Power Station. This station has been in operation since the 1970s, and has a peak generating capacity of 1,824 megawatts. To the northwest is the Reichhold Chemical Facility, which is a polyester resin manufacturing facility.

J.4.2 Visual Resources

The area surrounding the site is generally flat with sparse vegetation and tree cover. The Illinois River is to the north and north-west. The Des Plaines River, to the north-east, and the Kankakee River, to the east merge to form the Illinois River to the north and north-west of the site. The Morris facility and the Dresden Power Plant are highly visible from the site.

J.4.3 Site Infrastructure

The Morris Site has ready access to electrical power from the adjoining Dresden Power Station. The Morris Site is currently supplied with water from a ground water production well. There is no discharge of wastewater from the site, and sanitary sewage is treated in two onsite lagoons. Extensive rail lines exist throughout the area, with the closest spur approximately one mile to the west of the site.

J.4.4 Air Quality and Noise

Illinois is located in the Midwestern United States and experiences a wide range of weather patterns in both temperature and precipitation. In general, summers in northern Illinois are hot and humid and winters are cold and snowy. Southeasterly and easterly winds from the Atlantic Ocean and Gulf of Mexico usually bring mild and wet weather. Winds from the northwest and north out of Canada are usually cooler and drier. Winds in northern Illinois blow predominantly out of the northwest during the colder months followed by south wind directions during the warmer months. The annual average windspeed for Moline, Illinois is 8 mi/hr (13 km/hr) and for the same period and location, the maximum recorded peak wind gust was 81 mi/hr (130 km/hr).

The Great Lakes affect local climates by enhancing precipitation, particularly with the formation of lake-effect snows. The Morris Site has averaged 28 to 32 in (71 to 81 cm) from 1971 through 2000. The average rainfall in the vicinity of the Morris Site from 1971 through 2000 (most recent comprehensive data set available) was 33 to 34 in/yr (84 to 86 cm/yr). Annual high and low temperatures are on average 60°F (15.6°C) and 39°F (3.9°C). Seasonal variations in temperature at the Morris Site are typical for a location in the Midwest.

High velocity wind speeds in the vicinity of the Morris Site can result from either straight-line winds or tornadoes. Grundy County has had an annual average of three days per year with wind speeds at or above 45 mi/hr (72 km/hr). Winds at this speed or above can result in some degree of damage. The recorded annual maximum for Grundy County is 20 days with windspeed above 45 mi/hr (72 km/hr). From 1950 to 2006, there were ten tornadoes in Grundy County. The closest tornado to the Morris Site was an F2 magnitude tornado 8.3 mi (13.4 km) to the southwest on April 19, 1973. Tropical storms affecting Illinois weather are rare. Over the past 20 years, the only storm of tropical origin that affected the weather near the Morris Site was Hurricane Gilbert in 1998.

The Morris Site is located in the Metropolitan Chicago Interstate Air Quality Control Region (AQCR). The AQCR is currently an attainment area for all criteria pollutants except ozone, and in some areas for PM_{10} as well.

J.4.5 Water Resources

The proposed site is located on the east bank of the Kankakee River, just on the confluence of the Kankakee River and the Des Plains River. Local hydrology is dominated by the flat topography of the proposed site which is amenable to development of wetlands, ponds and small intermittent streams. These waterbodies can be found on the southern and northwestern portions of the proposed site.

Much of the Kankakee River and the Illinois River are classified as impaired waters and included on the Illinois 303(d) list. The Illinois River is impaired for human fish consumption due to mercury and polychlorinated biphenyls (PCBs) contamination. The Kankakee River near the proposed site is impaired for fish consumption due to mercury contamination, and for primary contact recreation due to fecal coliform contamination. These impairments are not anticipated to inhibit use of either waterway as a source of water for the proposed facilities. The right to withdraw surface water for the proposed GNEP facility would be within the confines of environmental regulations which limit total water removal to no more than 5 percent of the annual mean flow (e.g., 40 CFR Part 125 Subpart I) and IEPA/IDNR water withdrawal reduction requirements near 7Q10 flow conditions. The water that could be withdrawn from the Kankakee River is 145 million gallons per day (mgd) and 320 mgd from the Illinois River under normal flow conditions.

The elevation for the proposed site is about 0.29 ft (0.09 m) less than msl elevation levels presented in U.S. Geological Survey (USGS) topographic maps. The eastern edge of the Morris Site is between 509.5 ft and 510.0 ft (155.3 m and 155.4 m) National Geodetic Vertical Datum (NGVD 29). The 500-year flood is between 511.5 ft and 512.0 ft (155.9 m and 156.1 m) NGVD. Therefore, the eastern edge of the proposed site borders the 100- and 500-year flood zones, but the northern portion of the proposed site is approximately 10 to 22 ft (3 to 7 m) above the 100-year floodplain and 8.5 to 20.5 ft (2.6 to 6.3 m) above the 500-year floodplain.

The areal extent of aquifers and confining units vary in northeastern Illinois because of glacial erosion, depositional extent, and the presence of certain geologic structures (i.e., regional inactive faults). Overall, groundwater from the aquifers in the upper Illinois River basin is generally suitable for most uses. Although not considered a health issue, total dissolved solids (TDS), and chlorides can be high and cause difficulties with water distribution systems. In addition, naturally occurring constituents, such as arsenic, barium, and isotopes of radium, have been problematic enough to cause groundwater users (e.g., both domestic and community well systems) to abandon their wells in favor of surface water supplies. The available groundwater resources in northeastern Illinois are adequate to supply the needs of the region in the near future. With planning and careful management, large volumes of water could be safely withdrawn from the deep bedrock aquifer system. Illinois groundwater quantity use law is based principally on the doctrine of reasonable use. The Illinois General Assembly passed the *Water Use Act* in 1983, abolishing the English common law of absolute ownership (previously allowing capture of all groundwater beneath a parcel, regardless of the impact on neighboring wells). Currently, there are no groundwater use restrictions or mandatory reporting of water withdrawals in Illinois. Different types of groundwater users have been identified within 6 mi (10 km) of the proposed site. These groundwater users may withdraw groundwater from wells in the sand and gravel aquifers, the shallow bedrock aquifer, the deep bedrock aquifer system, or potentially in a few cases, the Mt. Simon aquifer.

J.4.6 Geology and Soils

The Morris Site is located in Grundy County, in northeastern Illinois at the western end of the Kankakee Plain subprovince of the Till Plains Section of the Central Lowland Physiographic Province. Based on an age of faulting of more than 280 million years, a prior analysis concluded that the "faulting is not capable" (as defined by the USNRC in 10 CFR Part 100), meaning that no movement on the fault has taken place at or near the ground surface at least once within the past 35,000 years, or movement of a recurring nature has occurred within the past 500,000 years. The Morris Site is located adjacent to the Dresden Power Station, which underwent thorough seismic evaluations as part of its licensing process to operate as a nuclear generating station, and was found to be suitable by the Atomic Energy Commission when the Construction Permit for Dresden Unit I was issued.

The Morris Site is overlaid by approximately 1 to 2 ft (0.3 to 0.6 m) of an undulating, erosional, bedrock surface soil. This soil generally consists of about 3 to 8 in (8 to 20 cm) of dark brown to black clayey silt topsoil with some occasional inclusions of extremely weathered limestone, sandstone, and glacial erratics. The Channahon Series is the soil series that is the most prevalent (>35 percent) on the Morris Site. This series consists of shallow, well-drained, moderately permeable soils that formed in loamy material over dolomitic limestone terraces.

J.4.7 Biological Resources

The animals observed within the 889 acre (360 ha) parcel during the winter field observations included: whitetail deer, gray squirrel, deer mouse, meadow vole, red-tailed hawk, rough-legged hawk, Swainson's hawk, northern harrier, American kestrel, rock dove, mourning dove, northern flicker, American goldfinch, song sparrow, house sparrow, tree sparrow, and dark-eyed junco.

There are some areas with wetland vegetation and soil located to the south and, to a lesser extent, west of the Morris Site. There is a small (0.6 acre [0.24 ha]) bluejoint and river bulrush dominated wetland area to the west of the Morris Site. There are apparent wetlands just to the south of the existing Morris Site that are primarily common reed and common cattail areas associated with a low swale.

J.4.8 Cultural and Paleontological Resources

No archaeological surveys were identified that have been conducted within the Morris Site. Additionally, no documentation of previously recorded archaeological sites within the site was identified. Upon evaluation of the historic maps, atlases, and plat maps, a number of potentially sensitive areas were identified within the Morris property. The most extensive of these areas is located in the southeastern corner of the site.

J.4.9 Socioeconomics

The population density near the site is 91.48 people per square mile within the first 5 mi (8 km) radius from the site. The population density slowly increases, reaching a cumulative 485.49 people per square mile at the 35 mi (56 km) radius. The population density then climbs quickly as the radii include portions of Cook County and Chicago. Between the 35 mi (56 km) radius and the 50 mi (80 km) radius, the cumulative population density increases to 842.78 people per square mile, even though the counties to the south and west of the site have relatively low population levels. The region's labor force was approximately 4.2 million in 2000. In 2000, 6.5 percent of this labor force (273,000) was unemployed. That year, the majority of the labor force (2.6 million) resided in Cook County.

J.4.10 Environmental Justice

Minority in this analysis is defined as any ethnic group other than white, non-Hispanic. Overall, more than 30 percent of the region's residents are members of minority groups. Minority residents are of special concern because their behaviors may cause higher exposures to environmental contaminants; they may do more subsistence fishing, for example, and thus be more affected by water pollution. Of the populations in the region for which the U.S. Census was able to determine the poverty status, more than 11 percent has income below the poverty line. Poverty status is determined for an individual, household, or family by comparing their reported income to officially determined income thresholds. Residents of the region who are both a minority and have incomes below the poverty line are of particular concern from an environmental justice perspective.

J.4.11 Public and Worker Health and Safety

There are small radiological air emissions associated with the storage of spent nuclear fuel. To assure compliance with regulatory standards, effluent air is continuously sampled for particulates. Samples are analyzed weekly for gross beta activity. With respect to surrounding population doses, the Dresden Power Plant is a more predominant source of radiological emissions than Morris. The review revealed that the doses to maximally exposed individuals (MEIs) in the vicinity of Dresden Site were a small fraction of the Environmental Protection Agency (EPA) limits. The impact to the environment from radioactive releases from Dresden Units 2 and 3 is small. For comparison, the average American living in the United States is typically exposed to 360 millirem (mrem) annually from natural and other sources of radiation.

J.4.12 Transportation

Grundy and Will Counties are crossed by I-55, I-57, I-80, and I-355, a network of interstates connecting them to the Chicago area. The Kankakee River and the Des Plains River come together near the Grundy-Will County line to form the Illinois River, providing a connection for barge traffic to the Chicago area and down the Mississippi River through a system of canals and locks. A total of nine airports or heliports were identified within 10 mi (16 km) of the Morris Site. Only two, the Morris Municipal Airport and the Joliet Regional Airport, are public airports. There are extensive rail lines in the area, and the Morris Site has a spur that connects it to the nearest rail line, which is located approximately 1 mile to the west.

J.4.13 Waste Management

Currently the Morris Site is classified as a conditionally exempt small quantity generator (CESQG) of hazardous waste. CESGQ facilities are those that generate less than 220 lbs (100 kg) of hazardous waste per month. Solid wastes generated by the Morris Site include spent resin filter materials that are disposed of as radioactive waste and sanitary wastes that are disposed of as solid, non-hazardous wastes.

J.5 HANFORD SITE

This section presents a summary of the affected environments for the Hanford Site (Hanford).

J.5.1 Land Use

Hanford, established in 1943 as one of the three original Manhattan Project sites, is located on approximately 375,000 acres (148,000 hectares [ha]) in Washington State, just north of Richland. It extends over parts of Adams, Benton, Grant, and Franklin counties (DOE 2006b).

Hanford is owned and used primarily by the U.S. Department of Energy (DOE), but portions of it are owned, leased, or administered by other Government agencies. Only about 6 percent of the land area has been disturbed and is actively used, leaving mostly vacant land with widely scattered facilities. On June 9, 2000, the President issued a proclamation that established the 195,000 acre (78,900 ha) Hanford Reach National Monument (65 FR 37253). Industrially and agriculturally developed land lies to the southwest (all zoned industrial by the City of Richland). The Columbia River is located due east. There is also a barge-docking facility, located to the southeast that is used for transferring reactor components and other materials destined for the Hanford Site. A haul road connecting the barge facility to Stevens Drive traverses the buffer area from southeast to northwest. The Washington State University (WSU)-Tri-Cities branch campus, Hanford High School, and Richland residential area are located to the south-southeast (DOE 2000g).

J.5.2 Visual Resources

The topography of land in the vicinity of Hanford ranges from generally flat to gently rolling. Rattlesnake Mountain, rising to 3,480 feet (ft) (1,061 meters [m]) above mean sea level, forms the southwestern boundary of the site. Gable Mountain and Gable Butte are the highest land forms within the site, rising approximately 200 ft (61 m) and 590 ft (180 m), respectively. The Columbia River flows through the northern part of the site and, turning south, forms part of the eastern site boundary. Typical of the regional shrub-steppe desert, the site is dominated by widely spaced, low-brush grasslands (DOE 2000g, DOE 2007h).

Hanford is characterized by mostly undeveloped land, with widely spaced clusters of industrial buildings along the southern and western banks of the Columbia River and at several interior locations. The adjacent visual landscape consists primarily of rural rangeland and farms. Viewpoints affected by DOE facilities are primarily associated with the public access roadways. The Energy Northwest (formerly known as the Washington Public Power Supply System) nuclear reactor and DOE facilities are brightly lit at night and are highly visible from many areas. The tallest structures within the 300 area vicinity are the water towers, with a height of 130 ft (40 m) and the meteorological tower with a height of 200 ft (61 m) in height. The 300 Area is visible from Route 4. The Fuels and Materials Examination Facility, the tallest building in the 400 Area, is 100 ft (30 m) tall and can be seen from State Route 240 (DOE 2000g).

J.5.3 Site Infrastructure

The DOE road network at the Hanford Site includes about 122 lane miles (mi) (196 kilometers [km]) of primary roads and 377 lane mi (607 km) of secondary roads that provide access to the various work centers (DOE 2007h).

The Hanford Site rail system now includes about 110 mi (177 km) of active track and an estimated 275 mi (443 km) of inactive track (DOE 1999a).

Electricity for the Hanford Site is purchased from Bonneville Power Administration (BPA), a federal power agency within the DOE, which provided 90 percent of the electricity consumed on the Hanford Site in 2005 (Slocum 2006).

The coal-fired steam plants at the Hanford Site are no longer in operation. Building heat is now provided by natural gas and fuel oil (Slocum 2006).

Propane and gasoline fuels are also used to support site operations. Fuels used onsite are delivered by truck. The Columbia River is the principal source of water for the Hanford Site. Based on current demand for water and water treatment, the systems now in place have plenty of excess capacity to accommodate additional water and treatment needs (Slocum 2006).

J.5.4 Air Quality and Noise

The Environmental Protection Agency (EPA) has issued regulations (40 CFR Part 50) setting National Ambient Air Quality Standards (NAAQS). Individual states have the primary responsibility for assuring that air quality within the state meets the NAAQS through state implementation plans (SIP) that are approved by EPA. Areas that meet ambient air quality standards are said to be in attainment. Areas that do not meet one or more ambient air quality standards are designated as nonattainment areas.

None of the areas within Hanford and its surrounding counties are designated as nonattainment areas with respect to NAAQS for criteria air pollutants (40 CFR Part 81). The primary sources of air pollutants at Hanford include emissions from power generation and chemical processing (DOE 2000g). Other sources include vehicles, construction, environmental remediation, and waste management activities (DOE 2000j). Hanford sources are limited and background concentrations of criteria pollutants are well below ambient standards. Carbon monoxide, sulfur dioxide, and nitrogen dioxide have been monitored periodically in communities and commercial areas southeast of Hanford (DOE 2006b).

Small quantities of tritium (i.e., hydrogen-3), strontium-90, iodine-129, cesium-137, plutonium-238, plutonium-239/240, plutonium-241, americium-241, and several other longer lived isotopes are released to the environment through state and federally permitted emission points. Distinguishing Hanford-produced radionuclides in the environment is extremely challenging because concentrations in emissions from the Hanford Site stacks are comparable to background concentrations of radionuclides that originated from historical atmospheric nuclear weapons testing (DOE 2000g).

Studies of the propagation of noise at Hanford have been concerned primarily with occupational noise at work sites. Environmental noise levels have not been extensively evaluated because of the remoteness of most Hanford activities and isolation from receptors that are covered by federal or state statutes. Most industrial facilities on the Hanford Site are located far enough away from the Site boundary that noise levels at the boundary are not measurable or are barely distinguishable from background noise levels.

J.5.5 Water Resources

Major surface water features at and surrounding the Hanford Site include the Columbia River, Columbia riverbank seepage, springs, and ponds. In addition, the Yakima River flows along a short section of the southern boundary of the site. The Columbia River is the second largest river in the contiguous United States in terms of total flow and is the dominant surface water feature on the site. Several communities use the Columbia River as their source of drinking water, and various facilities at the Hanford Site use water from the Columbia River (DOE 2006b).

About one-third of the Hanford Site drains into the Yakima River. Water is expected to flow from the Yakima River into the aquifer underlying the Hanford Site rather than from the aquifer into the river, due to the higher elevation of the river surface compared to the elevation of the adjacent water table (DOE 2006b). Groundwater contaminants from the Hanford Site do not reach the Yakima River (DOE 2006b).

No floodplains are found in the 400 Areas. Flooding on the Hanford Site has occurred along the Columbia River, but chances of recurrence have been greatly reduced by the construction of dams to regulate river flow. Major floods are typically due to the melting of the winter snowpacks combined with above normal precipitation (DOE 2006b). Discharges from the Hanford Site enter the Columbia River along the Hanford Reach, which is routinely monitored and regulated for radioactive and chemical pollutants in accordance with the *Clean Water Act* (CWA) (33 U.S.C. 1251 et seq.). According to the general water use and water quality criteria established by Washington State for the Columbia River, the stretch of the River from Grand Coulee Dam to the Washington-Oregon border, which includes the Hanford Reach is classified as Class A, Excellent (WAC 2006) Class A waters are suitable for essentially all uses, including raw drinking water, recreation, and wildlife habitat (DOE 2006b).

Groundwater under Hanford occurs in confined and unconfined aquifer systems. The unconfined aquifer system lies within the glacioalluvial sands and gravels of the Hanford Formation and, to a greater degree, the fluvial and lacustrine sediments of the Ringold Formation. Groundwater generally flows eastward across the site from recharge areas in the higher elevations on the western site boundary, with discharge primarily to the Columbia River (DOE 1999a, DOE 2000g).

The area of contaminant plumes on the Hanford Site with concentrations exceeding drinking water standards was estimated to be 80.3 mi^2 (207.9 km^2) in fiscal year 2001. This estimate is 1 percent smaller than that for fiscal year 2000. The decrease is primarily due to shrinkage of the known tritium plume, which was caused primarily by radioactive decay (DOE 2004i). By 2006 the total combined plume area is 71.8 mi^2 (185.9 km^2) (Poston et al. 2007).

The groundwater usage in the Pasco Basin can be characterized by a large proportion (50 percent) of domestic use followed by agricultural uses (24 percent) and industrial (3 percent) (DOE 1999a). Most of Hanford Site's water supply is withdrawn from the Columbia River and it is distributed to the 100-B, 100-D, 200, and 300 Areas at Energy Northwest (DOE 1999a). The 400 Area and other low-use facilities at remote locations use groundwater from wells located at those locations. The 700 and 1100 Areas are supplied with water by the City of Richland (DOE 1999a).

J.5.6 Geology and Soils

The Hanford Site is located within the Pasco Basin, a topographic, structural depression in the southwest corner of the Columbia Basin physiographic subprovince. This subprovince is characterized by generally low-relief hills with deeply carved river drainage. Relief in the Pasco Basin area ranges from 390 ft (120 m) above mean sea level at the Columbia River level, to 750 ft (230 m) above mean sea level (DOE 2004i).

The stratigraphy of the Hanford Site consists of Miocene-age and younger rocks. Older Cenozoic sedimentary and volcaniclastic rocks underlying the Miocene rocks are not exposed at the surface. Over 100 basalt flows of the Columbia River Basalt Group, with a total thickness exceeding 10,000 ft (3000 m), lie beneath the Hanford Site. Interbedded between many of these basalt flows are sedimentary rocks of the Ellensburg Formation, a series of sand, gravel, or silt layers that were deposited by the ancestral Columbia River system. The sedimentary deposits of the Ringold Formation, Hanford Formation, and surficial deposits overlie the Columbia River Basalt Group and are up to 750 ft (230 m) thick. The 400 Area stratigraphy consists of sand-dominated sediments of the Hanford Formation which attain a thickness of about 164 ft (50 m) beneath the site (DOE 2004i).

The Hanford Site lies in an area of relatively low seismic activity. The nearest capable fault to the 400 Area (Central Gable Mountain fault) is 12 mi (19.3 km) away. The most recent Hanford Site-specific hazard analysis (DOE 2004i) estimated that 0.10 g (1 g is the acceleration of gravity) horizontal acceleration would be experienced on average every 500 years (yr) (or with a 10 percent chance every 50 yr). This study also estimated that 0.2 g would be experienced on average every 2,500 years (or with a 2 percent chance in 50 yr) (DOE 2004i).

Several major volcanoes are located in the Cascade Range west of the Hanford Site. The nearest volcano, Mount Adams, is about 102 mi (165 km) from the Hanford Site. The most active volcano, Mount St. Helens, is located approximately 136 mi (220 km) west-southwest of the Hanford Site (DOE 2004i).

No economically viable mineral resources exist at the Hanford Site. Fifteen different soil types have been identified on the Hanford Site, varying from sand to silty and sandy loam (DOE 2004i). The predominant soil type in the 400 Area is the Quincy (Rupert) sand, and the soils and surface sediments are not subject to liquefaction or other instabilities.

J.5.7 Biological Resources

Plants at the Hanford Site are adapted to low annual precipitation, low water-holding capacity of the rooting substrate (sand), dry summers, and cold winters. Range fires that burn through the area during dry summers have reduced species that are less resistant to fire (for example, big sagebrush) and have allowed more opportunistic and fire-resistant species a chance to become established. Perennial shrubs and bunchgrasses generally dominate native plant communities on the site. However, Euro-American settlement and development have resulted in the proliferation of non-native species. Of the 727 plant species recorded on the Hanford Site, approximately 25 percent of the species are considered non-native (DOE 2007h) (DOE 2006b). The Nature Conservancy of Washington also conducted rare plant surveys. The Conservancy found 112 populations/occurrences of 28 rare plant taxa on the Hanford Site. When combined with observations preceding the 1994–1999 inventories, a total of 127 populations of 30 rare plant taxa have been documented on the Hanford Site (DOE 2004i).

The shrub and grassland habitat of the Hanford Site supports many groups of terrestrial wildlife. Species include large game animals like Rocky Mountain elk and mule deer; predators such as coyote, bobcat, and badger; and herbivores like deer mice, harvest mice, ground squirrels, voles, and blacktailed jackrabbits. The most abundant mammal on the Hanford Site is the Great Basin pocket mouse (DOE 2006b).

Shrubland and grassland provide nesting and foraging habitat for many passerine bird species. Surveys conducted during 1993 (DOE 2007h) reported the occurrence of western meadowlarks and horned larks more frequently in shrubland habitats than in other habitats on the site. Long-billed curlews and vesper sparrows were also noted as commonly occurring species in shrubland habitat. Common upland game bird species that occur in shrub and grassland habitat include chukar partridge, California quail, and Chinese ring-necked pheasant. Among the raptor species that use shrubland and grassland habitats are American kestrel, red-tailed hawk, Swainson's hawk, and ferruginous hawks. Northern harriers, sharp-shinned hawks, rough-legged hawks, and golden eagles also occur in these habitats but are not sighted as frequently. Many species of insects occur throughout all habitats on the Hanford Site. Butterflies, grasshoppers, and darkling beetles are among the most conspicuous of the approximately 1,500 species of insects that have been identified from specimens collected on the Hanford Site (DOE 2007h). The high diversity of insect species on the Hanford Site is believed to reflect the size, complexity, and quality of the shrub-steppe habitat (DOE 2006b).

Two types of natural aquatic habitats are found on the Hanford Site: the Columbia River that flows along the northern and eastern edges of the site, and the small spring-streams and seeps located mainly on Arid Lands Ecology reserve (ALE) in the Rattlesnake Hills (DOE 2004i).

The Columbia River is the dominant aquatic ecosystem on the Hanford Site and supports a large and diverse community of plankton, benthic invertebrates, fish, and other communities. Steelhead and salmon are regulated as evolutionary significant units (ESUs) by the National Marine Fisheries Service based on their historic geographic spawning areas. The Upper Columbia River steelhead ESU is listed as threatened (USFWS 2007b). Conditions in the Hanford Reach promote spawning success for salmonids, sturgeon and bass. Three species of fish (bull trout, spring-run Chinook and steelhead) that are currently found on the federal list of threatened and endangered species are found at the Hanford Site.

Washington State considers shrub-steppe habitat as a priority habitat because of its relative scarcity in the state and because of its requirement as nesting/breeding habitat by several state and federal species of concern.

Primary wetland areas at Hanford are found in the riparian zone along the Columbia River. The extent of this zone varies, but includes large stands of willows, grasses, and other plants. There are no natural wetlands in the 400 Area, although a small cooling and wastewater pond does contain some wetland vegetation.

J.5.8 Cultural and Paleontological Resources

Twenty-four percent of the Hanford Site has been surveyed for archaeological resources (DOE 2005f). Archaeological surveys have focused on islands and a 1,312 ft (400 m) corridor on each side of the Columbia River. Approximately 1,447 cultural resource sites and isolated finds have been documented, and 127 of these have been evaluated for eligibility to the National Registry of Historic Places (NRHP). Documentation and evaluation have occurred on 531 buildings and structures at the Hanford Site.

Prehistoric resources at the Hanford Site include pithouse villages, open campsites, graves, spirit quest sites, hunting camps, game drive complexes, quarries, and temporary camps (DOE 2000g). Approximately 720 archaeological sites and isolated finds associated with the pre-contact period have been recorded on the Hanford Site; of these, 80 contain historic components as well (DOE 2005f). Forty-nine prehistoric archaeological sites have been listed on the NRHP, with 3 listed individually and 46 contained within 6 listed archaeological districts. Five prehistoric archaeological sites have been determined eligible for individual listing on the NRHP. Most of the 400 Area has been so disturbed by construction activities, that an archaeological survey in 1978 found that only 30 acres (12 ha) were undisturbed. Survey of the undisturbed acreage identified no archaeological resources. No archaeological sites are known to be located within 0.6 miles (1 km) of the 400 Area (DOE 2005f).

Historic resources at the Hanford Site that pre-date the Hanford era include homesteads, ranches, trash scatters, gold mines, roads, and townsites. More recent historic resources include reactors and materials processing facilities that played important roles in the Manhattan Project and Cold War era (DOE 2000g). The 400 Area does contain six Cold War-era buildings/structures that have been determined eligible for the NRHP as contributing properties within this historic district (DOE 2005f).

Native American tribes who retain secular and religious ties to the Hanford Site region include the Yakama, Cayuse, Nez Perce, Wanapum, Chamnapum, Palus, Walla Walla, and Umatilla Peoples. These groups have knowledge of the traditional and historical ceremonies and lifeways of their cultures, and resources that are found on the Hanford Site are used by tribal members for ceremonies and other traditional uses.

Remains from the Pliocene and Pleistocene Ages have been identified at the Hanford Site. The Upper Ringold Formation dates to the Late Pliocene Age and contains fish, reptile, amphibian, and mammal fossil remains. Late Pleistocene Touchet beds have yielded mammoth bones. These beds are composed of fluvial sediments deposited along ridge slopes that surround the Hanford Site. No paleontological resources have been discovered in the 400 Area at Hanford.

J.5.9 Socioeconomics

Socioeconomic characteristics addressed at Hanford include employment, income, population, housing, and community services. These characteristics are analyzed for a two-county ROI consisting of Benton and Franklin Counties in Washington.

The state and local government, professional and technical services, retail trade, and administrative and waste services sectors employ the greatest number of workers in the ROI (BEA 2006a, TtNUS 2006a). The state and local government sector provides 12.4 percent of all employment, while the professional and technical services sector provides 11.1 percent, the retail trade sector provides 11.1 percent, and the administrative and waste services sector provides 9.2 percent of the jobs in the ROI. Another important sector of employment is healthcare and social assistance (8.7 percent) (BEA 2006a, TtNUS 2006e).

The labor force in the ROI increased 43.8 percent from 1990 to 2005 (BLS 2005b, TtNUS 2006a). In comparison, for the same period, the state-wide labor force in Washington increased 29.8 percent. Between 1990 and 2005, the ROI population grew from 150,033 to 220,961, an increase of 47.3 percent (USCB 1990, USCB 2007c, and TtNUS 2006e). This was a higher rate of growth than for the state of Washington, which grew at a rate of 29.2 percent, during the same time period.

J.5.10 Environmental Justice

Census data from the year 2000 was used to determine minority and low-income characteristics by block group within 50 mi (80 km) of the Hanford Site. Eleven census block groups (3 percent) have a significant American Indian or Alaskan Native minority population, 94 census block groups (26 percent) have significant “some other race” populations, 87 census block groups (24 percent) have significant aggregate minority percentages, and 147 census block groups (41 percent) have significant Hispanic Ethnicity populations (TtNUS 2006e).

Thirty-seven census block groups within the 50 mi (80 km) radius have a significant percentage of low-income households (TtNUS 2006e).

J.5.11 Public and Worker Health and Safety

An individual’s radiation exposure in the vicinity of the Hanford Site amounts to approximately 365 millirem (mrem), and is comprised of natural background radiation from cosmic, terrestrial, and internal body sources; radiation from medical diagnostic and therapeutic practices; weapons test fallout; consumer and industrial products, and nuclear facilities.

Releases of radionuclides to the environment from Hanford operations provide another source of radiation exposure to individuals in the vicinity of Hanford. Types and quantities of radionuclides released from Hanford operations in 2005 are listed in *Hanford Site Environmental Report for Calendar Year 2005* (DOE 2006b). The potential sources of radionuclide contamination included gaseous emissions from stacks and ventilation exhausts, liquid effluent from operating wastewater treatment facilities, contaminated groundwater seeping into the Columbia River, and fugitive emissions from contaminated soil areas and facilities. The doses from these emissions and effluents fall within the radiological limits given in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, and are much lower than those from background radiation (DOE Order 5400.5), (DOE 2006b).

Hanford worker doses have typically been well below DOE worker exposure limits. DOE set administrative exposure guidelines at a fraction of the exposure limits to help enforce doses that are as low as reasonably achievable (ALARA). Every year DOE evaluates the Hanford Sites' ALARA administrative control levels and adjusts them as needed.

Liquid effluent and airborne emissions that may contain hazardous constituents are continually monitored at the Hanford Site (DOE 2006b).

J.5.12 Transportation

Vehicle access to Hanford is provided by State Routes 240, 243, and 24. State Route 240 connects to the Richland bypass highway, which interconnects with I–182. State Route 243 exits the site's northwestern boundary and serves as a primary link between the site and I–90. State Routes 24 and 240 are both two-lane roads that traverse the Hanford Site. These roads are maintained by Washington State (DOE 1999a). State Route 24 enters the site from the west and continues eastward across the northernmost portion of the site and intersects State Route 26 about 10 mi (16 km) east of the site boundary. State Route 240 is a north-south highway that skirts the western edge of the Site.

A DOE-maintained road network within the Hanford Site, mostly paved and two lanes wide provides access to the various work centers. There is presently no rail service at Hanford, except for a spur to Energy Northwest.

The ports of Benton, Kennewick, and Pasco use the commercial waterways of the Snake and Columbia Rivers to provide access to the deep-water ports of Portland, Oregon and Vancouver, Washington. The Port of Benton provides a barge slip where shipments arriving at Hanford may be off-loaded (DOE 2000g).

J.5.13 Waste Management

Currently, Hanford's mission is focused on cleanup of wastes associated with past nuclear research, development, and weapons production activities, and decommissioning and demolition projects. The following waste types are managed at Hanford: high-level, transuranic, mixed transuranic, low-level, mixed low-level and hazardous waste. In addition to these radioactive and hazardous wastes, Hanford generates and manages sanitary solid waste, uncontaminated demolition debris, and sanitary sewage. A major focus of DOE's environmental management mission at Hanford is cleanup and management of the site's legacy waste from more than 45 years of nuclear materials production. However, beginning in 1999, non-dangerous waste has been disposed of at an offsite landfill. In addition to newly generated waste, significant quantities of legacy waste remain from years of nuclear material production and waste management activities. Most legacy waste from past operations at the Hanford Site resides in *Resource Conservation and Recovery Act* (RCRA) compliant waste sites or is stored in places awaiting cleanup and ultimate safe storage or disposal (40 CFR Parts 239-299), (DOE 2004i).

J.6 IDAHO NATIONAL LABORATORY

The Idaho National Laboratory (INL) is located on approximately 570,000 acres (230,671 ha) in southeastern Idaho, and is 45 miles (mi) (72 kilometers [km]) west of Idaho Falls, 38 mi (61 km) northwest of Blackfoot, and 22 mi (35 km) east of Arco. It is primarily located within Butte County, but portions of the site are also in Bingham, Jefferson, Bonneville, and Clark Counties. The site is roughly equidistant from Salt Lake City, Utah, and Boise, Idaho (INL 2006).

This section presents a summary of the affected environments for the Idaho National Laboratory site.

J.6.1 Land Use

The Federal Government, the state of Idaho, and various private parties own lands immediately surrounding INL. Regional land uses include grazing, wildlife management, mineral and energy production, recreation, and crop production. Two national natural landmarks border INL: Big Southern Butte (1.5 mi [2.4 km] south) and Hell's Half Acre (1.6 mi [2.6 km] southeast). Land is also used for recreation and environmental research associated with the designation of INL as a National Environmental Research Park. Much of INL is open space that has not been designated for specific use. Because INL is remote from most developed areas, its lands and adjacent areas are not likely to experience residential and commercial development, and no new development is planned near the site. Recreational and agricultural uses, however, are expected to increase in the surrounding area in response to greater demand for recreational areas and the conversion of rangeland to cropland (DOE 2005b).

J.6.2 Visual Resources

The Bitterroot, Lemhi, and Lost River Mountain ranges border INL on the north and west. Volcanic buttes near the southern boundary of INL can be seen from most locations on the site. INL generally consists of open desert land predominantly covered by big sagebrush and grasslands. Pasture and farmland border much of the site. INL facilities have the appearance of low-density commercial/industrial complexes clustered and widely dispersed throughout the site. Structure heights generally range from 10 to 100 feet (ft) (3 to 30 meters [m]); a few stacks and towers reach 250 ft (76 m). Although many INL facilities are visible from highways, most are more than 0.5 mi (0.8 km) from public roads. The operational areas are well defined at night by security lights (DOE 2005b).

J.6.3 Site Infrastructure

The road network at INL provides for onsite ground transportation. There are about 90 mi (145 km) of paved public roads at the INL site. In addition, there are 87 mi (140 km) of non-public paved roads and 100 mi (161 km) of unpaved non-public roads at the INL site (INL 2006).

The Union Pacific Railroad's Blackfoot-to-Arco Branch crosses the southern portion of INL and provides rail service to the site. There are 30 mi (48 km) of railroad track at INL (DOE 2005b).

DOE presently contracts with the Idaho Power Company and Rocky Mountain Power and Light to supply electric power to INL. The contract allows for power demand of up to 45,000 kilowatts (45 megawatts [MW]) (DOE 2005b).

Fuel consumed at INL includes natural gas, fuel oil (heating fuel), diesel fuel, gasoline, and propane. All fuels are transported to the site for use and storage (INL 2006).

The Snake River Plain Aquifer is the source of all water used at INL. The water is provided by a system of about 30 wells, together with pumps and storage tanks (DOE 2005b).

J.6.4 Air Quality and Noise

The climate at INL and the surrounding region is characterized as that of a steppe (a vast semiarid grass-covered plain). The average annual precipitation is 8.7 in (221.0 mm), and prevailing winds are generally southwest or northeast. The average annual temperature at INL is about 42°F (6°C) and average monthly temperatures range from a minimum of around 16°F (-9°C) in January to a maximum of 68°F (20°C) in July. The annual average wind speed is 7.5 mi/hr (12.1 km/hr) (DOE 2005b).

None of the ambient air pollutant concentrations measured by the monitors exceeded the state or national standards (DOE 2005b).

The primary source of air pollutants at INL are from combustion of fuel oil for heating. Other emission sources include combustion of waste materials, industrial processes, stationary diesel engines, vehicle engines, and fugitive dust from waste burial and construction activities (IDEQ 2004a).

Radiological air pollutants are routinely monitored at locations within, around, and at longer distances from INL. In 2005, an estimated 6,614 curies of radioactivity were released to the atmosphere from all INL sources (DOE 2005b). The impacts to human health from radiological releases are summarized in Section J.6.11.

Noise emission sources within INL include various industrial facilities, equipment, and machines (e.g., coolant systems, transformers, engines, pumps, boilers, steam vents, pager systems, construction equipment and materials-handlers, and vehicles). Most INL industrial facilities are far enough from the site boundary that noise levels from these sources are not measurable or are barely distinguishable from background levels at the boundary (DOE 2005b).

J.6.5 Water Resources

INL is in the Mud Lake-Lost River Basin (also known as the Pioneer Basin). This closed drainage basin includes three main streams, the Big and Little Lost Rivers and Birch Creek. These three streams are essentially intermittent and drain the mountain areas to the north and west of INL, although most flow is diverted for irrigation in the summer months before it reaches the site boundaries. Flow that reaches INL infiltrates into the ground surface along the length of the streambeds in the spreading areas at the southern end of INL and, if the streamflow is sufficient in the ponding areas (playas or sinks), in the northern portion of INL. During dry years, there is little or no surface water flow on the INL site.

The Snake River Plain Aquifer, which lies below INL, extends from near the western boundary of Yellowstone National Park in eastern Idaho to the Idaho-Oregon border where the Snake River enters Hells Canyon. The Snake River Plain Aquifer is the most widely used source of water for drinking and agriculture in southern Idaho (Roback et al. 2001). This aquifer has been designated a Sole Source Aquifer by Environmental Protection Agency (EPA). Water storage in the aquifer is estimated at some 2 billion acre ft (2.47 x 10^{12} m^3), and irrigation wells can yield 7,000 gal/min (26,498 L/min) (DOE 2002e). The aquifer is composed of numerous relatively thin basalt flows with interbedded sediments extending to depths in excess of 3,500 ft (1,067 m) below land surface (DOE 2005b).

The U.S. Geological Survey has estimated that the thickness of the active portion of the Snake River Plain Aquifer at INL ranges between 250 to 820 ft (76 to 250 m). Depth to the water table ranges from about 200 ft (61 m) below land surface in the northern part of the site to more than 900 ft (274 m) in the southern part (Ackerman et al. 2006). Depth to water at the proposed site is 475 ft (145 m) (DOE 1989a).

Average groundwater consumption during 2004 was 1.6 billion gal/yr (6.1 billion L/yr). This amount of water represents less than 1 percent of the groundwater that flows underneath INL (ATSDR 2004). Since 1950, DOE has held a Federal Reserved Water Right for the INL site that permits a pumping capacity of approximately 80 ft^3/sec. Total groundwater withdrawal at INL historically averages between 15 and 20 percent of that permitted amount (DOE 2002e).

J.6.6 Geology and Soils

INL occupies a relatively flat area on the northwestern edge of the Eastern Snake River Plain, part of the Eastern Snake River Plain Physiographic Province. The area consists of a broad plain that has been built up from the eruptions of multiple flows of basaltic lava over the past 4 million years. The proposed site is fairly level to gently sloping, with some areas of moderate slope due to basalt rock outcroppings. Elevations on the proposed site range from 4,900 to 5,000 ft (1,493 to 1524 m). Generally, the terrain slopes toward the Big Lost River.

The upper 0.6 to 1.2 mi (1.0 to 1.9 km) of the crust beneath INL is composed of a sequence of Quaternary age (recent to 2 million years old) basalt lava flows and poorly consolidated sedimentary interbeds collectively called the Snake River Group. The lava flows at the surface range from 2,100 to 2 million years old. The sediments are composed of fine-grained silts that were deposited by wind; silts, sands, and gravels deposited by streams; and clays, silts, and sands deposited in lakes such as Mud Lake and its much larger ice-age predecessor, Lake Terreton. The accumulation of these materials in the Eastern Snake River Plain has resulted in the observed sequence of interlayered basalt lava flows and sedimentary interbeds (DOE 2005b).

The Arco Segment of the Lost River Fault is thought to terminate about 4.3 mi (6.9 km) from the INL boundary, and approximately 22 mi (35 km) west of the proposed site. The Howe Segment of the Lemhi Fault terminates near the northwest boundary of INL, and approximately 17 mi (27 km) northwest of the proposed site (DOE 2005b). Both segments are considered capable or potentially active. A capable fault is one that has had movement at or near the ground surface at least once within the past 35,000 years, or recurrent movement within the past 500,000 years (10 CFR Part 100).

Based on the maximum considered earthquake ground motions, INL is located in a broadly defined region of low and moderate to high seismicity. Ground motions in these regions are controlled by earthquake sources that are not well defined, with estimated maximum earthquake magnitudes having relatively long return periods.

Basaltic volcanic activity occurred from about 2,100 to 4 million years ago in the INL site area. Although no eruptions have occurred on the Eastern Snake River Plain during recorded history, lava flows of the Hell's Half Acre lava field erupted near the southern INL boundary as recently as 5,400 years ago. The most recent eruptions within the area occurred about 2,100 years ago, 19 mi (31 km) southwest of the site at the Craters of the Moon Wilderness Area. The estimated recurrence interval for volcanism associated with the five identified volcanic zones ranges from 16,000 to 100,000 years (DOE 2005b).

Within INL, mineral resources include sand, gravel, pumice, silt, clay, and aggregate (e.g., sand, gravel, and crushed stone). These resources are extracted at several quarries or pits at INL and used for road construction and maintenance, new facility construction and maintenance, waste burial activities, and ornamental landscaping. The geologic history of the Eastern Snake River Plain makes the potential for petroleum production at INL very low. The potential for geothermal energy exists at INL and in parts of the Eastern Snake River Plain; however, a study conducted in 1979 identified no economic geothermal resources (DOE 2005b).

Four basic soilscapes exist at INL: river-transported sediments deposited on alluvial plains, fine-grained sediments deposited into lake or playa basins, colluvial sediments originating from bordering mountains, and wind-blown sediments over lava flows. The surface soils at the proposed site are shallow with numerous basalt outcrops. Malm sandy loam, Matheson sandy loam, bondfarm sandy loam, Matheson loamy sand, and Malm loamy sand comprise most of the soils at the proposed site. Basalt bedrock was typically encountered at depths ranging from 1.5 to 4 ft (0.5 to 1 m) (DOE 2005b).

J.6.7 Biological Resources

INL lies in a cool desert ecosystem dominated by shrub-steppe communities. Most land within the site is relatively undisturbed and provides important habitat for species native to the region. Facilities and operating areas occupy 2 percent of INL; approximately 60 percent of the area around the periphery of the site is grazed by sheep and cattle. Although sagebrush communities occupy about 80 percent of INL, a total of 20 plant communities have been identified. These communities may be grouped into six basic types: juniper woodland, grassland, shrub-steppe (which consists of sagebrush-steppe and salt desert shrubs), lava, bareground-disturbed, and wetland vegetation (DOE 2005b). Similar to most of INL, vegetation at the proposed site is dominated by big sagebrush vegetation associations (DOE 1989a).

The interspersion of low sagebrush (*Artemisia arbuscula*) and big sagebrush (*Artemisia tridentate*) communities in the northern portion of INL and juniper communities in the northwestern and southeastern portions of the site are considered sensitive habitats.

Large wildfires in 1994, 1995, 1996, 1999, 2000, and 2007 played an important role in the ecology of INL. The most recent fires burned about 36,000 acres (14,568 ha) in the summer and early fall of 2000 (DOE 2005b). Of particular concern is the loss of sagebrush. This plant is slow to regenerate since it must grow from seed, whereas many other plant species regenerate from underground root systems. The slow recovery of sagebrush is likely to have a detrimental impact on greater sage grouse (DOE 2005b).

INL supports numerous animal species, including two amphibian, 11 reptile, 225 bird, and 44 mammal species. Common animals on the site include short-horned lizards (*Phrynosoma douglassi*), gopher snakes (*Pituophis melanoleucus*), sage sparrows (*Amphispiza belli*), Townsend's ground squirrels (*Spermophilus townsendii*), and black-tailed jackrabbits (*Lepus californicus*). Important game animals include the greater sage grouse, mule deer (*Odocoileus hemionus*), elk (*Cervus elaphus*), and pronghorn (DOE 2005b).

Aquatic habitat on INL is limited to the Big Lost River, Little Lost River, Birch Creek, and a number of liquid waste disposal ponds. All three streams are intermittent and drain into four sinks in the north-central part of the site. Six species of fish have been observed within water bodies located onsite. Species observed in the Big Lost River include brook trout (*Salvelinus fontinalis*), rainbow trout (*Salmo gaidneri*), mountain whitefish (*Prosopium williamsoni*), speckled dace (*Rhinichthys osculus*), shorthead sculpin (*Cottus confuses*), and kokanee salmon (*Oncorhynchus nerka*) (DOE 2005b).

Twenty Federal- and state-listed threatened, endangered, and other special status species occur, or possibly occur on INL. Federally-listed plants and animals include 2 threatened, one candidate, and ten species of concern. No critical habitat for threatened or endangered species, as defined in the *Endangered Species Act*, exists on INL.

National Wetland Inventory maps prepared by the U.S. Fish and Wildlife Service (USFWS) have been completed for most of INL. These maps indicate that the primary wetland areas are associated with the Big Lost River, the Big Lost River spreading areas, and the Big Lost River sinks, although smaller (less than about 1 acre) isolated wetlands also occur intermittently. Wetlands associated with the Big Lost River are classified as riverine/intermittent, indicating a defined stream channel with flowing water during only part of the year (DOE 2006r).

J.6.8 Cultural and Paleontological Resources

Archaeological investigations conducted in southeastern Idaho have provided evidence of human use of the Eastern Snake River Plain for at least 15,000 years (INL 2006). Prehistoric resources identified at INL are generally reflective of Native American hunting and gathering activities. At least 688 prehistoric sites and 753 prehistoric isolates have been located, and known resources are concentrated along the Big Lost River and Birch Creek, atop buttes, and within craters and caves (DOE 2005a). Resources include residential bases, campsites, caves, hunting blinds, rock alignments, and limited activity locales such as lithic and ceramic scatters, isolated hearths, and concentrations of fire-cracked rock. Most known sites at INL have not been formally evaluated for nomination to the National Register of Historic Places (NRHP), but are considered to be potentially eligible. Given the rather high density of prehistoric sites at INL, additional sites are likely to be identified as more surveys are conducted (DOE 2005a).

Historic resources found at INL are representative of European-American activities, including fur trapping and trading, immigration, transportation, mining, agriculture, and homesteading, as well as more recent military and scientific/engineering research and development activities (DOE 2005b).

The INL is located within the aboriginal territory of the Shoshone and Bannock peoples. These two groups of nomadic hunters and gatherers used the region at the time of European-American contact for harvesting plant and animal resources and collecting obsidian from Big Southern Butte and Howe Point (DOE 2005a), among other uses. Because the INL site is considered part of the Shoshone-Bannock Tribes' ancestral homeland, it contains many localities that are important for traditional, cultural, educational, and religious reasons (DOE 2005b).

Surveys for paleontological remains outside of and within INL boundaries have identified several fossils that suggest the region contains abundant and varied paleontological resources, including vertebrate and invertebrate animals, plants, and pollen. No paleontological localities have been identified within the proposed project area. The north and northwest margins of the proposed project area level out across the Big Lost River floodplain, where Pleistocene vertebrate fossils have been discovered near the surface and in deeply buried sand and gravel deposits. The potential for encountering surface or buried paleontological remains in the project area is characterized as low to moderate (DOE 2005b).

J.6.9 Socioeconomics

Approximately 8,000 people work at the INL Site. The state and local government, retail trade, and healthcare and social assistance sectors employed the greatest number of workers in the region of influence (ROI) during 2004 (BEA 2006a, TtNUS 2006a). The labor force in the ROI increased 27.2 percent from 1990 to 2005 (BLS 2005b, TtNUS 2006a). In comparison, for the same period, the state-wide labor force in Idaho increased 49.5 percent. Between 1990 and 2005, the ROI population grew from 192,359 to 235,330, an increase of 22.3 percent (USCB 1990, USCB 2007a, TtNUS 2006a). This was a slower rate of growth than for the state of Idaho, which grew at a rate of 42 percent during the same time period.

J.6.10 Environmental Justice

Census data for Idaho characterizes 0.4 percent of the population as Black or African American; 1.4 percent American Indian or Alaskan Native; 0.9 percent Asian; 0.1 percent Native Hawaiian or other Pacific Islander; 4.2 percent some other race; 2.0 percent multi-racial (two or more races); 9.0 percent aggregate of minority races; and 7.9 percent Hispanic ethnicity (USCB 2007a).

Based on the "more than 20 percent" or the "exceeded 50 percent" criteria, no Black or African American, Native Hawaiian or Other Pacific Islander, Asian, or Multi-racial minority block groups exist in the geographic area (TtNUS 2006a). Five American Indian or Alaskan Native block groups, three Some Other Race, six Aggregate, and five Hispanic block groups are found within the 50 mi (80 km) radius. Also within this area, two block groups have a significant percentage of low-income households (TtNUS 2006a).

J.6.11 Public and Worker Health and Safety

Releases of radionuclides to the environment from INL operations provide a source of radiation exposure to individuals in the vicinity of INL. These doses fall within the radiological limits given in DOE Order 5400.5 (DOE O 5400.5), *Radiation Protection of the Public and the Environment*, and are much lower than those of background radiation.

INL workers receive the same dose as the general public from background radiation, but they also receive an additional dose from working in facilities with nuclear materials. These doses fall within the radiological regulatory limits of 10 CFR Part 835.

The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (e.g., soil through direct contact or via the food pathway). Adverse health impacts to the public are minimized through administrative and design controls to decrease hazardous chemical releases to the environment and to achieve compliance with permit requirements. The effectiveness of these controls is verified through the use of monitoring information and inspection of mitigation measures. Health impacts to the public may occur during normal operations at INL via inhalation of air containing hazardous chemicals released to the atmosphere by INL operations. Risks to public health from ingestion of contaminated drinking water or direct exposure are also potential pathways. Workers are protected from hazards specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. INL workers are also protected by adherence to Occupational Safety and Health Administration and EPA occupational standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals.

J.6.12 Transportation

Two interstate highways serve the INL regional area. Interstate 15, a north-south route that connects several cities along the Snake River, is approximately 25 mi (40 km) east of INL. Interstate 86 intersects Interstate 15 approximately 40 mi (64 km) south of INL and provides a primary linkage from Interstate 15 to points west. U.S. Highways 20 and 26 are the main access routes to the southern portion of INL and the Materials and Fuels Complex. Idaho State Routes 22, 28, and 33 all pass through the northern portion of INL, with State Routes 22 and 33 providing access to the northern INL facilities.

The Union Pacific Railroad's Blackfoot-to-Arco Branch crosses the southern portion of INL and provides rail service to the site. There are 30 mi (48 km) of railroad track at INL (DOE 2002e).

J.6.13 Waste Management

INL generates various waste streams during ongoing activities including routine operations and cleanup action, and stores wastes generated by past activities. INL manages the following types of waste: high-level, low-level radioactive, mixed low-level radioactive, transuranic, hazardous, sanitary solid, wastewater, and sanitary sewage. The waste is managed using appropriate treatment, storage, and disposal technologies, and in compliance with all applicable Federal and State statutes and DOE Orders (DOE 2005a).

EPA placed INL on the National Priorities List on December 21, 1989. In accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), DOE entered into a consent order with EPA and the state of Idaho to coordinate cleanup activities at INL under the 1995 Settlement Agreement (42 U.S.C. 9610).

Under the 1995 Settlement Agreement, the state of Idaho, U.S. Navy, and DOE reached agreement settling a lawsuit filed by the state to prevent shipment of spent nuclear fuel to the INL for storage. This agreement integrates DOE's CERCLA response obligations with *Resource Conservation and Recovery Act* (RCRA) corrective action obligations (40 CFR Parts 239-299). Clean up activities at INL are under the oversight of EPA Region 10 and the Idaho Department of Environmental Quality.

J.7 LEA COUNTY SITE

This section presents a summary of the affected environment for the Lea County site. The information was summarized from the Site Characterization Report prepared by the Funding Opportunity Announcement (FOA) grant recipient (SCR 2007d).

J.7.1 Land Use

The site is located in southeastern New Mexico in Lea County, 32 miles (mi) (51 kilometers [km]) east of Carlsbad, New Mexico, and 34 mi (55 km) west of Hobbs, New Mexico. The site is comprised of 1,040 acres (421 hectares [ha]) of patented land spread across three section of land running west to east. The area surrounding the site is Bureau of Land Management (BLM) land and two small parcels of state land. The surface estate is privately owned, and the subsurface minerals are owned by the state of New Mexico. The nearest residents to the site are located at the Salt Lake Ranch, 1.5 mi (2.4 km) north of the site. There are several existing right-of-ways (ROW) in the site. These existing ROW include pipelines, roads, well pads, power lines, telephone lines, and a communications tower.

Intrepid Mining, LLC owns both mines located within 6 mi (10 km) of the site. Mineral extraction in the area consists of underground potash mining and oil/gas extraction. Both industries support major facilities on the surface, although mining surface facilities are confined to a fairly small area. The Intrepid North mine, located to the west, is no longer actively mining potash underground. However, the surface facilities are still being used in the manufacture of potash products. The Intrepid East facility is still mining its underground potash ore.

J.7.2 Visual Resources

The following are situated at the site

- A communications tower in the southwest corner of the site;
- A producing gas and distillate well with associated tank battery is located near the communications tower;
- A small water drinker (livestock) is located along the aqueduct in the northern half of the property;
- Oil recovery facility (abandoned) that still has tanks and associated hardware left in place in the northeast corner; and
- An oil recovery facility with tanks and associated hardware still in place in the far southeast corner.

J.7.3 Site Infrastructure

Oil and gas extraction provides most of the activity in the vicinity. Roads are built and maintained to provide access to the various wells. Pipelines are installed to move the product efficiently from one area to the next. Where pipelines are not used, access for heavy trucks to haul the oil and produce water is required. Compressor stations are needed to pump the product through the pipelines. Electric power is required at the individual well pads to provide the electricity necessary to operate the pumps, compressors, and other equipment as needed. There are two major facilities related to oil/gas activity in the area. The Zia Gas Plant is located northwest of the site, while Controlled Recovery Incorporated is southwest of the site.

J.7.4 Air Quality and Noise

The climate at the site and the surrounding region is characterized as that of semi arid region with generally mild temperatures, low precipitation and humidity, and a high evaporation rate. The average precipitation in Hobbs is 18.5 inches (in) (47.0 centimeters [cm]) annually. The average temperature is 62.2°F (16.7°C). The annual mean wind speed was 11.0 miles per hour (mi/hr) (17.6 kilometers per hour [km/hr]) and the prevailing wind direction was wind from 180 degrees with respect to True North.

One exceedance of the national ambient air quality standards (NAAQS) maximum 24-hour limit was reported in Hobbs, New Mexico, for particulate matter in 2003 due to a natural event—a dust storm. Corrective actions were taken by the state of New Mexico. According to NAAQS, one exceedance of this limit is allowed per year. Based on U.S. Environmental Protection Agency (EPA) information (EPA 2007a), the entire region within 50 mi (80 km) of the site is in an attainment area for all of the criteria pollutants.

There are no existing facilities at the Lea County site resulting in increased noise levels.

J.7.5 Water Resources

There are no potable surface water resources within the vicinity of the site. Surface drainage at the site is contained within two local playa lakes that have no external drainage. The only major natural lakes or ponds within 6 mi (10 km) of the site include Laguna Gatuna, Laguna Tonto, Laguna Plata, and Laguna Toston which are ephemeral playas. Surface runoff from the site flows into Laguna Gatuna to the east and Laguna Plata to the northwest (SCR 2007d). The site lies within the Pecos River Basin, which has a maximum basin width of 130 mi (209 km), and a drainage area of 44,535 square miles (mi^2) (71,672 square kilometers [km^2]). The Pecos River generally flows year-round. Seventy-five percent of the total annual precipitation and 60 percent of the annual flow result from intense local thunderstorms between April and September. Water quality in the Pecos River basin is affected by mineral dissolution from natural sources and from irrigation return flows. The site is not located in any 100 year or 500 year floodplain.

The site is located in the Lea County Underground Water Basin (UWB). Evapo-transpiration at the site is five times the precipitation rate, indicating that there is little infiltration of precipitation into the subsurface. Groundwater encountered on the east side of the site is brackish, exceeding 10,000 parts per million in total dissolved solids which is the New Mexico regulatory threshold (NM Water Quality Control Commission Regulations, 20.6.2.3101A) for protected water. Regional data indicates that groundwater is on the order of 300 to 400 feet (ft) (91 to 122 meters [m]) deep (WQCC 2002).

Potable water for the area is generally obtained from potash company pipelines that convey water to area potash refineries from the Ogallala High Plains aquifer on the caprock area of eastern Lea County. Much of the shallow groundwater near the site has been directly or indirectly influenced by brine discharges from potash refining or oil and gas production. The High Plains Aquifer in the Ogallala Formation contains 3.270 billion acre-feet (4.03 trillion m^3) of water and underlies 174,050 mi^2 (450,787 km^2) in parts of eight states. The volume of recoverable water in the New Mexico portion of the aquifer is on the order of 50 million acre feet (61.67 billion m^3). It is estimated that the Lea County portion of the High Plains Aquifer contains 14,000,000 acre feet of recoverable water.

The City of Carlsbad owns and operates Double Eagle Water System, located near Maljamar in northwestern Lea County. The Double Eagle Water System is supplied by groundwater pumped from 11 wells completed in the Ogallala Formation. The first 16 mi (26 km) segment of the pipeline carrying water from these wells to the Waste Isolation Pilot Plant (WIPP) facility has a 24 in (61 cm) diameter and runs to Highway 62/180.

The Double Eagle Water Resource System is 3 mi (5 km) west of the site. The City of Carlsbad has indicated that the Double Eagle water line near the site is capable of delivering 6,000 gallons per minute (22,712 liters per minute). This equates to over 8,000,000 gallons of water per day (30,283,290 liters per day). The City of Carlsbad is in the process of modeling the Double Eagle system to determine what upgrades are needed for future users.

J.7.6 Geology and Soils

The entire site is underlain by Triassic bedrock consisting of shale, siltstone, and minor, fine-grained, poorly sorted sandstone. Most of the proposed operational area is relatively flat and the shale bedrock is covered by a laterally extensive veneer of 25 ft (8 m) of Quaternary sediment deposits consisting of well sorted eolian sand and sandy-gravelly materials near the bedrock interface.

The site is located in the northern portion of the Delaware Basin, a northerly-trending, southward plunging asymmetrical trough with structural relief of greater than 20,000 ft (6,096 m) on top of the Precambrian. The Basin was formed by early Pennsylvanian time, followed by major structural adjustment from Late Pennsylvanian to Early Permian time. Regional eastward tilting of the Basin occurred much later in the Cenozoic era.

Tectonic activity in the Basin is characterized by slow uplift relative to surrounding areas which has resulted in erosion and dissolution of rocks in the Basin. Faulting has not occurred in the northern Delaware Basin in the area of the site. The regional geology suggests that there have been no recent, dramatic changes in geologic processes and rates in the vicinity of the site.

The USGS shows that the Guadalupe fault is located 80 mi (129 km) west of the site. Little is known about this fault except that it is a normal fault, 3.6 mi (5.8 km) in length, and has a slip rate of less than 0.01 in/yr. The Guadalupe fault forms a scarp on unconsolidated Quaternary deposits at the western base of the Guadalupe Mountains in the Basin and Range physiographic province.

J.7.7 Biological Resources

The site does not support any vegetation of significance. The site is located primarily (roughly 98 percent) in an environment of Simona-Tonuca soils and includes varying combinations of sand, fine sands, loam, and gravel. The soil type affects the depth to which roots can grow and thus, the vegetative species in the area. The vegetation community for the site is Desert Grassland which contains both prairie grasses and shrubs and provides food and cover for specific types of wildlife.

There are three species considered "Species of Concern" within the habitat near the site. These include the Lesser Prairie Chicken (*Tympanuchus pallidicinctus*), the Sand Dune Lizard (*Sceloporus aerinicolus*), and Gypsum wild-buckwheat (*Eriogonum gypsophilum*). These species have not been located within the site and regulatory reviews and field inspections do not support the belief that they are present within the site.

There are no wetlands or unique habitats for threatened or endangered plant or animal species on the site.

J.7.8 Cultural and Paleontological Resources

Only three archaeological sites (LA 22116, 89675, and 89676) have been recorded within or immediately adjacent to the site. LA 22116, a non-structural site measuring 7.4 acres (2.9 ha) was identified in 1979 by New Mexico State University (NMSU). It contains fire-cracked rock and lithic debitage (the waste from tool manufacture), but is of unknown cultural and temporal affiliation. LA 89675 is a 7.4 acre (2.9 ha) non-structural Mogollon site dated at A.D. 750-1175. LA 89676 is of unknown cultural and temporal affiliation, measures 7.4 acres (2.9 ha), and contains fire-cracked rock and lithic debitage. These sites were identified in 1992.

The 6 mi (10 km) zone around the site contains 211 previously recorded archaeological sites.

J.7.9 Socioeconomics

Statistics for population, housing, and local transportation are presented for the region of influence, a three-county area in New Mexico, consisting of Chaves, Eddy and Lea Counties. The number of people that are covered within the 50 mi (80 km) radius indicates that approximately 20,000 people reside within 30 mi (48 km) of the site. Extending the radius another three miles captures an additional 30,000 people. More than 100,000 people reside just over 40 mi (64 km) from the site. The areas within the 30 mi (48 km) radius of the project are sparsely populated. The cities and urban areas in the study area are more than 30 mi (48 km) away. Altogether, approximately 115,000 people reside in the study area.

From 1990 to 2000, the study area population increased by almost four percent or approximately 4,200 people. The assumption is that the compound annual average growth rate experienced during the period July 1, 2001 to July 1, 2005 continues into the future. For the very near future the population projections should be useful. However, projections need to be updated every 3 to

5 years, especially for places like southeastern New Mexico that are undergoing rapid economic and demographic change.

J.7.10 Environmental Justice

The preliminary conclusion is that although there are census tracts within the 50 mi (80 km) radius that have minority percentages exceeding 64 percent, they are confined to the urban areas which are at least 30 mi (48 km) from the site.

From 1990 to 2000, the Hispanic population in the study area increased by 26 percent. In comparison, the overall study area population increased by only four percent. The younger age groups are represented by minority and Hispanic individuals while the older age groups are primarily Anglos or White Not Hispanic. The minority population comprised approximately 60 percent of the population who were younger than 10 years old and greater than 50 percent among the 10-19 years old.

J.7.11 Public and Worker Health and Safety

There are currently no existing facilities or structures on the site to contribute radiological or hazardous chemical contaminants to the environment. The closest facilities with the potential to contribute radiological or hazardous chemical contaminants are the Waste Isolation Pilot Plant (WIPP) and the National Enrichment Facility (NEF). The WIPP is located approximately 37 mi (60 km) southwest of the proposed GNEP sites, while the NEF is approximately 40 mi (64 km) southeast.

J.7.12 Transportation

The nearest transportation route to the site is U.S. Highway 62/180 (0.5 mi to the south [0.8 km]), which is the major route between Carlsbad and Hobbs, New Mexico. The nearest Interstate Highway is Interstate 20, 95 mi (153 km) to the southeast in Odessa, Texas.

Two railroads service the area. One railroad company operates to the west of the site and the other to the east. Southwestern Railroad operates the Burlington Northern-Santa Fe (BNSF) Carlsbad Subdivision (Carlsbad to Clovis, New Mexico, plus industrial spurs serving potash mines east of Carlsbad and east of Loving, New Mexico) under a lease agreement.

J.7.13 Waste Management

There are currently no existing facilities or structures on the Lea County site; therefore, no waste is produced and no waste management services provided.

J.8 OAK RIDGE RESERVATION

This section presents a summary of the affected environments for the Oak Ridge Reservation (ORR) and Oak Ridge National Laboratory (ORNL).

J.8.1 Land Use

ORR was established in 1943 as one of the three original Manhattan Project sites. It is located on 33,718 acres (13,645 hectares [ha]) in Oak Ridge, Tennessee, and includes ORNL, the Y-12 National Security Complex (Y-12), and the East Tennessee Technology Park (ETTP).

Land use at the ORR site includes industrial, mixed industrial, institutional/research, institutional/environmental laboratory, Black Oak Ridge Conservation Easement, and mixed research/future initiatives. Land within the mixed research/future initiative category includes land that is used or available for use in field research and land reserved for future U.S. Department of Energy (DOE) initiatives. Most mixed research and future initiatives areas are forested. Undeveloped forested lands on ORR are managed for multiple uses. Although soils that would be identified as prime farmland occur on the site, that designation is waived because they are within the city of Oak Ridge (DOE 2000g). Only a small fraction of ORR has been disturbed by Federal activities, including the construction and operation of facilities, roadways, or other structures (DOE 2005b).

The largest mixed use is biological and ecological research in the Oak Ridge National Environmental Research Park (ORNERP), which is on 20,000 acres (8,094 ha). The National Environmental Research Park, established in 1980, is used by the Nation's scientific community as an outdoor laboratory for environmental science research on the impact of human activities on the eastern deciduous forest ecosystem (DOE 2000g, DOE 2005b).

ORNL is primarily located within Bethel Valley between Haw and Chestnut Ridges, and covers 4,250 acres (1,720 ha) of land. The site is classified as an industrial area that encompasses a number of facilities dedicated to energy research. Lands bordering ORNL and ORR are predominantly rural and are used primarily for residences, small farms, forest land, and pasture land. The city of Oak Ridge, Tennessee, has a typical urban mix of residential, public, commercial, and industrial land uses. It also includes almost all of ORR (DOE 2000g, DOE 2005b).

The landscape at ORR is characterized by a series of ridges and valleys that trend in a northeast-to-southwest direction. The vegetation is dominated by deciduous forest mixed with some coniferous forest.

J.8.2 Visual Resources

The surrounding area consists mainly of rural land. Sensitive viewpoints affected by DOE facilities are primarily associated with Interstate 40, State Highways 58, 62, and 95, and Bethel Valley and Bear Creek Roads. The Clinch River/Melton Hill Lake, and the bluffs on the opposite side of the Clinch River also have views of ORR, but views of most of the existing DOE facilities are blocked by terrain and/or vegetation. Although only a small portion of State Highway 62 crosses ORR, it is a major route for traffic to and from Knoxville and other communities. The hilly terrain, heavy vegetation, and generally hazy atmospheric conditions limit views (DOE 2005b).

While a large part of ORNL is visible from Bethel Valley Road, it is not visible to persons in offsite locations because of the presence of the Haw and Chestnut Ridges.

J.8.3 Site Infrastructure

ORNL contains 217 mi (349 km) of improved roadways, including 37 mi (59.5 km) of paved roads. Two main branches provide rail service to the ORR (DOE 2005b).

Electrical power is supplied to ORNL and ORR by the Tennessee Valley Authority. Two transmission lines supply ORNL and vicinity. Total electrical energy availability to ORR from the Tennessee Valley Authority grid is 13,880,000 megawatt-hours per year. Total electrical energy consumption across ORR is about 726,000 megawatt-hours annually (DOE 2005b).

The Duke Energy Company supplies natural gas to ORNL. This company owns, operates, and maintains the main line and the three pressure-reduction stations that comprise the supply system to ORR. The system is designed with more capacity than is now demanded. However, contractual agreements do limit the amount of gas ORNL can demand (DOE 2005b).

Water for ORNL is taken from the Clinch River south of the eastern end of the Y-12 National Security Complex and pumped to the water treatment plant located on the ridge northeast of the Y-12 Plant. The treatment plant is owned and operated by the City of Oak Ridge and can supply water at a potential rate of 24 million gallons (gal)/day (991.8 million liters ([L]/day) to two storage reservoirs with a combined capacity of 7 million gal (26.5 million L). Water from the two reservoirs is distributed to the Y-12 Plant, ORNL, and the City of Oak Ridge (ORNL 2002).

J.8.4 Air Quality and Noise

ORNL is located entirely within Anderson County. The Environmental Protection Agency (EPA) has designated Anderson County as a basic non-attainment area for the 8-hour ozone standard, as part of the larger Knoxville basic 8-hour ozone non-attainment area that encompasses several counties, and for $PM_{2.5}$. For all other criteria pollutants for which EPA has made attainment designations, existing air quality in the greater Knoxville and Oak Ridge areas is in attainment with the National Ambient Air Quality Standards (NAAQS) (DOE 2006e).

Average radionuclide concentrations measured for the ORNL network were less than 1 percent of the applicable derived concentration guides (DCGs) in all cases (DOE 2006e).

ORNL holds a Title V permit that covers ten emission sources and a separate Title V permit for Environmental Management (EM) activities. No permit limits were exceeded in 2005. Cumulative actual criteria pollutant emissions from ORNL in 2004 were roughly one-thirtieth of the actual emissions from the Y-12 site. Current ORNL emissions would therefore have only a minor affect on regional criteria pollutant concentrations (DOE 2006e).

Radioactive airborne discharges at ORNL consist primarily of ventilation air from radioactively contaminated areas, vents from tanks and processes, and ventilation for hot cell operations and reactor facilities. These airborne emissions are treated and then filtered with high-efficiency particulate air filters or charcoal filters before discharge (DOE 2006e).

Radiological airborne emissions from ORNL include solid particulates, absorbable gases (e.g., iodine), tritium, and nonadsorbable gases (e.g., noble gases). The major radiological emission point sources for ORNL include five stacks located in Bethel and Melton Valleys (DOE 2006e).

Noise emission sources within ORNL include various industrial facilities, equipment, and machines (e.g., coolant systems, transformers, engines, pumps, boilers, steam vents, pager systems, construction equipment and materials-handlers, and vehicles). Most ORNL industrial facilities are far enough from the residential or commercial areas that noise levels from these sources are not measurable or are barely distinguishable from background levels. The most significant noise to nearby off-site receptors is due to traffic noise along State Highway 95 generated by personal vehicles and trucks that travel to and from ORNL (DOE 2005b).

Existing ORNL-related noises of public significance result from the transportation of people and materials to and from the site and in-town facilities primarily via private vehicles and trucks. A site-specific survey has not been conducted, but ambient noise levels in a rural environment such as the ORNL site boundary are typically in the 35-45 dB range (DOE 2005b).

J.8.5 Water Resources

The major surface water feature in the immediate vicinity of ORNL is the Clinch River, which borders ORR to the south and west. There are four major subdrainage basins on ORR that flow into the Clinch River and are affected by site operations: Poplar Creek, East Fork Poplar Creek, Bear Creek, and White Oak Creek.

The Clinch River and connected waterways supply raw water for ORNL. The ORR water supply system, which includes the city of Oak Ridge treatment facility (formerly the DOE treatment facility) and the East Tennessee Technology Park (ETTP) treatment facility, has a capacity of 24 to 32.1 million gal/day (90.8 to 121.5 million L/day) (DOE 2000g).

The Tennessee Valley Authority has conducted flood studies along the Clinch River, Bear Creek, and East Fork Poplar Creek, and has also performed probable maximum flood studies along the Clinch River. Based on the studies, most of ORNL is above the probable maximum flood elevation along the Clinch River (DOE 2000g).

The Clinch River is the only surface water body near ORNL classified for domestic water supply. In addition, the Clinch River and a short segment of Poplar Creek from its confluence with the Clinch River are also classified for industrial water supply use.

White Oak Creek and Melton Branch are the only streams not classified for irrigation. East Fork Poplar Creek is posted by the state of Tennessee with warnings against fishing and contact recreation (DOE 2000g). Wastewater treatment facilities are located throughout ORR, including six treatment facilities at Y-12 that discharge to East Fork Poplar Creek, and three treatment facilities at ORNL that discharge into White Oak Creek Basin.

These discharge points are included in existing National Pollutant Discharge Elimination System (NPDES) permits (DOE 2000b, Hughes et al. 2004). At ORNL, water samples are collected and analyzed from 18 locations around the reservation to assess the impact of past and current DOE operations on the quality of local surface water. Sampling locations include streams, both upstream and downstream of ORNL waste sources, and public water intakes.

Two broad hydrologic units have been identified on the ORR: 1) the Knox Aquifer, which includes the Maynardville Limestone and is highly permeable, and 2) the ORR Aquitards, which consist of the less permeable Rome Formation, Conasauga Group, excluding the Maynardville Limestone, and the Chickamauga Group. Active groundwater flow can occur at substantial depths in the Knox Aquifer (300 to 400 feet (ft) [91.4 to 121.9 meters {m}] deep). The Knox Aquifer is the primary source of groundwater to many streams (base flow), and most large springs on ORR receive discharge from the Knox Aquifer. Because of the abundance of surface water and its proximity to the points of use, very little groundwater is used at ORNL. Industrial and drinking water supplies are primarily taken from surface water sources. However, single-family wells are common in adjacent rural areas not served by the public water supply system (DOE 2000g).

Groundwater monitoring at ORNL consists of two components: the DOE Environmental Management and Enrichment Facilities (EMEF) groundwater monitoring program and the DOE Office of Science (OS) groundwater monitoring surveillance program (DOE 2006e). In the current ORNL program, groundwater quality wells are sampled on an annual basis (Hughes et al. 2004).

J.8.6 Geology and Soils

ORNL is in the southwestern portion of the Valley and Ridge physiographic province in east-central Tennessee. The topography consists of alternating valleys and ridges that have a southwest-northeast trend, with most facilities occupying the valleys. The topography reflects the underlying geology, which consists of a sequence of sedimentary rocks deformed by a series of major southeast-dipping thrust faults. The ridges are underlain by relatively erosion-resistant rocks, while weaker rock strata underlie the valleys (DOE 2005b).

Bedrock in the ORNL vicinity is of Early Cambrian (about 570 million years ago) to Ordovician Age (505 to 540 million years ago). The bedrock units encompass a wide variety of lithologies ranging from pure limestone to dolostone to fine sandstone. The total thickness of the stratigraphic section is about 1.6 miles (mi) (2.6 kilometers [km]). Four primary geologic units occur in the area. These include (from oldest to youngest) the Rome Formation, Conasauga Group, Knox Group, and Chickamauga Group (DOE 2005b).

There is no evidence of active capable faults in the Valley and Ridge physiographic province or within the rocks comprising the Appalachian Basin structural feature where ORNL is located. A capable fault is one that has had movement at or near the ground surface at least once within the past 35,000 years, or recurrent movement within the past 500,000 years (10 CFR Part 100). The nearest capable faults are approximately 298 mi (479.6 km) northwest in the New Madrid (Reelfoot Rift) Fault Zone. Historical earthquakes occurring in the Valley and Ridge are not attributable to fault structures in underlying sedimentary rocks, but rather occur at depth in basement rock (DOE 2005b). Numerous studies have been conducted as part of establishing the design-basis earthquake for evaluating and designing new ORR facilities. For this purpose, an earthquake producing an effective peak-ground acceleration of 0.15g has been established and calculated to have an annual probability of occurrence of about 1 in 1,000. For comparison, an earthquake with a peak acceleration of 0.32g has an annual probability of occurrence of 1 in 5,000 (DOE 2005b).

There is no volcanic hazard at ORNL. The area has not experienced volcanic activity within the last 230 million years (DOE 2005b).

Soils of ORNL are highly disturbed and would be classified as Urban Land. Urban Land includes areas where more than 80 percent of the surface is covered with industrial plants, paved parking lots, and other impervious surfaces (DOE 2005b). While there are soils that would be classified as prime farmland on ORR, that designation is waived within the ORR site boundary (DOE 2005b).

The ORNL main site is underlain primarily by calcareous siltstones and silty-to-clean limestone of the Chickamauga Group. No mineral resources have been identified at the site.

J.8.7 Biological Resources

Plant communities at ORNL are characteristic of the intermountain regions of central and southern Appalachia; only a small fraction of ORR has been disturbed by Federal activities. A portion of land was set aside for the Black Oak Ridge Conservation Easement, which is managed by the State of Tennessee.

The vegetation of ORR has been categorized into seven plant communities. Although outbreaks of southern pine beetles (*Dendroctonus frontalis*) killed over 1,100 acres (445 ha) of pine forests in 1994 and 1999 to 2000, pine and pine-hardwood forest is the most extensive plant community on the site. Another abundant community is the oak-hickory forest, which is commonly found on ridges. Northern hardwood forest and hemlock-white pine-hardwood forest are the least common forest community types on the site. Over 1,100 vascular plants species are found on ORR (DOE 2005b, ORNL 2002). ORNL in Melton Valley contains a variety of ecosystems that range from those that are greatly disturbed to some that are relatively undisturbed. Where the valley has been heavily disturbed, the current vegetation cover is primarily grass and weeds. Vegetation of the rest of the valley is typical of forests found throughout ORR. Relatively undisturbed second-growth forests of mixed oak-hickory occur on the ridges and dry slopes, while pine and pine-hardwood on the lower slopes and valleys are typical of abandoned, eroded farmland (DOE 1996a).

According to the ORNERP animal species found on the ORR include 64 amphibians and reptiles, 205 birds, and 34 mammals (USFWS 2007b). Fauna of Melton Valley are typical of

ORR and include the rat snake (*Elaphe obsolete*), black racer (*Coluber constrictor*), red-eyed vireo (*Vireo olivaceus*), scarlet tanager (*Piranga olivacea*), red-tailed hawk, red-shouldered hawk (*Buteo lineatus*), yellow-billed cuckoo (*Coccyzus americanus*), coyote, deer mouse, eastern gray squirrel (*Sciurus carolinensis*), southern flying squirrel (*Glaucomys volans*), and whitetail deer (DOE 2005b).

Aquatic habitat on or adjacent to ORNL and ORR ranges from small, free-flowing streams in undisturbed watersheds to larger streams with altered flow patterns due to dam construction. These aquatic habitats include tailwaters, impoundments, reservoir embayments, and large and small perennial streams. Aquatic areas in ORR also include seasonal and intermittent streams and old farm ponds (DOE 2005b). The minnow family has the largest number of species and is numerically dominant in most streams. Fish species representative of the Clinch River in the vicinity of ORR are shad, herring, common carp (*Cyprinus carpio*), catfish, bluegill (*Lepomis macrochirus*), crappie (*Pomoxis* spp.), and freshwater drum (*Aplodinouts grunniens*). The most important fish species taken commercially in the ORR area are common carp and catfish. Commercial fishing is permitted on the Clinch River downstream from Melton Hill Dam.

Thirty Federal- and state-listed threatened, endangered, and other special status species have been recently identified on the ORR (ORNERP). Among these are 26 birds, two mammals, one fish, and one amphibian and reptile. The spotfin chub (*Cyprinella monnacha*), both a Federal and state threatened species, has been sighted and collected in the city of Oak Ridge and is potentially present on the ORR (USFWS 2007b). Approximately 580 acres (235 ha) of wetlands occur on ORR, ranging in size from several square yards to about 25 acres (10 ha) (ORNL 2002). There are six wetlands at ORNL in the vicinity of the Radiochemical Engineering Development Center and the High Flux Isotope Reactor, including one small unclassified wetland; however, none are within the developed area.

J.8.8 Cultural and Paleontological Resources

At least ten major archaeological reconnaissance surveys have been conducted on the ORR. In 1993, an archaeological field review of the ORNL installation was conducted. In 1994, an intensive architectural and historic survey was conducted for the ORNL complex.

The project area has been assessed as having very low archaeological potential due to moderate to steep terrain, and drainages with low banks and wide floodplains. No historic archaeological resources are located within the ORNL complex, and the likelihood for intact historic archaeological resources is extremely low (Thomason and Associates 2004).

The majority of the geological units with surface exposures at ORR contain paleontological materials consisting primarily of invertebrate remains (DOE 2005b). These types of remains are relatively widespread and common, and as such, have relatively low research potential. Paleontological resources at ORNL would not be expected to differ from those found elsewhere on ORR.

J.8.9 Socioeconomics

Socioeconomic characteristics addressed at ORNL include employment, income, population, housing, and community services. These characteristics are analyzed for a four-county region of influence (ROI) consisting of Anderson, Knox, Loudon, and Roane Counties in Tennessee, in which 87.7 percent of all ORNL employees reside.

In 2003, ORNL employed 12,856 persons. The retail trade, state and local government, manufacturing, and healthcare and social assistance, sectors employ the greatest number of workers in the ROI (BEA 2006a and TtNUS 2006c). The retail trade sector provides more than 12 percent of all employment in the ROI, while the state and local government, healthcare and social assistance, and manufacturing sectors provide 11.5, 9.9, and 8.9 percent, respectively. Other important sectors of employment include professional and technical services (7.9 percent), accommodation and food services (7.6 percent), and administrative and waste services (7.1 percent) (BEA 2006a).

The labor force in the ROI increased 21.3 percent from 1990 to 2005 (BLS 2005b, TtNUS 2006c). In comparison, for the same period, the state-wide labor force in Tennessee increased 21.2 percent. Total employment in the ROI increased at a similar rate to the labor force, at 21.9 percent. The unemployment rate in the ROI decreased from 4.9 percent in 1990 to 4.4 percent in 2005. In comparison, the state-wide unemployment rate increased in Tennessee from 5.5 percent in 1990 to 5.6 percent in 2005 (BLS 2005b, TtNUS 2006c).

In 2004, per capita income in the ROI ranged from a high of $32,040 in Knox County to a low of $26,051 in Roane County (BEA 2006b). In 2004, per capita income in the ROI was $30,838, compared to the Tennessee per capita income of $29,844 (TtNUS 2006c). Per capita income increased in the ROI by 70.8 percent between 1990 and 2004, compared to a state-wide increase of 78.8 percent in Tennessee (BEA 2006b, TtNUS 2006c).

Between 1990 and 2005, the ROI population grew from 482,481 to 573,678, an increase of 18.9 percent (USCB 1990, USCB 2007f, TtNUS 2006c). This was a slower rate of growth than for Tennessee, which grew at a rate of 22.3 percent, during the same time period.

J.8.10 Environmental Justice

Census data from the year 2000 was used to determine minority and low-income characteristics by block group within 50 mi (80 km) of ORNL. Twenty-nine block groups have a significant Black or African American minority population, one census block group has a significant Asian population, and 29 block groups have significant aggregate minority percentages (TtNUS 2006c).

Based on the "more than 20 percent" or the "exceeded 50 percent" criteria, no American Indian or Alaskan Native, Native Hawaiian or Other Pacific Islander, some other race, multi-racial, or Hispanic ethnicity minority block groups exist in the geographic area (TtNUS 2006c).

Fifty-six census block groups within the 50 mi (80 km) radius have a significant percentage of low-income households (TtNUS 2006c).

J.8.11 Public and Worker Health and Safety

An individual's radiation exposure in the vicinity of ORNL amounts to approximately 390 mrem, and is comprised of natural background radiation from cosmic, terrestrial, and internal body sources; radiation from medical diagnostic and therapeutic practices; weapons test fallout; consumer and industrial products; and nuclear facilities. Annual background radiation doses to individuals are expected to remain constant over time. The total dose to the population, in terms of person-rem, changes as the population size changes. Background radiation doses are unrelated to ORNL operations (DOE 2000g).

Releases of radionuclides to the environment from ORNL operations provide another source of radiation exposure to individuals in the vicinity of ORNL. ORNL worker doses have typically been well below DOE worker exposure limits (ORNL 2004a).

The average radiation dose recorded for workers at ORNL with a measurable dose in 2005 was 71 mrem (DOE 2005b). ORNL workers receive the same dose as the general public from background radiation, but they also may receive an additional dose from working in facilities with nuclear materials. These doses fall within the radiological regulatory limits of 10 CFR Part 835. The number of projected latent cancer fatalities (LCFs) among ORR workers from normal operations in 2003 is 0.02. For the population living within 50 mi (80 km) of ORNL 0.002 excess fatal cancers are projected from normal ORNL operations.

J.8.12 Transportation

Vehicles access to ORNL is via three State Routes: State Route 95 forms an interchange with Interstate 40 and enters the reservation from the south approximately 1 mi (2 km) to the west of ORNL's main complex; State Route 58 enters ORR from the west and passes just south of the East Tennessee Technology Park; and State Route 62 provides access from the east.

The Norfolk Southern main line from Blair provides easy access to the East Tennessee Technology Park. No tracks run to the ORNL (DOE 2005b). ORNL is bordered by the Clinch River on the south, but no barge facility has been developed.

J.8.13 Waste Management

ORNL generates waste from its ongoing operations and from cleanup and decommissioning and demolition projects. ORNL has 344 sites that are contaminated to the extent that they require monitoring and remediation and the waste quantities from these activities are expected to increase (ORNL 2002). The following types of waste are generated from operations: transuranic (TRU); low-level radioactive; mixed low-level radioactive; hazardous; and nonhazardous including sanitary solid waste, industrial waste and construction debris, sanitary sewage, and process wastewater. In addition, TRU waste mixed with *Resource Conservation and Recovery Act* (RCRA) hazardous waste, and waste mixed with PCBs which are regulated under the *Toxic*

Substances Control Act (TSCA), are generated by cleanup and decommissioning and demolition activities (40 CFR Parts 239-299), (15 U.S.C. 2601 et seq.).

Waste management responsibilities at ORNL are shared between the generator (i.e., ORNL) and the waste management contractor. The generator is responsible for collecting, characterizing, and certifying the waste prior to receipt by the waste management contractor. The waste management contractor is then responsible for storage, transport, treatment, and disposal operations (ORNL 2002).

J.9 PADUCAH SITE

This section presents a summary of the affected environments for the Paducah Site. The information was summarized from the Site Characterization Report prepared by the Funding Opportunity Announcement (FOA) grant recipient (SCR 2007e).

J.9.1 Land Use

The Paducah Site covers an estimated 3,556 acres (1,439 hectares [ha]) currently held by U.S. Department of Energy (DOE) in rural McCracken County of western Kentucky. The city of Paducah is located approximately 10 miles (mi) (16 [km]) east of the site, and the Ohio River runs 3.6 mi (5.8 km) north of the Paducah Site.

The Paducah Gaseous Diffusion Plant occupies a 750 acre (303.5 ha) complex within the Paducah Site. The Paducah Site is heavily developed and includes approximately 115 buildings with a combined floor space of an estimated 8.2 million square feet (ft^2) (0.76 million square meters [m^2]). In 1994, the Paducah Site was placed on the Environmental Protection Agency (EPA) National Priorities List (NPL), a list of hazardous waste sites across the nation that the EPA has designated as high priority for site remediation. The NPL designation was assigned primarily because of groundwater contamination with trichloroethylene (TCE) and Technetium-99 (Tc-99), which were first detected in 1988. As a site on the NPL, the Paducah Site would undergo remediation efforts that met the requirements set forth by *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) (42 U.S.C. 9610). The City of Paducah is the largest urban area in the six counties surrounding the Paducah Site. The six-county area in which the site is located is primarily rural, with industrial uses accounting for less than 5 percent of the land use.

J.9.2 Visual Resources

The Paducah Site is characterized by a flat, rural landscape. Over 90 percent of the land surrounding the site is either undeveloped or serves as agricultural lands. The Ohio River flows 3.6 mi (5.8 km) north of the site. SR 358 (Ogden Landing Road) provides public access through the northern section of the Paducah Site.

J.9.3 Site Infrastructure

The Paducah Site has the infrastructure to functions as a standalone operation, with the exception of imported electrical power and telecommunications. The site is served by two interstate highways, several U.S. and state highways, several rail lines, barge service, and a regional airport (DOE 2004d). There are 9 mi (14 km) of railroad and 19 mi (31 km) of road on site.

Eighteen 161 kilovolt (kV) transmission lines deliver power to the site from three separate providers (Tennessee Valley Authority, Electric Energy, Inc., and Kentucky Utilities). Peak electrical demand is about 2,000 megawatts (MW) with a site capacity of 3,040 MW.

The Paducah Site has waste management systems in place for treatment and disposal of hazardous, non-hazardous, and radioactive waste. The Paducah Site steam plant burns coal to generate steam used primarily to heat non-production facilities. Annual coal consumption is nearly 33,100 tons (30,000 metric tons [MT]). All water (potable, process, fire) used by the site is obtained from the Ohio River through an intake at the steam plant near the Shawnee Power Plant north of the site.

J.9.4 Air Quality and Noise

The Paducah Site is located in the humid continental zone, characterized by warm summers and moderately cold winters. Tornadoes are rare in the area surrounding the Paducah Site.

The Paducah Site is located in the Paducah-Cairo Interstate Air Quality Control Region (AQCR), which covers the westernmost parts of Kentucky. McCracken County currently is designated as being in attainment for all criteria pollutants (40 CFR 81.318). Major air pollution sources around the Paducah Site in Kentucky include United States Enrichment Corporation (USEC) and the Tennessee Valley Authority's (TVA) coal-fired Shawnee Power Plant, about 3 mi (5 km) northeast of the Paducah Site. Potential radionuclide sources from the Paducah Site in 2000 were the Drum Mountain Removal Project, Northwest Plume Groundwater System, and fugitive emission sources. Ambient air monitoring stations in and around the site mainly collect data on radionuclides released from the site. Monitoring results showed that all airborne radionuclide concentrations in the surrounding area were at or below background levels.

The noise-producing activities within the Paducah Site are associated with processing and construction activities and local traffic, similar to those at any other industrial site. During site operations, noise levels near the cooling towers are relatively high, but most noise sources are enclosed in the buildings. Another noise source is associated with rail traffic in and out of the Paducah Site. In particular, train whistle noise, at a typical noise level of 95 to 115 dB (A), is high at public grade crossings. Currently, rail traffic noise is not a factor in the local noise environment because of infrequent traffic (one train per week).

J.9.5 Water Resources

The Paducah Site existing water supply plant obtains water from the Ohio River through an intake near the TVA Shawnee Fossil Plant. The Paducah Site water supply plant's capacity is about 30 million gallons per day (gal/day) (113.6 million liters per day [L/day]), which is approximately double the current requirement for the Paducah Site. The State of Kentucky has created a permitting system to allocate groundwater resources. Any person, business, industry, city, county, water district or other political subdivision desiring to withdraw, divert, or transfer public water must register with the Cabinet and submit an application for a permit if not exempted by the law. The regional gravel aquifer and sections of the McNairy Flow System are contaminated with volatile organic compounds (VOCs) and radiological components. Plumes emanating from the Paducah Site are located to the southwest, northwest, and northeast and generally flow north toward the Ohio River. Big Bayou Creek and its main tributary receive discharges of treated process water and sanitary wastewater through KPDES-permitted outfalls.

Flooding is associated with the Ohio River, Big Bayou Creek, and Little Bayou Creek. The majority of overland flooding is associated with the Ohio River floodplain.

Floodplains outside the DOE property have been mapped by the Federal Emergency Management Agency but no floodplain determination has been made within the DOE property. The minimum elevation of the proposed site is approximately 380 feet (ft) (116 meters [m]), which is above both the 100-year floodplain level (333 ft [101 m] elevation) and the historical high water level (1937 flood level of 342 ft [104 m]) for the Ohio River.

J.9.6 Geology and Soils

The topography of the Paducah Site is relatively flat. The Paducah Site is located near the northern end of the Mississippian Embayment, which is characterized by unconsolidated Cretaceous, Tertiary, and Quaternary sediments that dip gently to the south and overlie indurated Paleozoic limestone and shale bedrock. Several zones of faulting occur in the vicinity of the site. These zones include the New Madrid, St. Genevieve, Rough Creek, Cottage Grove, Wabash Valley, and Shawneetown fault zones. In addition, there is a northeast-trending rift zone. The area near the site has been the location of some of the largest earthquakes that have occurred in North America. The largest recorded earthquakes that occurred in the vicinity of the site happened between 1811 and 1812. Four of the earthquakes had Modified Mercalli intensities (MMI) that ranged from IX to XI. The largest earthquakes that have occurred since then were on January 4, 1843, and October 31, 1895, with body wave magnitude estimates of 6.0 and 6.2, respectively. In addition to these events, seven events of magnitude greater than 5.0 have occurred in the area. Since 1895, more than 4,000 earthquakes have been located in the zone. For the Paducah Site, the evaluation basis earthquake (EBE) was designated by DOE to have a return period of 250 years. A detailed analysis indicated that the peak ground motion for the EBE was 0.15 times the acceleration of gravity. An earthquake of this size would have an equal probability of occurring any time during a 250-year period, which approximately correlates to an MMI of VII.

J.9.7 Biological Resources

The DOE property between the Paducah Site and the surrounding West Kentucky Wildlife Management Area consists primarily of open, frequently mowed grassy areas. The DOE property also includes several small upland areas of mature forest, old-field, and transitional habitats. The habitats at the Paducah Site support a relatively high diversity of wildlife species.

Common species of the surrounding West Kentucky Wildlife Management Area and undeveloped areas of the Paducah Site outside the Paducah Site fence line include white-tailed deer, red fox, raccoon, opossum, coyote, turkey, and bobwhite quail. Ground-nesting species include the white-footed mouse, bobwhite, and eastern box turtle. Bayou Creek, upstream of the Paducah Site, supports aquatic fauna indicative of oxygen-rich, clean water, including 14 fish species. Aquatic species just downstream of the Paducah Site discharge points include 11 fish species.

Although no occurrence of federally listed plant or animal species on the Paducah Site itself have been documented, the Indiana Bat (Federal- and state-listed as endangered) has been found near the confluence of Bayou Creek and the Ohio River 3 mi (5 km) north of the Paducah Site.

Although no wetlands are identified on the Paducah Site by the National Wetlands Inventory, approximately 5 acres (2 ha) of jurisdictional wetlands have been identified in drainage ditches scattered throughout the Paducah Site. Several wetland areas occur on the Paducah Site and total approximately 7.2 acres (2.9 ha). The open area in the northern portion of this location is crossed by several drainage ditches and swales that contain wetlands. The northernmost of these drainages conveys storm water from the cylinder storage yard to KPDES Outfall 017, located west of the Paducah Site entrance road.

J.9.8 Cultural and Paleontological Resources

In 1994, the United States Department of the Army (USDOA) completed a cultural resources survey (CRS) of 1,653 acres (669 ha) surrounding the Paducah Site. Besides presenting the results of the 1994 survey, it also included data from a survey conducted in 1932 by the University of Kentucky. In 2004, forty-one sample survey units were examined. Three of the 41 survey units were located within the proposed site. No pre-historic or historic sites were discovered within those three aforementioned survey units. No determinations of eligibility for listing in the National Register of Historic Places (NRHP) were made at that time.

J.9.9 Socioeconomics

Socioeconomic data for the Paducah Site focus on a region of influence (ROI) surrounding the site consisting of six counties: Ballard, Carlisle, Graves, Marshall, and McCracken Counties in Kentucky, and Massac County in Illinois. More than 92 percent of Paducah workers currently reside in these counties.

The population of the ROI in 2000 was 161,465 people and 65,514 people (41 percent of the ROI total) resided in McCracken County, with 26,307 of them residing in the City of Paducah.

In 2000, total employment in the ROI was 67,866. The economy of the ROI is dominated by the trade and service industries, with employment in these activities currently contributing 60 percent of all employment in the ROI.

In the ROI, total personal income grew at an annual rate of 2.1 percent over the period 1990 through 2000.

J.9.10 Environmental Justice

Based on data from the 2000 census, of the 173 census tracts within 50 mi of the proposed site, 42 had minority populations in excess of state percent minority (SCR 2007e). As recommended by the Council on Environmental Quality (CEQ) guidelines, the environmental justice analysis identifies low-income populations as those falling below the statistical poverty level identified annually by the U.S. Bureau of the Census in its Series P-60 documents on income and poverty. Based on data from 2000, of the 173 census tracts within 50 mi (80 km) of the then-proposed conversion facility at Paducah, 109 had low-income populations in excess of state-specific thresholds—a total of 118,029 low-income persons in all. In McCracken County in 1999, 15.1 percent of the individuals for whom poverty status was known were low-income (SCR 2007e, DOE 2004d).

J.9.11 Public and Worker Health and Safety

Operations at the Paducah Site result in radiation exposure of both on-site workers and off-site members of the general public. Exposures of onsite workers generally are associated with the handling of radioactive materials used in the on-site facilities and with the inhalation of radionuclides released from processes conducted on site. Offsite members of the public are exposed to radionuclides discharged from onsite facilities with airborne and/or waterborne emissions and, in some cases, to radiation emanated from radioactive materials handled in the on-site facilities. The total radiation dose to a maximally exposed individual (MEI) of the general public is estimated to be 1.9 mrem/year (yr), which is much lower than the maximum radiation dose limit set for the general public of 100 mrem/yr.

Permissible exposure limits (PELs) for uranium compounds and hydrogen fluoride in the workplace (29 CFR Part 1910) are as follows: 0.05 mg/m^3 for soluble uranium compounds, 0.25 mg/m^3 for insoluble uranium compounds, and 2.5 mg/m^3 for HF. Paducah worker exposures are kept below these limits.

J.9.12 Transportation

The Paducah Site is located in an area with an established highway network. The area is served by an interstate highway, several U.S. and state highways, and local roads and freeways. The Site is surrounded by the West Kentucky Wildlife Management Area, which in turn is bordered on the west by Route 1132 and on the west by State Highway 996. These two roadways do not access the Site. Two roads provide access to Paducah Site. Along the northern border is the east-west rural major collector State Highway 358. Along the southern border lies State Highway 725; this interchanges with an access road, Route 1154. Route 1154 is a freeway connecting the Site with US Highway 60, which is approximately 3 mi (4.8 km) to the south.

The onsite network of roadways is approximately 19 mi (30.6 km) in distance. State Highway 358 links the Site with the greater area through an interchange with Interstate 24 to the east between the Site and the City of Paducah, which lies approximately 10 mi (16 km) to the east. US Highway 60 travels east-west linking the City of Paducah with Missouri to the west and Louisville to the east. US Highway 60 also has an interchange with Interstate 24. The US Highway in the area that traverses north-south is US Highway 45. It travels from the Tennessee border to the south through Paducah and into Illinois.

DOE owns an onsite railway system, a spur from the Paducah and Louisville rail line. The Paducah and Louisville rail lines also serve the Paducah-McCracken Riverport for transferring shipments to and from Ohio River barges. The onsite system is composed of approximately 9 mi (14 km) of track). Rail traffic is approximately one train per week. The Paducah Site can be served by barge transportation via the Ohio River.

J.9.13 Waste Management

The Paducah Site generates wastewater, solid low level waste (LLW), solid and liquid mixed low level waste (MLLW), nonradioactive hazardous waste, and nonradioactive nonhazardous solid waste. Wastes generated from site operations and environmental restoration is managed by DOE. DOE also manages the disposal of waste generated from ongoing management of the DOE-generated DUF_6 cylinders currently in storage. Wastewater at the Paducah Site consists of nonradioactive sanitary and process-related wastewater streams, cooling water blowdown, and radioactive process-related liquid effluents. Wastewater is processed at on-site treatment facilities and is discharged to Bayou Creek or Little Bayou Creek through eight permitted outfalls. The total capacity of the site wastewater control facilities is approximately 1.75 million gal/day (6.6 million L/day). Solid waste—including sanitary refuse, cafeteria waste, industrial waste, and construction and demolition waste—is collected and disposed of at the on-site landfill, which consists of three cells. The landfill is permitted for 1 million cubic yards (yd^3) (764,600 cubic meters [m^3]) per Permit KY073-00045.

The site has a permit that authorizes it to treat and store hazardous waste in 10 treatment units, 16 tanks, and 4 container storage areas at the site. Several additional 90-day storage areas for temporary storage of hazardous waste are located on the site. LLW generated at the Paducah Site is stored on site pending shipment to a commercial facility in Tennessee for volume reduction.

J.10 PORTSMOUTH SITE

This section presents a summary of the affected environments for the Portsmouth Site (Portsmouth). The information was summarized from the Site Characterization Report prepared by the Funding Opportunity Announcement (FOA) grant recipient (SCR 2007f).

J.10.1 Land Use

The Portsmouth Site is located on the U.S. Department of Energy (DOE) Reservation in Piketon, Ohio. It covers an estimated 3,714 acres (1,500 hectares [ha]) located in Pike County, approximately 22 miles (mi) (35 kilometers [km]) north of the Kentucky/Ohio state line and 3 mi (5 km) southeast of the town of Piketon in south-central Ohio. The Portsmouth Gaseous Diffusion Plant (PGDP) was previously operated by DOE and then by the United States Enrichment Corporation (USEC). Uranium enrichment operations were discontinued in May 2001, and the plant has been placed in cold standby, a non-operational condition in which the plant retains the ability to resume operations within 18 to 24 months. Currently, NRC has given USEC a license to locate the American Centrifuge Program at the Portsmouth Site. The facility will be located on approximately 200 acres (81 ha) of the southwest quadrant of the controlled access area.

Of the 3,714 acre (1,500 ha) Portsmouth Site, 800 acres (320 ha) comprise the fenced core area which contains the former uranium enrichment operation facilities. The 2,914 acres (1,180 ha) outside the core area include restricted buffers, waste management areas, plant management and administrative facilities, gaseous diffusion plant support facilities, and vacant land. The site is heavily developed and includes approximately 150 buildings, trailers, and sheds.

J.10.2 Visual Resources

The Portsmouth Site is characterized by a primarily flat, rural landscape. Over 90 percent of the land surrounding the site is either undeveloped or serves as grazing or agricultural lands. SR 23 runs parallel to the western border of the Portsmouth Site less than 1 mi (2 km) away. It provides limited public views to the site due to the forested portions of the surrounding site area, which partially obscure the view of the facilities at the Portsmouth Site.

J.10.3 Site Infrastructure

The PGDP was constructed in the mid-1950s. The Portsmouth Site has an on-site steam plant, water treatment plant, wastewater treatment plant, and storm water management system. The DOE Reservation is the largest industrial user of water in the vicinity and obtains its water supply from an on-site X-611 Water Treatment Facility that draws water from three well fields located along the Scioto River. The maximum potential production associated with the well fields is 13 million gallons per day (gal/day) (49 million liters per day [L/day]). The current production is approximately 5 million gal/day (19 million L/day).

The Portsmouth Site is supplied electricity by the Ohio Valley Electric Corporation. Sewage treatment at the site is provided by the X-6619 Sewage Treatment Facility. The system is activated sludge using plug flow processes, aerobic digestion, secondary clarification, and granular-media filtration for effluent polishing. Post-chlorination is used to produce a bacteriologically safe effluent, and the final product is dechlorinated with sulfur dioxide before discharge to the Scioto River at National Pollutant Discharge Elimination System (NPDES) Permit Outfall 003. The X-6619 Sewage Treatment Plant has a design capacity of 700,000 gal/day (2,649,780 L/day) and currently has 400,000 gal/day (1,514,160 L/day) excess capacities available. The proposed site has a developed and functioning storm water system consisting of open ditch and some very limited storm drains adjacent to the existing buildings that discharge to open ditches.

J.10.4 Air Quality and Noise

The Portsmouth Site is located in the humid continental climatic zone and has weather conditions that vary greatly throughout the year. Tornadoes are rare in the area surrounding the Portsmouth Site, and those that do occur are less destructive in this region than those occurring in other parts of the Midwest. For the period from 1950 through 1995, 656 tornadoes were reported in Ohio, with an average of 14 tornadoes per year. For the same period, 3 tornadoes were reported in Pike County, but most of those were relatively weak, at most, F2 of the Fujita tornado scale.

The Portsmouth Site is located in the Wilmington-Chillicothe-Logan Intrastate Air Quality Control Region (AQCR), which covers the south-central part of Ohio. Currently, Pike County is designated as being in attainment for all criteria pollutants. Ambient concentration data for criteria pollutants around the site are not available. On the basis of 2003 monitoring data, the highest concentration levels for SO_2, NO_2, CO, PM_{10}, and Pb representative of the region near the Portsmouth Site are less than 44 percent of their respective National Ambient Air Quality Standards (NAAQS). However, the highest O_3 and $PM_{2.5}$ concentrations are approaching or are somewhat higher than the applicable NAAQS. These high ozone concentrations of regional concern are associated with high precursor emissions from the Ohio Valley region and long-range transport from southern states.

Nonradiological air emissions from the USEC are predominant sources in Pike County. Currently, USEC has three Ohio Environmental Protection Agency (OEPA) operating permits. These emissions are associated with the boilers at the X-600 steam plant (which provides steam for the Portsmouth reservation), a boiler at the X-611 water treatment plant, an emergency generator, and a trash pump (DOE 2004b). DOE operates numerous small sources that release criteria pollutants and volatile organic compounds (VOCs). Other emission sources at DOE, which include two landfill venting systems, two glove boxes (not used in 2001), two aboveground storage tanks in the X-6002A fuel oil storage facility, and two groundwater treatment facilities, emit less than 1.0 ton (0.9 metric tons [MT]) per year of conventional air pollutants (on an individual basis).

J.10.5 Water Resources

The Portsmouth reservation is within the Lower Scioto River watershed. Surface waters drain from the Portsmouth Site via a network of tributaries to the Scioto River located approximately 2 mi (3.2 km) to the west. The average flow in the Scioto River is 2.1 x 10^6 gallons per minute

(7.9 x 10^6 liters per minute). The Scioto River discharges into the Ohio River approximately 25 mi (40 km) south and downstream of the reservation. There are no known public- or private-water supplies drawn from this section of the Scioto River. Storm water at the Portsmouth Site is collected by a series of storm water sewers and open culverts. The reservation has eight specific storm water collection areas, which transmit the storm water flow to one of the onsite streams or ditches. The largest stream on the Portsmouth Site is Little Beaver Creek, which discharges into Big Beaver Creek, which then discharges into the Scioto River.

The surface water features that drain the Portsmouth reservation as well as the Scioto River and their designated uses are as follows:

– Little Beaver Creek: State Resource Water; Warm Water Habitat; Agricultural Water Supply; Industrial Water Supply; and Primary Contact Recreation.
– Big Run Creek: Warm Water Habitat; Agricultural Water Supply; Industrial Water Supply; and Primary Contact Recreation.
– DOE Piketon Tributary: Limited Resource Water; Agricultural Water Supply; Industrial Water Supply; and Secondary Contact Recreation.
– West Ditch: Warm Water Habitat; Agricultural Water Supply; Industrial Water Supply; and Secondary Contact Recreation.
– Scioto River: Warm Water Habitat; Public Water Supply; Agricultural Water Supply; Industrial Water Supply; and Primary Contact Recreation.

The domestic wastewater generated by the offices and change houses is treated on the reservation at the sewage treatment plant. The design capacity of the sewage treatment plant is 601,000 gallons per day (gal/day) (2.3 million liters per day [L/day]), and in 2003, the facility operated at 27 percent of that capacity. The discharge from the sewage treatment plant is within its National Pollutant Discharge Elimination System permit criteria.

The Portsmouth reservation has not been affected by flooding of the Scioto River. The highest recorded flood elevation of the Scioto River in the vicinity of the site was 570 feet (ft) (174 meters [m]) above mean sea level in January 1913. The reservation occupies an upland area at an elevation of 670 ft (204 m) above mean sea level.

Groundwater quality has been studied extensively as part of DOE’s environmental restoration activities. Groundwater quality is monitored for radioactive and nonradioactive constituents in 11 areas at and near the facility using more than 400 wells. On site, five areas of groundwater contamination have been identified that contain contaminants. The main contaminants are VOCs (mostly trichloroethylene) and radionuclides (e.g., uranium, technetium-99). Data from the 2000 annual groundwater monitoring showed that five contaminants exceeded primary drinking water standards at the Portsmouth Site: beryllium, chloroethane, americium, trichloroethylene, and uranium. Alpha and beta activity also exceeded the standards. The concentration of contaminants and the lateral extent of the plume did not significantly increase in 2001.

J.10.6 Geology and Soils

The topography of the Portsmouth Site area consists of steep hills and narrow valleys, except where major rivers have formed broad floodplains. The site is underlain by bedrock composed of shale and sandstone. Surface and near-surface geology at the site have been heavily influenced by glaciation and the resultant ice damming and drainage reversals.

The Portsmouth Site is within 60 mi (96 km) of the Bryand Station-Hickman Creek Fault (DOE 2004b). The largest recorded seismic event in this zone was the Sharpsburg, Kentucky, earthquake of July 1980. That earthquake registered a magnitude of 5.3 and a Modified Mercalli intensity of VII. For this site, the evaluation-basis earthquake (EBE) was designated by DOE to have a return period of 250 years. The USGS earthquake database shows that 9 earthquakes have occurred within 62 mi (100 km) of the site since 1973. The magnitudes of the earthquakes ranged from 1.60 to 4.40. The closest earthquake was a distance of 21 mi (34 km), had a magnitude of 3.5 and occurred at a depth of 7 mi (11 km). This earthquake occurred August 17, 1983.

J.10.7 Biological Resources

The vegetative cover in surrounding Pike County consists mostly of hardwood forests and field crops. The most common type of vegetation on the Portsmouth Site is managed grassland, which makes up about 1,100 acres (445 ha). Grasses are the dominant species in these communities.

The other types of habitat on the site include oak-hickory forest which covers 17 percent of the site and occurs on well-drained upland areas; old-field communities, approximately 11 percent of the site, consisting of tall weeds, shade-intolerant trees and shrubs that occur in previously disturbed areas; upland mixed hardwood forest which also covers 11 percent of the site and consists of black walnut, black locust, honey locust, black cherry, and persimmon in these mesic to dry upland communities; and riparian forest which occurs in low, periodically flooded areas near streams, makes up four percent of the site, and for which the dominant species are cottonwood, sycamore, willows, silver maple, and black walnut.

Within the area surrounded by Perimeter Road, the Portsmouth Site consists primarily of open grassland (including areas maintained as lawns) and developed areas consisting of buildings, paved areas, and storage yards. Wetlands are also located around one of the Cylinder Storage Yards and are associated with the tributaries of Little Beaver Creek. The flora associated with the wetlands includes emergent vegetation including sedges, rushes, cat-tails, and various woody species (trees and shrubs) tolerant of the saturated conditions of wetlands.

A wetland survey of the Portsmouth Site was conducted in 1995. Approximately 34 acres (84 ha) of wetlands occur on the site, excluding retention ponds. Forty-one wetlands meet the criteria for jurisdictional wetlands, while four wetlands are non-jurisdictional. Wetlands on the site primarily support emergent vegetation that includes cattail, great bulrush, and rush. Palustrine forested wetlands occur on the site along Little Beaver Creek.

No occurrence of federally listed plant or animal species has been documented on the Portsmouth Site.

J.10.8 Cultural and Paleontological Resources

An archaeological reconnaissance was performed in September 1996, April 1997, and May 1997 on the entire Portsmouth Site, with the exception of areas occupied by plant-related buildings or structures, sanitary landfills, or lagoons. The surveys resulted in the identification of 36 previously undocumented archaeological sites within the boundary of the Portsmouth Site. The 36 sites included 13 remnants of historic farmsteads, seven historic scatters or open refuse dumps, two historic isolated finds, four Portsmouth Site plant related structural remnants, one historic cemetery, five prehistoric isolated finds, two prehistoric lithic scatters, and two sites that contained both prehistoric and historic temporal components, an historic cemetery with a prehistoric isolated find, and a prehistoric lithic scatter on a historic farmstead.

J.10.9 Socioeconomics

Currently, approximately 92 percent of workers reside in the four selected counties. Geographically, Ross, Jackson, and Scioto counties bound Pike County to the North, East and South, respectively.

The major population centers in the four county region of influence are as follows:

– **Piketon** is the nearest residential center to the Portsmouth Site. Located in Pike County, this town is approximately 4 mi (6.4 km) north of the Portsmouth Site on U.S. Route 23. In 2000, the population of Piketon was 1,907.
– **Waverly** is the largest town in Pike County. Located 8 mi (13 km) north of the Portsmouth Site, the population of Waverly was 4,433 in 2000.
– **Chillicothe**, which is located in Ross County, is the largest population center in the region of influence. Chillicothe is 27 mi (43 km) north of the Portsmouth Site, and had a population of 21,796 in 2000.
– **Portsmouth** is in Scioto County and is 27 mi (43 km) south of the Portsmouth Site. The population of Portsmouth was 20,909 in 2000.
– **Jackson** is located in Jackson County and is 26 mi (42 km) east of the Portsmouth Site. In 2000, Jackson’s population was 6,184.

The population of the region of influence was 212,876 people in 2000, having grown 4.3 percent since 1990. This growth was marginally lower than the Ohio population growth rate of 4.7 percent in the same decade.

J.10.10 Environmental Justice

In 2000, of the 206 census tracts within 50 mi (80 km) of the proposed conversion facility at Portsmouth, 12 had minority populations in excess of state-specified thresholds, a total of 7,735 minority persons in all. Within the region of influence, as well as in Pike County, 3.7 percent of the population is minority. There are two census tracts in which minority populations either exceed 50 percent and/or are significantly greater than the State or county percentage.

In 1999, of the 206 census tracts within 50 mi (80 km) of the proposed facilities at Portsmouth, 142 had low-income populations in excess of state-specified thresholds, a total of 133,303 low-income persons in all. In Pike County, 18.6 percent of the individuals for whom poverty status was known in 1999 were low-income. There are 18 census tracts in which low-income populations either exceed 50 percent and/or are significantly greater than the State or county percentage.

J.10.11 Public and Worker Health and Safety

The maximum radiation dose to an off-site member of the public as a result of on-site facility operations is estimated to be 2.0 millirem/year (mrem/yr), which is significantly less than the NRC or DOE dose limit for the general public and the 40 CFR Part 190 regulatory limits of 25 mrem/yr for uranium fuel-cycle facilities. According to USEC, the Portsmouth Site reservation worker average whole body dose is less 10 mrem/yr. Radiation exposures of the cylinder yard workers include exposures from activities performed outside the cylinder yards. The average dose in 2001 was 64 mrem/yr. That dose is considerably below the maximum dose limit of 5,000 mrem/yr set for radiation workers (10 CFR Part 835). The average dose in 2001 for all monitored DOE/Portsmouth employees and subcontractors was 1.85 mrem/yr.

Two of the key chemicals of concern—soluble and insoluble uranium compounds and hydrogen fluoride—are historically below permissible exposure limits. Other chemicals have been measured over the years at various levels at the Portsmouth Site. Some of these levels have approached or exceeded occupational health benchmarks. For example, arsenic levels ranged up to 2.1 milligrams per cubic meter (mg/m^3), which is higher than the permissible exposure limit of 0.01 mg/m^3, and lead levels ranged up to 19.5 mg/m^3, which is higher than the permissible exposure limit of 0.050 mg/m^3. Several other such examples exist. The measured levels were at the upper ends of the relevant ranges and the permissible exposure limits for eight-hour time weighted averages.

J.10.12 Transportation

The Portsmouth Site is served directly by road and rail. The site is 3.5 mi (5.6 km) south of the intersection of the U.S. Route 23 and Ohio SR 32 interchange. Two rail carriers, CSX and Norfolk Southern, service Pike County. The Norfolk Southern rail line is connected to the CSX Transportation Inc. rail line via a rail spur entering the northern portion of the site. The onsite system is used infrequently.

The site can be served by barge transportation via the Ohio River at the ports of Wheelersburg, Portsmouth, and New Boston. The Portsmouth barge terminal bulk-materials-handling facility is available for bulk materials and heavy unit loads. Nearby barge terminals on the Ohio River can be accessed by public road.

The nearest airport is the Greater Portsmouth Regional Airport located approximately 15 mi (24 km) south of the site. Three international airports are within a two-hour drive of the site: Cincinnati/Northern Kentucky International Airport, Dayton International Airport, and Port Columbus International Airport.

J.10.13 Waste Management

Waste is generated at the Portsmouth Site from DOE cleanup activities and its monitoring activities for stored waste including depleted uranium hexafluoride (UF_6) cylinders, hazardous waste, and classified/sensitive waste. DOE waste types are low-level radioactive waste, mixed (radioactive and *Resource Conservation and Recovery Act* [RCRA] hazardous) waste, RCRA hazardous waste, *Toxic Substances Control Act* (TSCA) waste, and mixed TSCA waste (radioactive and TSCA hazardous) (40 CFR Parts 239-299), (15 U.S.C. 2601 et seq.). Portsmouth does not generate or store high-level radioactive waste or store transuranic (TRU) waste. Solid low level waste generated by DOE activities include refuse, sludge, and debris contaminated with radionuclides, primarily uranium and Technetium-99 (DOE 2004b).

J.11 ROSWELL SITE

This section presents a summary of the affected environments for the Roswell Site. The information was summarized from the Site Characterization Report prepared by the Funding Opportunity Announcement (FOA) grant recipient (SCR 2007g).

J.11.1 Land Use

The Roswell Site is approximately 920 acres (372 hectares [ha]) and is located in the arid high desert ranchland of east-central New Mexico's Chaves County, 40 miles (mi) (64 kilometers [km]) east of Roswell. Currently, there are no existing structures or facilities within the boundaries of the site. Within the Roswell Site, the western 480 acres (194 ha) is zoned industrial for use as a *Resource Conservation and Recovery Act* (RCRA) hazardous waste disposal facility owned by Grandy Marley and permitted by the New Mexico Oil Conservation Division (40 CFR Parts 239-299). The remaining 440 acres (178 ha) are zoned for agricultural use.

J.11.2 Visual Resources

There are currently no existing facilities or structures within the boundaries of the Roswell Site that could affect the aesthetic resources of the area.

J.11.3 Site Infrastructure

There is an existing section of railroad track owned and operated by Burlington Northern and Santa Fe and/or Union Pacific Rail Roads that runs through Roswell and northwest through Elida, approximately 30 mi (48 km) from the site. One electrical power distribution line (>13.5 kv) is located several miles to the east. One existing water well, owned by Robert W. Marley (a principle in Gandy Marley, Inc.), is present within 3 mi (4.8 km) of the site property and two additional wells are permitted for construction. The western 480 acres (194 ha) of the Roswell Site are zoned for use as a RCRA hazardous waste disposal facility.

J.11.4 Air Quality and Noise

The site is located in an arid to semiarid continental climate. The normal average daily temperature ranges from 38°F (3.3°C) in January to 80.8°F (27°C) in July.

There are no non-attainment, maintenance, or near non-attainment areas within the 50 mi (80 km) buffer radius of the Roswell Site. There are no current or existing facilities at the Roswell Site to contribute to radiological air emissions. There are no existing facilities at the Roswell Site resulting in elevated noise levels.

One exceedance of the PM_{10} concentration of 150 micrograms occurred in Chavez County due to strong prevailing winds. The strong winds resulted in the lifting and blowing of dust. Since this was caused by natural events, the Environmental Protection Agency (EPA) allows States to describe alternative steps and measures to take to avoid nonattainment status by developing a Natural Events Action Plan (NEAP) to protect public health. In October 2004, the NMED submitted to EPA a NEAP for Chaves County to avoid non-attainment.

Average rainfall in New Mexico ranges from less than 10 inches (in) (25 centimeters [cm]) over much of the south desert and the Rio Grande and San Juan Valleys to more than 20 in (51 cm) in the higher elevations in the state. Rainfall at the Roswell Site falls within these averages.

J.11.5 Water Resources

There are no perennial surface water bodies present at or near the site. The only surface water present in the vicinity of the site is runoff from precipitation or snowmelt. The site is located in the arid eastern ranchland of New Mexico where annual potential evaporation of up to 110 inches so greatly exceeds average annual precipitation of 13 to 16 in (33 to 41 cm) that perennial surface water simply does not exist. There are no natural perennial surface water features in the vicinity of the site for which a water quality assessment can be determined. The site is not in or near a 10, 100, or 500 year floodplain delineated by *Federal Emergency Management Act* (42 U.S.C. 5121-5170).

The Roswell Site is situated in the Roswell Artesian Underground Water Basin (UWB), near its boundary with the Lea County UWB. The Roswell UWB is an administrative unit that includes several aquifers, including an alluvial aquifer about 35 mi (56 km) west of the site along the Pecos River, the Roswell Artesian Aquifer, local perched groundwater bodies near the site, and groundwater in formations beneath the site. Formations beneath the site yield little groundwater and water quality is considered poor. The western boundary of the Ogallala Aquifer coincides with Mescalero Ridge about 1 mi (2 km) east of the site. The Ogallala is the only aquifer within 10 mi (16 km) that is known to yield large amounts of groundwater. The closest major body of perennial surface water is the Pecos River, located approximately 35 mi (56 km) west of the site at its nearest point. Ephemeral surface water at the site is derived exclusively from local precipitation and snowmelt.

The saturated thickness in the aquifer near Mescalero Point is approximately 60 to 70 feet (ft) (18 to 21 meters [m]) and transmissivity is reported to be 10,000 to 30,000 gal/day per ft or 1,300 to 4,000 ft^2 per day. Storativity of the aquifer is approximately 0.2. The expected yield from wells completed in the Ogallala Aquifer is in excess of 100 gpm near the site. No groundwater wells have been completed at the Roswell Site. There are no known future groundwater rights appurtenant to the site. There are no known Native American Tribal water rights that would be affected. There are no known existing permits that will expire, providing available water rights.

J.11.6 Geology and Soils

The Roswell Site is located approximately 40 mi (64 km) east of Roswell, New Mexico in the Pecos River Valley Section of the Great Plains Physiographic Province. Terrain within this province ranges from low-lying plains to rugged canyons. In the area near the Roswell Site, the terrain consists of hummocky eolian deposits, sand ridges and dunes. The site encompasses 920 acres (372 ha) and slopes moderately from east to west from an elevation of 4,260 ft (1,298 m) above sea level to 4,120 ft (1,256 m) above sea level. No faults or folds that have been active in Quaternary time are near the site. The closest capable fault is the Rio Grande Rift approximately 100 mi (161 km) west of the site.

J.11.7 Biological Resources

There are four ecological habitats known to occur within the boundaries of the Roswell Site. These include the loamy, sandhills, deep sand, and sandy plains ecosystems. The most important vegetation communities on the Roswell Site are those that provide habitat for the lesser prairie-chicken and sand dune lizard. These are both federal candidate species.

The privately owned 980 acre (396 ha) Roswell Site is located within the Caprock Wildlife Habitat Management Area (WMA), which encompasses approximately 561,300 acres (227,150 ha) of public, state, and private lands in eastern Chaves County, southwestern Roosevelt County, and northern Eddy County, New Mexico. The WMA was established to protect the Mescalero Sands habitat area that is located primarily to the west of the Roswell Site; protection of this habitat is primarily focused on the lesser prairie-chicken. There are no riparian, wetlands, or aquatic habitats present within or directly adjacent to the Roswell Site. There are no wetlands under jurisdiction of the U.S. Army Corps of Engineers (USACE) at or near the site. The only 2 species that have been documented within or adjacent to the Roswell Site are the sand dune lizard and lesser prairie-chicken.

J.11.8 Cultural and Paleontological Resources

Twelve previously recorded sites were noted in the NMCRIS review for lying near but not within the Roswell Site.

J.11.9 Socioeconomics

The Roswell Site is located in the sparsely populated ranchland of eastern Chaves County, approximately 40 mi (64 km) east of Roswell. Based on the 2000 Census block group data, it is estimated that 91,713 people live within 50 mi (80 km) of the Roswell Site. The construction, mining, and accommodation and food sectors employ the greatest number of workers in the ROI.

At a radial distance up to 50 mi (80 km) of the Roswell Site, the great majority of the area has a population density of less than 10 people per square mile. In some areas of Roswell, Artesia, and Lovington, however, the population density is greater than 1,000 people per square mile. Based on the 2000 Census the average population density within 50 mi (80 km) from the Roswell Site is estimated to be less than 12 people per square mile.

The unemployment level in the ROI for 2006 was 3.9 percent. This level was below the New Mexico average of 4.3 percent and the national unemployment average of 4.6 percent for 2006.

The New Mexico economy is expected to generate about 158,000 new jobs from 2002 to 2012. This represents growth of about 20 percent (an average of approximately 2 percent per year), faster than the projected national increase of 14.8 percent over the same 10-year period. Employment growth for the ROI from 2003 to 2006 has averaged 1.6 to 4.6 percent per year.

J.11.10 Environmental Justice

The average minority population in New Mexico as of the 2000 Census was 55.3 percent. Therefore, block groups with a minority population of 65.3 percent or greater were considered minority areas. During the 2000 Census, there were a total of 83 New Mexico census block groups fully or partially within 50 mi (80 km) of the Roswell Site. A total of 15 block groups within 50 mi (80 km) of the Roswell Site had minority populations that were at least 10 percent greater than the state average.

The low-income population (households below the poverty line) in New Mexico as of the 2000 Census was 18.4 percent. Therefore, New Mexico block groups with a low-income population of 28.4 percent or greater were considered low-income areas. A total of 18 block groups had low-income populations that were at least 10 percent greater than the state average. The low-income census block groups were located in Roswell and Hagerman (in Chaves County).

Two census block groups within 50 mi (80 km) of the Roswell Site were located in Texas. The average minority population in Texas as of the 2000 Census was 47.6 percent. Block groups in Texas with a minority population of at least 57.6 percent were considered minority areas in Texas. The low-income population in Texas as of the 2000 Census was 15.4 percent. Therefore, block groups with a low income population of at least 25.4 percent were considered low-income areas in Texas. Neither of the Texas census block groups within 50 mi (80 km) of the Roswell Site was considered minority or low-income areas.

J.11.11 Public and Worker Health and Safety

There are currently no existing facilities or structures on the Roswell Site to contribute radiological or hazardous chemical contaminants to the environment.

J.11.12 Transportation

Major U.S. Highway 380 is located within 3 mi (5 km) of the site. The nearest rail access is located 30 mi (48 km) northwest of the site. There are currently no forms of transportation on the Roswell Site.

J.11.13 Waste Management

The western 480 acres (194 km) of the Roswell Site are zoned for use as a RCRA hazardous waste disposal facility. The surface waste management facility is permitted to use lined landfill-type cells for the disposal of oilfield waste classified as non-hazardous by RCRA subtitle C exemption or by characteristic testing.

J.12 SAVANNAH RIVER SITE

This section provides a summary of the affected environments for the Savannah River Site (SRS).

J.12.1 Land Use

SRS is located in south-central South Carolina and occupies an area of approximately 198,420 acres (80,300 hectares [ha]) in Aiken, Barnwell, and Allendale Counties (DOE 2005b). The site is approximately 15 miles (mi) (9.5 kilometers [km]) southeast of Augusta, Georgia and 12 mi (7.5 km) south of Aiken, South Carolina (DOE 2003a).

Currently, production and support facilities, infrastructure, research and development (R&D), and waste management facilities account for approximately 10 percent (approximately 19,000 acres [8,000 ha]) of land on the SRS (DOE 2000b; DOE 2003a). Of the remaining 90 percent (approximately 191,000 acres [77,300 ha]), approximately 80 percent is planted pine forest managed by the U.S. Forest Service (USFS) (under an interagency agreement with U.S. Department of Energy [DOE]), with the remainder consisting of aquatic habitats and developed landscapes (DOE 1995d, SRS 2006, Wike et al. 2006). The 19,000 acres (8,000 ha) of developed SRS land includes five non-operational nuclear production reactors, two chemical separations facilities (one is being deactivated), waste treatment, storage and disposal facilities, and various supporting facilities. The site was designed with a buffer zone that provides security and prevents accidental exposure to the general public (DOE 2003a, SRS 2006).

J.12.2 Visual Resources

The industrial areas, including the reactors and large facilities, are primarily located in the interior of the site away from public access (DOE 2003a). SRS facilities are not generally visible from public access roads due to the distance to the boundary from the industrialized areas, the gently rolling terrain, and heavy vegetation (DOE 2003a). The limited public areas that have views of some SRS structures (other than the administrative areas) are approximately 5 mi (8 km) or more away from viewable structures (DOE 2003a).

The facilities are scattered across SRS and are brightly lit at night (DOE 1995d). Typically, the reactors and principal processing facilities are large concrete structures as much as 100 ft (30 m) tall adjacent to shorter administrative and support buildings and parking lots (DOE 1995d). These facilities are visible in the direct line-of-sight when approaching them on SRS access roads. Heavily wooded areas that border the SRS road system and public highways crossing SRS limit views of the facilities (DOE 1995d).

J.12.3 Site Infrastructure

The SRS site has over 1,400 mi (2,250 km) of roads total. About 143 mi (230 km) of these roads are paved, and 34.2 mi (55 km) of onsite roads are public roads. Most of the roads are adequate for the current level of normal transportation activity and could handle increased traffic volume. In addition, there are 64 mi (103 km) of railroad track at SRS.

SRS uses a 115-kilovolt (kV) power line system to supply electricity to the operations areas. Power is supplied by three transmission lines from the South Carolina Electric and Gas Company. The total SRS usage of electrical power is 370,000 megawatt-hours per year (MWh/yr) out of a site capacity of 4,400,000 MWh/yr.

Coal and oil are used at SRS to power steam plants located in A-, D-, H- and K-Areas. Coal is delivered by rail and is stored at coal piles in A-, D-, and H-Areas. Number 2 grade fuel oil is delivered by truck and is used in the K-Area. Natural gas is not used at SRS.

Domestic water supplies at SRS come from a system composed of several wells and water treatment plants.

J.12.4 Air Quality and Noise

The SRS is located in the Augusta-Aiken Interstate Air Quality Control Regions (AQCR). All areas within this region are classified as achieving attainment with the National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50). Ambient air is defined as that portion of the atmosphere, external to buildings, to which the general public has access. The NAAQS define ambient concentration criteria or limits for sulfur dioxide (SO_2), particulate matter equal to or less than 10 microns in aerodynamic diameter (PM_{10}), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb). These pollutants are generally referred to as “criteria pollutants.”

Significant sources of regulated air pollutants at SRS include coal-fired boilers for steam production, diesel generators, chemical storage tanks, the Defense Waste Processing Facility (DWPF), groundwater air strippers, and various other process facilities. Another source of criteria pollutant emissions at SRS is the prescribed burning of forested areas across the Site by the USFS.

Atmospheric emissions of radionuclides from DOE facilities are limited under the U.S. Environmental Protection Agency (EPA) regulation “National Emission Standards for Hazardous Air Pollutants (NESHAP),” 40 CFR Part 61, Subpart H. A network of sampling stations in and around SRS monitors the concentrations of tritium and radioactive particulate materials in the air. Except for tritium, specific radionuclides are not routinely detectable at the site perimeter.

Most industrial facilities at SRS are at a sufficient distance from the site boundary that noise levels at the boundary from these sources would not be distinguishable from ambient background noise levels. Major noise sources in active areas at the SRS include industrial facilities and equipment such as cooling systems, transformers, engines, vents, paging systems, construction and materials handling equipment, and vehicles. Outside of active operational areas, vehicles and trains generate noise.

J.12.5 Water Resources

The regional drainage is dominated by the north to south running Savannah River. This major river forms in Lake Hartwell with the confluence of the Seneca and the Tugaloo rivers. It drains a watershed of 10,577 square miles (mi^2) (27,394 square kilometers [km^2]) in the mountains of North Carolina, South Carolina and Georgia. There are five main watersheds that originate on, or pass through the SRS before discharging into the Savannah River Swamp. Closer to SRS, the flood plain of the Savannah River turns into a swamp and begins to flood over a levee when river flows exceed 15,300 cubic feet [ft^3]/s (433 cubic meters [m^3]/s) (DOE 2003a).

There are two major artificial bodies of water onsite, Par Pond and L-Lake. There are also approximately 200 Carolina bays, which are naturally occurring pond formations found in parts of the Southeastern United States, that are scattered throughout the site covering a total area of approximately 1,100 acres (445.5 ha). These bays serve as natural habitats for many species of wildlife on the site.

A series of five upstream reservoirs—Jocassee, Keowee, Hartwell, Richard B. Russell, and Strom Thurmond—were built along the river with the objectives to reduce the variability of flow downstream in the area of SRS, create hydroelectric power, and improve navigation and recreation among other things (DOE 2005d).

The Savannah River is classified as a freshwater source that is suitable for primary and secondary contact recreation, drinking after appropriate treatment, balanced native aquatic species development, and industrial and agricultural purposes.

Steel Creek received cooling water from L-Reactor and ash basins runoff, non-process cooling water, powerhouse wastewater, reactor process effluents, sanitary treatment plant effluents, and vehicle wash waters. Releases of radioactive materials to surface water were highest during the early and middle 1960s. Tritium, cesium-137, and strontium-90 were the main radioactive materials of concern for releases to surface streams at SRS. Meyer et al. (1999) estimated that, for all years of operation at SRS, the total tritium released to the Savannah River is 1.8 million curies (Ci), the total cesium-137 released is about 250 Ci and the total strontium-90 released to the river for all years is about 100 Ci (DOE 1995d).

SRS monitors nonradioactive liquid discharges to surface waters through the NPDES, as mandated by the *Clean Water Act* (33 U.S.C. 1251 et seq.). As required by Environmental Protection Agency (EPA) and SCDHEC, SRS has NPDES permits in place for discharges to the waters of the United States and South Carolina. These permits establish the specific sites to be monitored, parameters to be tested, and monitoring frequency—as well as analytical, reporting, and collection methods (SRS 2006).

The hydrostratigraphic units of primary interest beneath SRS are part of the Southeastern Coastal Plain Hydrogeologic Province. Within this sequence of aquifers and confining units are two principal subcategories, the overlying Floridan Aquifer System and the underlying Dublin-Midville Aquifer System. These systems are separated from one another by the Meyers Branch

Confining System. In turn, each of the systems is subdivided into two aquifers, which are separated by a confining unit (WSRC 2005).

In the central to southern portion of SRS, the Floridan Aquifer System is divided into the overlying Upper Three Runs Aquifer and the underlying Gordon Aquifer, which are separated by the Gordon Confining Unit. The water table surface can be as deep as 160 ft (49 m) below ground surface (bgs), but intersects the ground surface in seeps along site streams. The top of the Gordon Aquifer typically is encountered at depths of 150–250 ft (46–76 m) bgs (WSRC 2005).

The shallower groundwater aquifers underneath SRS are contaminated with a variety of elements that range from organic compounds to metals and radionuclides. The sources of the detected groundwater contamination included burial grounds, waste management facilities, canyon buildings, seepage basins, and saltstone disposal facilities (NRC 2005c). The shallower Upper Three Runs Aquifer is contaminated with solvents, metals, and low levels of radionuclides near several SRS areas and facilities, including the F-Area. Tritium has been reported in the Gordon Aquifer under the Separation Areas (F- and H-Areas). The deep Crouch Branch Aquifer is generally unaffected by site operations, except for a location near A-Area, where trichloroethylene (TCE) contamination has been found.

SRS derives its own drinking and production water supply from groundwater. The site ranks as South Carolina's largest self-supplied industrial consumer of groundwater, utilizing approximately 5.3 million gallons (gal)/day (20 million liters (L)/day). SRS domestic and process water systems are supplied from a network of approximately 40 wells in widely scattered locations across the site, of which eight supply the primary drinking water system for the site (WSRC 2005).

J.12.6 Geology and Soils

The Aiken Plateau, the subdivision of the Coastal Plain that includes SRS, is highly dissected and characterized by broad, flat areas between streams and narrow, steep-sided valleys. It slopes from an elevation of approximately 300 to 330 ft (91 to 100 m) above mean sea level (msl) with an average slope of less than four percent (DOE 2002a).

The sediments of the Atlantic Coastal Plain dip gently seaward from the Fall Line thickening from essentially 0 ft (0 m) thick at the Fall Line to more than 4,000 ft (1,219 m) at the coast. The topmost sediment layer (known as the Tinker/Santee Formation) consists of 60 ft (18 m) of Paleocene-age clayey and silty quartz sand and silt (NRC 2005c). Within this layer, there are occasional beds of clean sand, gravel, clay, or carbonate. Deposits of pebbly, clayey sand, conglomerate, and Miocene and Oligocene-age clay occur at higher elevations. This layer is noteworthy because it contains small, discontinuous, thin calcareous sand zones (i.e., sand containing calcium carbonate) that are potentially subject to dissolution by water. These "soft-zone" areas have the potential to subside, causing settling of the ground surface (NRC 2005c). The second layer of sediments overlies bedrock and consists of about 700 ft (210 m) of Upper Cretaceous-age quartz sand, pebbly sand, and kaolinitic clay. The underlying bedrock consists of sandstones of Triassic age and older metamorphic and igneous rocks (DOE 2002a).

The Atlantic Coastal Plain tectonic province in which SRS is located is characterized by generally low seismic activity that is expected to remain subdued (DOE 2005p). There are six subsurface faults at SRS: Pen Branch, Steel Creek, Advanced Tactical Training Area, Crackerneck, Ellenton, and Upper Three Runs. The actual faults do not reach the surface, but stop several hundred feet below grade. The most active seismic zones in the southeastern United States are all located over 100 mi (160 km) away from the site (DOE 2002a).

Seven soil associations are represented within SRS (Rogers 1990). Generally, sandy soils occupy the uplands and ridges and are less fertile than the loamy-clayey soils of the stream terraces and floodplains. The surface soils at the proposed GNEP site range from nearly level to sloping and well-drained, with a sandy surface and subsurface layer and a loamy subsoil. The Fuquay sand is the dominant soil mapping unit in the project area.

Some small gravel deposits were noted in the vicinity of the F-area. However, no other economically viable geologic resources occur (DOE 1995d).

Subsidence (lowering of the ground surface) and soil liquefaction are two geologic processes that are potentially problematic at SRS. Rock strata under some areas of SRS include layers of pockets of carbonate rock that are subject to dissolution, which would cause subsidence and could lead to soil liquefaction. Sites underlain by these "soft zones" are considered unsuitable for structural formations unless extensive soil stabilization is done (NRC 2005c).

J.12.7 Biological Resources

Currently, nearly 90 percent of the land (180,000 acres [72,000 ha]) at the SRS is forested with upland pine, hardwood, mixed (pine and hardwood), and bottomland hardwood forests. The loblolly-longleaf-slash pine community (*Pinus taeda-P. palustris-P. elliottii*) is the dominant community covering approximately 65 percent of the site. Swamp forests and bottomland hardwood forests are found along the Savannah River. Farming, fire, soil, and topography have influenced SRS vegetation patterns.

SRS supports numerous animal species, including 44 species of amphibians, 59 species of reptiles, 258 species of birds and 54 species of mammals (NRC 2005c). The SRS has among the highest biodiversity of herpetofauna (reptiles and amphibians) in the United States because of the area's warm, moist climate and its wide variety of habitats (NRC 2005c).

Approximately 25 percent of SRS's surface area is covered by water, including wetlands, bottomland hardwoods, cypress-tupelo swamp forests, two large cooling water reservoirs (i.e., Par Pond and L Lake), creeks, and streams. (Kilgo and Blake 2005, Lide et al. 1995, Wike et al. 2006). Six major streams and several associated tributaries flow through SRS, and the Savannah River bounds the southwestern border of SRS. More than 50 man-made ponds also occur at the SRS. The two largest are L Lake (1,000 acres [405 ha]), which discharges into Steel Creek, and Par Pond (2,640 acres [1,069 ha]), which discharges into Lower Three Runs Creek. Altogether, about 4,940 acres (2,000 ha) of open water occurs at the SRS (NRC 2005c). At least 81 fish species have been identified at SRS (NRC 2005c).

Under the *Endangered Species Act*, the Federal Government provides protection to six species that are known to occur on the SRS: American alligator (*Alligator mississippiensis*); shortnose sturgeon (*Acipenser brevirostrum*); wood stork (*Mycteria americana*); red-cockaded woodpecker (*Picoides borealis*); smooth purple coneflower (*Echinacea laevigata*); and pondberry (*Lindera melissifolia*). SRS contains no designated critical habitat for any listed threatened or endangered species (Wike et al 2006).

Wetlands on SRS encompass approximately 49,030 acres (19,850 ha), or over 20 percent of the SRS area, and are extensively and widely distributed. These wetlands include bottomland hardwood forests, cypress-tupelo swamp forests, floodplains, creeks, impoundments, and over 300 isolated upland Carolina bays and wetland depressions (NRC 2005c).

J.12.8 Cultural and Paleontological Resources

Approximately 60 percent of the SRS site has been inventoried and over 850 archaeological (prehistoric and historic) sites have been identified (NRC 2005c). Sixty-seven of these sites are considered potentially eligible for listing on the National Register of Historic Places (NRHP); however, most of the sites have not been evaluated for eligibility.

Prehistoric resources at SRS consist of villages, base camps, limited-activity sites, quarries, and workshops. Evidence of prehistoric use of the area is present at approximately 800 of the recorded archaeological sites. Fewer than 8 percent of these sites have been evaluated for NRHP eligibility (DOE 2003a).

Historic resources at SRS consist of farmsteads, tenant dwellings, mills, plantations and slave quarters, rice farm dikes, dams, cattle pens, ferry locations, towns, churches, schools, cemeteries, commercial building locations, and roads. Evidence of historic use of the area has been found at approximately 400 of the recorded archaeological sites. About 10 percent of the historic sites have been evaluated for National Register eligibility (DOE 2003a). Systematic historic building surveys have not yet been conducted at SRS. Native American groups with traditional ties to the SRS area include the Apalachee, Cherokee, Chickasaw, Creek, Shawnee, Westo, and Yuchi.

Paleontological resources at SRS date from the Eocene Age (54 to 39 million years ago) and include fossil plants, numerous invertebrate fossils, and deposits of giant oysters, other mollusks, and bryozoa. All resources from SRS are marine invertebrate deposits and, with the exception of the giant oysters, are relatively widespread and common fossils. Therefore, the assemblages have relatively low research potential or scientific value (DOE 2003a).

J.12.9 Socioeconomics

Socioeconomic characteristics addressed at SRS include employment, income, population, housing, and community services. These characteristics are analyzed for a four-county region of influence (ROI) consisting of Aiken and Barnwell Counties in South Carolina, and Columbia and Richmond Counties in Georgia, where 88 percent of site employees reside.

SRS employs approximately 15,112 workers, including DOE employees and multiple contractors. This represents approximately 7.3 percent of area employment. The labor force of

the Regional Economic Area grew by approximately 8 percent from 209,560 in 2000 to 226,087 in 2005. The overall ROI employment experienced a comparable growth rate of 6 percent with 195,162 in 2000 to 207,162 in 2005.
The ROI unemployment rate was 8.4 percent in 2005, which was higher than the unemployment rate of 6.9 percent in 2000. In 2005, unemployment rates within the regional economic area ranged from a low of 5.4 percent in Columbia County to a high of 10.9 percent in Richmond County. The unemployment rate in South Carolina was 6.7 percent in 2005, while the unemployment rate in Georgia was 5.2 percent (BLS 2005b, TtNUS 2006f).

Per capita income in the ROI was $26,621 in 2004, a 54.9 percent increase from the 1990 level of $17,188. Per capita income in 2004 in the ROI ranged from a low of $19,809 in Barnwell County, South Carolina to a high of $33,523 in Columbia County, Georgia. The 2004 per capita income in South Carolina was $27,185 and $29,782 in Georgia (BEA 2006a).

In 2000, approximately 563,501 people lived within census tracts, all or part of which are within a 50 mi (80 km) radius of SRS. The ROI population increased by 16 percent during the 15 year period, while the population in South Carolina and Georgia increased by 18 percent and 36 percent respectively.

J.12.10 Environmental Justice

Census data from 2000 was used to determine minority and low-income characteristics by block group within 50 mi (80 km) of SRS. A block group was included if any part of its area was within 50 mi (80 km) of the centroid of SRS. The 50 mi (80 km) radius includes 522 block groups (TtNUS 2006b). The geographic area was defined as Georgia and South Carolina, independently, for analysis of block groups in each state.

One-hundred-ninety-four block groups have a significant Black or African American minority population and 207 block groups have significant aggregate minority percentages. One census block group within the 50 mi (80 km) radius has a significant Hispanic ethnicity population (TtNUS 2006b).

Based on the “more than 20 percent” or the “exceeded 50 percent” criteria, no American Indian or Alaskan Native, Asian, Native Hawaiian or Other Pacific Islander, Some other race, or Multi-racial minority block groups exist in the geographic area (TtNUS 2006b).

Sixty seven census block groups within the 50 mi (80 km) radius have a significant percentage of low-income households (TtNUS 2006b).

J.12.11 Public and Worker Health and Safety

An individual’s radiation exposure in the vicinity of SRS amounts to approximately 357 millirem (mrem), and is comprised of natural background radiation from cosmic, terrestrial, and internal body sources; radiation from medical diagnostic and therapeutic practices; weapons test fallout; consumer and industrial products, and nuclear facilities.

Releases of radionuclides to the environment from SRS operations provide another source of radiation exposure to individuals in the vicinity of SRS. Types and quantities of radionuclides released from SRS operations in 2004 are listed in the Savannah River Site Environmental Report for 2004 (WSRC 2005). The radionuclide emissions contributing the majority of the dose to the offsite maximally exposed individual (MEI) from liquid releases were tritium and cesium-137 (WSRC 2005). For atmospheric releases, the radionuclides contributing the majority of the dose to the offsite MEI were tritium, iodine-129, and unspecified alpha emissions (estimated to be from diffuse and fugitive sources). These doses fall within the radiological limits given in DOE Order 5400.5 (DOE O 5400.5), *Radiation Protection of the Public and the Environment*, and are much lower than those from background radiation (WSRC 2005).

The average radiation dose recorded for workers at SRS in 2005 was 51.4 mrem (SRS 2006). The cumulative dose to all workers at SRS from operations in 2001 was 121.3 person-rem. These doses fall within the radiological regulatory limits of 10 CFR Part 835.

Major non-radiological emissions of concern from stacks at SRS facilities include sulfur dioxide, carbon monoxide, oxides of nitrogen, PM_{10}, volatile organic compounds (VOCs), and toxic air pollutants. Emissions from SRS sources are determined during an annual emissions inventory from calculations using source operating parameters such as fuel oil consumption rates, total hours of operation, and the emission factors provided in the EPA "Compilation of Air Pollution Emission Factors."

Air dispersion modeling was conducted during 2004 for new emission sources or modified sources as part of the sources' construction permitting process. The modeling analysis showed that SRS air emission sources were in compliance with applicable regulations (WSRC 2005).

J.12.12 Transportation

SRS is surrounded by a system of interstate highways, U.S. highways, state highways, and railroads. The regional transportation network services the four South Carolina counties (Aiken, Allendale, Bamberg, and Barnwell) and two Georgia counties (Columbia and Richmond) that generate nearly all of the SRS commuter traffic.

Railroads on the Site include both CSX Transportation tracks and 33 mi (53 km) of operational SRS track (DOE 2005d).

The Savannah River is navigable to the barge slip at SRS located at river mile 157 (SCR 2007b). The Savannah River barge dock is located approximately two miles northwest of the D Area on SRS and is surrounded by wooded areas (DOE 1992b). An on-site heavy-duty construction access road originates at the barge dock and extends approximately 2 mi (3.2 km) and connects with SC-125 (Atomic Road) (SCR 2007i).

J.12.13 Waste Management

SRS manages spent nuclear fuel, high level waste (HLW), low level waste (LLW), mixed low level waste (MLLW), transuranic (TRU) waste, hazardous waste, sanitary solid waste, low-level wastewater, and sanitary sewage.

Each operation at SRS has the goal of identifying and implementing measures that minimize waste and prevent pollution. Pollution prevention is integral to the SRS Environmental Management System. SRS's Pollution Prevention Program establishes the preference of source reduction and recycling over treatment, storage, and disposal. Accomplishments during 2004 included completion of 51 pollution prevention projects, resulting in an annualized avoidance of 9,277 yd^3 (7,093 m^3) of waste, with an accompanying cost avoidance of $41.5 million (WSRC 2005).

SRS is also engaged in cleanup and decommissioning and demolition projects. SRS is responsible for cleaning up more than 500 waste and groundwater units to reduce risk and protect human health and the environment. In 2004, SRS had completed more than 300 of the units. By 2025, all inactive SRS waste sites that pose a risk to human health or the environment will be remediated and controlled, and contaminated surface and groundwater will be remediated, in remediation, or closely monitored. By the end of 2006, more than 250 buildings were scheduled to be demolished. Across the site, there are about 6,000 buildings, encompassing about 10 million ft^2 (929,030 m^2). Decommissioning and decontamination (D&D) work is expected to continue until about 2025 (WSRC 2005).

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