NUREG-1834

Environmental Impact Statement for the Proposed American Centrifuge Plant in Piketon, Ohio

Draft Report for Comment

U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety and Safeguards
Washington, DC 20555-0001

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Office of Nuclear Material Safety and Safeguards
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For any questions about the material in this report, please contact:

Matthew Blevins
TWFN 7 J-8
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
Phone: 301-415-7684
E-mail: MXB6@nrc.gov

ABSTRACT

USEC Inc. (USEC) has submitted an application to the U.S. Nuclear Regulatory Commission (NRC) for a license to construct, operate, and decommission the American Centrifuge Plant (ACP), a gas centrifuge uranium enrichment facility located on the U.S. Department of Energy (DOE) reservation in Piketon, Ohio. The American Centrifuge Plant, if licensed, would enrich uranium for use in commercial nuclear fuel for power reactors. Feed material would be comprised of non-enriched uranium hexafluoride (UF_6). USEC proposes to enrich uranium up to 10 percent by weight of uranium-235. The initial license application is for a 3.5 million separative work unit[1] (SWU) per year facility. Because USEC indicated the potential for future expansion to 7.0 million SWU per year, the environmental review looks at the impacts from a 7.0 million SWU per year facility. The proposed ACP would be licensed in accordance with the provisions of the *Atomic Energy Act*. Specifically, an NRC license under Title 10, "Energy," of the *U.S. Code of Federal Regulations* (10 CFR) Parts 30, 40, and 70 would be required to authorize USEC to possess and use special nuclear material, source material, and byproduct material at the proposed ACP site.

This Draft Environmental Impact Statement (Draft EIS) was prepared in compliance with the *National Environmental Policy Act* and the NRC regulations for implementing the Act. This Draft EIS evaluates the potential environmental impacts of the proposed action and its reasonable alternatives. This Draft EIS also describes the environment potentially affected by USEC's proposal, presents and compares the potential environmental impacts resulting from the proposed action and its alternatives, and describes USEC's environmental monitoring program and mitigation measures.

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[1] SWU relates to a measure of the amount of enriched uranium produced.

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EXECUTIVE SUMMARY

BACKGROUND

The U.S. Nuclear Regulatory Commission (NRC) is considering whether to issue a license, pursuant to Title 10 of the *U.S. Code of Federal Regulations* (10 CFR) Parts 30, 40, and 70, that would allow USEC Inc. (USEC) to possess and use byproduct material, source material, and special nuclear material at a proposed gas centrifuge uranium enrichment facility near Piketon, Ohio. The scope of activities to be conducted under the license would include the construction, operation, and decommissioning of the proposed plant, which is called the American Centrifuge Plant (ACP). This licensing action would be taken in response to an application filed with the NRC by USEC by letter dated August 23, 2004. To support its licensing decision on the proposed ACP, the NRC determined that an Environmental Impact Statement (EIS) is required by the NRC's implementing regulations in 10 CFR Part 51 for the *National Environmental Policy Act* (NEPA).

The enriched uranium produced at the proposed ACP would be used to manufacture nuclear fuel for commercial nuclear power reactors. Enrichment is the process of increasing the concentration of the naturally occurring and fissionable uranium-235 isotope. Uranium ore usually contains approximately 0.72 weight percent uranium-235. In order to be useful in nuclear power plants as fuel for electricity generation, the uranium must typically be enriched up to 5 weight percent.

THE PROPOSED ACTION

The proposed action considered in this Draft EIS is for the NRC to issue a license that would authorize USEC to possess and use special nuclear material, source material, and byproduct material at the ACP, a gas centrifuge uranium enrichment facility proposed to be located on the U.S. Department of Energy (DOE) reservation near Piketon, Ohio. Piketon is between Chillicothe and Portsmouth, Ohio, approximately 113 kilometers (70 miles) south of Columbus, Ohio. If a license is issued, USEC would construct, operate, and decommission the proposed ACP. The ACP would be located at the same site as DOE's Portsmouth Gaseous Diffusion Plant, which has been shut down since May 2001. The ACP would consist of refurbished existing buildings, newly constructed facilities, and adjacent grounds owned by DOE and leased by USEC.

In its license application, USEC indicated that the proposed ACP would utilize centrifuge technology to enrich uranium-235 up to 10 weight percent, although enrichment would typically be between 2.5 and 5 weight percent uranium-235. The license application is for a 3.5 million separative work units (SWU) per year facility. However, because USEC indicated the potential for future expansion to 7 million SWU per year, this Draft EIS examines the potential impacts of a full 7-million SWU facility. Depending on the timing of the NRC licensing process and other factors, USEC plans to start construction of the proposed ACP in 2007, begin commercial centrifuge operations in 2009, and ramp up to the 3.5 million SWU design capacity by 2011. The NRC license, if granted, would be for a period of 30 years. After the proposed ACP becomes operational, production of enriched uranium would ultimately cease at the gaseous diffusion plant in Paducah, Kentucky and be replaced by the proposed new gas centrifuge process at Piketon.

PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed action would be to allow USEC to construct and operate a plant to enrich uranium up to 10 percent by weight of uranium-235, with an initial production capacity of 3.5 million SWU per year potentially expandable to 7 million SWU per year, using gas centrifuge technology at the DOE reservation in Piketon, Ohio. The proposed action is intended to satisfy the overall need for an additional reliable and economical domestic source of enriched uranium and to replace existing aging and less efficient uranium enrichment facilities.

For the purpose of this Draft EIS, the need for the proposed ACP can be organized more specifically into: (1) the need for enriched uranium to fulfill electricity requirements; (2) the need for domestic supplies of enriched uranium for national energy security; and (3) the need for upgraded uranium enrichment technology in the U.S. The proposed action fulfills each of these needs as explained below.

By 2020, the U.S. is estimated to need about 393 gigawatts or 393,000 megawatts of new generating capacity. To meet this growing demand, installed nuclear-generating capacity in the U.S. is projected to increase from approximately 98 gigawatts (98,000 megawatts) in 2001 to about 103 gigawatts (103,000 megawatts) in 2025, which is the equivalent of about five large nuclear power reactors. While this demand for enriched uranium is going up, the supplies of enriched uranium currently used in the U.S. are on the decline. In particular, the Megatons-to-Megawatts program, which currently supplies approximately 42 percent of the U.S.'s enriched uranium needs by "down blending" uranium from dismantled nuclear warheads from Russia, is only planned to continue until 2013. Enriched uranium will have to come from one or more new sources, such as the proposed ACP, to fulfill the shortfall in supply that may exist after that time.

Foreign sources currently provide as much as 86 percent of U.S. enriched uranium needs. This includes 42 percent from the Megatons-to-Megawatts program with Russia as noted above, along with 44 percent from other countries that produce and export enriched uranium to the U.S., including China, France, Germany, the Netherlands, and the United Kingdom. The only uranium enrichment facility currently operating in the U.S. is the Paducah Gaseous Diffusion Plant. A supply disruption with the Paducah plant production could impact national energy security because domestic commercial reactors, which currently supply approximately 20 percent of the nation's electricity requirements, would be fully dependent on foreign sources for enriched uranium. The proposed ACP, therefore, would help decrease this dependence on foreign sources and improve the nation's national energy security.

In addition to advancing national energy security goals, development of the proposed ACP would help accomplish the goals of the June 17, 2002 DOE-USEC Agreement to "facilitate the deployment of new, cost effective advanced enrichment technology in the U.S. on a rapid schedule." It would enable USEC to construct and operate a modern, more efficient, less costly enrichment plant to supplement and replace its more than 50-year old gaseous diffusion plants. Gas centrifuge technology represents a more efficient and less energy intensive uranium enrichment technology than the gaseous diffusion technology currently in use. According to USEC, the energy requirements of a gas centrifuge plant are about five percent of that required by a comparably sized gaseous diffusion plant, resulting in considerably lower operating cost. Moreover, increasing production levels at the Paducah Gaseous Diffusion Plant to meet growing needs for domestic supplies of enriched uranium may not even be technically feasible given the maturity of the plant and its dated technology.

ALTERNATIVES

This Draft EIS evaluates the potential environmental impacts of several alternatives, including the no-action alternative. Under the no-action alternative, the proposed ACP would not be constructed, operated, and decommissioned at the DOE reservation in Piketon, Ohio. Enriched uranium needs would continue to be met with existing domestic and foreign uranium enrichment suppliers. Any future uses of facilities and grounds currently proposed for the ACP would be up to USEC and DOE, but would be expected to include similar activities within the nuclear fuel cycle, consistent with USEC's and the reservation's history and mission.

The NRC staff considered several alternatives to fulfill domestic enrichment needs:

(1) Construct and operate the ACP at the Paducah Gaseous Diffusion Plant in Paducah, Kentucky;

(2) Construct and operate the ACP at alternative locations at the DOE reservation in Piketon, Ohio;

(3) Down blend highly enriched uranium instead of constructing a domestic uranium enrichment plant;

(4) Re-activate the Gaseous Diffusion Plant at the DOE reservation in Piketon; and

(5) Purchase low-enriched uranium from foreign sources.

These alternatives were eliminated from further consideration in this Draft EIS because they either did not offer any environmental advantage over the proposed action, or did not meet the need for a reliable, economical source of domestic uranium enrichment.

The NRC staff also considered alternative technologies to the proposed gas centrifuge process. These technologies included the electromagnetic isotope separation process, liquid thermal diffusion, atomic vapor laser isotope separation, and the separation of isotopes by laser excitation. These technologies, however, are not economically viable or remain at the research developmental scale and were thus eliminated from further consideration.

POTENTIAL ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

Potential environmental impacts of the proposed action are evaluated in Chapter 4 of this Draft EIS and summarized below. The environmental impacts from the proposed action are generally SMALL, although they could be as high as MODERATE in the areas of air quality, socioeconomics, and transportation. Methods for mitigating the potential impacts are described in Chapter 5. Environmental monitoring methods are described in Chapter 6.

Land Use

Small Impact. Site preparation and construction activities would occur on approximately 22 hectares (55 acres) of land, which comprises about one percent of the total 1,497 hectare (3,700 acre) DOE reservation. These changes would convert previously disturbed land (e.g., managed lawns, fields, and forests) on the DOE reservation to developed areas. The land is not considered prime farmland, and changes would be consistent with current land use. It is anticipated that after decommissioning activities

are completed, existing buildings and structures would remain onsite and the site would remain categorized for industrial use.

Historic and Cultural Resources

Small Impact. NRC identified the Portsmouth Gaseous Diffusion Plant historic district, thirteen historic farmsteads, and one prehistoric lithic scatter as being potentially eligible for inclusion on the National Register of Historic Places. In addition, NRC included three properties located around the perimeter in its consideration of potential effects. There would be no adverse indirect or direct effect on these sites. In addition, construction of new buildings and refurbishment of existing buildings would result in buildings of design, size, and function similar to the existing buildings, and therefore would not alter the historic setting of the existing Gaseous Diffusion Plant.

Determination of the Significance of Potential Environmental Impacts

A standard of significance has been established for assessing environmental impacts. Based on the Council of Environmental Quality's regulations, each impact is to be assigned one of the following three significance levels:

- ***Small:*** *The environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.*
- ***Moderate:*** *The environmental effects are sufficient to noticeably alter but not destabilize important attributes of the resource.*
- ***Large:*** *The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.*

Any additional disturbance of the site during decommissioning is not anticipated to have impacts to historic and cultural resources that exceed those associated with construction of the proposed ACP. Any changes to or demolition of buildings or structures proposed to be conducted during decommissioning would be evaluated for historic and cultural resources impacts prior to any implementation.

Visual and Scenic Resources

Small Impact. Construction of the proposed ACP would not alter the site's Bureau of Land Management Visual Resources Management rating system classification of Class III or IV (moderate to little scenic value). There are no scenic rivers, nature preserves, or unique visual resources in the proposed project area. While not anticipated, any changes to, or demolition of, buildings or structures proposed during decommissioning would be evaluated for visual and scenic resource impacts prior to any implementation.

Air Quality

Small to Moderate Impact. Airborne emissions from site preparation and construction should not result in exceedances of air quality standards, with the possible exception of short-term increases in particulate matter that could exceed the applicable standard up to a distance of 1,000 meters (3,280 feet) beyond the fenceline. Radiological releases from soil disturbances and from activities to refurbish existing buildings that would be used for the ACP would be small and controlled. Emissions from diesel generators would not cause air quality problems, and maximum predicted concentrations of hydrogen fluoride resulting from ACP operations are below safe levels. Based on the maximum radiological emission rates for the ACP, and the comprehensive site monitoring program, the expected impact to air quality from the plant's radiological emissions during operations is also expected to be small. The air quality impacts associated

with decontamination and decommissioning are expected to be less than the air quality impacts associated with site preparation and construction and proposed ACP operations; however, there is the potential for emission of solvents during the decontamination phase if solvent cleaning methods are used. These emissions would be of short duration (i.e., a few weeks) and would probably involve small amounts of solvent.

Geology and Soils

Small Impact. Most of the site is an existing industrial facility with altered natural soils. The soils are cohesive and over-consolidated and have low potential for liquefaction. There is little likelihood of impact from soil compaction or subsidence and there are no unique mineral deposits or geologic resources that stand to be affected. The flat terrain where the ACP buildings would be located, and the dense soil, low moisture content, and vegetative cover in the area of a new 10 hectare (24 acre) cylinder storage yard to be located in another spot on the reservation make landslides unlikely. Construction activities would not alter current drainage and would not disturb any soils that qualify for protection as prime farmland. There would be a potential for increased erosion and siltation of streams near the construction site of the new large cylinder storage yard, but both of these potential impacts should be minimized by the use of standard best management practices. Likewise, the potential for soil contamination resulting from ACP operations would be small. A plan would be in place to address any spills that might occur.

Impacts to geology and soils associated with the decommissioning of the proposed ACP are not anticipated to exceed the geology and soils impacts associated with construction of the ACP. There is potential for additional removal of contaminated surface soils from the site during decontamination and decommissioning; however, any such surface removal is anticipated to be limited in scope and not anticipated to affect the site terrain or the subsurface.

Water Resources

Small Impact. Potential stream sedimentation from construction activities would be minimized by the use of silt fences and other best management practices. Any impacts to stream water quality would be of short duration. None of the proposed site preparation and construction activities would occur within a 100-year floodplain. Groundwater withdrawals would increase by 10 percent over current usage rates, but would still be only 31 percent of the total design capacity of the site's well fields, would not affect groundwater availability, and would not pose an increased risk of subsidence. Wastewater would continue to discharge from permitted National Pollutant Discharge Elimination System outfalls and discharge rates, though increased above current levels, would represent only 75 percent of the existing system's design capacity. USEC does not anticipate any liquid discharges of radioactive materials from the proposed ACP (i.e., from cooling water, storm water runoff, or sanitary water). The potential for leaks or spills that could contaminate water resources would be limited by an approved Spill Prevention Control and Countermeasures Plan.

Ecological Resources

Small Impact. Construction of the new large cylinder storage yard referenced above in the section on geology and soils would result in increased erosion, stormwater runoff, and loss of 10 hectares (24 acres) of vegetation, but with planned best management practices, would result in small impacts to the flora and fauna in and around the tributaries of Little Beaver Creek. That same cylinder storage yard would also be located within 500 meters (1,640 feet) of suitable summer habitat for the endangered Indiana bat,

although studies have not documented the presence of this bat species on the DOE reservation. None of the site construction activities would occur in wetlands. However, some construction would occur adjacent to small wetlands, and standard erosion control measures would be used to limit sedimentation in these areas. Areas of reestablished vegetation may need to be cleared during site decommissioning (e.g., to conduct surface soil removal for site remediation). Any areas cleared of vegetation during decommissioning are anticipated to be small and vegetation could reestablish itself in cleared unpaved areas after decommissioning activities are completed.

Socioeconomics

Small to Moderate Impact. In each year between 2006 and 2010, average annual employment as a result of site preparation, refurbishment, and construction activities is estimated at 3,362 full-time jobs in the region of influence. During the ACP operations phase between 2010 and 2040, 1,500 jobs would be created in the region of influence. These impacts to regional employment are considered moderate, based on existing employment levels in the region. All other socioeconomic impacts from site preparation and construction and ACP operations are estimated to be small. This includes a small increase in regional tax revenues as well as small impacts to population characteristics, housing resources, community and social services, and public utilities.

Cessation of operations at the Paducah enrichment plant (assumed to occur with start-up of operations at the ACP) would result in direct and indirect socioeconomic impacts associated with the termination of the operations workforce at the plant and associated reduction in payroll. The impacts to regional employment around the Paducah site are estimated to be moderate, but all other socioeconomic impacts in the region are expected to be small.

Decontamination and decommissioning of the proposed ACP also would generally have small impacts. As a result of such activities, an average of 841 direct and indirect jobs are expected to be created, of which 407 would be new (the others would be filled by transitioned USEC workers). It is unlikely that State income tax, State sales tax, and county-level tax revenues would significantly increase as a result of the decontamination and decommissioning phase of the proposed action. Likewise, decontamination and decommissioning activities are not expected to lead to a large influx of workers that could cause housing shortages or increases in rental rates in the region. The small influx of workers would also have a small effect on public utilities, fire, law enforcement, healthcare, and administrative levels of service.

Environmental Justice

Small Impact. The environmental justice analysis focused on an area within 80 kilometers (50 miles) around the proposed ACP site. The analysis found that, within this area, there are 18 Census tracts that have populations qualifying as low-income and two Census tracts that have populations qualifying as minority. The closest of these tracts is 28 kilometers (17 miles) from the proposed site. Although the impacts to the general population were small to moderate as summarized elsewhere in this section, an examination of the various environmental pathways by which low-income and minority populations could be affected found no disproportionately high or adverse impacts from construction, operation, or decommissioning on any of these populations.

Noise

Small Impact. Site preparation and construction activities are expected to generate a 53 day-night average noise level, which is below applicable land use compatibility guidelines. No adverse noise impacts from routine ACP operations are expected at the closest residence due to low operational noise, the attenuation provided by the building facade, and distance attenuation of over 900 meters (3,000 feet). Catastrophic failure of a centrifuge could cause a sudden but brief loud noise, due to the high rotational speed of the centrifuge. However, the likelihood of a single centrifuge catastrophically failing is very low. Noise levels during decontamination and decommissioning are also anticipated to be small and similar to those generated during construction of the proposed ACP.

Transportation

Small to Moderate Non-radiological Impacts from Routine Transportation. Increased truck and vehicle traffic associated with proposed ACP operations should result in small changes in current levels of congestion and delays on U.S. Route 23 and Ohio State Road 32. Traffic associated with proposed operations should also result in small increases in the number of traffic accidents resulting in injuries or fatalities.

Substantially greater transportation requirements during the construction phase could result in moderate impacts during the five-year period in which most of the proposed construction activity is projected to occur. The NRC estimates that increased traffic during construction would temporarily decrease the level of service on U.S. Route 23 and, to a lesser extent, on Ohio State Road 32. The changes on U.S Route 23 would temporarily increase traffic density, affect the ability to maneuver within the traffic stream, and reduce travel speeds somewhat. It is also expected that construction traffic accidents would result in about 18 injuries a year involving employees traveling to and from their jobs, and one fatality over the entire construction period. These same injury and fatality rates would be expected if the same employees were driving to different employers.

Small Radiological Impacts from Routine Transportation and Transportation Accidents. The transportation of materials containing radionuclides would result in some increased risk of cancer to both the occupational workers transporting and handling the material and to members of the public driving along the roads or living along the transportation routes. The transport of all materials is estimated to result in approximately 0.013 latent cancer fatalities per year of operation from exposure to direct radiation during "incident-free" transport (i.e., shipping that does not involve the breach of a shipping container and subsequent release of radioactive material), and an additional 0.008 latent cancer fatalities per year from accidents that result in the release of radioactive material into the environment. The total latent cancer fatalities is estimated to be 0.02 per year of operation or less than one cancer fatality over the 30 years of operation.

Moderate Non-Radiological Impacts from Transportation Accidents. Transportation accidents involving the release of uranium hexafluoride (UF_6), which is the form of uranium that would be transported the most to and from the proposed ACP, could also result in chemical impacts to drivers and the surrounding public. When released from a shipping cylinder, UF_6 reacts with the moisture in the atmosphere to form hydrogen fluoride and uranyl fluoride, both of which can cause adverse effects due to chemical toxicity (as opposed to radiation hazards) if exposures are high enough. The analysis in Section 4.2.11.1 of this Draft EIS shows that the probability of a severe transportation accident that releases sufficient quantities of UF_6 that could pose a health risk is low, but that the consequences of such an accident, should it occur,

are high. Based on this analysis, the impacts associated with such an accident as part of the proposed action are considered moderate.

Small Impact During Decontamination and Decommissioning. Traffic associated with material and equipment transportation to the site during this phase would be much lower than that during site preparation and construction. Decontamination and decommissioning activities, including waste generation and handling, would require almost 5,000 truck shipments for offsite disposal over the five-year decommissioning period proposed by USEC. Because this volume of truck traffic is far less than the estimated 17,870 truck trips needed during the five-year proposed ACP construction period, the transportation impacts associated with the decommissioning truck traffic should be far less than that described for site preparation and construction. The number of latent cancer fatalities from the incident-free transportation of all decontamination and decommissioning waste is estimated to be less than one, and there are no projected deaths resulting from the release of radioactive material as a result of accidents during such shipments.

Public and Occupational Health and Safety

Small Impact. The proposed action would result in small increases in the current number of occupational injuries and illnesses at the site, though still less than historical levels. Construction and process areas would be segregated, and personnel monitoring programs would be implemented, to minimize worker exposures to annual radiation doses of less than the 10 CFR § 20.1201 limit of 50 millisieverts (5,000 millirem). All routine radiation exposures to members of the public are expected to be significantly below the 10 CFR Part 20 regulatory limit of 1 millisievert (100 millirem) and 40 CFR Part 190 regulatory limit of 0.25 millisieverts (25 millirem) for uranium fuel-cycle facilities. Analytical results also indicate that plausible radiological accidents at the proposed ACP pose acceptably low risks. In addition, public and occupational exposures to non-radiological contaminants are projected to be less than applicable limits.

Occupational exposures during onsite decontamination and decommissioning would be bounded by the potential exposures during operation. At the end of plant life, gas centrifuges containing residual uranium would be purged, leaving radioactive material in amounts significantly less than handled during operations. Because systems containing this residual contamination would be opened, decontaminated (with the removed radioactive material processed and packaged for disposal), and dismantled, an active environmental and dosimetry (external and internal) program would be conducted to maintain as low as reasonably achievable doses to workers and doses to individual members of the public as required by 10 CFR Part 20.

Waste Management

Small Impact. Site preparation, construction, and operations would generate varying amounts of low-level radioactive, low-level mixed, hazardous, sanitary/industrial, and recyclable wastes. All of these wastes would be managed in accordance with existing procedures for controlling contaminant releases and exposures. With the exception of the depleted uranium, all of the wastes would also be generated at volumes that are well within existing management capacities. The ACP would generate approximately 42,800 cylinders of depleted UF_6, containing approximately 571,000 metric tons (630,000 tons) of material. Production of depleted UF_6 for the 10 percent enrichment scenario would be less than this amount. All of this depleted UF_6 could be converted to a more stable form at a new conversion facility that DOE is constructing at Piketon, which would require DOE to significantly extend the life of this

facility. The converted material would then be shipped by rail to an acceptable western disposal site, where sufficient capacity exists and where the disposal impacts should be small. The waste management and recycling programs used during operations would also apply to decontamination and decommissioning.

SUMMARY OF THE COSTS AND BENEFITS OF THE PROPOSED ACTION

The proposed action would result in both direct and indirect costs. The direct costs can be categorized by facility life-cycle stages:

- Site preparation and construction is estimated to incur costs of $1,449 million (nominal dollars, i.e., dollars that are not adjusted for inflation) between calendar years 2006 and 2010;

- Centrifuge manufacturing and assembly is estimated to cost $1,423 million (nominal dollars) between calendar years 2004 and 2013; and

- Decontamination and decommissioning is estimated to cost $435 million (2004 real dollars, i.e., dollars stated in year 2004 price levels) over a period of six years, which are expected to begin 30 years after the commencement of ACP operations and are expected to occur from 2040 through 2045.

Indirect costs include the environmental impacts that are expected to be caused by the proposed action. As summarized in the preceding section, these impacts are generally considered small, although they could be as high as moderate in a few resource areas.

The primary benefit of the proposed action is that it would result in the production of 3.5-7 million SWUs of enriched uranium between 2010 and 2040. The ACP operating costs per SWU would be approximately 20 percent of the operating costs per SWU of a gaseous diffusion plant. This level of production would represent an augmentation of the domestic supply of enriched uranium and would meet the following needs:

- The need for enriched uranium to fulfill domestic electricity requirements and replace the shortfall in supply created by the end of the Megatons-to-Megawatts program planned in 2013;

- The need for domestic supplies of enriched uranium for national energy security; and

- The need for upgraded uranium enrichment technology in the United States to replace the existing aging and less efficient gaseous diffusion plants.

At the same time, the proposed action would result in positive socioeconomic impacts in the region around Piketon. During the site preparation and construction phase between 2006 and 2010, these impacts include the creation of 3,362 full-time jobs, an increase of $2.3 million in annual state income tax revenues, and an increase in $3.7 million in annual state sales tax receipts. During the ACP operations phase between 2010 and 2040, 1500 jobs would be created in the region and the State would benefit from $1.8 million and $2.4 million in additional annual income and sales tax receipts, respectively.

Overall, the costs of the proposed action are estimated to be small in comparison to the benefits fo the proposed action. Therefore, the benefits of the proposed action are believed to outweigh the costs of the proposed action.

COMPARISON OF ALTERNATIVES

The no-action alternative would consist of USEC not constructing, operating, or decommissioning the proposed ACP at Piketon. The buildings and land proposed to be used for the ACP at the DOE reservation in Piketon would therefore be available for some other use. At the same time, the uranium fuel fabrication facilities in the United States would continue to obtain low-enriched uranium from currently available sources, including the Paducah Gaseous Diffusion Plant and the down blending of highly enriched uranium under the Megatons to Megawatts program. In order to meet growing demands for enriched uranium, additional domestic enrichment facilities utilizing a more efficient technology in the future could be constructed. This could include the gas centrifuge facility proposed by Louisiana Energy Services near Eunice, New Mexico, as well as other possible facilities. The associated impacts associated with the existing uranium fuel cycle activities in the United States would continue as expected today if the proposed ACP is not constructed, operated, or decommissioned.

The no-action alternative would have small local impact on historic and cultural resources; visual and scenic resources; air, water, and ecological resources; geology and soils; environmental justice; transportation; public and occupational health; and waste management. For land use, the facilities currently leased to USEC for the ACP would remain leased to USEC. Some of these facilities would likely continue to be used for the Lead Cascade Demonstration Facility, which is currently scheduled to operate until the middle of 2008 in order to continue to provide a demonstration of the gas centrifuge enrichment process. Any future uses of the facilities currently proposed for the ACP would be up to USEC and DOE, but would be expected to include similar activities within the nuclear fuel cycle, not completely different uses. Nevertheless, the current program for examining and implementing reindustrialization alternatives at the DOE reservation would remain in place under the no-action alternative.

Adverse socioeconomic effects of the no-action alternative to the Piketon region would include a missed opportunity for approximately 1,500 direct and indirect jobs during the 30-year operations phase, 3,362 direct and indirect jobs during the five-year construction phase, and 2,130 direct and indirect jobs during the 10-year manufacturing phase that would have been created by the proposed action. The cessation of enrichment operations at Paducah and the corresponding socioeconomic impacts in that region would be postponed, but would likely occur sometime later when new enrichment facilities are expected to be built to meet the nation's growing demand for enriched uranium. Depending on the construction methods, design of any new facilities, and local demographics, the likely socioeconomic impacts would be similar to the proposed action, but at an alternate location.

In comparison to the no-action alternative, the proposed action would also have small impacts on land use; historical and cultural resources; visual and scenic resources; geology and soils; water resources; ecological resources; environmental justice; noise; public and occupational health; and waste management. Air quality impacts could be small to moderate due to short-term increases in particulate matter emissions from dust during construction. Transportation impacts of the proposed action are expected to be small to moderate, accounting for increased traffic during construction and the possibility of a severe accident releasing significant quantities of UF_6, as described above.

ACRONYMS AND ABBREVIATIONS

ACP	American Centrifuge Plant
CFR	Code of Federal Regulations
DOE	Department of Energy
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
HF	hydrogen fluoride
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
OAC	Ohio Administrative Code
RCRA	Resource Conservation and Recovery Act
SWU	Separative Work Unit
UF_6	uranium hexafluoride
U_3O_8	triuranium octaoxide
UO_2	uranium dioxide
USEC	USEC Inc.

1. INTRODUCTION

1.1 Background

The U.S. Nuclear Regulatory Commission (NRC) prepared this Draft Environmental Impact Statement (EIS) in response to an application submitted by USEC Inc. (USEC) for a license that would allow the construction, operation, and decommissioning of a gas centrifuge uranium enrichment facility in Piketon, Ohio (Figure 1-1). The proposed facility is called the American Centrifuge Plant (ACP).

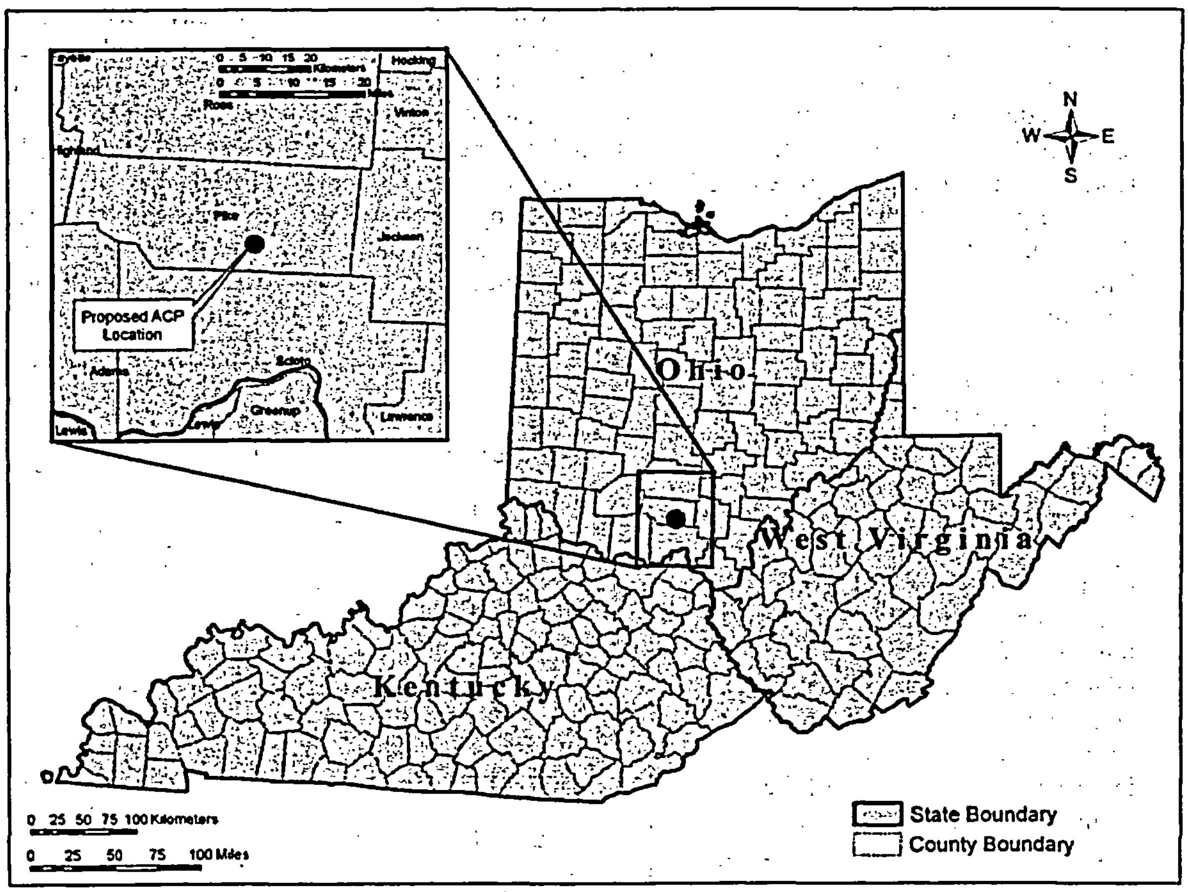

Figure 1-1 Location of the Proposed American Centrifuge Plant

The NRC's Office of Nuclear Material Safety and Safeguards prepared this Draft EIS as required by Title 10, "Energy," of the *U.S. Code of Federal Regulations* (10 CFR) Part 51. These regulations implement the requirements of the *National Environmental Policy Act of 1969*, as amended (Public Law 91-190). The Act requires the Federal Government to assess the potential environmental impacts of its proposed actions.

1.2 The Proposed Action

The proposed action is the issuance of an NRC license for USEC under the provisions of the *Atomic Energy Act*. The license would authorize USEC to possess and use special nuclear material, source material, and byproduct material at the proposed ACP, in accordance with the NRC's regulations in

10 CFR Parts 70, 40, and 30, respectively. The scope of activities to be conducted under the license would include the construction, operation, and decommissioning of the proposed plant.

USEC has proposed that the ACP be located in leased portions of the U.S. Department of Energy (DOE) reservation in Piketon, Ohio. The Portsmouth Gaseous Diffusion Plant, which has been shut down since May 2001, is also located on the DOE reservation in Piketon. The ACP would consist of refurbished existing buildings, newly constructed facilities, and adjacent areas at the Portsmouth plant.

The proposed ACP is intended to help fulfill the terms of a DOE-USEC Agreement signed on June 17, 2002. Among other requirements, this agreement calls for USEC to deploy an advanced technology enrichment plant, meet the need for lower cost production of enriched uranium, and replace the aging gaseous diffusion technology formerly used at the Portsmouth plant and currently used to enrich uranium at the Paducah Gaseous Diffusion Plant in Paducah, Kentucky. Both the Portsmouth and Paducah plants are owned by DOE but operated by USEC's wholly owned subsidiary, the United States Enrichment Corporation. After the proposed ACP becomes operational, production of enriched uranium would ultimately cease at the Paducah plant and be replaced by the proposed new gas centrifuge process at the Portsmouth site. Decontamination and decommissioning of facilities at Paducah currently leased to the United States Enrichment Corporation would begin once the Paducah Gaseous Diffusion Plant ceases operation (USEC, 2005).

Uranium ore usually contains approximately 0.72 weight percent uranium-235, and this percentage is significantly less than the 3 to 5 weight percent uranium-235 required by nuclear power plants as fuel for electricity generation. Therefore, uranium must be enriched in one of the steps of the nuclear fuel cycle (Figure 1-2) so it can be used in commercial nuclear power plants. Enrichment is the process of increasing the percentage of the naturally occurring and fissile uranium-235 isotope and decreasing the percentage of uranium-238.

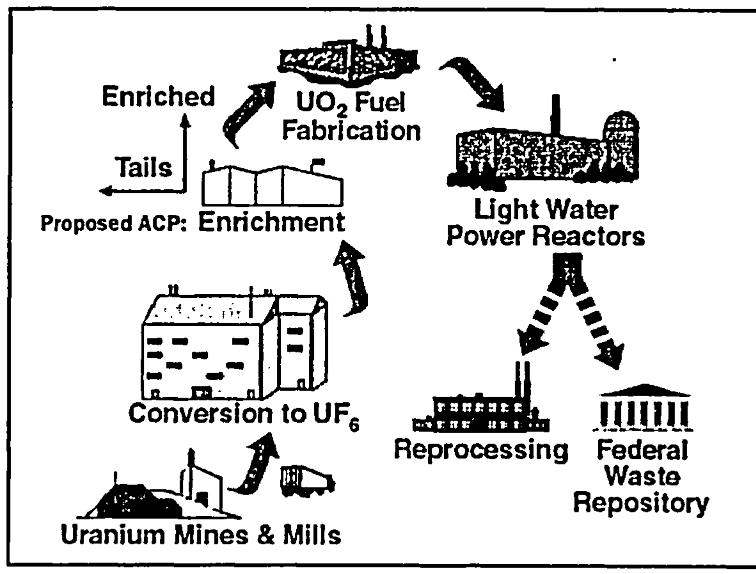

Figure 1-2 Nuclear Fuel Cycle (NRC, 2004a)

USEC's license application seeks authorization to produce enriched uranium up to 10 percent by weight of uranium-235, although enrichment would normally be less than 5.5 percent by weight of uranium-235 to meet the needs of most power plants. Enriched uranium from the proposed ACP would be used in commercial nuclear power plants, and is termed low-enriched uranium in contrast to highly enriched uranium used in military reactors and nuclear weapons. The proposed ACP would not alter the total amount of enriched uranium used in the U.S. nuclear fuel cycle because the amount of enriched uranium produced at the proposed ACP would only substitute for enriched uranium from other sources, as discussed further in this document.

USEC has requested a license for a production capacity of 3.5 million separative work units (SWUs) per year. A SWU is a measure of enrichment in the uranium enrichment industry; it represents the level of effort or energy required to raise the concentration of uranium-235 to a specified level, and is an indicator of the amount of enriched uranium. Because USEC has indicated a potential for future expansion to 7.0

million SWU, this Draft EIS also examines the impacts of the additional construction and operations that would increase the plant's production capacity to approximately 7 million SWUs annually.

1.3 Purpose and Need for the Proposed Action

The purpose of the proposed action would be to allow USEC to construct and operate a plant to enrich uranium up to 10 percent by weight of uranium-235, with an initial production capacity of 3.5 million SWUs potentially expandable to 7 million SWUs, using gas centrifuge technology at the DOE reservation in Piketon, Ohio. The proposed action is intended to satisfy the overall need for an additional reliable and economical domestic source of enriched uranium and to replace existing aging and less efficient production facilities.

For the purpose of this Draft EIS, the need for the proposed ACP is organized by:

- The need for enriched uranium to fulfill electricity requirements;
- The need for domestic supplies of enriched uranium for national energy security; and
- The need for upgraded uranium enrichment technology in the U.S.

The following sections discuss each of these needs and how they are addressed by the proposed action.

1.3.1 The Need for Enriched Uranium to Fulfill Electricity Requirements

Enriched uranium from the proposed ACP would be used in commercial nuclear power plants. Such plants are currently supplying approximately 20 percent of the nation's electricity requirements (EIA, 2005). As the demand for electricity increase in the future, the need for enriched uranium to fuel nuclear power plants is also expected to increase.

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

By 2020, the U.S. is estimated to need about 393 gigawatts or 393,000 megawatts of new generating capacity (DOE, 2003). To meet this growing demand, installed nuclear-generating capacity in the U.S. is projected to increase from approximately 98 gigawatts (98,000 megawatts) in 2001 to about 103 gigawatts (103,000 megawatts) in 2025. This amounts to an increase in U.S. nuclear capacity of more than 5 gigawatts (5,000 megawatts), which is the equivalent of adding about five large nuclear power reactors. In actuality, approximately 3.5 gigawatts (3,500 megawatts) of the new capacity is projected to come from the uprating of existing plants, rather than constructing new facilities (EIA, 2005). As of June 2004, the NRC had granted 102 uprates and was reviewing 10 uprate applications (NRC, 2004b). As a further indicator of the growth in nuclear-generating capacity, domestic nuclear facilities reported a record high median three-year design electrical rating capacity factor[1] of 89.7 percent for the period 2001–2003 as compared to 70.8 percent for the period 1989–1991 (Blake, 2004).

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[1] This factor reflects the amount of energy a facility generates in one year divided by the total amount it could generate if it ran at full capacity.

These forecasts of nuclear power generating capacity suggest a continuing, if not increasing, demand for enriched uranium. Table 1-1 shows uranium enrichment requirements in the U.S. for the next two decades as forecasted by the Energy Information Administration. The Energy Information Administration forecast shows a growth in demand from 11.5 SWUs in 2002 to 14.2 SWUs in 2025.

Table 1-1 Projected Uranium Enrichment Demand in the U.S. for 2002-2025 in Million SWUs

Year	EIA Forecast [a]
2002	11.5 (actual) [b]
2003	12.0 (actual) [b]
2005	14.6
2010	12.9
2015	15.4
2020	13.5
2025	14.2

Notes:
EIA - Energy Information Administration.
[a] EIA, 2003.
[b] EIA, 2004a.

The demand for enriched uranium in the U.S. is currently being fulfilled by three main categories of supply:

- Domestic production of enriched uranium. The only uranium enrichment facility currently operating in the U.S. is the Paducah Gaseous Diffusion Plant. One other enrichment facility presently exists in the U.S., the Portsmouth Gaseous Diffusion Plant, but it ceased production in May 2001 and is in cold standby (a condition under which the plant could be returned to a portion of its previous production capacity in approximately 18-24 months).

- The Megatons-to-Megawatts program. Under this program, the United States Enrichment Corporation implements the 1993 government-to-government agreement between the U.S. and Russia that calls for Russia to convert 500 metric tons (550 tons) of highly enriched uranium from dismantled nuclear warheads into low-enriched uranium. This is the equivalent of about 20,000 nuclear warheads. The United States Enrichment Corporation purchases the enriched portion of the "down blended" material, tests it to make sure it meets specifications, adjusts the enrichment level if needed, and then sells it to its electric utility customers for fuel in commercial nuclear power plants. The activities in the United States all now take place at the Paducah plant. (USEC, 2004a)

- Other foreign sources. Other countries that produce and export enriched uranium to the U.S. include China, France, Germany, the Netherlands, and the United Kingdom.

The Paducah facility and Russian highly enriched uranium supply via the United States Enrichment Corporation provide approximately 56 percent of the U.S. enrichment market needs (USEC, 2004b), with the remaining 44 percent supplied by other foreign sources. Of the 56 percent supplied by the United States Enrichment Corporation, approximately 14 percent comes from the Paducah Gaseous Diffusion Plant (EIA, 2004a) and the remainder comes from the highly enriched uranium agreement, which is itself dependent on deliveries from Russia. Taken together, this means that foreign sources presently provide as much as 86 percent of U.S. enriched uranium needs (EIA, 2004a). Moreover, DOE anticipates "the inevitable cessation of all domestic gaseous diffusion enrichment operations" due to the higher cost of aging diffusion facilities like Paducah relative to new centrifuge technology (DOE, 2001a).

Existing U.S. sources will not be able to provide a dependable and economical domestic supply to meet the continuing U.S. demand for enriched uranium in the future. The Megatons-to-Megawatts program is only planned to be available until 2013, after which the nation could have a significant shortfall in supply

if the agreement is not renewed. Therefore, new domestic sources of enriched uranium are needed to replace the aging, energy-intensive Paducah gaseous diffusion facility even if the Megatons-to-Megawatts program is extended beyond 2013. The ACP proposed by USEC is one such facility. At a capacity of 3.5 million SWUs, the proposed ACP would provide roughly 25 percent of the projected U.S. enrichment needs and allow the Paducah plant to be retired. The National Enrichment Facility that Louisiana Energy Services has proposed to build near Eunice, New Mexico, could provide another 3 million SWUs per year. The NRC is evaluating the National Enrichment Facility as part of a separate proposed action (NRC, 2005), and the combined output from the proposed ACP and National Enrichment Facility would roughly offset the current output from the aging Paducah, Kentucky gaseous diffusion plant.

Although the U.S. is a substantial net importer of enriched uranium, the United States Enrichment Corporation also provides enriched uranium to foreign customers, which is indicative of utility customer preferences for multiple suppliers. An exclusive focus on domestic supply and demand projections clearly indicates a need for the ACP facility, but the reality of global trade in enriched uranium also provides another context for assessing the significance of any potential domestic supply shortfall, because global enrichment forecasts indicate that international supply and demand will be in very close balance after 2010 (ERI, 2004; Grigoriev, 2002; NUKEM, 2002; DOE, 2001a; Combs, 2004). These enrichment demand forecasts reflect global nuclear generation capacity forecasts and the Energy Information Administration has subsequently increased its forecast for 2020 world nuclear generation capacity by about 5 percent (EIA, 2004b), indicating that earlier enrichment demand forecasts were conservative. Supply forecasts reflect current sources of enriched uranium, the anticipated loss of supply from diffusion technology facilities like Paducah, new supply from the proposed National Enrichment Facility and the proposed ACP, and continuation of current levels of supply from the Russian highly enriched uranium agreement. The current Russian highly enriched uranium agreement actually expires in 2013, and while an extension of that agreement through 2020 is a reasonable assumption, any reduction in Russian highly enriched uranium supply after 2013 could shift the close balance after 2010 to a supply shortfall. The U.S. market would be especially vulnerable to any unforeseen global supply shortfall if the Paducah facility closes, as expected, without an offsetting increase in supply from the combined output of the ACP and the National Enrichment Facility.

1.3.2 The Need for Domestic Supplies of Enriched Uranium for National Energy Security

With all domestic production now coming from a single plant—the aging gaseous diffusion plant in Paducah—there is some reliability risk of U.S. domestic enrichment capability. A supply disruption associated with the Paducah plant production or the Megatons-to-Megawatts deliveries could impact national energy security because domestic commercial reactors, which supply approximately 20 percent of the nation's electricity requirements (EIA, 2005), would be fully dependent on foreign sources for enrichment services.

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

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

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

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

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

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

DOE's 2002 letter reinforces the Administration's energy policy, which was released in May 2001 (NEP, 2001). This policy called the expansion of nuclear energy dependence "a major component of our national energy policy."

The proposed ACP would contribute to the attainment of these national energy security policy objectives by helping maintain a reliable and economical domestic source of enriched uranium. Beginning production in 2009 and achieving an annual production capacity of 3.5 million SWUs by 2011, the proposed ACP would provide roughly 25 percent of the projected U.S. enrichment services demand (EIA, 2003).

1.3.3 The Need for Upgraded Uranium Enrichment Technology in the U.S.

In addition to advancing national energy security goals, the proposed ACP would help accomplish the goals of the June 17, 2002 DOE-USEC Agreement to "facilitate the deployment of new, cost effective advanced enrichment technology in the U.S. on a rapid schedule." It would enable USEC to operate a modern, more efficient, and less costly enrichment plant to supplement and replace its more than 50-year old gaseous diffusion plants (USEC, 2004c).

Gaseous diffusion technology has relatively large resource requirements that make it less attractive than gas centrifuge technology, from both an economical and environmental perspective. Most importantly, gaseous diffusion plants require large amounts of power. USEC reports that the cost for electricity to run such plants represents approximately 60 percent of the total production cost. Two coal-fired power plants routed through four switchyards provide the electrical supply necessary to operate the gaseous diffusion process at Paducah. In addition to being energy-intensive, a plant using the gaseous diffusion process requires large-scale use of Freon and non-contact cooling water. (USEC, 2005)

The gas centrifuge technology is known to be more efficient and require less energy to operate than the gaseous diffusion technology currently in use. According to USEC, the energy requirements of a gas centrifuge plant are about five percent of that required by a comparably sized gaseous diffusion plant, resulting in a considerably lower operating cost. At the same time, the gas centrifuge technology does not require such large-scale use of Freon and requires much less use of cooling water. The gas centrifuge technology is also modular, allowing production capacity to be easily geared up or down in response to market demands. (USEC, 2005)

1.4 Scope of the Environmental Analysis

To fulfill its responsibilities under the *National Environmental Policy Act*, the NRC has prepared this Draft EIS to analyze the environmental impacts (i.e., direct, indirect, and cumulative impacts) of the proposed ACP as well as reasonable alternatives to the proposed action. The scope of this Draft EIS includes consideration of both radiological and nonradiological (including chemical) impacts associated

with the proposed action and the reasonable alternatives. The Draft EIS also addresses the potential environmental impacts relevant to transportation.

In addition, this Draft EIS identifies resource uses, monitoring, potential mitigation measures, unavoidable adverse environmental impacts, the relationship between short-term uses of the environment and long-term productivity, and irreversible and irretrievable commitments of resources.

The development of this Draft EIS is the result of the NRC staff's review of the USEC license application (USEC, 2004c) and its supporting Environmental Report (USEC, 2005). This review has been closely coordinated with the development of the Safety Evaluation Report being prepared by the NRC to evaluate, among other aspects, the health and safety impacts of the proposed action. The Safety Evaluation Report is the outcome of the NRC safety review of the USEC license application.

The NRC Environmental and Safety Reviews

The focus of an EIS is a public review and presentation of the environmental impacts of a proposed action.

In addition to meeting its responsibilities under the National Environmental Policy Act, *the NRC prepares a Safety Evaluation Report to analyze the safety of the proposed action and assess its compliance with applicable NRC regulations.*

The safety and environmental reviews are conducted in parallel. Although there is some overlap between the content of a Safety Evaluation Report and EIS, the intent of the documents is different.

To aid in the decision process, the EIS summarizes some of the more detailed analyses included in the Safety Evaluation Report. For example, the EIS does not address how accidents are prevented; rather, it addresses the environmental impacts that would result, should an accident occur.

Much of the information describing the affected environment in the EIS also is applicable to the Safety Evaluation Report (e.g., demographics, geology, meteorology).

Source: NRC, 2003; NRC, 2002.

1.4.1 Scoping Process and Public Participation Activities

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

On October 15, 2004, the NRC published in the *Federal Register* (69 FR 61268) a Notice of Intent to prepare an EIS for the construction, operation, and decommissioning of the proposed ACP and to conduct the scoping process for the EIS. The Notice of Intent summarized the NRC's plans to prepare the EIS and presented background information on the proposed ACP. For the scoping process, the Notice of Intent invited comments on the proposed action and announced a public scoping meeting to be held concerning the project.

On November 8, 2004, the NRC published a notice in the *Federal Register* (69 FR 64794) postponing the public scoping meeting for the proposed ACP. The NRC took this step in order to allow members of the public adequate access to USEC's license application and Environmental Report before the scoping meeting. These documents had been temporarily unavailable to the public due to a security review, by agency experts, of NRC's Agencywide Documents Access and Management System. After the documents were made publically available, the NRC published another notice in the *Federal Register* (69 FR 78058; December 29, 2004) announcing a new date, January 18, 2005 for the public scoping meeting.

On January 18, 2005, the NRC staff toured the proposed ACP site and held the public scoping meeting in Piketon, Ohio. During the scoping meeting, a number of individuals offered oral and written comments and suggestions to the NRC concerning the proposed ACP and the development of the EIS. In addition, the NRC received written comments from various individuals during the public scoping period that ended on February 1, 2005. The NRC carefully reviewed and identified substantive scoping comments (both oral and written). These comments were then consolidated and categorized by topical areas.

After the scoping period, the NRC issued the *Environmental Scoping Summary Report: Proposed USEC Inc. American Centrifuge Plant in Piketon, Ohio* in April 2005 (see Appendix A). The report identifies categories of issues to be analyzed in detail and issues determined to be beyond the scope of the EIS.

1.4.2 Issues Studied in Detail

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

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

1.4.3 Issues Eliminated from Detailed Study

The NRC has determined that detailed analysis for mineral resources is not necessary because there are no known nonpetroleum mineral resources at the proposed site that would be affected by any of the alternatives being considered. In addition, detailed analysis of the impact of the proposed ACP on connected actions that include the overall nuclear fuel cycle activities were not considered. The proposed ACP would not measurably affect the mining and milling operations and the demand for enriched uranium (it would instead provide a replacement supply to meet current and projected demands, as discussed in Section 1.3). The amount of mining and milling is dependent upon the stability of market prices for uranium balanced with the concern of environmental impacts associated with such operations (NRC, 1980). The demand for enriched uranium in the U.S. is primarily driven by the number of commercial nuclear power plants and their operation. The proposed ACP would only result in the

creation of new transportation routes within the fuel cycle to and from the enrichment facility. The existing transportation routes between the other facilities are not expected to be altered. Because the environmental impacts of all of the transportation routes other than those to and from the proposed ACP have been previously analyzed, they are eliminated from further study (NRC, 1980; NRC, 1977).

1.4.4 Issues Outside the Scope of the EIS

The following issues raised during the scoping process have been determined to be outside the scope of the EIS:

- Nonproliferation;
- Safety and security;
- Credibility; and
- Terrorism.

As noted in Section 1.4, some of these issues are analyzed in detail in the NRC's Safety Evaluation Report, and are only summarized in the Draft EIS. For example, within the area of safety and security, the Safety Evaluation Report analyzes the probabilities and consequences of various accidents at the ACP, as well as measures to prevent those accidents and mitigate their effects. This Draft EIS does not go into the same level of detail, but summarizes, in Section 4.2.12.3 and Appendix H, the accident analysis from the Safety Evaluation Report for the purpose of assessing the potential environmental impacts of accidents.

1.4.5 Related National Environmental Policy Act and Other Relevant Documents

The following *National Environmental Policy Act* documents were reviewed as part of the development of this Draft EIS.

- *Environmental Impact Statement for the Proposed National Enrichment Facility in Lea County, New Mexico, Final Report, NUREG-1790, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, June, 2005.* This EIS analyzes the potential environmental impacts of the proposed siting, construction, operation, and decommissioning of a gas centrifuge uranium enrichment facility near Eunice, New Mexico. Its description of the purpose and need of the proposed action, as well as its review of alternatives to the proposed action, are highly relevant to the proposed ACP analysis, because the technologies and production capacities being proposed at the ACP and the National Enrichment Facility are similar. The environmental impacts discussed for the proposed National Enrichment Facility are also relevant to the impact analysis for the proposed ACP, especially the analysis of cumulative impacts associated with the management of wastes from the two facilities.

- *Final Environmental Impact Statement for the Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at the Portsmouth, Ohio, Site. DOE/EIS-0360, Oak Ridge Operations, Office of Environmental Management, U.S. Department of Energy, June, 2004.* This site-specific EIS analyzes the construction, operation, maintenance, and decommissioning of the proposed depleted uranium hexafluoride (UF_6) conversion facility at three alternative locations within the Portsmouth, Ohio, site; transportation of all cylinders (depleted UF_6, enriched uranium, and empty) currently stored at the East Tennessee Technology Park near Oak Ridge, Tennessee, to Portsmouth; construction of a new cylinder storage yard at Portsmouth (if required) for cylinders from the East Tennessee Technology Park; transportation of depleted UF_6 conversion products and waste materials to a disposal facility; transportation and sale of the hydrogen fluoride produced as a conversion co-product; and neutralization of hydrogen fluoride to calcium fluoride and its sale or

disposal in the event that the hydrogen fluoride product is not sold. The affected environment characterized in this EIS is the same as the environment at the proposed ACP, because the two facilities would be near each other on DOE's Portsmouth Reservation. In addition, the results presented in this EIS are relevant to the management, use, and potential impacts associated with the depleted UF_6 that would be generated at the proposed ACP.

- *Final Environmental Impact Statement for the Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at the Paducah, Kentucky, Site. DOE/EIS-0359, Oak Ridge Operations, Office of Environmental Management, U.S. Department of Energy, June, 2004.* This site-specific EIS considers the construction, operation, maintenance, and decommissioning of the proposed depleted UF_6 conversion facility at three locations within the Paducah, Kentucky site, which is a DOE facility; transportation of depleted UF_6 conversion products and waste materials to a disposal facility; transportation and sale of the hydrogen fluoride produced as a conversion co-product; and neutralization of hydrogen fluoride to calcium fluoride and its sale or disposal in the event that the hydrogen fluoride product is not sold. The results presented in this EIS are relevant to the management, use, and potential impacts associated with the depleted UF_6 that would be generated at the proposed ACP.

- *Environmental Assessment of the USEC Inc. American Centrifuge Lead Cascade Facility in Piketon, Ohio, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, January, 2004.* This Environmental Assessment supported the NRC's decision to issue Material License No. 70-7003 to authorize USEC to possess and use source and special nuclear material at the Lead Cascade Demonstration Facility. Beginning in late 2005, this facility will provide a real-time demonstration of the basic building block for the commercial-scale gas centrifuge process proposed at the ACP and will provide information on the reliability, performance, and cost of the centrifuge machines and auxiliary systems. The Lead Cascade facility will have up to 240 operable centrifuges for testing, and will recycle tails and product with no product withdrawals except for sampling. It will be located within some of the same buildings proposed to be used by the proposed ACP. Many aspects of this Environmental Assessment relate directly to the commercial-scale plant now being proposed by USEC, assuming the Lead Cascade facility tests prove successful.

- *Environmental Assessment for the Leasing of Facilities and Equipment to USEC Inc. DOE/EA-1451, U.S. Department of Energy, October 2002.* This Environmental Assessment analyzed the environmental impacts of leasing facilities and equipment to USEC that would be used in its Gas Centrifuge Research and Development Project at East Tennessee Technology Park. The purpose of this research and development project was to develop an economically attractive gas centrifuge machine and process using DOE's centrifuge technology. This Environmental Assessment includes an analysis of potential impacts associated with the fabrication, assembly, and testing of centrifuge components, which is relevant to the proposed manufacturing and assembly of centrifuges for the ACP.

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

- *Final Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride. DOE/EIS-0269, Office of Nuclear Energy, Science and Technology, U.S. Department of Energy, April 1999.* This EIS analyzes strategies for the long-term management of the DUF_6 inventory currently stored at three DOE sites near Paducah, Kentucky; Portsmouth, Ohio; and Oak Ridge, Tennessee. This EIS also analyzes the potential environmental consequences of implementing each alternative strategy for the period from 1999 through 2039. The results presented in this EIS are relevant to the management, use, and potential impacts associated with the depleted UF_6 that would be generated at the proposed ACP.

- *Environmental Assessment for the Reindustrialization Program at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio. DOE/EA-1346, Oak Ridge Operations Office, U.S. Department of Energy, May 2001.* This environmental assessment evaluated the potential impacts of transferring by lease and/or disposal, land and facilities located on the DOE reservation in Piketon, OH, as part of a reindustrialization program. Under the proposed action DOE would transfer land and facilities to a community reuse organization, the Southern Ohio Diversification Initiative, or other entities, should DOE determine them suitable.

- *Environmental Assessment for the Winterization Activities in Preparation for Cold Standby at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio. DOE/EA-1392, Oak Ridge Operations Office, U.S. Department of Energy, June 2001.* This environmental assessment evaluated the potential impacts of winterizing activities to include the installation and operation of a hot water heating facility and associated recirculating pipes and gas lines, as well as ongoing cold standby operations.

1.5 Applicable Regulatory Requirements

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

1.5.1 Federal Laws and Regulations

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

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

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

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

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

The *Clean Air Act* establishes regulations to ensure air quality and authorizes individual States to manage permits. The *Clean Air Act*: (1) requires the U.S. Environmental Protection Agency (U.S. EPA) to

establish National Ambient Air Quality Standards as necessary to protect the public health, with an adequate margin of safety, from any known or anticipated adverse effects of a regulated pollutant (42 U.S.C. §7409 et seq.); (2) requires establishment of national standards of performance for new or modified stationary sources of atmospheric pollutants (42 U.S.C. §7411); (3) requires specific emission increases to be evaluated so as to prevent a significant deterioration in air quality (42 U.S.C. §7470 et seq.); and (4) requires specific standards for releases of hazardous air pollutants (including radionuclides) (42 U.S.C. §7412). These standards are implemented through plans developed by each State and approved by the U.S. EPA. The *Clean Air Act* requires sources to meet standards and obtain permits to satisfy those standards. The proposed ACP may be required to comply with the *Clean Air Act* Title V, Sections 501–507, for sources subject to new source performance standards or sources subject to National Emission Standards for Hazardous Air Pollutants.

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

The *Clean Water Act* requires the U.S. EPA to set national effluent limitations and water-quality standards, and establishes a regulatory program for enforcement. Specifically, Section 402(a) of the Act establishes water-quality standards for contaminants in surface waters. The *Clean Water Act* requires a National Pollutant Discharge Elimination System permit before discharging any point source pollutant into U.S. waters. The Ohio EPA administers this program in Ohio, with review and support from U.S. EPA Region 5. The National Pollutant Discharge Elimination System General Permit for Industrial Storm Water is required for point source discharge of storm water runoff from industrial or commercial facilities to State waters. Construction of the proposed ACP would require a National Pollutant Discharge Elimination System Construction Storm Water General Permit from the Ohio EPA. Section 401(a)(1) of the *Clean Water Act* requires States to certify that the permitted discharge would comply with all limitations necessary to meet established State water-quality standards, treatment standards, or schedule of compliance.

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

The *Resource Conservation and Recovery Act*, as amended, requires the U.S. EPA to define and identify hazardous waste; establish standards for its transportation, treatment, storage, and disposal; and require permits for persons engaged in hazardous waste activities. Section 3006 (42 U.S.C. §6926) allows States to establish and administer these permit programs with U.S. EPA approval. U.S. EPA Region 5 has delegated regulatory jurisdiction to the Ohio EPA for nearly all aspects of permitting as required by the *Resource Conservation and Recovery Act*. U.S. EPA regulations implementing the *Resource Conservation and Recovery Act* are found in 40 CFR Parts 260 through 283. Regulations imposed on a generator or on a treatment, storage, and/or disposal facility vary according to the type and quantity of material or waste generated, treated, stored, and/or disposed. The method of treatment, storage, and/or disposal also impacts the extent and complexity of the requirements. The proposed ACP would be classified as a large quantity generator of hazardous waste (meaning it is expected to generate more than 1,000 kilograms (2,200 pounds) of such waste per month) (USEC, 2005). Hazardous wastes would not be treated or disposed onsite; instead, USEC plans to store such wastes onsite for less than 90 days and then transfer them to appropriately permitted treatment, storage, and disposal facilities.

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

The *Low-Level Radioactive Waste Policy Act of 1980* amended the *Atomic Energy Act* to specify that the Federal Government is responsible for disposal of low-level radioactive waste generated by its activities and that States are responsible for disposal of other low-level radioactive waste. The *Low-Level Radioactive Waste Policy Act of 1980* provides for and encourages interstate compacts to carry out the

State responsibilities. Low-level radioactive waste would be generated from activities conducted from the proposed ACP. The State of Ohio is a member of the Midwest Compact.

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

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

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

The *Safe Drinking Water Act* was enacted to protect the quality of public water supplies and sources of drinking water. The Ohio EPA, under 42 U.S.C. §300g-2 of the Act, established standards applicable to public water systems. These regulations include maximum contaminant levels (including those for radioactivity) in public water systems. Other programs established by the *Safe Drinking Water Act* include the Sole Source Aquifer Program, the Wellhead Protection Program, and the Underground Injection Control Program. In addition, the Act provides underground sources of drinking water with protection from contaminated releases and spills. The proposed ACP would not use onsite ground-water or surface-water supplies, but rather would obtain potable water from a nearby municipal water supply system and non-potable cooling water (primarily for tower water cooling and a lesser amount for machine cooling water) from a nearby water treatment facility.

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

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

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

The *National Historic Preservation Act* was enacted to create a national historic preservation program, including the National Register of Historic Places and the Advisory Council on Historic Preservation. Section 106 of the Act requires Federal agencies to take into account the effects of their undertakings on historic properties. The Advisory Council on Historic Preservation regulations implementing Section 106 of the Act are found in 36 CFR Part 800. These regulations were revised on July 6, 2004 (69 FR 40544) and became effective on August 5, 2004. The regulations call for public involvement in the Section 106 consultation process, including Indian tribes and other interested members of the public, as applicable. The NRC has initiated the Section 106 consultation process and entered into consultation with the Ohio Historic Preservation Office and interested Indian tribes (see Section 1.5.6 and Appendix B).

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

The *Endangered Species Act* was enacted to prevent the further decline of endangered and threatened species and to restore those species and their critical habitats. Section 7 of the Act requires consultation with the U.S. Fish and Wildlife Service of the U.S. Department of the Interior or the National Marine Fisheries Service of the U.S. Department of Commerce to determine whether endangered and threatened species or their critical habitats are known to be in the vicinity of the proposed action, and to determine whether the proposed Federal action may affect listed species or critical habitat. The NRC has initiated the consultation process with the U.S. Fish and Wildlife Service for the proposed ACP (see Section 1.5.6 and Appendix B).

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

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

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

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

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

These regulations establish maximum doses to the body or organs of members of the public, as a result of operational normal releases from uranium fuel cycle activities, including uranium enrichment. These regulations were promulgated by U.S. EPA under the authority of the *Atomic Energy Act of 1954*, as amended, and have been incorporated by reference in the NRC regulations in 10 CFR §20.1301(e). The proposed ACP would be required to comply with these regulations for its releases from normal operations.

1.5.2 Applicable Executive Orders

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

- *Executive Order 12898* (Environmental Justice) calls for Federal agencies to address environmental justice in minority populations and low-income populations (59 FR 7629), and directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. In response to this Executive Order, the NRC has issued a final policy statement

on the "Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions" (69 FR 52040; August 24, 2004) and environmental justice procedures to be followed in NEPA documents prepared by the NRC's Office of Nuclear Material Safety and Safeguards (NRC, 2003).

1.5.3 Applicable State of Ohio Requirements

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

Table 1-2 State of Ohio Environmental Requirements

Law/Regulation	Citation	Requirements
	Air Quality Protection	
Title V Permit Rules	ORC, Title 37, Chapter 3704 "Air Pollution Control," and implementing regulations in OAC, Chapter 3745-77	Establishes the policies and procedures by which the Ohio EPA will administer the Title V permit program under the *Clean Air Act*. Requires Title V sources, as defined by OAC 3745-77-02, to apply for and obtain a Title V permit prior to operation of the source facility.
Permits to Install New Sources of Pollution	ORC, Title 37, Chapter 3704 "Air Pollution Control," and implementing regulations in OAC 3745-31	Requires a permit prior to the installation of a new source of air pollutants, or the modification of an air contaminant source. Discusses exemptions and conditions under which approval will be granted. Also requires an impact analysis to determine if the air contaminant source will cause or contribute to violations of the National Ambient Air Quality Standards.
Air Permits to Operate and Variances	ORC, Title 37, Chapter 3704 "Air Pollution Control," and implementing regulations in OAC 3745-35	Requires a permit prior to the operation or use of any air contaminant source in violation of any applicable air pollution control law, unless a variance has been applied for and obtained from the Director of Environmental Protection.
Accidental Release Prevention Program	ORC, Title 37, Chapter 3704 "Air Pollution Control," and implementing regulations in OAC 3745-104	Establishes the policies and procedures by which the Ohio EPA will administer the Accidental Release Prevention Program, or Risk Management Plan program under the *Clean Air Act Amendments of 1990*. Requires the owner or operator of a stationary source that has more than a threshold quantity of a regulated substance to comply with all the provisions of the rule, including creating a hazard assessment, risk management plan, a prevention program, and an emergency response program.
General Conformity Rules	ORC, Title 37, Chapter 3704 "Air Pollution Control," and implementing regulations in OAC 3745-102	Establishes Ohio's rules on "general conformity," a process mandated by the *Clean Air Act* to ensure that Federal actions uphold the State Implementation Plan and do not contribute to air quality violations within the State. Discusses which Federal actions are subject to the conformity requirements, the procedures for conformity analysis, public participation/consultation, and the final conformity determination.

Table 1-2 State of Ohio Environmental Requirements (continued)

Law/Regulation	Citation	Requirements
Water Resources Protection		
Ohio National Pollutant Discharge Elimination System Permits	ORC Title 61, Chapter 6111,"Water Pollution Control" and implementing regulations in OAC 3745-33 and 3745-38	Initiates plans and programs for the prevention, control, and abatement of new or existing pollution of the waters of the State of Ohio. Requires an Ohio individual or general permit prior to any discharge of sewage, industrial waste, or other waste as defined by divisions (B) to (D) of Section 6111.01 of the Ohio Revised Code. Requires the compliance of each point source with authorized discharge levels, monitoring requirements, and other appropriate requirements.
Permits to Install New Sources of Pollution	ORC Title 61, Chapter 6111,"Water Pollution Control" and implementing regulations in OAC 3745-31	Requires a permit prior to the installation of a new source of water pollutants, or the modification of any pollutant discharge source.
Water Quality Standards	ORC Title 61, Chapter 6111,"Water Pollution Control" and implementing regulations in OAC 3745-1	Establishes water quality standards for surface waters in the State of Ohio, including beneficial use designations, numeric water quality criteria, and the anti-degradation waterbody classification system.
Section 401 Water Quality Certifications	ORC Title 61, Chapter 6111,"Water Pollution Control" and implementing regulations in OAC 3745-32 and 3745-45	Requires a Section 401 water quality certification and payment of applicable fees before the issuance of any Federal permit or license to conduct any activity that may result in any discharge to waters of the State.
Public Water Systems Licenses to Operate	ORC Title 61, Chapter 6109, "Safe Drinking Water" and implementing regulations in OAC 3745-84	Requires a public water systems license prior to operating or maintaining a public water system.
Design, Construction, Installation, and Upgrading for Underground Storage Tank systems	ORC Title 37, Chapter 3737, "Underground Storage Tanks" and implementing regulations in OAC 1301: 7-9-06	Establishes performance standards and upgrading requirements for USTs containing petroleum or other regulated substances. Requires an installation or upgrading permit for each location where such installation or upgrading is to occur prior to beginning either an installation or upgrading of a tank or piping comprising an underground storage tank system.
Registration of Underground Storage Tank System	ORC Title 37, Chapter 3737, "Underground Storage Tanks" and implementing regulations in OAC 1301: 7-9-04	Establishes annual registration requirements for underground storage tanks containing petroleum or other regulated substances.

Table 1-2 State of Ohio Environmental Requirements (continued)

Law/Regulation	Citation	Requirements
Flammable and Combustible Liquids	ORC Title 37, Chapter 3737, "Fire Marshal; Fire Safety" and implementing regulations in OAC 1301: 7-7-28	Requires a permit to install, remove, repair, or alter a stationary tank for the storage of flammable or combustible liquids or modify or replace any line or dispensing device connected thereto.
Waste Management and Pollution Prevention		
Generator Standards	ORC Title 37, Chapter 3734, "Solid and Hazardous Waste" and implementing regulations in OAC 3745-52-11 and 3745-52-12	Requires any person who generates a waste in the State of Ohio, as defined in rule 3745-51-02 of the Administrative Code, to determine if that waste is a hazardous waste. Requires a generator identification number from U.S. EPA or Ohio EPA prior to treatment, storage, disposal, transport, or offer for transport of hazardous waste.
Licensing Requirements for Solid Waste, Construction, and Demolition Debris Facilities	ORC Title 37, Chapter 3734, "Solid and Hazardous Waste" and implementing regulations in OAC 3745-37 and 3745-29	Requires an annual license for any municipal solid waste landfill, industrial solid waste landfill, residual solid waste landfill, compost facility, transfer facility, infectious waste treatment facility, or solid waste incineration facility prior to operation. New facilities must obtain a permit to install prior to construction. Also, requires a license to establish, modify, operate, or maintain a construction and demolition debris facility.
Radiation Generator and Broker Reporting Requirements	OAC 3701: 1-54-02	Requires completion of a low-level radioactive waste generator report within 60 days of beginning to generate low-level waste in Ohio. Additionally, requires each generator to submit an annual report on the state of low-level waste activities in their facility and pay applicable fees.
Hazardous Waste Management System, Permits	ORC Title 37, Chapter 3734, "Solid and Hazardous Waste" and implementing regulations in OAC 3745-50-40	Requires operation permits for any new or existing hazardous waste facility.
Emergency Planning and Response		
Hazardous Chemical Reporting	ORC Title 37, Chapter 3750, "Emergency Planning" and implementing regulations in OAC 3750-30	Requires the submission of Material Safety Data Sheets and an annual Emergency and Hazardous Chemical Inventory to local emergency response officials for any hazardous chemicals that are produced, used, or stored at the facility in an amount that equals or exceeds the threshold quantity.

Table 1-2 State of Ohio Environmental Requirements (continued)

Law/Regulation	Citation	Requirements
Emergency Planning Requirements of Subject Facilities	ORC Title 37, Chapter 3750, "Emergency Planning" and implementing regulations in OAC 3750-20	Requires any facility having an extremely hazardous substance present in an amount equal to or exceeding the threshold planning quantity to notify the emergency response commission and the local emergency planning committee within 60 days after onsite storage begins. Also, requires the designation of a facility representative who will participate in the local emergency planning process as a facility emergency coordinator.
Toxic Chemical Release Reporting	ORC Title 37, Chapter 3751, "Hazardous Substances" and implementing regulations in OAC 3745-100	Establishes reporting requirements and schedule for each toxic chemical known to be manufactured (including imported), processed, or otherwise used in excess of an applicable threshold quantity. Applies only to facilities of a certain classification.
Biotic Resources Protection		
State Endangered Plant Species Protection	ORC Title 15, Chapter 1518, "Endangered Species"	Establishes criteria for identifying threatened or endangered species of native Ohio plants and prohibits injuring or removing endangered species without permission.
State Endangered Fish and Wildlife Species Protection	ORC Title 15, Chapter 1531, "Division of Wildlife," Section 1531.25 and implementing regulations in OAC 1501:31-23-01	Grants the Chief of the Division of Wildlife with the approval of the Wildlife Council, the power to adopt, modify, and repeal rules to restrict the taking or possession of native wildlife, or any eggs or offspring thereof, that he/she finds to be threatened with statewide extinction. Establishes and requires periodic update to a list of endangered fish and wildlife species native to Ohio.
Permits for Impacts to Isolated Wetlands	ORC Title 61, Chapter 6111, "Water Pollution Control"	Requires a general or individual State isolated wetland permit prior to engaging in an activity that involves the filling of an isolated wetland.
Cultural Resources Protection		
Ohio Historical Society	ORC Title 1, Chapter 149, Section 149.30	Creates the Ohio Historical Society and Advisory Board. Outlines the Society's duties for the preservation of Ohio's designated or potentially designated historic and archaeological objects, sites, and properties.
State Registry of Archaeological Landmarks	ORC Title 1, Chapter 149, Section 149.51	Directs the Ohio Historical Society to maintain a State Registry of Archaeological Landmarks. Prohibits any person from excavating or destroying such land, or from removing skeletal remains or artifacts from any land placed on the registry without first notifying the Director of the Historical Society.

Table 1-2 State of Ohio Environmental Requirements (continued)

Law/Regulation	Citation	Requirements
Survey and Salvage; Discoveries; Preservation	ORC Title 1, Chapter 149, Section 149.53	Directs all State departments, agencies, and political subdivisions to cooperate with the Ohio Historical Society in the preservation of archaeological and historic sites and the recovery of scientific information from such sites. Also, requires State agencies and contractors performing work on public improvements to cooperate with archaeological and historic survey and salvage efforts and to notify the Society or the Board about archaeological discoveries.

Sources: http://www.epa.state.oh.us/dapc/regs/regs.html and http://onlinedocs.andersonpublishing.com.

1.5.4 Permit and Approval Status

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

1.5.5 Cooperating Agencies

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

1.5.6 Consultations

As a Federal agency, the NRC is required to comply with the consultation requirements in the *Endangered Species Act of 1973*, as amended, and the *National Historic Preservation Act of 1966*, as amended. For this proposed action, the NRC conducted these consultations as well as consultations in accordance with the *Fish and Wildlife Coordination Act of 1934* and the *Farmland Protection Policy Act of 1981*. All consultation letters related to each of these laws are presented in Appendix B of this Draft EIS and are summarized below.

Table 1-3 Potentially Applicable Requirements for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Required Approval	Responsible Agency	Authority	Relevance and Status
		Air Quality Protection	
Title V Operating Permit: Required for sources that are not exempt and are major sources, affected sources subject to the Acid Rain Program, sources subject to new source performance standards, or sources subject to National Emission Standards for Hazardous Air Pollutants.	Ohio EPA; U.S. EPA	*Clean Air Act* (CAA), Title V, Sections 501-507 (*U.S. Code*, Title 42, Sections 7661-7661f [42 USC 7661- 7661f]); *Ohio Administrative Code* (OAC) 3745-77-02	United States Enrichment Corporation is the holder of a final Title V Operating Permit (Facility ID 0666000000) with an issue date of July 31, 2003 and effective date of August 21, 2003. The plant is subject to 40 CFR Part 61, Subpart H (40 CFR Part 61, Subpart H), "National Emissions Standards for Emissions of Radionuclides," which is included in the terms and conditions of the Title V Operating Permit.
Ohio Permit to Install: Required for (1) any source to which one or more of the following CAA programs would apply: prevention of significant deterioration, nonattainment area, New Source Performance Standards, and/or National Emission Standards for Hazardous Pollutants; and (2) any source to which one or more of the following State air quality programs would apply: Gasoline Dispensing Facility Permit, Direct Final Permit, and/or Small Maximum Uncontrolled Emissions Unit Registration.	Ohio EPA	CAA, Title I, Sections 160-169 (42 USC 7470-7479); OAC 3745-31-02	USEC has determined that the prevention of significant deterioration, nonattainment area, and NSPS programs do not apply to the proposed ACP. However, air emission sources at the proposed ACP would require an Ohio Permit to Install and USEC would submit a timely application to the Ohio EPA.

Table 1-3 Potentially Applicable Requirements for the Construction and Operation of the American Centrifuge Plant (continued)

License, Permit, or Other Required Approval	Responsible Agency	Authority	Relevance and Status
Ohio Permit to Operate: Required for (1) any source to which one or more of the following CAA programs would apply: prevention of significant deterioration, nonattainment area, New Source Performance Standards, National Emission Standards for Hazardous Air Pollutants; and (2) any source to which one or more of the following State air quality programs would apply: State Permit to Operate and/or registration of operating unit with potential air emissions of an amount and type considered minimal. This permit is not required, however, for any facility that must obtain a Title V Operating Permit.	Ohio EPA	CAA, Title I, Sections 160-169 (42 USC 7470-7479); OAC 3745-35-02	United States Enrichment Corporation is the holder of a final Title V Operating Permit (Facility ID 0666000000) with an issue date of July 31, 2003 and effective date of August 21, 2003. New sources at the proposed ACP requiring a Permit to Install would be incorporated in the Title V Operating Permit.
Risk Management Plan: Required for any stationary source that has a regulated substance (e.g., chlorine, hydrogen fluoride, nitric acid) in any process (including storage) in a quantity that is over the threshold level.	U.S. EPA; Ohio EPA	CAA, Title 1, Section 112(R)(7) (42 USC 7412); 40 CFR Part 68; OAC 3745-104	USEC has determined that no regulated substances would be stored at the proposed ACP in quantities that exceed the threshold levels. Accordingly, a Risk Management Plan would not be required.
***Clean Air Act* Conformity Determination:** Required for each criteria pollutant (i.e., sulfur dioxide, particulate matter, carbon monoxide, ozone, nitrogen dioxide, and lead) where the total of direct and indirect emissions in a nonattainment or maintenance area caused by a Federal action would equal or exceed threshold rates.	Ohio EPA	CAA, Title 1, Section 176(c) (42 USEC 7506); 40 CFR Part 93; OAC 3745-102	Pike County, Ohio has been designated as "Cannot be Classified or Better Than Standard" for criteria pollutants. Because the county is in attainment with National Ambient Air Quality Standards for criteria pollutants and contains no maintenance areas, no *Clean Air Act* conformity determination is required for any criteria pollutant that would be emitted as a result of the Proposed Action. Existing air quality on the site is in attainment with National Ambient Air Quality Standards for the criteria pollutants.

Table 1-3 Potentially Applicable Requirements for the Construction and Operation of the American Centrifuge Plant (continued)

License, Permit, or Other Required Approval	Responsible Agency	Authority	Relevance and Status
Water Resources Protection			
National Pollutant Discharge Elimination System Permit: Construction Site Storm Water: Required before making point source discharges into waters of the State of storm water from a construction project that disturbs more than 2 hectares (5 acres) of land.	Ohio EPA	*Clean Water Act* (CWA) (33 USC 1251 et seq.); 40 CFR Part 122; OAC-3745-33-02, 3745-38-02, and 3745-38-06	Construction of the proposed ACP and new cylinder storage yards would require a permit for the construction site storm water discharges. United States Enrichment Corporation is the holder of Permit number 0IS00023AD. If requested, a Storm Water Pollution Prevention Plan would be submitted to the Ohio EPA at the appropriate time. Storm water would discharge through existing outfalls covered by a permit.
National Pollutant Discharge Elimination System Permit: Industrial Facility Storm Water: Required before making point source discharges into waters of the State of storm water from an industrial site.	Ohio EPA	CWA (33 USC 1251 et seq.); 40 CFR Part 122; OAC-3745-33-02, 3745-38-02, and 3745-38-06	Storm water would be discharged from the proposed ACP site during operations. Storm water would discharge through existing outfalls covered by a permit.
National Pollutant Discharge Elimination System Permit: Process Water Discharge: Required before making point source discharges into waters of the State of industrial process wastewater.	Ohio EPA	CWA (33 USC 1251 et seq.); 40 CFR Part 122; OAC-3745-33-02, 3745-38-02, and 3745-38-06	The proposed ACP would process industrial wastewater through an existing permitted facility and through existing outfalls covered by the permit.
Ohio Surface Water Permit to Install: Required before constructing sewers or pump stations.	Ohio EPA	OAC-3745-31-02	If required, before construction of sewer lines and pump stations at the proposed ACP, a Permit to Install to modify the existing National Pollutant Discharge Elimination System permit would be submitted to the Ohio EPA at the appropriate time.
Ohio Surface Water Permit to Install: Required before constructing any wastewater treatment or collection system or disposal facility.	Ohio EPA	OAC-3745-31-02	If required, a Permit to Install to modify the existing National Pollutant Discharge Elimination System permit would be submitted to the Ohio EPA at the appropriate time.

Table 1-3 Potentially Applicable Requirements for the Construction and Operation of the American Centrifuge Plant (continued)

License, Permit, or Other Required Approval	Responsible Agency	Authority	Relevance and Status
Spill Prevention Control and Countermeasures Plan: Required for any facility that could discharge oil in harmful quantities into navigable waters or onto adjoining shorelines.	U.S. EPA	CWA (33 USC 1251 et seq.); 40 CFR Part 112	A Spill Prevention Control and Countermeasures plan would be required. The United States Enrichment Corporation's plan is currently being revised to incorporate changes in plant operation and to reflect new requirements mandated in the *Federal Register* on July 17, 2002. The U.S. EPA requires plan approval by August 17, 2005 and implementation by February 18, 2006. USEC would revise the plan to include proposed ACP operations at the appropriate time.
***Clean Water Act* Section 401 Water Quality Certification:** Required to be submitted to the agency responsible for issuing any Federal license or permit to conduct an activity that may result in a discharge of pollutants into waters of a state.	Ohio EPA	CWA, Section 401 (33 USC 1341); ORC Chapters 119 and 6111; OAC Chapters 3745-1, 3745-32, and 3745-47	USEC believes that it would not be required to obtain a *Clean Water Act* Section 401 Water Quality Certification for construction or operation of the proposed ACP or new cylinder storage yards. If USEC determines that a Federal license or permit is required (e.g., a *Clean Water Act* Section 404 Permit), a *Clean Water Act* Section 401 Water Quality Certification would be requested from the Ohio EPA at the appropriate time.
Public Water System: A completed application for an initial public water system license is required prior to the operation of the public water system.	Ohio EPA	OAC-3745-84-01 (B)(b)	USEC would procure water from a qualified vendor, which draws water from groundwater wells sunk near the Scioto River. USEC would not operate a public water system subject to these requirements.

Table 1-3 Potentially Applicable Requirements for the Construction and Operation of the American Centrifuge Plant (continued)

License, Permit, or Other Required Approval	Responsible Agency	Authority	Relevance and Status
Underground Storage Tank Installation Permit: Required before beginning installation of an underground storage tank system (i.e., a tank and/or piping of which 10 percent or more of the volume is underground and that contains petroleum products or substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act, except those hazardous substances that are also defined as hazardous waste by the Resource Conservation and Recovery Act).	Ohio Department of Commerce, Ohio Bureau of Underground Storage Tank Regulations	OAC 1301:7-9-06(D)	Two existing UST systems are anticipated to be used by the proposed ACP. Registration number: 66005107-R00010. Tank Numbers: T00007 and T00016.
New Underground Storage Tanks System Registration: Required within 30 days of bringing a new underground storage tank system into service.	U.S. EPA; Ohio Bureau of Underground Storage Tank Regulations	RCRA, as amended, Subtitle I (42 USC 6991a-6991i); 40 CFR §280.22; OAC 1301:7-9-04	If new underground storage tank systems would be installed at the proposed ACP the Registration would be filed at the appropriate time. No new systems are currently planned.
Above Ground Storage Tank: A Permit to Install required to install, remove, repair or alter any stationary tank for the storage of flammable or combustible liquids.	Ohio Department of Commerce, State Fire Marshal	OAC 1301:7-7-28(A)(3) 40 CFR §112.8	New Above ground Storage fuel storage tanks would be required for the proposed ACP. Permits to install would be filed at the appropriate time.
Waste Management and Pollution Prevention			
Submit Determination Results: Required when a person who generates waste in the State of Ohio or a person who generates waste outside the State that is managed inside the State determines that the waste he/she generates is hazardous waste.	Ohio EPA	OAC 3745-52-11	Upon characterization of newly generated waste streams from the proposed ACP, notification would be made to the Ohio EPA.
Registration and Hazardous Waste Generator Identification Number: Required before a person who generates over 100 kg (220 lb) per calendar month of hazardous waste ships the hazardous waste off-reservation.	U.S. EPA; Ohio EPA	RCRA, as amended (42 USC 6901 et seq.), Subtitle C; OAC 3745-52-12	United States Enrichment Corporation has Hazardous Waste Generator Identification Number OHD987054723.

Table 1-3 Potentially Applicable Requirements for the Construction and Operation of the American Centrifuge Plant (continued)

License, Permit, or Other Required Approval	Responsible Agency	Authority	Relevance and Status
Construction and Demolition Debris Facility License: Required before establishing, modifying, operating, or maintaining a facility to dispose of debris from the alteration, construction, destruction, or repair of a man-made physical structure; however, the debris to be disposed of must not qualify as solid or hazardous waste; also, no license is required if debris from site clearing is used as fill material on the same site.	Ohio EPA or Pike County Board of Health	OAC 3745-37-01	Construction debris would not be disposed of onsite at the proposed ACP. Therefore, no Construction and Demolition Debris Facility License would be required.
Low-Level Radioactive Waste Generator Report: Required within 60 days of commencing the generation of low-level waste in Ohio.	Ohio Department of Health	OAC 3701:1-54-02	USEC would file a Low-Level Radioactive Waste Generator Report with the Ohio Department of Health at the appropriate time. ODH ID Number 52-2109255.
Hazardous Waste Facility Permit: Required if hazardous waste will undergo nonexempt treatment by the generator, be stored onsite for longer than 90 days by the generator of 1,000 kg (2,205 lb) or more of hazardous waste per month, be stored onsite for longer than 180 days by the generator of between 100 and 1,000 kg (220 and 2,205 lb) of hazardous waste per month, disposed of onsite, or be received from off-reservation for treatment or disposal.	U.S. EPA; Ohio EPA	RCRA, as amended (42 USC 6901 et seq.), Subtitle C; OAC 3745-50-40	Hazardous waste would not be disposed of onsite at the proposed ACP. Also, USEC does not plan to store any hazardous wastes that are generated onsite for more than 90 days. However, should waste require storage onsite for greater then 90 days for characterization, profiling, or scheduling for treatment or disposal, a Hazardous Waste Facility Permit would be required and submitted at the appropriate time.
Depleted UF_6 Management Measures: Establishes requirements for management, *inspection, testing, and* maintenance associated with the depleted UF_6 storage yards and cylinders owned by USEC at the DOE reservation as stipulated in the ACP License Application.	Ohio EPA	OAC 3745-266; 40 CFR Part 266, Subpart N	USEC would manage the depleted UF_6 tails cylinders in accordance with 40 CFR Part *266, Subpart N and Ohio* Administrative Code Chapter 3745-266 while in storage.

Table 1-3 Potentially Applicable Requirements for the Construction and Operation of the American Centrifuge Plant (continued)

License, Permit, or Other Required Approval	Responsible Agency	Authority	Relevance and Status
Low-Level Mixed Waste: Low-level mixed waste is a waste that contains both low-level radioactive waste and RCRA-regulated hazardous waste.	Ohio EPA	OAC 3745-266; 40 CFR Part 266, Subpart N	USEC would manage low-level mixed waste in compliance with 40 CFR Part 266, Subpart N and Ohio Administrative Code Chapter 3745-266.
Industrial Solid Waste Landfill Permit to Install: Required before constructing or expanding a solid waste landfill facility in Ohio.	Ohio EPA	OAC 3745-29-06	Industrial solid waste would not be disposed of onsite at the proposed ACP. Therefore, no Industrial Solid Waste Landfill Permit to Install would be required.
Emergency Planning and Response			
List of Material Safety Data Sheets: Submission of a list of material Safety Data Sheets is required for hazardous chemicals (as defined in 29 CFR Part 1910) that are stored onsite in excess of their threshold quantities.	Local Emergency Planning Commission; Ohio State Emergency Response Commission	Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), Section 311 (42 USC 11021); 40 CFR §370.20; OAC 3750-30-15	USEC would prepare and submit a List of Material Safety Data Sheets at the appropriate time.
Annual Hazardous Chemical Inventory Report: Submission of the report is required when hazardous chemicals have been stored at a facility during the preceding year in amounts that exceed threshold quantities.	LEPC; Ohio State Emergency Response Commission; local fire department	EPCRA, Section 312 (42 USC 11022); 40 CFR §370.25; OAC 3750-30-01	United States Enrichment Corporation would prepare and submit an Annual Hazardous Chemical Inventory Report each year. United States Enrichment Corporation Facility ID Number 45661NTDST3930U.
Notification of On-Site Storage of an Extremely Hazardous Substance: Submission of the notification is required within 60 days after on-site storage begins of an extremely hazardous substance in a quantity greater than the threshold planning quantity.	Ohio State Emergency Response Commission	EPCRA, Section 304 (42 USC 11004); 40 CFR §355.30; OAC 3750-20-05	United States Enrichment Corporation would prepare and submit the Notification of On-Site Storage of an Extremely Hazardous Substance at the appropriate time, if such substances are determined to be stored in a quantity greater than the threshold planning quantity at the proposed ACP. Facility ID Number 45661NTDST3930U.
Annual Toxics Release Inventory Report: Required for facilities that have 10 or more full-time employees and are assigned certain Standard Industrial Classification codes.	U.S. EPA; Ohio EPA	EPCRA, Section 313 (42 USC 11023); 40 CFR Part 372; OAC 3745-100-07	United States Enrichment Corporation would prepare and submit a Toxics Release Inventory Report to the U.S. EPA each year. Facility ID Number 45661NTDST3930U.

Table 1-3 Potentially Applicable Requirements for the Construction and Operation of the American Centrifuge Plant (continued)

License, Permit, or Other Required Approval	Responsible Agency	Authority	Relevance and Status
Transportation of Radioactive Wastes and Conversion Products Certificate of Registration: Required to authorize the registrant to transport hazardous material or cause a hazardous material to be transported or shipped.	U.S. Department of Transportation	*Hazardous Materials Transportation Act* (HMTA), as amended by the *Hazardous Materials Transportation Uniform Safety Act* of 1990 and other acts (49 USC 1501 et seq.); 49 CFR §107.608(b)	United States Enrichment Corporation Certificate of Registration Number 052803005022LN.
Transportation of Radioactive Wastes and Conversion Products Packaging, Labeling, and Routing Requirements for Radioactive Materials: Required for packages containing radioactive materials that will be shipped by truck or rail.	U.S. Department of Transportation	HMTA (49 USC 1501 et seq.); Atomic Energy Act (AEA), as amended (42 USC 2011 et seq.); 49 CFR Parts 172, 173, 174, 177, and 397	When shipments of radioactive materials are made, USEC would comply with U.S. Department of Transportation packaging, labeling, and routing requirements.
Land Resource Protection			
Farmland Protection and Policy Act: Prime farmland is land that has the best combination of physical and chemical characteristics for producing crops of statewide or local importance. Prime farmland is protected by the Farmland Protection and Policy Act of 1981 which seeks "... to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmlands to nonagricultural uses..."	U.S. Department of Agriculture	Farmland Protection and Policy Act (FPPA) of 1981 Public Law 97-98; 7 USC 4201[b]; 7 CFR Part 7	Consultation letters are included in Appendix B of this Draft EIS and summarized in Section 1.5.6.4. The Natural Resources Conservation Service has concluded that the proposed site does not contain prime soils, so the Farmland Protection and Policy Act does not apply.

Table 1-3 Potentially Applicable Requirements for the Construction and Operation of the American Centrifuge Plant (continued)

License, Permit, or Other Required Approval	Responsible Agency	Authority	Relevance and Status
Biotic Resource Protection			
Threatened and Endangered Species Consultation: Required between the responsible Federal agencies and affected states to ensure that the project is not likely to: (1) jeopardize the continued existence of any species listed at the Federal or State level as endangered or threatened; or (2) result in destruction of critical habitat of such species.	U.S. Fish and Wildlife Service (FWS); Ohio Department of Natural Resources	Endangered Species Act of 1973, as amended (16 USC 1531 et seq.); ORC 1531.25-26 and 1531.99	Consultation letters are included in Appendix B of this Draft EIS and summarized in Section 1.5.6.1. NRC's review and subsequent analysis of the information provided by the FWS and the Ohio Department of Natural Resources has concluded that threatened or endangered species or their critical habitat are not likely to be adversely affected.
***Clean Water Act* Section 404 (Dredge and Fill) Permit:** Required to place dredged or fill material into waters of the U.S., including areas designated as wetlands, unless such placement is exempt or authorized by a nationwide permit or a regional permit; a notice must be filed if a nationwide or regional permit applies.	U.S. Army Corps of Engineers	CWA (33 USC 1251 et seq.); 33 CFR Parts 323 and 330	Construction of the proposed ACP would not result in dredging or placement of fill material into wetlands within the jurisdiction of the U.S. Army Corps of Engineers.
Ohio General Permit for Filling Category 1 and Category 2 Isolated Wetlands: Required where the proposed project involves the filling or discharge of dredged material into Category 1 and Category 2 isolated wetlands, causing impacts that total 0.20 hectares (0.5 acres) or less.	Ohio EPA	*Ohio Revised Code* (ORC) Sections 6111.021-6111.029	Construction of the proposed ACP would not result in dredging or placement of fill material into wetlands within the jurisdiction of the Ohio EPA isolated wetlands program.
Ohio Individual Isolated Wetland Permit: Required where the proposed project involves the filling or discharge of dredged material into Category 1 and Category 2 isolated wetlands, causing impacts that total greater than 0.20 hectares (0.5 acres) for Category 1 isolated wetlands and/or greater than 0.20 hectares (0.5 acree) but not exceeding 1.21 hectares (3 acres) for Category 2 isolated wetlands.	Ohio EPA	ORC Sections 6111.021-6111.029	Construction of the proposed ACP would not result in dredging or placement of fill material into wetlands within the jurisdiction of the Ohio EPA isolated wetlands program.

License, Permit, or Other Required Approval	Responsible Agency	Authority	Relevance and Status
Cultural Resources Protection			
Archaeological and Historical Resources Consultation: Required before a Federal agency approves a project in an area where archaeological or historic resources might be located.	Ohio State Historic Preservation Officer	*National Historic Preservation Act* of 1966, as amended (16 USC 470 et seq.); *Archaeological and Historical Preservation Act* of 1974 (16 USC 469-469c-2); Antiquities Act of 1906 (16 USC 431 et seq.); *Archaeological Resources Protection Act* of 1979, as amended (16 USC 470aa-mm)	NRC has consulted with the Ohio State Historic Preservation Officer and Indian tribes regarding previous archaeological and architectural surveys at the DOE reservation. Consultation letters are included in Appendix B of this Draft EIS and summarized in Section 1.5.6.2. In consultation with the Ohio State Historic Preservation Officer and the Indian tribes, NRC has concluded that the proposed action would have no effect (direct or indirect) on the eligible or potentially eligible properties on or immediately adjacent to the DOE reservation.

Source: USEC, 2005.

1.5.6.1 *Endangered Species Act of 1973* Consultation

The *Endangered Species Act* was enacted to prevent the further decline of endangered and threatened species and to restore those species and their critical habitats. Section 7 of the Act requires consultation with the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service to ensure that actions they fund, authorize, permit, or otherwise carry out will not jeopardize the continued existence of any listed species or adversely modify designated critical habitats.

NRC initiated consultation with the U.S. Fish and Wildlife Service in September 2004 by reviewing the information that the FWS submitted to USEC on June 21, 2004 regarding the threatened, endangered, proposed, and candidate species, and designated critical habitats that may be present in the project area. In a phone conversation on September 23, 2004 between the NRC and the U.S. Fish and Wildlife Service, the U.S. Fish and Wildlife Service indicated that the information presented in the letter was still current and accurate.

The U.S. Fish and Wildlife Service letter dated June 21, 2004, states that the proposed project lies within the range of the Federally endangered Indiana bat *(Myotis sodalis)*, and within the range of timber rattlesnake (*Crotalus horridus*), a species of concern and Ohio-listed endangered species. After the issuance of the Draft EIS, NRC will continue consultations with the U.S. Fish and Wildlife Service .

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

To comply with Federal historic preservation laws and regulations as well as mandates of the *National Environmental Policy Act*, the NRC is required to identify historic properties in the area potentially affected by its actions and to consider potential effects on those properties. The principal driver for this process is Section 106 of the *National Historic Preservation Act*, as amended (16 U.S.C. 470 et seq.), and implementing regulations at 36 CFR Part 800, as amended through August 2004. Under Section 106, Federal agencies are required to consider the effects of their undertakings on historic properties; 36 CFR Part 800 spells out the process by which this is done in consultation with the State Historic Preservation Officer. The *National Historic Preservation Act* and 36 CFR Part 800 also require that consultation in the Section 106 process should provide Indian tribes the opportunity to identify concerns about historic properties on or off Tribal lands, present views about an undertaking's effects on such properties, and participate in the resolution of adverse effects.

This Draft EIS process has offered State agencies, Federally recognized Indian tribes, and other organizations that may be concerned with the possible effects of the proposed action on historic properties an opportunity to participate in the consultation process required by Section 106. The following subsections summarize the consultations with the various agencies, tribes, and organizations contacted during the ongoing consultation process.

Advisory Council on Historic Preservation

By letter dated May 20, 2005, the NRC notified the Advisory Council on Historic Preservation, Office of Federal Agency Programs of their proposed licensing activity and intent to use the NRC's *National Environmental Policy Act* review process to satisfy the Section 106 requirements as specified at 36 CFR §800.8. NRC provided the Advisory Council on Historic Preservation a review of the current consultation activities with the Ohio State Historic Preservation Officer and the Indian tribes and indicated that the Draft EIS will be provided to the Advisory Council on Historic Preservation for review.

Ohio Historic Preservation Office

By letter dated December 28, 2004, the NRC initiated the Section 106 consultation process with the Ohio State Historic Preservation Officer. This letter requested information on other parties that may be entitled to be consulting parties by the proposed action, as well as notified the office of NRC's intent to use the EIS process for Section 106 purposes as described in 36 CFR §800.8. The letter included portions of the Environmental Report prepared by USEC that indicated that the proposed action would not have adverse effects on historical resources included or eligible for inclusion in the National Register of Historic Places, should not impact the historical integrity of the Portsmouth reservation, and should not result in any impact to Native American Indian tribal, religious, or cultural sites.

The Ohio State Historic Preservation Officer responded by letter dated February 2, 2005 stating that the proposed project would not adversely affect the Portsmouth Gaseous Diffusion Plant historic property; however, it recommended that the NRC provide a more detailed discussion of the previous studies that occurred on the DOE reservation and recommended that the NRC consider notifying Native American Federally Recognized Tribal Authorities that were historically associated with the area. A listing of potentially interested Federally Recognized Tribal Authorities was included to the letter to the NRC, as well as a point of contact at the Pike County Commissioners.

The NRC will continue to consult with the Ohio State Historic Preservation Officer. Through the Section 106 consultation process and through the publication of this Draft EIS, NRC will provide the Ohio State

Historic Preservation Officer an opportunity to comment on the area of potential effect and on the NRC's review of potential adverse effects.

<u>Federally Recognized Indian Tribes</u>

Based on information found in the Tribal Leaders Directory issued by the Bureau of Indian Affairs, the information provided by the Ohio State Historic Preservation Officer, and information from the National Park Service, National Center for Cultural Resources, NRC has identified 17 Federally recognized Indian tribes with ties to the region that may be interested in being a consulting party. NRC submitted the letters on March 14 and 18, 2005, and provided the Indian tribes with a brief description of the proposed action, the initial cultural resource review information, inquired if the Indian tribe had any information regarding historic sites or cultural resources in the area. The letters also notified the Indian tribes of NRC's intent to use the EIS process for Section 106 purposes as described in 36 CFR §800.8. To date, NRC has confirmed that one Indian tribe, the Absentee Shawnee Tribe of Oklahoma, identified cultural ties to the area. The Tribe considers that it is descendant from the people of the Hopewell culture who built the many earthwork sites in the region. The Tribe refers to "the Barnes Works in Scioto Township" (a reference to the Scioto Township Works) as "one of the largest sacred sites in North America" (see Appendix B).

The NRC will continue to consult with the Indian tribes. Through the Section 106 consultation process and through the publication of this Draft EIS, NRC will provide the Indian tribes who express an interest and are considered consulting parties an opportunity to comment on the area of potential effect and on the NRC's review of potential adverse effects.

<u>Other Organizations</u>

By letter dated March 14, 2005, the NRC contacted the Pike County Commissioners and provided the County with a brief description of the proposed action, the initial cultural resource review information, and inquired if the County had any information regarding historic sites or cultural resources in the area. The NRC will continue to consult with the Pike County Commissioners, and through the Section 106 consultation process and through the publication of the Draft EIS, NRC will provide the County with an opportunity to comment on the area of potential effect, and on NRC's review of potential adverse effects.

<u>Interested Members of the Public</u>

Through the NRC's scoping process, additional information about cultural resources in the area was obtained from interested members of the public. Additionally, information was also received through the adjudicatory hearing that is taking place on this license application. This information is considered in preparation of the Draft EIS.

Through publication of the Draft EIS the NRC will provide interested members of the public with an opportunity to comment on the areas of potential effect and on NRC's review of potential adverse effects.

1.5.6.3 *Fish and Wildlife Coordination Act of 1934* Consultation

The consultation component of the *Fish and Wildlife Coordination Act*, requires that "whenever the waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose whatever, including navigation and drainage, by any department or agency of the U.S., or by any public or private agency under Federal permit or license, such department or agency first shall consult with the U.S. Fish and Wildlife Service, Department of the Interior, and with the head of the agency exercising

administration over the wildlife resources of the particular State wherein the impoundment, diversion, or other control facility is to be constructed, with a view to the conservation of wildlife resources by preventing loss of and damage to such resources as well as providing for the development and improvement thereof in connection with such water-resource development." Because the proposed action does not involve such modifications to a stream or other body of water, the NRC is not implementing consultations under the *Fish and Wildlife Coordination Act*. The NRC is consulting with the U.S. Fish and Wildlife Service and the State agency that exercises administrative control over the wildlife resources under the *Endangered Species Act*.

1.5.6.4 *Farmland Protection Policy Act of 1981* Consultation

This Act requires consultation with the U.S. Department of Agriculture, Natural Resources Conservation Service, to determine if the proposed action would convert protected farmland to non-agricultural use. For lands protected by the Act, scoring the relative value of the land for preservation is performed by the Natural Resources Conservation Service and the project proponent on a "Form AD-1006." If the Farmland Conversion Impact Rating is below 160, no further analysis is necessary. Scores between 160 and 200 may have potential impacts and require additional review and further consideration of alternatives that would avoid or lessen the conversion and lower the impact rating score.

NRC reviewed the correspondence from the District Conservationist of the Natural Resources Conservation Service in Waverly, Ohio. This letter, dated December 5, 2003, indicates that all of the proposed ACP facilities in the southwest quadrant of the central area would be located on non-prime soils (Borchelt, 2003). For the cylinder storage yard (X-745H) in the northern portion of the reservation, NRC consulted with the Pike Soil and Water Conservation District and the District Conservationist of the U.S. Department of Agriculture and found that the yard would also be located on non-prime soils (Yost, 2005). Because the proposed activities would be conducted on non-prime soils, the Farmland Protection Policy Act would not apply.

1.6 Organizations Involved in the Proposed Action

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

- USEC Inc. (abbreviated as USEC for the purpose of this Draft EIS) is the NRC license applicant. If the license is granted, USEC would be the holder of an NRC license for the possession and use of special nuclear material, source material, and byproduct material at the proposed ACP. USEC would be responsible for constructing, operating, and decommissioning the proposed facility in compliance with that license and applicable NRC regulations. USEC is a global energy company and its wholly owned subsidiary, the United States Enrichment Corporation, is the world's leading supplier of enriched uranium fuel for commercial nuclear power plants. The NRC has issued Certificates of Compliance for that subsidiary to operate the Paducah and Portsmouth Gaseous Diffusion Plants. More recently, the NRC has issued a license to USEC to construct and operate the Lead Cascade Demonstration Facility described above. Consistent with the requirements in 10 CFR §76.22 and in connection with the issuance of these Certificates and the Lead Cascade license, the NRC has determined that USEC is neither owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government. All of the principal officers of USEC are citizens of the U.S. USEC, including its wholly owned subsidiaries, was organized under Delaware law in connection with the privatization of the United States Enrichment Corporation. It is listed on the New York Stock Exchange, and private and institutional investors own the outstanding shares of USEC. USEC's principal office is located in Bethesda, Maryland. (USEC, 2004c)

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

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2. ALTERNATIVES

This chapter describes the proposed action of issuing a U.S. Nuclear Regulatory Commission (NRC) license to USEC Inc. (USEC) to possess and use special nuclear material, source material, and byproduct material at the proposed ACP, and alternatives. Also, alternatives for the disposition of depleted uranium hexafluoride (UF_6) resulting from enrichment operations over the lifetime of the proposed ACP are analyzed. As required by the *National Environmental Policy Act*, this chapter also presents a no-action alternative. Under the no-action alternative USEC would not construct, operate, or decommission the ACP. The no-action alternative provides a basis for comparing and evaluating the potential impacts of the proposed action.

Section 2.1 presents technical details of the proposed action and connected actions, including descriptions of the proposed site, gas centrifuge enrichment technology, and the activities at the proposed ACP: refurbishment and construction; manufacturing and assembly; operation; and decontamination and decommissioning. It also describes the related action of ceasing uranium enrichment operations at the Paducah Gaseous Diffusion Plant. Section 2.2 describes the no-action alternative. Section 2.3 discusses alternatives to the proposed action that were considered but eliminated, including alternative sites, enrichment technologies other than the proposed centrifuge technology, and sources for enriched product. The chapter concludes with a comparison of predicted environmental impacts for each alternative and a preliminary recommendation from NRC staff regarding the proposed action.

2.1 Proposed Action

The proposed action is the issuance of an NRC license for USEC to possess and use special nuclear material, source material, and byproduct material at the proposed ACP in Piketon, Ohio. The NRC license, if granted, would be for a period of 30 years. If an NRC license is issued, USEC plans to start construction of the ACP in 2007, begin commercial centrifuge operations in 2009, and ramp up to the 3.5 million separative work unit (SWU) design capacity by 2011.

Although the proposed action is the issuance of a license to possess and use nuclear material, this Draft Environmental Impact Statement (EIS) analyzes activities that would occur as the result of the license because these activities - construction, operation, and decommissioning of the proposed ACP - may have the potential for environmental impacts. For purposes of this analysis, these activities are organized into four phases:

(1) Refurbishment, site preparation, and construction of new facilities;
(2) Centrifuge manufacture and equipment assembly;
(3) Facility operation; and
(4) Decontamination and decommissioning.

In addition, USEC indicates in its Environmental Report (USEC, 2005b) that subsequent to beginning operations at the ACP, the uranium enrichment operations currently taking place at the Paducah Gaseous Diffusion Plant in Kentucky would cease. Therefore, the impacts of ceasing operations at the Paducah, Kentucky plant are also analyzed in this Draft EIS. For the purpose of this analysis, cessation of uranium enrichment operations at Paducah would include stopping uranium enrichment plant operations, but would not include decommissioning of the Paducah Gaseous Diffusion Plant, changes to any other activities at that site, or any alternate uses of the site in the future. Those other actions at Paducah would be the subject of other decisions and other environmental reviews.

2.1.1 Location and Description of Proposed Site

The U.S. Department of Energy (DOE) reservation, on which the proposed ACP would be sited, is located in Pike County, Ohio, one of the State's less populated counties. The reservation is located in the town of Piketon, between Chillicothe and Portsmouth, Ohio, approximately 113 kilometers (70 miles) south of Columbus, Ohio. Figure 2-1 shows the location of the DOE reservation within the surrounding county.

The DOE reservation consists of approximately 1,497 hectares (3,700 acres), which includes a 526 hectare (1,300 acre) central area surrounded by a perimeter road. The proposed ACP would be located in the southwest quadrant of this central area approximately 2.5 kilometers (1.5 miles) east of U.S. Route 23. The land surrounding the reservation is sparsely populated, with the nearest residential center, Jasper, located approximately 1.9 kilometers (1.2 miles) to the northwest of the proposed site. The nearest major population center is Piketon, located approximately 6.4 kilometers (4 miles) north of the DOE reservation on U.S. Route 23. The land outside the Perimeter Road but still within the reservation is used for a variety of purposes, including a water treatment plant, lagoons for the process wastewater treatment plant, sanitary and inert landfills, and open and forested buffer areas. Most site developments are located within the fenced central area, which is largely devoid of trees, with grass and paved roadways dominating the open space. The proposed ACP would be situated on approximately 81 hectares (200 acres) of the southwest quadrant of the central area. The proposed ACP site boundary would lie along the Perimeter Road on the western edge of the central area, approximately 568 meters (1,865 feet) from the closest DOE reservation boundary. The distance from the ACP to the nearest member of the public (i.e., actual permanent residence) is about 914 m (3,000 ft) (USEC, 2005b). The environmental characteristics of the proposed site and surrounding areas are described in detail in Chapter 3 of this Draft EIS.

2.1.2 Gas Centrifuge Enrichment Process

The proposed ACP would employ a gas centrifuge technology for enriching natural uranium. Figure 2-2 shows the basic components of a gas centrifuge. A centrifuge consists of a large rotating cylinder (rotor) and piping to feed uranium hexafluoride (UF_6) gas into the centrifuge, and then withdraw enriched and depleted UF_6 gas streams. The rotor spins at a high rate of speed inside a protective casing, which maintains a vacuum around the rotor and provides physical containment of the rotor in the event of a major machine failure (USEC, 2004).

The UF_6 gas enters the centrifuge through a fixed pipe. The centrifugal force produced by the spinning rotor creates radial separation, in which the heavier uranium-238 hexafluoride molecules concentrate near the rotor wall and the lighter uranium-235 hexafluoride molecules collect closer to the axis of the rotor (USEC, 2004). In addition to the radial separation of isotopes, separation along the vertical axis (axial) is also induced in response to a thermal gradient along the length of the rotor (Green, 2003). The hotter gas stream rises, while the relatively cooler gas stream flows downward. Figure 2-2 shows the components of a gas centrifuge, including the flow of UF_6 gas. The combination of radial and axial separation results in a relatively large assay change between the top and bottom of the centrifuge. Enriched UF_6 is extracted by a scoop at the top of the centrifuge while depleted material is removed from a scoop at the bottom (USEC, 2004).

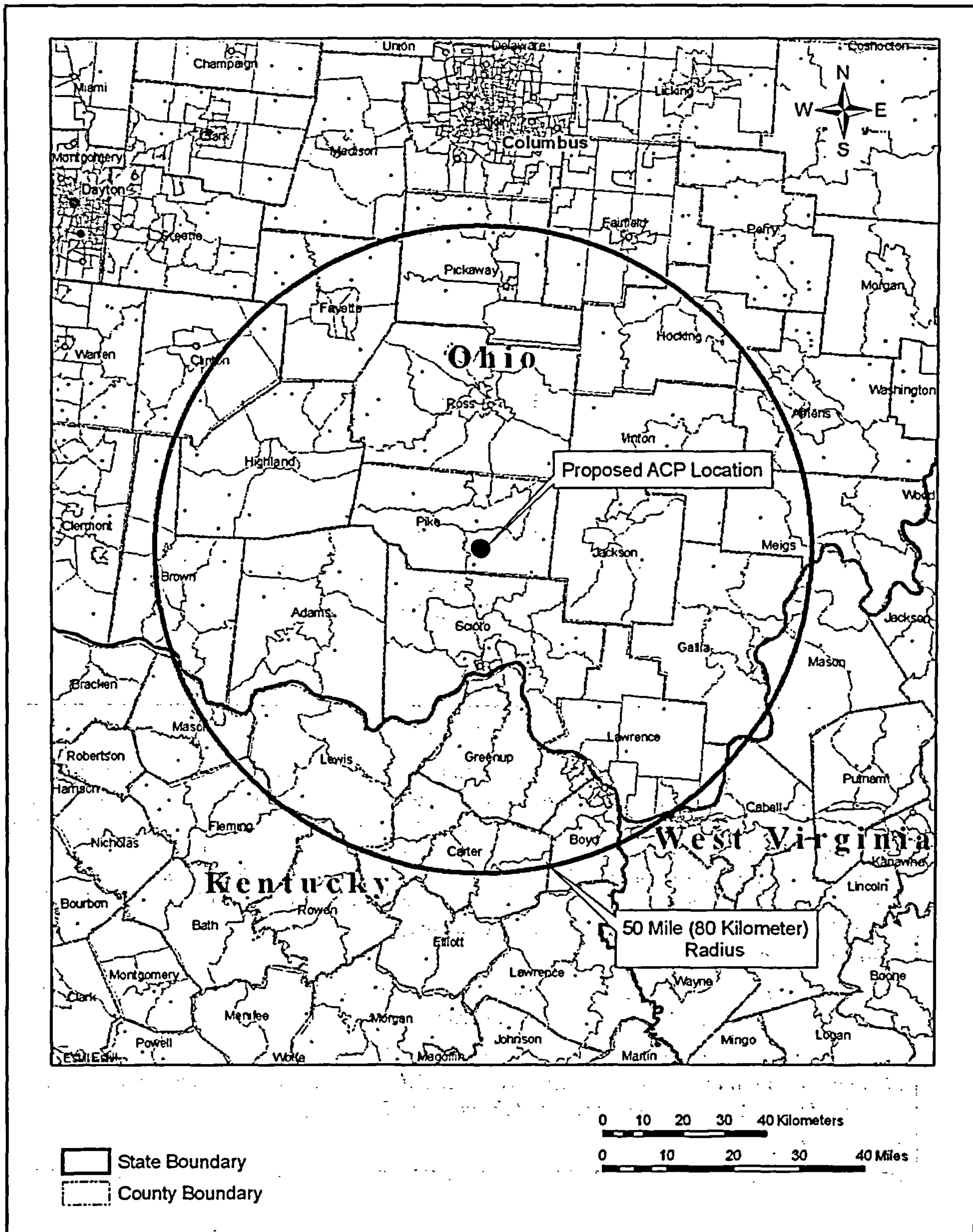

Figure 2-1 Location of the Proposed ACP Site

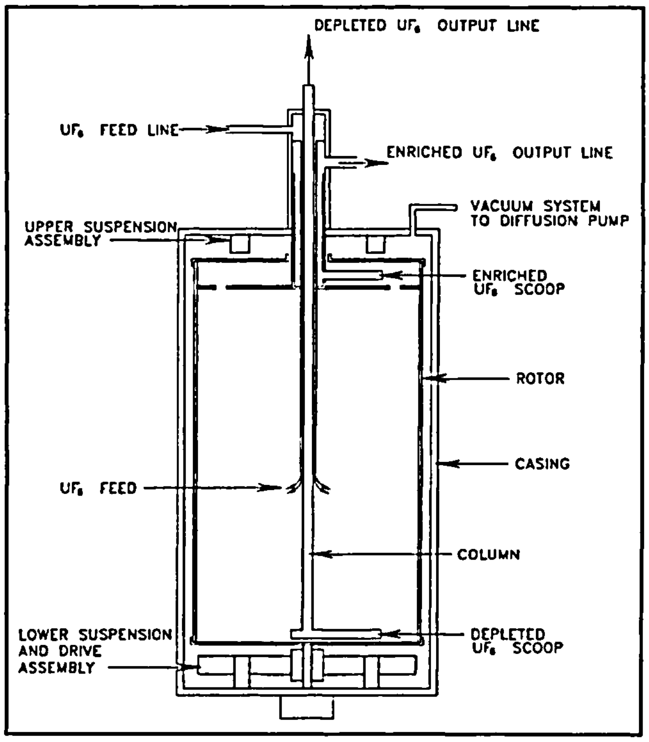

Figure 2-2 Schematic of a Gas Centrifuge (USEC, 2005b)

Enriching Uranium

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

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

To start the enrichment process, the UF_6 is heated, which causes the material to sublime (change directly from a solid to a gas). The UF_6 gas is then fed into the enrichment cascade where it is processed to increase the concentration of the uranium-235 isotope.

Source: WNA, 2003.

The enrichment level achieved by a single centrifuge is not sufficient to obtain the desired concentration of up to 10 percent by weight of uranium-235 in a single step; therefore, a number of centrifuges are connected in series to increase the concentration of the uranium-235 isotope (USEC, 2004). Additionally, a single centrifuge cannot process a sufficient volume for commercial production, which makes it

necessary to connect multiple centrifuges in parallel to increase the volume flow rate. The arrangement of centrifuges connected in series to achieve higher enrichment and in parallel for increased volume is known as a "cascade."

The centrifuge technology to be used at the proposed ACP is modular by design; the basic building block of enrichment capacity is a cascade of centrifuge machines. Once a complete cascade of centrifuge machines has been installed, the equipment would be placed into service producing enriched material. USEC would construct and install centrifuge machines in subsequent phases until it reaches a capacity of 3.5 million separative work units per year by 2011. As needed, enrichment capacity could continue to be increased up to 7 million separative work units per year.

> ***What is a Separative Work Unit?***
>
> *A separative work unit is a unit of measurement used in the nuclear industry, just as the units of a calorie, watt, decibel, ampere, volt, etc., are used in other industries. A separative work unit pertains to the process of enriching uranium so it can be used as fuel for nuclear power plants.*
>
> *A separative work unit is a unit of measurement of the effort needed to separate uranium-235 and -238 atoms in natural uranium in order to create a final product that is richer in uranium-235 atoms. It is calculated by a standard formula. For example, if you begin with 100 kilograms (220 pounds) of natural uranium, it takes about 60 separative work units to produce 10 kilograms (22 pounds) of uranium enriched in uranium-235 content to 4.5 percent. It takes on the order of 100,000 separative work units of enriched uranium to fuel a typical 1,000 megawatt commercial nuclear reactor for a year. A 1,000 megawatt plant can supply the electricity needs for a city of about 600,000 people.*
>
> *Source: USEC, 2001.*

2.1.3 Description of the Proposed American Centrifuge Plant

The proposed ACP would be comprised of various buildings and areas that house systems and equipment necessary to support the uranium enrichment process. Table 2-1 shows the existing buildings and new buildings that would be built as part of the proposed action. Figure 2-3 shows the locations of proposed ACP facilities on the DOE reservation. For their analysis, the NRC staff reviewed figures that included the building numbers of the proposed locations of the ACP facilities; however, the figures shown in this Draft EIS have had the building numbers removed pursuant to 10 CFR 2.390.

Primary facilities are those critical to the enrichment process, while secondary facilities provide indirect support to the process. These facilities are described in Sections 2.1.3.1 and 2.1.3.2. These sections are followed by summary descriptions of Proposed Operational Systems (Section 2.1.3.3) and Utilities and Other Services (Section 2.1.3.4).

Table 2-1 American Centrifuge Plant Facilities

Existing Facilities	Approx. Size (m^2)[a]	Primary	Secondary
X-3001 Process Building	28,242	X	
X-3002 Process Building	28,242	X	
X-3012 Process Support Building	4,482	X	
X-3346 Feed and Customer Services	14,307	X	
X-7726 Centrifuge Training and Testing	4,599	X	
X-7725 Recycle/Assembly Facility	41,136	X	
X-7727H Interplant Transfer Corridor	2,090	X	
X-2232C Interconnecting Process Piping	762 m[b]	X	
X-745G-2 Cylinder Storage Yard	12,542	X	
X-7725A Waste Accountability Facility	2,731		X
X-112 Data Processing Building	2,787		X
X-1020 Emergency Operations Center	667		X
X-6000 Pumphouse and Air Plant	1,657		X
X-6002 Boiler System and Oil Storage Facility	16,187		X
X-7721 Maintenance, Stores and Training Building	2,731		X
X-7745R Recycle/Assembly Storage Area	19,992		X
Total Area for Existing Facilities	**182,391[b]**		
New Facilities	**Approx. Size**	**Primary**	**Secondary**
X-3003 Process Building	28,242	X	
X-3004 Process Building	28,242	X	
X-3034 Process Support Building	4,459	X	
X-3346A Feed and Product Shipping and Receiving	2,118	X	
X-3356 Product & Tails Withdrawal Building	3,930	X	
X-3366 Product & Tails Withdrawal Building	3,930	X	
X-7727H Interplant Transfer Corridor Extension	2,415	X	
X-2232C Interconnecting Process Piping Addition	610 m[b]	X	
X-7756S Cylinder Storage Yard	1,301	X	
X-7746W Cylinder Storage Yard	12,263	X	
X-7746E Cylinder Storage Yard	6,968	X	
X-7746S Cylinder Storage Yard	3,066	X	
X-7746N Cylinder Storage Yard	12,634	X	
X-745H Cylinder Storage Yard	98,474	X	
X-7766S Cylinder Storage Yard	1,301	X	
X-2215A Power Ductbank Trench System	1,519		X
X-2220D Communications Ductbank Trench System	922		X
X-7725B Chemical Storage Building	1,394		X
Total Area for New Facilities	**213, 175[b]**		

Notes:
[a] m^2 = square meters; ft^2 = square feet.
To convert from m^2 to ft^2 multiply by 10.76.
[b] Interconnecting Process Piping is linear, not m^2. This piping is also not included in the totals.
Sources: USEC, 2004; USEC, 2005b; USEC 2005c.

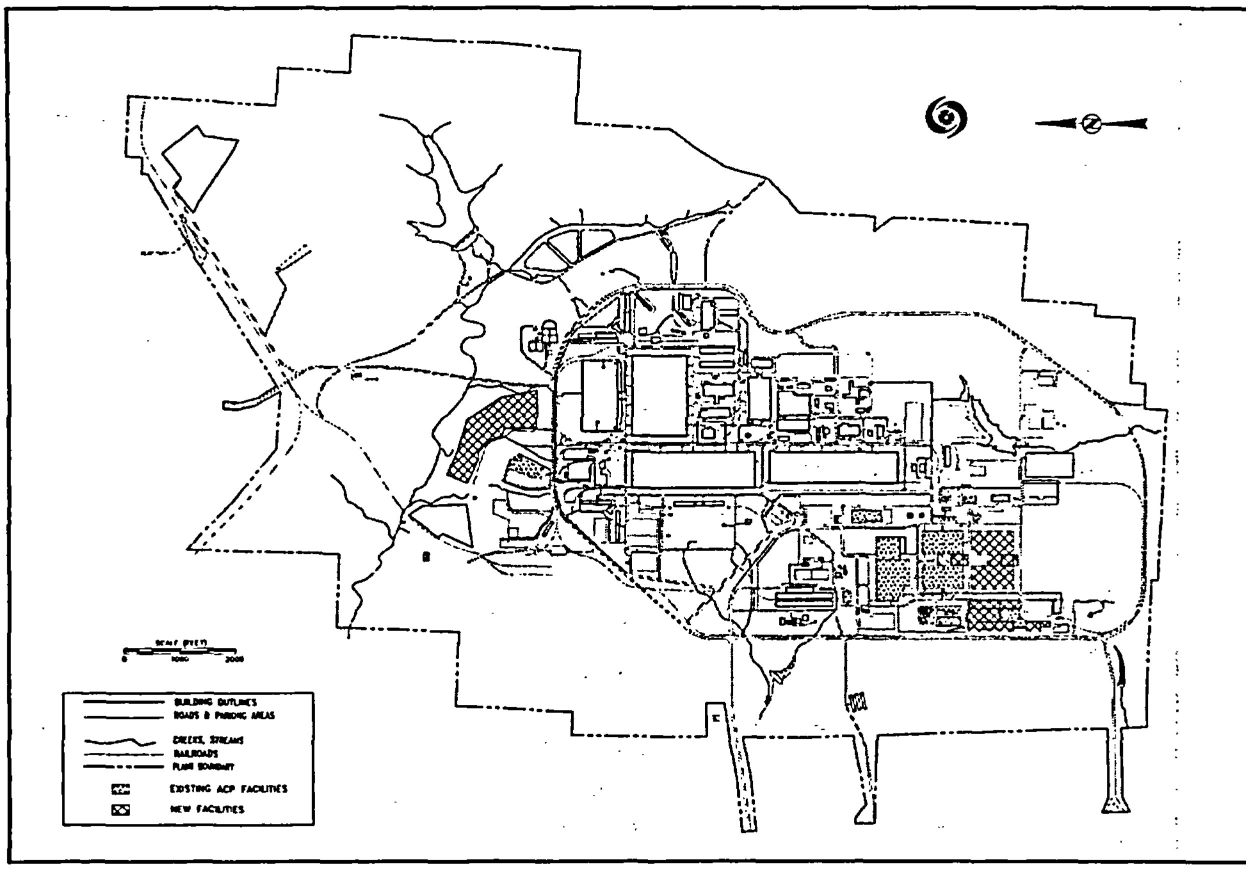

Figure 2-3 Locations of Proposed ACP Facilities (USEC, 2005b)
Building numbers have been withheld pursuant to 10 CFR 2.390.

2.1.3.1 Primary Facilities

Primary facilities are those where licensed material would be found and are considered to be key facilities in support of the uranium enrichment process. The primary facilities are located or would be constructed adjacent to each other in the southwest quadrant of the central area of the DOE reservation, as shown in Figure 2-4. The only exceptions are the X-745G-2 and X-745H cylinder storage yards, which are located in the northeast part of the DOE reservation just north of the Perimeter Road.

<u>Process Buildings</u>

The primary purpose of the process buildings would be to house the centrifuge machines and support systems necessary to perform the actual enrichment process. The X-3001 and X-3002 Process Buildings are existing facilities that are similar in construction, layout, and design. Each building has a large high bay process area and two utility areas. The height of each building is approximately 27 meters (87 feet) in the high bay area and 15 meters (49 feet) in the utility areas. A transfer aisleway provides access between the two buildings. The nearest reservation boundary is 794 meters (2,606 feet) to the west of the X-3001 Process Building. (USEC, 2004)

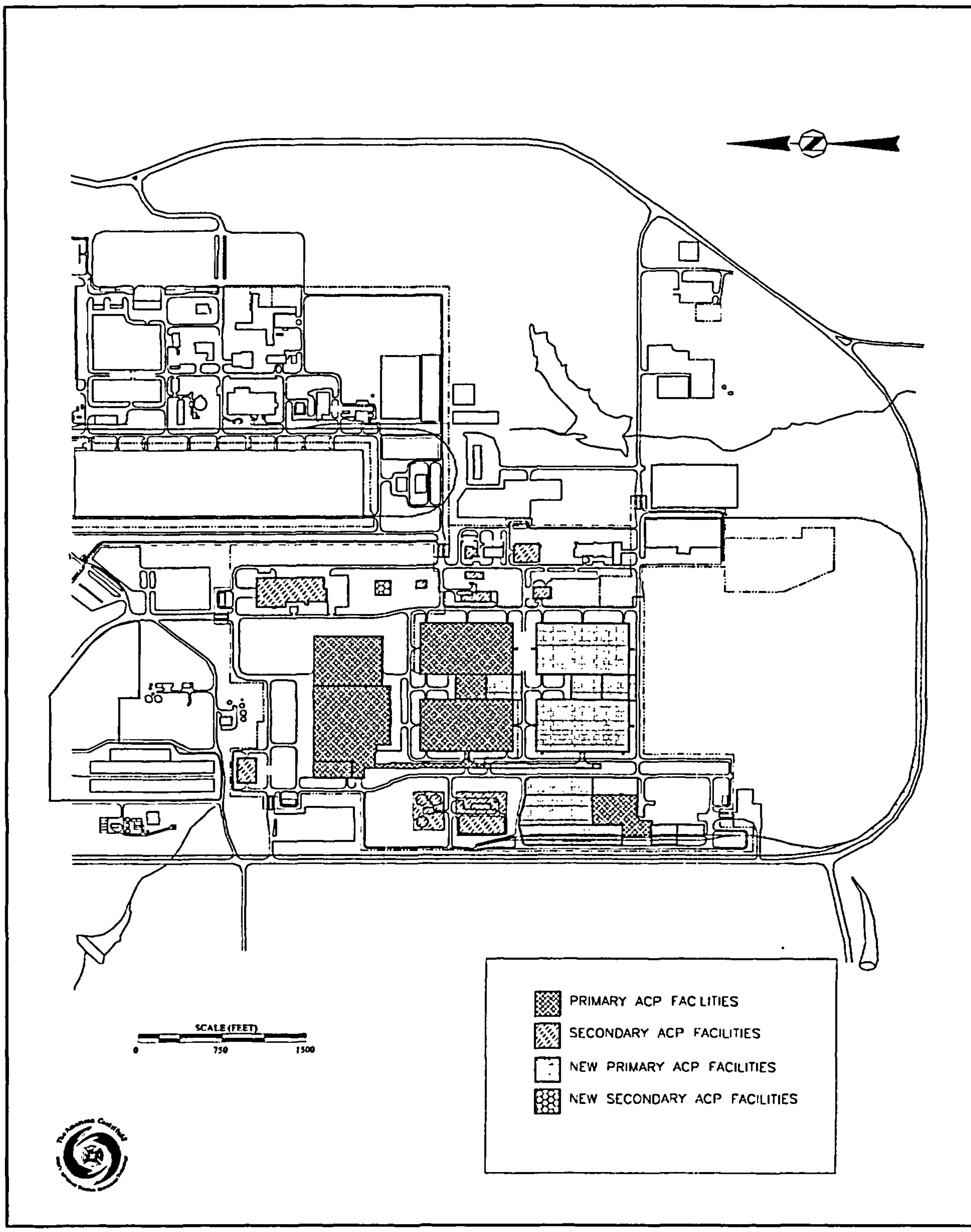

Figure 2-4 Locations of Process Buildings and other Primary Facilities (USEC, 2005d) Building numbers have been withheld pursuant to 10 CFR 2.390.

At the north and south ends of the X-3001and X-3002 Process Buildings are equipment/utility bays and mezzanines where auxiliary equipment is housed. Items in these areas consist of heating and ventilation equipment, cooling water pumps, vacuum pumps, electrical switchgear, and standby electrical equipment (i.e., diesel generators, battery rooms, and uninterruptible power supply systems). Building vents for the purge and evacuation vacuum systems are also located in the buildings. The vents are monitored and are permitted through the Ohio Environmental Protection Agency (Ohio EPA). (USEC, 2004)

The centrifuge machines would be installed in the high bay area in a cascade arrangement. The cascades would be supplied UF_6 feed via a header from the X-3346 Feed and Customer Services Building. The machines in each cascade would be grouped into stages that are connected in series. The feed, product, and tails lines to and from each centrifuge within a stage would connect into stage headers that convey the UF_6 streams between stages. The depleted material from the bottom stage would be piped to the X-3356 Product and Tails Withdrawal Building to be withdrawn as tails. The enriched material from the top stage would be piped to the X-3356 building to be withdrawn as product. The cascade enrichment would normally be less than 5 percent uranium-235 by weight, but enrichment levels up to 10 percent uranium-235 by weight would be allowed. (USEC, 2004)

Two new process buildings, X-3003 and X-3004, would be constructed as part of the proposed ACP. The layout, design, and purpose of these new facilities would be identical to that of the existing process buildings. The proposed location for the X-3003 and X-3004 Process Buildings is directly south of the X-3001 and X-3002 Process Buildings. (USEC, 2004)

<u>Process Support Buildings</u>

The X-3012 Process Support Building is an existing facility that would house the equipment and personnel in support of operations in the X-3001 and X-3002 Process Buildings. The X-3012 building is located between the X-3001 and X-3002 buildings. The nearest reservation boundary is 922 meters (3,024 feet) to the west of the X-3012 Process Support Building. (USEC, 2004)

The X-3012 Process Support Building is divided into an operational area and a maintenance area by a machine transfer aisleway. The operational area is located in the north section of the building and includes the Area Control Room for the X-3001 and X-3002 Process Buildings. The Area Control Room would provide the central operating functions to monitor and control both the X-3001 and X-3002 Process Building machines and processes. Other features of the operational area include staff offices and amenities, a battery room, a switchgear room, and heating, ventilation, and air conditioning rooms. A mezzanine above the north section contains the mechanical equipment room for the building. The maintenance area, located in the south section of the building, includes maintenance shops, storage areas, a battery charging room, staff offices and amenities, and a mezzanine area with additional office areas, and heating, ventilation, and air conditioning rooms. (USEC, 2004)

A new X-3034 Process Support Building would be constructed as part of the proposed action. This facility would be adjacent to and would serve to support the new X-3003 and X-3004 Process Buildings. (USEC, 2004)

<u>Feed and Customer Services Building</u>

The X-3346 Feed and Customer Services Building is located approximately 305 meters (1,000 feet) south-southwest of the X-3001 Process Building. The X-3346 building is connected to the X-3001 and X-3002 buildings by the X-2232C Interconnecting Process Piping. The nearest reservation boundary is 568 meters (1,865 feet) to the west of the X-3346 building. (USEC, 2004)

The X-3346 building has two distinct areas of operation to meet process feed, sampling, and transfer requirements. The first area, referred to as the Feed Area, would support the front end of the overall enrichment process by housing the equipment necessary to provide UF_6 feed (e.g., electrically heated feed ovens). UF_6 feed would be processed to purify the gas before being fed into the process piping. There are separate manifolds that direct each stream to the X-3001 and X-3002 Process Buildings. The Feed Area has scales for weighing the feed cylinders. The location of the feed oven would provide the crane sufficient room to transport the UF_6 cylinders between rows of ovens. Cylinders would be placed on rail carts that move the cylinders into and out of the feed ovens without lifting them up and moving them over feed ovens, autoclaves, or other cylinders. (USEC, 2005c)

The second area, referred to as the Customer Services Area, would house the sampling equipment necessary to ensure that customer products meet specifications and to transfer enriched UF_6 material to customer product cylinders. The 48X source cylinders filled with enriched product would be transferred from the X-3356 Product and Tails Withdrawal Building to the Customer Services Area. Cylinder sampling and transfer of enriched product would be the only operation at the proposed ACP that would require the handling of liquid UF_6 (to ensure a homogenized sample); therefore, the Customer Services Area would be the only location at the proposed ACP where liquid UF_6 may be present. Cylinder sampling and transfer operations involving liquid UF_6 would occur entirely within containment autoclaves, which are pressure vessels designed to contain a UF_6 release should an accident occur during sampling and transfer activities. (USEC, 2004)

The basic approach to sampling and transfer operations would be as follows. The containment autoclaves would be electrically heated to liquefy the UF_6 contained in the 48X source cylinders. Any approved UF_6 container may be heated for sampling and transfer purposes. The liquid would then be sampled and transferred to 30B customer product cylinders (typically three to four). The receiving UF_6 cylinder lines and valves would be kept warm during the transfer. The customer product cylinders are then cooled until the UF_6 has re-solidified. The autoclaves are supplied with cooling capability to expedite the cylinder heel cool-down process and shorten the cycle time. (USEC, 2004)

The X-3346 building is equipped with specialized support systems to allow the purge and evacuation of indoor air in the event of liquid UF_6 releases. Local area gulper (vacuum) systems are used to collect any small releases of UF_6 that might occur during operations. The purge and evacuation vents are monitored and permitted through the Ohio EPA. Other major support equipment includes refrigeration units, precision scales, and cranes. (USEC, 2004)

<u>Centrifuge Training and Test Facility</u>

The X-7726 Centrifuge Training and Test Facility is connected and adjacent to the northwest corner of the X-7725 Recycle/Assembly Facility. The nearest reservation boundary is 741 meters (2,431 feet) to the west of the facility. (USEC, 2004)

The X-7726 facility was originally built to support training of plant personnel for centrifuge assembly and testing. Under the proposed action, this facility may initially be used for centrifuge component manufacturing and centrifuge machine assembly. Specific activities that would occur in the X-7726 facility include receiving material and centrifuge components, inspecting and testing components or subassemblies, assembling the components into centrifuge machines, evacuating and leak-checking the final assembly, and repairing any machine or subassemblies as needed. There are various support areas throughout the building to provide the necessary ancillary support for the centrifuge assembly operations and personnel. These areas include mechanical equipment rooms, electrical equipment rooms, freight and personnel elevators, HVAC equipment rooms, maintenance areas, and staff offices and amenities. In

addition, an overhead crane system traverses the length of the X-7726 facility for movement of centrifuge machines and other large components. (USEC, 2004)

After the X-7725 Recycle/Assembly Facility becomes available for use, these activities would be performed there and the X-7726 Centrifuge Training and Test Facility would become a machine component preparation area and a training area for centrifuge subassembly preparation, column assembly, and machine assembly. The X-7726 facility may also be used for select repair of failed centrifuge machines or for disassembly of failed machines for failure analysis. (USEC, 2004)

<u>Recycle/Assembly Facility</u>

The X-7725 Recycle/Assembly Facility is connected to the X-7726 Centrifuge Training and Test Facility and the X-7727H Interplant Transfer Corridor. It is located just to the north of the X-3001 and X-3002 Process Buildings and the nearest reservation boundary is 741 meters (2,431 feet) to the west. (USEC, 2004)

The X-7725 facility provides an area for the manufacture, assembly, testing, and maintenance of centrifuge machines. Two dedicated rooms are located in the southwest corner to support the maintenance and operation of the centrifuge transporters and other mobile equipment. Other support areas include mechanical equipment rooms, electrical equipment rooms, a battery charging room, HVAC equipment rooms, maintenance areas, and staff offices and amenities. An overhead crane system traverses the buffer storage area and assembly area for movement of centrifuge machines and other large components. (USEC, 2004)

The assembly of centrifuge machines would begin with receipt of centrifuge machine components. These components would then be stored and staged for assembly. Centrifuge components and subassemblies would be assembled into a complete centrifuge machine on one of the machine assembly stands. Depending on the speed of assembly, completed centrifuges would either be transported for installation or stored in the buffer storage area for later installation. Some completely assembled centrifuge machines would undergo UF_6 testing in the Gas Test Stands to verify the correct placement of machine components and the proper operation of the centrifuge machine. The Gas Test would be performed prior to moving the centrifuge machines to the process building for installation. (USEC, 2004)

<u>Interplant Transfer Corridor</u>

The X-7727H Interplant Transfer Corridor is an elongated structure that connects the X-7725 Recycle/Assembly Facility and X-3001 Process Building. It provides a protected pathway to transport centrifuge machines between the X-7725 Recycle/Assembly Facility or X-7726 Centrifuge Training and Testing Facility and the Process Buildings. The X-7727H corridor also serves as a shipping and receiving area for equipment and components during construction and operation activities. The nearest reservation boundary is 756 meters (2,480 feet) to the west of the X-7727H corridor. Under the proposed action, the corridor would be extended, involving minor excavation and construction of an additional 2,423 square meters (26,078 square feet) of corridor, extending from the X-3001 Process Building to the X-3003 Process Building. (USEC, 2004)

<u>Interconnecting Process Piping</u>

The X-2232C Interconnecting Process Piping is the piping that connects the X-3346 building to the X-3001 and X-3002 buildings, and connects the X-3001 and X-3002 buildings to the adjacent X-3356 building. The nearest reservation boundary is 678 meters (2,225 feet) to the west of the X-2232C piping. An additional 1,555 meters (5,100 ft) of X-2232C Interconnecting Process piping would be constructed

under the proposed action to provide service to the X-3003 and X-3004 Process Buildings and the X-3366 Product and Tails Withdrawal Building. (USEC, 2004)

This piping is typically located in a series of elevated enclosures or modules that run from the X-3346 building to the X-3001 building valve house (approximately 518 meters [1,700 feet]) and then to the X-3002 valve house (approximately 224 additional meters [800 feet]). The standard X-2232C piping module is approximately 12 meters (40 feet) long, but non-standard pipe lengths and shapes may also be used to give extra clearance across roadways. The X-2232C piping enclosures are insulated to minimize heat loss and heated to prevent the freeze-out of UF_6. (USEC, 2004)

<u>Feed and Product Shipping and Receiving Building</u>

The X-3346A Feed and Product Shipping and Receiving Building would be constructed approximately 91 meters (300 feet) south of the existing X-3346 Feed and Customer Services Building. The proposed facility would contain the operations associated with receiving full UF_6 feed cylinders and returning empty feed cylinders to vendors, as well as the receipt of empty customer product cylinders and shipment of full customer product cylinders to customers. The nearest reservation boundary would be 555 meters (1,820 feet) to the west of the X-3346A building. (USEC, 2004)

The X-3346A building would be connected to the X-3346 Feed and Customer Services Building by a crane rail system that serves both facilities. X-3346A would have doors on the north and south sides for either tractor-trailer trucks, straddle carriers, or cranes utilized for movement of cylinders. The building would also contain a large shipping and receiving area, cylinder staging area, offices, and a trucker's rest area. (USEC, 2004)

<u>Product and Tails Withdrawal Buildings</u>

The X-3356 and X-3366 Product and Tails Withdrawal Buildings would be constructed to house the UF_6 and depleted UF_6 withdrawal equipment. The X-3356 facility would be located between the X-3001 and X-3002 Process Buildings, next to the X-3012 Process Support Building. Similarly, the X-3366 facility would be located between the new X-3003 and X-3004 Process Buildings. The nearest reservation boundary would be 918 meters (3,010 feet) to the west of the X-3356 building. (USEC, 2004)

Both buildings would have two distinct areas of operation to meet process withdrawal requirements, one for product withdrawal and the other for depleted UF_6 tails withdrawal. Product withdrawal would use cold traps to desublime the enriched product from a gas phase directly to a solid phase. The enriched product would then be transferred to 48X source cylinders, which are kept in interim storage until shipped to the X-3346 Feed and Customer Services Building for sampling. The west side of the X-3356 building would house the tails withdrawal equipment. Tails withdrawal would be performed via compression and direct desublimation of the UF_6 gas. The process is designed so that two uranium assays may be simultaneously withdrawn. The solid tails would then be transferred into tails cylinders. (USEC, 2004)

<u>Cylinder Storage Yards</u>

The uranium enrichment process relies on the use of cylinders to allow movement and storage of UF_6 material outside of the enrichment process. The cylinder yards would provide this storage for natural feed uranium, depleted uranium (tails), and enriched (product) uranium awaiting shipment. The yards are constructed with sealed airport runway-quality concrete. UF_6 cylinders may be stored in any storage yard, although cylinders of a certain type may be routinely stored in a particular yard. All of the cylinder storage yards are designed primarily for storage of 2.5, 10, and 14-ton UF_6 cylinders. (USEC, 2004)

The X-745G-2 Cylinder Storage Yard is located outside the Perimeter Road to the north of the GDP X-344 UF_6 Sampling Facility. The X-745G-2 is the only yard that does not require new construction. Seven new cylinder storage yards, X-7766S, X-7746W, X-7746E, X-7746S, X-7746N, X-745H, and X-7756S would be constructed to support the proposed ACP. The locations of all the cylinder storage yards are provided in Figure 2-5. With the exception of the X-745H Cylinder Storage Yard, all new construction would occur within the proposed ACP site, adjacent to the X-3346 Feed and Customer Services and X-3356 Product and Tails Withdrawal buildings. The X-745H Cylinder Storage Yard would be located to the northeast of the existing X-745G-2 Cylinder Storage Yard, outside the Perimeter Road. The nearest reservation boundary is to the west approximately 604 meters (1,982 feet) from the proposed X-7746N, S, E, and W Cylinder Storage Yards; 918 meters (3,010 feet) from the proposed X-7756S Cylinder Storage Yard; and 862 meters (2,827 feet) from the existing X-745G-2 Cylinder Storage Yard. (USEC, 2004)

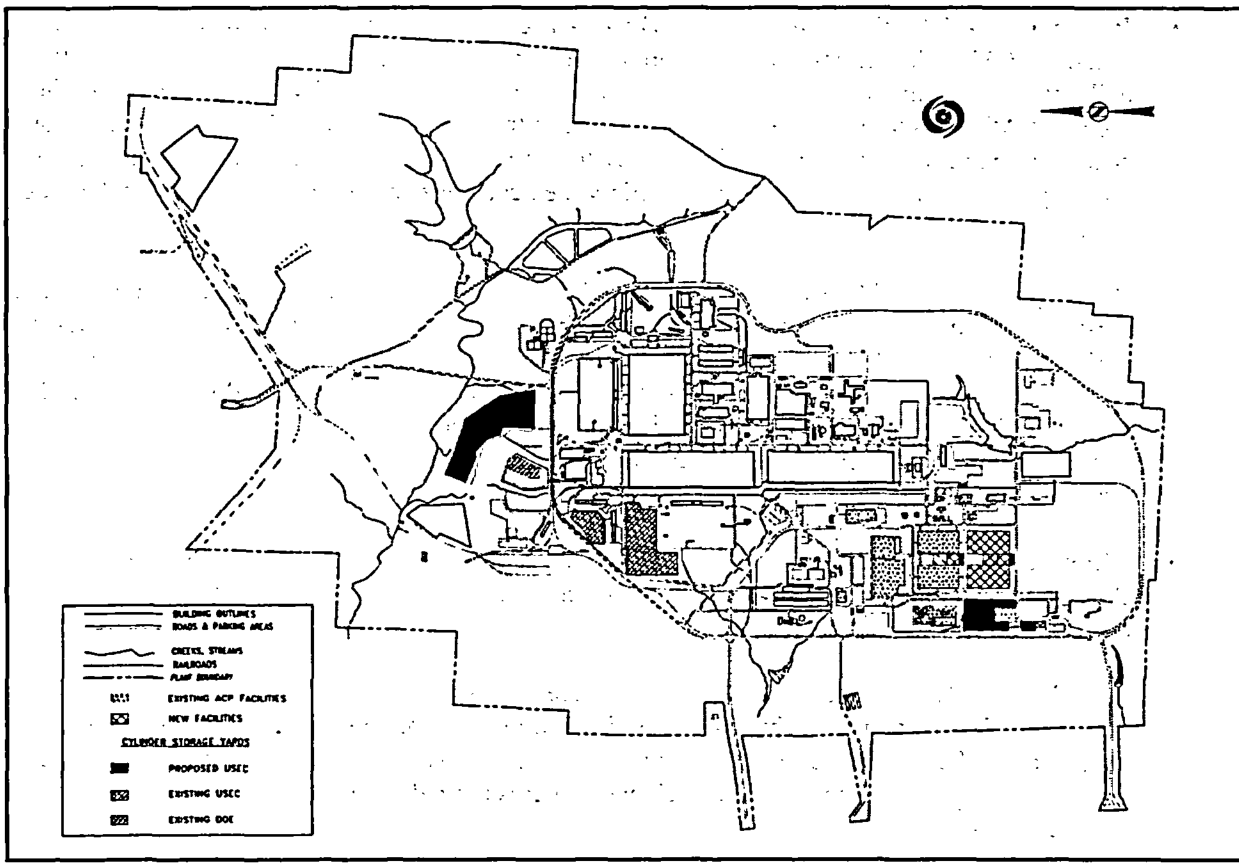

Figure 2-5 Locations of Cylinder Storage Yards (USEC, 2005b)

2.1.3.2 Secondary Facilities

In addition to the primary facilities, there are a number of secondary facilities and areas that would provide indirect support to the ACP enrichment process. No special nuclear material, depleted uranium, or other radiological materials would be found in these facilities and areas (USEC, 2004). The secondary facilities include a waste facility, storage facilities, and various support buildings and infrastructure for utilities and services. Some of these utilities and support services would be procured and others would be provided by USEC. The secondary facilities and areas leased to USEC to support the proposed ACP would include the following:

- *Waste Accountability Facility* - The X-7725A facility is located in the southwest quadrant of the DOE reservation north of the X-7725 facility. This facility serves as a storage area for equipment and parts necessary for the maintenance and repair of the process and process support equipment. (USEC, 2004)

- *Data Processing Building* - The X-112 Data Processing Building, located east of the X-3002 Process Building, provides secure housing for the data systems and personnel required to support ACP data processing. (USEC, 2004)

- *Emergency Operations Center* - The X-1020 EOC, located east of the X-3002 Process Building, serves as a central location to coordinate any emergencies that occur on the DOE reservation. (USEC, 2004)

- *Pumphouse and Air Plant, and Cooling Tower* - The X-6000 Pumphouse and Air Plant, located east of the X-3002 building, contains: the Cooling Tower Pump House and the Air Generation Plant. The building contains the necessary equipment and systems to distribute dry compressed air to the proposed ACP and to provide the requisite water to the X-6001 Cooling Towers for the removal of heat from the process buildings. The X-6001 tower also contains the necessary equipment, systems, fans, piping, and hardware structures to satisfy the necessary cooling requirements for the process buildings. (USEC, 2004)

- *Boiler System and Oil Storage Facility* - The X-6002 system is a gas-fired boiler system located northeast of the X-3002 Process Building. The boiler system provides recirculating hot water for building and process heat. The boiler normally is operated on natural gas, but it can also use fuel oil (USEC, 2004). The X-6002A Oil Storage Facility is located east of the X-3002 building and supplies fuel oil to the X-6002 system when required. It is expected that natural gas would be used approximately 90 percent of the time and fuel oil for approximately 10 percent of the time. (USEC, 2005c)

- *Maintenance, Stores, and Training Building* - The X-7721 building, located northeast of the X-3002 Process Building, provides areas for maintenance shops, stores and receiving activities, and training (USEC, 2004).

- *Recycle/Assembly Storage* - The X-7745R storage area is a concrete pad immediately adjacent to and east of the X-7725 facility. This area is used mainly for clean, non-contaminated, outside, horizontal rack storage of centrifuge casings before they are moved inside the building for machine assembly. Other centrifuge components and miscellaneous items may also be temporarily stored in this area. (USEC, 2004)

- *Power Ductbank Trench System* - This system includes 18 concrete vaults and an underground trench that provides supporting infrastructure to the electrical system. (USEC, 2005c)

- *Communications Ductbank Trench System* - This system includes four concrete vaults and an underground trench that provides supporting infrastructure to the communications system. (USEC, 2005c)

- *Chemical Storage Building* - The X-7725B building, located north of the X-3001 Process Building, provides a clean, non-contaminated, and protected storage area for manufacturing chemicals. (USEC, 2004)

- *Aboveground and Underground Storage Tanks* - Aboveground and underground storage tanks would be installed at various locations within the immediate vicinities of the four process buildings and support facilities. The size, location, and contents type of each aboveground storage tank would vary according to operational needs. Tanks would be constructed of materials compatible with the product to be stored and the conditions of storage (e.g., pressure and temperature), and will meet operational regulatory requirements. A secondary means of containment for tanks storing petroleum products, as required by 40 CFR 112.8, would provide for the entire capacity of the aboveground storage tank and any precipitation that might accumulate. Fuel would be transferred from fuel-bearing aboveground storage tanks to a 100 gallons per day (approximate) tank inside the process buildings to supply standby generators in case of power failures. (USEC, 2004)

  The fuel would be fed via aboveground and underground piping. The piping system would conform to standards for fuel distribution pressure piping, would be designed to minimize abrasion and corrosion, and would allow for expansion and contraction. Fuel lines and tanks would be labeled in accordance with regulatory standards. Spill cleanup materials, such as absorbent pads and/or spill pallets, would be available at hose connections. In accordance with Federal and State laws, proper safety procedures, spill prevention plans, and spill response plans would be used to minimize impacts from accidental discharges. (USEC, 2004)

2.1.3.3 Operational Systems

The DOE reservation has several operational systems in place to ensure security of the facilities and to respond to emergencies. The proposed ACP would utilize these existing systems, which include:

- *Evacuation Public Address System* - The Evacuation Public Address system provides instructions or notification in the event of an incident requiring evacuation or sheltering of reservation or plant personnel. The X-1020 Emergency Operations Center Public Address system control console is continuously manned. During emergencies, the Public Address system is not used for routine traffic. The Public Address system serves most occupied plant facilities. (USEC, 2004)

- *Public Warning Siren System* - The Public Warning Siren System is used to provide notification to the public within a two-mile radius of the DOE reservation in the event of an incident requiring evacuation or sheltering of the public. The system is comprised of sirens on poles/towers around a two-mile radius and an electronic siren controller at the X-1020 Emergency Operations Center and local sheriff's department. (USEC, 2004)

- *Security Access Control and Alarm System* - Due to the classified and proprietary nature of the ACP activities and equipment, access to areas classified as Limited Security Areas, Exclusion Area(s), and Vault-type Room(s) would be controlled utilizing a Security Access Control and Alarm System. The system consists of an Intrusion Detection System to provide interior protection and an Access Control System to provide high-security entry controls. The two subsystems report to a single operator's workstation forming a single security system. (USEC, 2004)

- *Security Fencing and Portals* - The ACP would be within a securely fenced area consisting of approximately three and a half miles of eight foot high chain-linked fence and barbed wire encompassing approximately 81 hectares (200 acres) of the southwest quadrant of the central area described in Section 2.1.1 above. Various gates support normal operation and provide emergency exits. The fence is routinely patrolled and maintained. (USEC, 2004)

  Access to the central area would consist of portals and gates at specific locations. When in use, portals would be staffed and gates (when open) would be under surveillance by Guard Force

personnel with communications equipment. Alternatively, the portals would be equipped with rotogates with an electronic badge reader. Portals would be secured with high security locks when not in use. Signs would be posted at the access portals and gates identifying contraband items that are not permitted without specific approval. Existing lighting at the portals and gates would assist Guard Force personnel and building or plant personnel in detecting unauthorized persons. Standby light would be available in the event of an extended power outage. (USEC, 2004)

2.1.3.4 Procured Utilities and Other Services

Some of the utilities and support services necessary for the operation of the proposed ACP would be procured and provided through existing buildings and services. Utilities procured include high voltage electrical power, water for fire-fighting, sanitary water, sanitary sewer, communications, and non-potable cooling water. Support services procured would include emergency response, training, maintenance, environmental management, and administrative support. Agreements, including performance requirements, have been established for those services not self-performed by USEC to help ensure they are available and reliable. The electrical, water, and sewage systems that would be procured are:

- *Electrical Distribution Systems* - Electrical power is supplied from the external 345 kilovolts power grid at 345 kilovolts through the X-530A Switch yard to the X-5001 Substation. At the X-5001 Substation, the electrical power is stepped down in voltage to 13.8 kilovolts then supplied through the X-5000 Switch House to the various centrifuge process buildings and other centrifuge support buildings. The distribution voltages are further stepped-down as necessary, depending on the facility requirements. (USEC, 2004)

- *Water Systems*– Water used at the reservation is supplied by a vendor from wells sunk into the Scioto River alluvium (see Chapter 3 for more detail). The raw water is pumped from wells at three locations along the Scioto River. There is also a backup system that can draw directly from the Scioto River when the wells are unable to produce sufficient water to meet the reservation demand. No known public or private water is withdrawn from the Scioto river downstream of the ACP. The well fields and pump house are located where flooding is anticipated, so the equipment is designed and installed to operate without adverse effect (i.e., the well pumps can operate under water). (USEC, 2004)

- *Sewage Treatment*– The X-6619 Sewage Treatment Plant services the entire DOE reservation and currently operates under the United States Enrichment Corporation National Pollutant Discharge Elimination System (NPDES) permit. Sewage from the reservation facilities is fed into a series of underground sanitary sewers. The plant's sanitary sewers feed into one of several lift stations located around the DOE reservation. From the lift stations, the sewage is pumped to the X-6619 facility. In accordance with the United States Enrichment Corporation National Pollutant Elimination Discharge System permit, the design capacity of the Sewage Treatment Plant is 2,275,032 liters per day (601,000 gallons per day) and is currently operating at 40 percent of that capacity. (USEC, 2005c)

  The X-6619 is an activated-sludge facility utilizing the plug flow process, aerobic digestion, secondary clarification, and granular-media filtration for effluent polishing (tertiary treatment). Post-chlorination followed by de-chlorination with sulfur dioxide is used to meet National Pollutant Elimination Discharge System effluent standards. The treated effluent is discharged to the Scioto River via an underground pipeline to a permitted outfall. An automated sampler collects a weekly composite sample of the liquid effluent for radiological analysis and other required analyses. This existing monitoring system and resulting data would be available as a means of assuring that no unanticipated discharge of licensed material occurred. (USEC, 2005b)

2.1.3.5 Local Road and Rail Network

<u>Intraplant Roadways</u>

The DOE reservation is accessed by small roads that intersect with the Perimeter Road from four directions. The area of the reservation where the proposed ACP would be located has an extensive roadway system. The buildings/facilities on the reservation are serviced with a system of roads, which as a rule generally follow a north-south grid. The system is in generally good condition due to road repaving projects. Except during shift changes, traffic levels on the site access roads and Perimeter Road are low. Peak traffic flows occur at shift changes and the principal traffic areas during peak morning/afternoon traffic are at locations where parking lot access roads meet the Perimeter Road. The DOE reservation has 12 parking lots varying in capacity from approximately 50 to 800 vehicles. Total parking capacity is approximately 4,400 vehicles. (USEC, 2004) Under the proposed action, approximately 10,033 square meters (108,000 square feet) of new roads and parking areas would be constructed to support the ACP (USEC, 2005b).

<u>Offsite Road Network</u>

The DOE reservation is served by two of southern Ohio's major highway systems: U.S. Route 23 and Ohio SR 32/124. The DOE reservation can be accessed by the Main Access Road, a four-lane interchange with U.S. Route 23. This access route accommodates the plant traffic flow. (USEC, 2005b)

The DOE reservation is 5.6 kilometers (3.5 miles) from the intersection of the U.S. Route 23 and Ohio SR 32/124 interchange. Both routes are four lanes with U.S. Route 23 traversing north-south and Ohio SR 32 traversing east-west. Approximately 113 kilometers (70 miles) north of the plant, U.S. Route 23 intersects I-270, I-70, and I-71. Trucks also may access I-64 approximately 32.2 kilometers (20 miles) southeast of Portsmouth. (USEC, 2005b)

SR 32/124/50 runs 298 kilometers (185 miles) east-west from Cincinnati, and through Piketon to Parkersburg, West Virginia. To the west, SR 32 provides access to Cincinnati's three interstate highways, I-71, I-74, and I-75. To the east, SR 32/50 is linked with I-77. (USEC, 2005b)

<u>Rail</u>

The proposed site has rail access, and several track configurations are possible within the site. The Norfolk Southern rail line is connected to the CSX Transportation Inc. line via a rail spur entering the northern portion of the site. This onsite system is currently used infrequently. Track in the vicinity of Piketon, Ohio allows a maximum speed of 96.6 kilometers per hour (60 miles per hour). The CSX Transportation Inc. line also provides access to other rail carriers. (USEC, 2005b)

2.1.4 Description of the Phases of the Proposed Action

Activities at the proposed ACP would be comprised of four distinctive phases starting with refurbishment, site preparation, and construction, and ending with decontamination and decommissioning. Each of these phases is described in separate sections below, followed by a fifth section that describes the cessation of uranium enrichment operations at the Paducah Gaseous Diffusion Plant, which, while not part of the proposed action, would likely result from start-up of operations at the proposed ACP. (USEC, 2005b)

2.1.4.1 Refurbishment, Site Preparation, and Construction

Prior to operation, a number of activities would be required to refurbish, prepare, and construct facilities necessary for uranium enrichment at the proposed site.

<u>Refurbishment Activities</u>

A number of existing facilities at the proposed ACP have already undergone preliminary refurbishment to build the USEC American Centrifuge Lead Cascade facility. The environmental impacts of the Lead Cascade facility were analyzed in an Environmental Assessment published by NRC in January 2004 (NRC, 2004). Refurbishment of the existing facilities in the proposed ACP would continue as part of the proposed action. Specific refurbishment activities that would be completed are listed in Table 2-2.

Table 2-2 Refurbishment Activities for the Proposed ACP

Refurbishment Activity	Location
Preliminary facility repairs and modifications; maintenance servicing of support equipment	X-7726 Centrifuge Training and Test Facility, X-7727H Interplant Transfer Corridor, X-3012 Process Support Building, X-3346 Feed and Customer Services Building, X-2232C Interconnecting Process Piping, XT-847 Waste Management Staging Facility, and the X-710 Technical Services Facility.
Partial relocation of DOE operations and office space	X-3012 Process Support Building
Partial or complete clean out and disposal of material (e.g., old centrifuges associated with the Gas Centrifuge Enrichments Plant built onsite in the early 1980s, parts, classified material, records, miscellaneous equipment)	X-3001 and X-3002 Process Buildings
Disposal of stored hazardous waste and subsequent modification of the RCRA Part B permit to reflect a new storage area for the proposed ACP	X-7725 Recycle/Assembly Building
Relocation of the X-6002 Heat Plant	From X-3002 building to an area adjacent to X-6002A

Sources: NRC, 2004; USEC, 2005b

The relocation of the X-6002 Heat Plant would consist of the removal and relocation of system components and piping. Construction would take place between the X-6002A Oil Storage Facility and the X-7721 Maintenance, Stores, and Training Building, located northeast of the X-3002 building. Approximately four acres of soil disturbance is anticipated, but appropriate design reviews would be performed prior to construction to identify the detailed scope of the project effort. The DOE air permits would be transferred to USEC and incorporated in the site's *Clean Air Act* Title V air permit. USEC would also utilize applicable erosion control measures and storm water run off controls to minimize these effects during the relocation and removal effort (USEC, 2005b).

<u>Site Preparation and Construction Activities</u>

As part of the proposed ACP, eight primary facilities, three secondary facilities, and seven cylinder storage yards would be constructed. These facilities and their approximate sizes are listed in Table 2-1 and described in Sections 2.1.3.1 and 2.1.3.2.

With the exception of the X-745H Cylinder Storage Yard, the proposed construction areas were previously graded and improved during the construction phase of the former DOE Gas Centrifuge Enrichment Plant in the early 1980's (USEC, 2004). Some additional site preparation would be necessary, however, and an estimated 146,865 cubic meters (192,099 cubic yards) of earth would be excavated, with 37,385 cubic meters (48,899 cubic yards) of that being backfilled. An estimated 109,480 cubic meters (143,200 cubic yards) of earth would be placed in a borrow area on the DOE reservation for future use (USEC, 2005b).

Soil disturbance from project activities would occur in construction lay-down areas, altering the soil profile and leading to a possible temporary increase in erosion because of storm water runoff and wind. Engineering controls and best management and construction practices would be implemented to minimize removal and erosion of soils. Physical barriers, such as silt fences and temporary berms would be utilized to reduce impacts on surface water quality from silt and erosion (USEC, 2005b).

Construction activities would comply with all applicable permits. Best management practices would be followed to minimize solid waste and hazardous material generation during construction. A minimal amount of oils or solvents would be used during construction to decrease potential leakage to groundwater. If a spill occurs, trained, qualified professionals would promptly deploy spill cleanup materials. Affected soils would be sampled, analyzed, and managed according to appropriate procedures that encompass State and Federal requirements.

Dust suppression techniques would be used to mitigate excessive releases of fugitive dust and particulate matter during site preparation activities, although the site is located in a county that is exempt from the restrictions on emissions for fugitive dust specified in Ohio Administrative Code 3745-17-08.

<u>Management of Wastes from Refurbishment, Site Preparations, and Construction</u>

Refurbishment and construction activities would generate solid sanitary/industrial waste, low-level radioactive waste from the former Gas Centrifuge Enrichment Plant, hazardous waste regulated under the *Resource Conservation and Recovery Act*, and recyclables. Sanitary/industrial waste would include normal building construction materials such as steel beams, plywood and concrete, and general building trash such as paper and packing products, wood, and cement. Sanitary/industrial waste from maintenance of support equipment would be non-regulated lubricants, cleaning materials, and general maintenance debris. Incandescent and fluorescent light bulbs, lead acid and non-lead acid batteries, aerosol cans, etc. would be generated throughout the project and would be handled in accordance with established recycling and hazardous waste management programs. Low level radioactive waste, and hazardous and non-hazardous wastes would be handled according to procedures that comply with NRC, State, and Federal requirements. As previously mentioned, reasonable efforts would be taken to minimize the amount of waste generated during this phase using USEC-approved waste minimization and pollution prevention policies. The majority of the wastes generated during the refurbishment phase would occur in the X-3001, X-3002, and X-3346 buildings. Table 2-3 presents a summary of the major sources of waste and projected annual rates of waste generation from this life-cycle phase.

2.1.4.2 Manufacturing and Equipment Assembly

This section summarizes the proposed activities for manufacturing and assembling centrifuges for the proposed ACP. A description of airborne emissions, liquid wastes, and solid wastes expected to be generated from these activities is also provided.

Table 2-3 Waste Generation during Refurbishment and Construction

Material/Activity	Type of Waste	Projected Annual Rate
Centrifuge parts, piping, and excess equipment from the former Gas Centrifuge Enrichment Plant	Low-level radioactive waste	7,793-8,509 m^3[a]
Rags, wipes, and aerosol cans	RCRA-regulated	3-17 m^3
Paper, construction debris, wood, etc.	Sanitary/industrial	1,270 t
Circuit boards, bulbs, lead parts	Recyclables	144-184 m^3

Notes:
[a] This waste will only be generated one-time during refurbishment and construction. It is not a waste generated annually.
m^3 = cubic meters; t = metric tons; RCRA = *Resource Conservation and Recovery Act.*
To convert m^3 to ft^3 multiply by 35.31.
To convert t to tons multiply by 1.1.
Source: USEC, 2005b.

Manufacturing and Assembly Activities

New centrifuges and related components would be manufactured onsite at the proposed ACP or at a commercial manufacturing plant located off the DOE reservation. For offsite manufacturing, USEC is contemplating three different candidate locations in different States across the country. Centrifuge components from an offsite manufacturing plant would be transported by truck to the proposed ACP for assembly and installation.

Centrifuge manufacturing features a filament winding process. This process typically materials such as carbon fibers, resin systems (resins, hardeners, and modifiers), prepregs (fibers/resin system), and other chemicals for cleaning parts and for support of the manufacturing process. Final curing of the resulting parts occurs in a curing oven or hood. Solvents are used to clean the produced parts and manufacturing equipment.

Control of combustible materials used in the manufacture of centrifuge components includes storage in National Fire Protection Association 30-approved flammable storage cabinets or areas and the use of local ventilation. The approved storage areas and flammable storage cabinets would be located away from licensed material. Back-up power ensures continued ventilation in the event of loss of power. Inadequate ventilation flow from the hoods and cabinets triggers an alarm.

Onsite centrifuge manufacturing, assembly, testing, and maintenance operations would occur primarily in the X-7725 Recycle/Assembly facility, which would house up to six centrifuge assembly positions and six column assembly stands. The X-7726 Centrifuge Training and Test facility would have two centrifuge assembly positions and one column assembly stand and would be used initially for centrifuge component manufacturing and machine assembly, then for assembly training and machine component preparation only. These locations would also receive and store parts for the centrifuge machine assembly.

The assembly and testing of sub-assemblies and assemblies would be an ongoing activity through the production of approximately 24,000 completed centrifuges and sufficient spares to operate the enrichment plant at the potential capacity of 7 million separative work units annually (USEC, 2005b). Each of the manufacturing and assembly areas would have multiple workstation and equipment sets to allow for the production of up to 16 machines per day (USEC, 2005b). Overhead cranes, fork trucks, and parts elevators would deliver material to the assembly stands. Lifting fixtures and other assembly tooling would be required during the assembly of the centrifuges. Completed machines may be moved via crane

to an adjacent storage location until they can be moved again by crane or moved directly to a transporter for movement to the process buildings.

Gross leak testing of the machines using UF_6 may be performed in the X-7725 Recycle/Assembly facility Gas Test Stands or in the process buildings after installation prior to being placed into service. No process gas (UF_6) testing of the machines would take place in the assembly areas. The Gas Test Stands would be in a separate room within the X-7725 facility, which has its own ventilation and emission control system. UF_6 for the test stands would be supplied from a small cylinder within this room. Testing activities could also include mechanical testing and planned failure testing of smaller parts or sub-assemblies.

<u>Management of Wastes from Manufacturing and Equipment Assembly</u>

The common chemicals that may be used and released are acetone, alcohols, carbon dioxide, ethanol, Freon 134, resin products, solvent vapors, and n-methylpyrrolidone. The airborne emissions generated by the processes would be confined and captured by the use of hoods or local ventilation capture systems that divert emissions to permitted vents. Where required (e.g. for volatile organic vapors), emission control equipment, such as air flow monitored hoods and local exhaust systems, would be used as part of the permitted emission vent system. Airflow from the hoods would be monitored to ensure adequate flow and alarm if a reduced flow is detected so that operations can be curtailed (USEC, 2005b).

Exhaust from the test stands would pass through alumina traps to a continuously monitored vent. The vent would be equipped with continuous gas flow monitoring instrumentation with local readout, as well as the analytical instrumentation required to continuously sample, monitor, and alarm UF_6 breakthrough in the effluent gas stream (USEC, 2005b).

Some hazardous wastes would be generated through the use of solvents and would be in the form of excess spent solvent, rags, wipes and other material that come into contact with the spent solvents. Wastes would be stored in approved storage areas in flammable storage cabinets/areas according to National Fire Protection Association 30 requirements prior to removal for disposal. Excess fibers, reacted resins, and curing agents would be considered sanitary/industrial waste. Solvents for cleaning would be used during assembly of parts (either sub-assembly or final assembly), which would generate some air emissions, a small quantity of sanitary waste (dry wipes, rags, etc.), and hazardous wastes from the solvent cleaning (USEC, 2005b). Table 2-4 provides a summary of solid waste expected to be generated during the manufacturing phase.

2.1.4.3 Facility Operation

This section provides an overview of the production activities that would be carried out to operate the proposed ACP. The overall process of uranium enrichment at the proposed ACP can be divided into six basic operations: (1) receipt of UF_6 feed material; (2) feeding UF_6 into the enrichment process; (3) enrichment, where the UF_6 assay is increased to its desired uranium-235 content; (4) material withdrawal, where enriched UF_6 and depleted UF_6 is removed from the enrichment process; (5) UF_6 sampling and transfer, where enriched UF_6 is sampled to ensure it meets customer specifications and the enriched UF_6 product material is transferred to customer product cylinders; and (6) shipment of UF_6 cylinders to customers.

Each of these operations is briefly described below, followed by a discussion of waste management and the activities associated with conversion and disposal of depleted UF_6.

Table 2-4 Solid Waste Generation during Manufacturing

Material/Activity	Type of Waste	Projected Annual Rate
Spent solvent rags, wipes from parts cleaning operations in support of start-up and testing activities	RCRA-regulated	9-11 m^3
General maintenance and proposed ACP materials in support of start-up and testing activities	Non-regulated[a]	5-6 m^3
Packing material, paper, wood, etc. in support of start-up and testing activities	Sanitary/industrial	392-490 t

Notes:
[a] A Non-Regulated Waste is any discarded material that is excluded under the Ohio Administrative Code - OAC 3745-51-04, does not exhibit a characteristic of a hazardous waste under OAC 3745-51-20 to 3745-51-24, or does not meet any of the listing descriptions in OAC 3745-51-31 to 3745-51-33.
m^3 = cubic meters; t = metric tons; RCRA = *Resource Conservation and Recovery Act*
To convert m^3 to ft^3 multiply by 35.31.
To convert t to tons multiply by 1.1.
Source: USEC, 2005b.

Receipt of UF_6 Feed Material

Uranium feed for the proposed ACP would be natural uranium in the form of UF_6. The UF_6 would be transported to the plant in 48-inch (48X or 48Y), 10-ton or 14-ton cylinders that are designed, fabricated, packaged and shipped in accordance with American National Standards Institute N14.1, Uranium Hexafluoride-Packaging for Transport (ANSI, 1990). Feed cylinders would be typically transported to the site by 18-wheeled tractor-trailer trucks. It is anticipated that approximately 1,100 shipments of feed cylinders per year would arrive at the proposed ACP (USEC, 2005b). Expected feed suppliers include the Cameco Corporation (Ontario, Canada) and Honeywell Specialty Chemical Plant (Metropolis, Illinois), as shown in Figure 2-6.

Feed Operations

UF_6 feed cylinders would be transported to the feed area of the X-3346 Feed and Customer Services building and placed inside feed ovens. Feed ovens are not pressurized, but do restrict air-leakage to provide efficient heating of the cylinders. Each feed oven is equipped with a UF_6 leak detector. The ovens would heat the cylinders utilizing electrically heated air at a constant temperature of approximately 85 degrees Celsius (185 degrees Fahrenheit). (USEC, 2004)

The feed process has several stages. UF_6 is sublimed from the solid phase into the gas phase and monitored for the presence of light gases (e.g., nitrogen oxide, oxygen, hydrogen fluoride, etc.). It is then purified, held, mixed, and pressure-controlled before entering the process buildings. There are two feed headers located in the feed area that direct each stream to the X-3001 and X-3002 Process Buildings via the X-2232C Interconnecting Process Piping. Any solid UF_6 left in the cylinder after the feed rate declines to a predetermined level goes to a freezer-desublimer in a process called "heeling." This process removes residual UF_6 "heels" from a cylinder when it can no longer be used to feed material into the cascade. The emptied feed cylinder would then be placed into storage. (USEC, 2004)

Figure 2-6 Incoming UF_6 Feed Material

1

Enrichment Operations

The uranium enrichment process as described in Section 2.1.2 would occur within the X-3001, X-3002, X-3003, and X-3004 Process Buildings. Each building would contain multiple cascades to optimize operating costs and production flexibility. Each cascade would be capable of enriching UF_6 gas to the desired product assay. Enrichment would normally be less than 5.5 percent by weight of uranium-235, although USEC's license application seeks authorization to produce enriched uranium up to 10 percent by weight of uranium-235. (USEC, 2004)

Figure 2-7 shows the proposed flow of feed, enriched, and depleted UF_6 material and cylinders during full operation of the ACP. Incoming UF_6 feed gas would be distributed to the feed control systems for each cascade. The feed flow rates to each cascade would be automatically adjusted to ensure the desired feed is added to the cascade to support the production rate. As the feed enters the cascade, it mixes with material already in the cascade and separates into enriched and depleted material streams. The proportion of feed that becomes enriched product is controlled by the stage control valves, which would be adjusted to provide the desired product and tails assays. This process would continue until the material exits the top of the cascade as enriched product or the bottom of the cascade as depleted tails material, and is sent to the X-3356 Product and Tails Withdrawal building. (USEC, 2004)

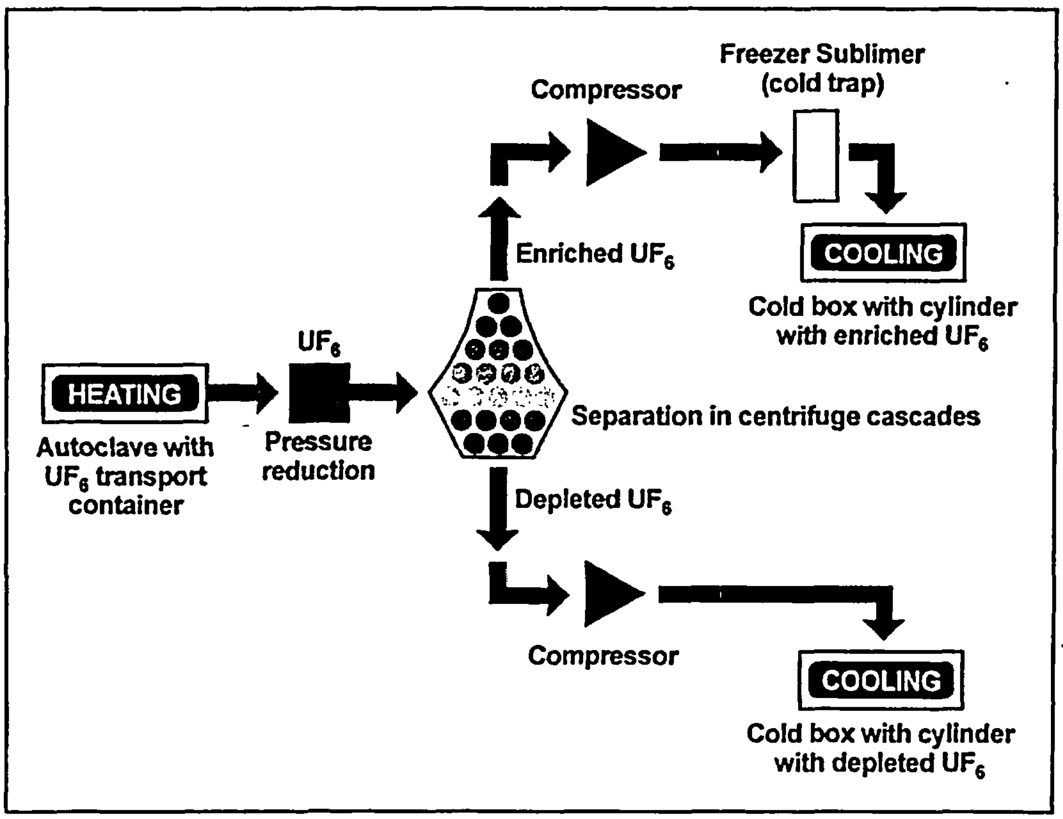

Figure 2-7 Enrichment Operations Flow

Product and Tails Withdrawal

Product withdrawal would occur in the X-3356 and X-3366 Product and Tails Withdrawal buildings. As many as three different product assays can be fed from the process buildings to the X-3356 and X-3366 buildings. Product material first transitions from the gas to the solid phase via cold traps, with the off-gas

passing through backup traps and vented through an evacuation system. From the cold traps, the enriched product is transferred into 48X source cylinders located in cold boxes. The filled 48X source cylinders are then moved to interim storage and subsequently moved to the X-3346 building sampling and transfer area. (USEC, 2004)

Tails withdrawal would occur in the same buildings and would be accomplished through compression and direct deposition of UF_6 material into tails cylinders. This process does not involve UF_6 pressures above atmospheric pressure, which helps to prevent gas leakage. The tails withdrawal design incorporates the capability for simultaneously withdrawing two uranium assays (USEC, 2004). The compression train consists of centrifugal compressors arranged in series with coolers and with recycle capability. Tails withdrawal can also be used for emergency inventory removal.

The major components that would support the withdrawal operations are withdrawal (compression) trains, cold boxes, cold traps, assay spectrometers, and vents. The Area Control Room within the X-3356 and the X-3366 buildings would house the assay spectrometers for monitoring tails and product withdrawal, control equipment, and alarms associated with the withdrawal operation.

<u>Sampling and Transfer Operations</u>

UF_6 sampling and transfer operations for UF_6 product material would be carried out in the product operations area of the X-3346 Feed and Customer Services building. Autoclaves with heating and cooling capability liquefy UF_6 in the source cylinder in order to obtain a homogenized sample, as mandated by the American Society for Testing and Materials sampling standards. Liquid UF_6 would then be transferred into customer product cylinders and the autoclave would cool the remaining UF_6 heels in the source cylinders until they are solid (USEC, 2004). The autoclaves are pressure vessels and are designed to contain a UF_6 release. Electrically heated hot air is the heating medium and cold air is used for cooling.

The major components that comprise the sampling and transfer operations are autoclaves, cold traps, and vents. The Area Control Room within the X-3346 building would house the monitoring, control, and alarm equipment associated with the feed operations and sampling and transfer operations.

<u>Shipment of Enriched Product to Customers</u>

The X-3346A Shipping and Receiving building would be the shipping point for all cylinders leaving the ACP. Filled customer product cylinders (30-inch, 2.5-ton cylinders) would be transported to customers (nuclear fuel fabrication facilities), while emptied feed cylinders would be returned to vendors. All cylinders would be prepared for shipment and shipped in accordance with NRC and U.S. Department of Transportation regulatory requirements (USEC, 2004). Figure 2-8 shows the destinations of outgoing enriched uranium customer product cylinders.

All cylinders from the proposed ACP would be transported by 18-wheeled tractor-trailer trucks. These cylinders would be designed, fabricated, and shipped in accordance with the American National Standards Institute standard for packaging and transporting UF_6 cylinders, ANSI N14.1 (USEC, 2005b). A shipment frequency of 1-20 cylinders per five days is typical, with an annual total of approximately 1,200 cylinders. Table 2-5 shows the expected recipients of product and the average number of customer product cylinders they would receive yearly.

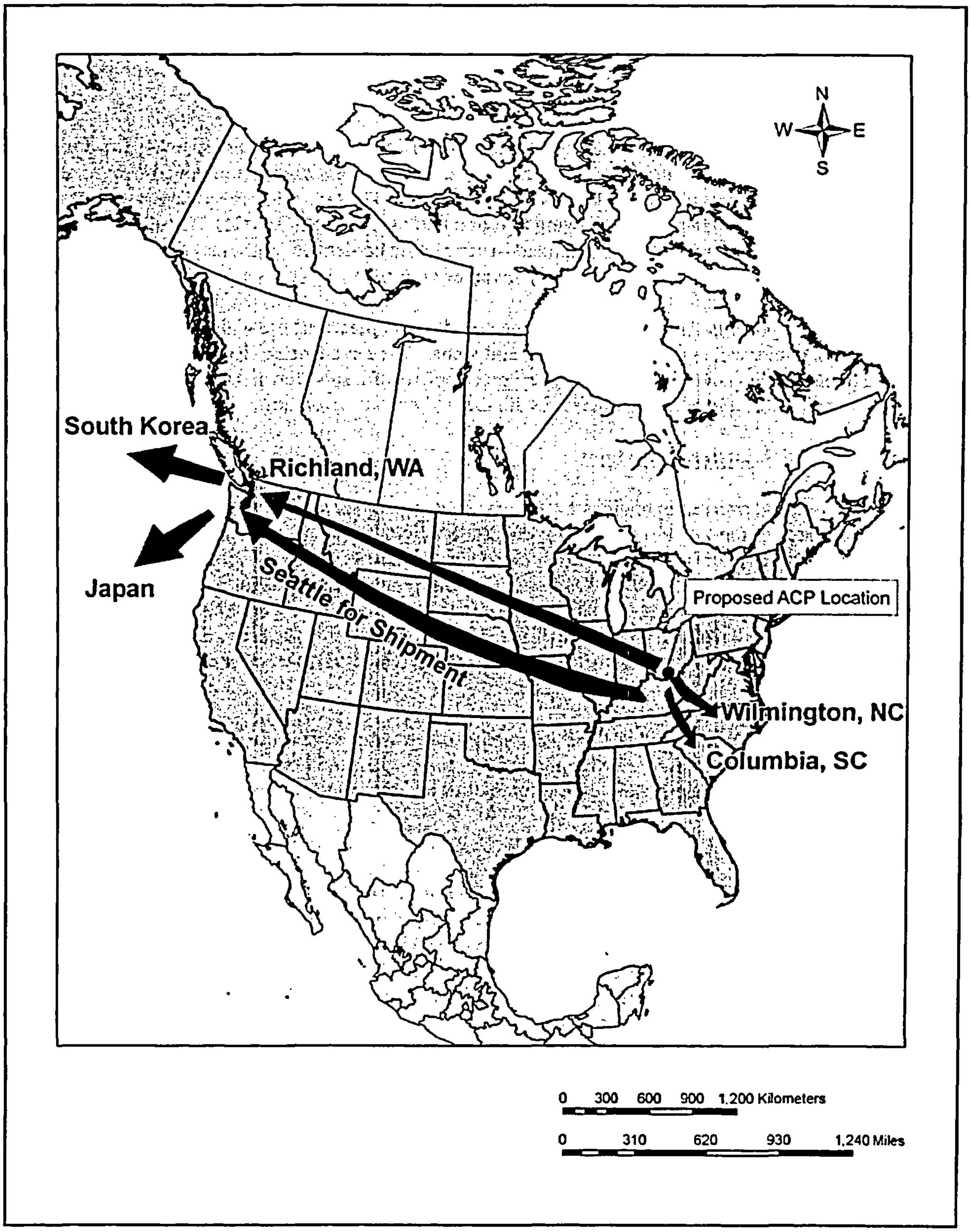

Figure 2-8
Destination of Outgoing Customer Product

Approximately 50 30-inch heel cylinders would be shipped to vendors monthly for cleaning and recertification, or washing only (USEC, 2005b). These cylinders have heel weights of less than 25 pounds. The planned vendors are Westinghouse (Columbia, SC), and Framatome (Richland, Washington).

Table 2-5 Expected Product Recipients

Company	Location	Yearly Average
Framatome ANP Inc.	Richland, Washington	300 cylinders
Global Nuclear Fuel - Americas	Wilmington, North Carolina	400 cylinders
Westinghouse Electric Corporation	Columbia, South Carolina	350 cylinders
Korea Nuclear Fuel Company	Korea	70 cylinders
Mitsubishi Nuclear Fuel Co., Ltd.	Japan	75 cylinders

Source: USEC, 2005b.

<u>Management of Wastes from Facility Operation</u>

Waste generated by the proposed ACP would be collected, handled, packaged, segregated, stored, and shipped for offsite treatment and disposal in accordance with plant procedures and applicable State and Federal regulations. The regulatory requirements associated with waste management are described in Chapter 1, Section 1.5. The proposed ACP would obtain waste management services from a qualified provider licensed by the NRC or an Agreement State. Potential waste streams generated include low level mixed waste, low level radioactive waste, hazardous waste regulated under the *Resource Conservation and Recovery Act*, sanitary/industrial waste, recyclable waste, and classified waste. The proposed ACP is not projected to generate any polychlorinated biphenyls or asbestos-containing waste that would be regulated under the *Toxic Substances Control Act*. Activities would be evaluated for waste minimization opportunities to reduce the volume and toxicity of waste generated to the degree determined to be economically practicable. Waste products would be classified based upon various factors, which includes laboratory analysis, radiological assessment, process knowledge, material safety data sheets, and non-destructive analysis.

The proposed ACP would also maintain and use gaseous and liquid effluent treatment systems, as appropriate, to maintain releases of radioactive material to unrestricted areas below the limits specified in 10 CFR 20.1301 and 40 CFR Part 190, and in accordance with its "As Low As Reasonably Achievable" policy. These treatment systems are described below.

<u>Air Emissions Monitoring and Treatment Systems</u>

The primary facilities described in Section 2.1.3 would be equipped with various air emissions monitoring and treatment systems. Since there is potential for the release of hydrofluoric acid gas during operation of the ACP, the vent systems in each primary facility would have gas flow monitoring instrumentation with local readouts. They would also contain analytical instrumentation to continuously sample, monitor, and to alarm if UF_6 should escape in the effluent gas stream. Gases evacuated from process systems would pass through cold traps to desublime the potentially high concentrations of UF_6 and separate it from the non-UF_6 gases. Residual gases leaving the cold trap would pass through a set of alumina traps to remove any trace quantities of UF_6 prior to the gases being vented to atmosphere. When an evacuation system cold trap becomes full, it would be valved off from the vent and its contents desublimed to a drum so the material could be fed back into the enrichment plant. The cold traps can be

bypassed to allow rapid evacuation of a volume not containing radioactive material. The alumina traps cannot be bypassed. In compliance with the policies of USEC's Radiation Protection Program, the ventilation air in the primary facilities would be continuously monitored and the data would be verified quarterly to enure that ventilation exhausts are less than 11 x 10^{-08} becquerel per milliliter (3 x 10^{-13} microcuries per milliliter) uranium (USEC, 2005b).

A portable gulper (vacuum) system would be used for localized exhaust on applications ranging from pigtail operations to small-scale maintenance tasks. The gulper inlet duct or hose would be placed near the work area. Any escaping airborne contamination would be removed from the source and passed through the duct or hose and into the filter bank, where, depending on the operation, gases are neutralized and the particulates removed. The resultant exhaust would be clean air that would typically be discharged into the work area.

Based on historic experience and operating plans, the radionuclides anticipated to be present in gaseous effluents are uranium-234, -235, and -238. The intention is to not introduce feedstock contaminated with significant concentrations of other nuclides into the process. Feed material that meets the American Standards for Testing and Materials specification for recycled feed may be used, and may contain radionuclides such as uranium-236 and technetium-99. Based on experience at the Portsmouth Gaseous Diffusion Plant, technicium-99 may eventually appear in some ACP gaseous emissions. Consequently, ACP emissions would be analyzed for these four nuclides routinely. The "As Low As reasonably Achievable" goal for airborne radioactive releases from the ACP is 5 percent (5.0 x 10^{-06} sievert per year [0.5 millirem per year]) of the NRC 10 CFR 20.1101 constraint of 0.0001 sievert per year (10 millirem per year) for the most exposed member of the public. This is less than the 10 millirem per year goal recommended in NRC Regulatory Guide 8.37, Regulatory Position C.1.2 (USEC, 2005b).

<u>Liquid Effluent Collection and Treatment Systems</u>

The proposed ACP would be equipped with various liquid effluent collection and treatment systems. The centrifuges and other support equipment are cooled by a closed-loop Machine Cooling Water system to minimize the amount of water potentially contaminated by uranium. There would be no routine blowdown from the Machine Cooling Water system. Waste heat from the Machine Cooling Water system would be discharged via heat exchangers to the Tower Water Cooling system, which would be cooled by a single cooling tower. Waste heat from the cold trap refrigeration systems in X-3346 Feed and Customer Services and X-3356 Product and Tails Withdrawal buildings would also be discharged to the Tower Water Cooling system. Currently, the Tower Water Cooling system discharges its blowdown to the Portsmouth Gaseous Diffusion Plant Recirculating Cooling Water system under a service agreement, which in turn discharges its blowdown directly to the Scioto River via an underground pipeline (permitted outfall 004). The Recirculating Cooling Water system does not provide any treatment of the Tower Water Cooling system blowdown; it simply provides a convenient pathway to a suitable permitted discharge point. At some point in the future, the Tower Water Cooling system blowdown will likely be modified to bypass the Recirculating Cooling Water system and discharge directly to the Recirculating Cooling Water discharge pipeline. No licensed material is anticipated in the Tower Water Cooling system blowdown (USEC, 2005b).

In the interim, the Portsmouth Gaseous Diffusion Plant Recirculating Cooling Water system has ample capacity to accept the Tower Water Cooling system effluent without either physical modification or adjustment to its discharge limits. Discharges from the Recirculating Cooling Water system are monitored by an automated sampler, which collects a weekly composite sample of the liquid effluent for radiological analysis as well as sample(s) for other required analyses. Historical data indicate that there is reasonable assurance that no unanticipated discharge of licensed material has occurred (USEC, 2005b).

Leakage from the Machine Cooling Water system and incidental spills of water elsewhere in the ACP would be collected by the Liquid Effluent Collection system. The proposed collection system consists of a set of drains and underground collection tanks for the collection and containment of leaks and spills of chemically treated water. The drains are located throughout the DOE reservation. The tanks have a capacity of 550 gallons (gal) each and would be monitored by liquid level gauges mounted above grade on pipe stands. Water accumulated in the tanks would be sampled and analyzed prior to disposal. If the contents meet the requirements of 10 CFR 20.2003, they may be pumped to the reservation sanitary sewer system. Otherwise the tank contents would be containerized for off-site disposal. An integrity assurance plan would assure that the tanks are not leaking as the ACP takes possession of them. Following completion of this integrity assurance plan, inventory monitoring of the tank contents would be used to detect leaks from the Liquid Effluent Collection System (USEC, 2004).

Storm water runoff from the proposed ACP, along with some once-through cooling water, would drain to a pair of existing holding ponds, the X-2230N West Holding Pond and the X-2230M Southwest Holding Pond. These ponds provide an area for settling suspended solids, dissipation of chlorine, and oil diversion and containment before discharging to unnamed tributaries of the Scioto River. An automated sampler collects a weekly composite sample of the liquid effluent for radiological analysis as well as other required analyses (USEC, 2005b).

An inspection and maintenance program would be conducted for the proposed ACP's UF_6 cylinders to ensure that no licensed material is released to the storage pads (USEC, 2005b). Cylinder storage yards would have flat airport runway-quality concrete and would be sealed. The pad would be designed so that spills of liquids could be promptly contained and cleaned up, limiting decontamination of areas to the pad surfaces. Similarly, the floor designs in the process buildings would ensure that any spills of liquids can be contained and cleaned up, limiting decontamination of areas to floor surfaces (USEC, 2005b).

The radionuclides anticipated to be present in ACP liquid effluents are uranium-234, -235, -238, and technicium-99, due to historic contamination of the DOE reservation. Technicium-99 is a fission product that has contaminated much of the national fuel cycle and is present on the Piketon site. Measured technicium-99 concentrations in site outfalls have been falling for several years, but are still sometimes detected. Consequently, effluents from the proposed ACP would be analyzed for these four nuclides routinely. The "As Low As Reasonably Achievable" goal for liquid effluent radioactive releases from the ACP is 5 percent (5.0×10^{-06} sievert per year [0.5 milllirem per year]) of the NRC 10 CFR 20.1101 constraint of 0.0001 sievert per year (10 millirem per year) for the most exposed member of the public. This is less than the 10 milllirem per year goal recommended in NRC Regulatory Guide 8.37, Regulatory Position C.1.2 (USEC, 2005b).

Solid Waste Handling, Storage, and Transport

Waste accumulation areas, such as the XT-847 Waste Preparation Facility, would be established throughout the proposed ACP as necessary to support waste handling, storage, and transport activities. Waste would be sampled and measured to assist in determining the proper waste characterization and disposal or treatment method.

Operations for long-term storage and preparation of waste for off-reservation shipment include sampling, batching, blending, glove box operations, nondestructive assay measurements, dry active waste and contaminated metal sorting, repackaging, and overpacking (USEC, 2005b). Sampling and batching of some solid waste, especially that with airborne potential, would be performed within a glove box enclosure. Sampling and batching of some liquid waste would be performed by utilizing a blending unit system that is specifically designed for liquid waste collection and sampling. Sampling, batching, and repackaging may also be performed elsewhere on-site, as necessary. The nondestructive assay equipment

located within the XT-847 facility includes a low density waste assay monitor and box monitor. This equipment is utilized to measure the activity of waste in a variety of containers including small diameter containers, drums, and boxes (USEC, 2005b).

Waste could also be repackaged and/or overpacked within the XT-847 facility. Prior to off-reservation shipment or upon discovery, damaged containers would be repackaged using either a similar container or an 85 or 110-gallon overpack. The contents of a leaking or damaged waste container may be repackaged by hand, or by utilizing a barrel lift, forklift, forklift rotator attachment, pump, or other means of transfer. Waste would be containerized and labeled in accordance with applicable U.S. Department of Transportation regulations and site procedures. Some general types of waste packaging include:

- Solid Waste — 5, 30, 55, or 110 gallon drums; small diameter containers
- Liquid Waste — polybottles; 5, 30, or 55 gallon drums
- Corrosives, Acids — polybottles or polydrums
- Scrap Metal/Dry Active Waste — B25 boxes or other similar boxes; various drums

Contaminated scrap metal, dry active waste, and other boxed waste may be stored outside. Typically, these B25 boxes would be stored on the XT-847 facility west pad; however, they may be stored outside elsewhere on the DOE reservation. If outdoor storage of waste is necessary in other than B25 boxes, radioactive wastes with removable contamination are packaged in containers, wrapped, or covered to prevent the release of radioactivity (USEC, 2005b).

Waste would be typically removed from the generating facilities and transferred to the XT-847 Waste Preparation facility prior to final disposal; however, in some instances, waste may be shipped off-reservation directly from other on-site areas. Sanitary/industrial waste would be transported to the USEC-approved onsite landfill. Hazardous waste would be stored on-site for up to 90 days prior to off-reservation shipment. Classified wastes[1] would be stored in accordance with the appropriate security and regulatory requirements and would be disposed at an appropriate site in accordance with regulatory requirements. Low level mixed waste and low level radioactive waste would be stored on-site in compliance with NRC, Federal, and State regulatory requirements until shipped off-reservation to a licensed Treatment, Storage, Disposal, Recycling facility. Shipments of low level mixed waste would occur approximately every 90 days. The low level mixed waste is exempted from the storage requirements of the *Resource Conservation and Recovery Act* as defined in OAC 37455-103. Low level mixed waste is eligible for this conditional exemption as it is a hazardous waste and would be generated and managed by USEC as described in 40 CFR Part 266, Subpart N and OAC 3745-266 (USEC, 2005b).

Low level radioactive waste and low level mixed waste generated at the proposed ACP would be containerized and given a unique identification number. The identification numbers would be entered and maintained in a computer-based database, and the database would be regularly updated to reflect location, characterization, treatment data, and waste disposal information. Table 2-6 presents a summary of solid waste generated during the operations phase.

<u>Management and Disposal of Depleted UF_6 from Facility Operation</u>

Approximately 42,800 Type 48G cylinders of depleted UF_6 would be generated by the 7 million SWU plant operating full time for 30 years (USEC, 2005a). These cylinders would contain approximately 571,000 metric tons (630,000 tons) of depleted UF_6. The depleted UF_6 would be stored onsite in cylinders prior to management or disposal in accordance with USEC's disposal strategy and applicable

[1] A waste that is classified because of its configuration, composition, contamination, or contained information.

regulations under 40 CFR Part 266 and OAC 3745-266 (USEC, 2004). Figure 2-9 shows some example depleted UF_6 cylinders. Cylinders would be managed in accordance with NRC, U.S. EPA and Ohio EPA rules for storage, treatment, transportation and disposal of mixed wastes. These requirements include waste storage compatibility, personnel training, emergency planning, and full compliance with the NRC license.

Table 2-6 Solid Waste Generated during Facility Operations

Material/Activity	Type of Waste	Projected Annual Rate
Paper, office waste, bathroom supplies	Sanitary/industrial	227-272 t
Classified Waste[a]	Non-regulated[b]	9-11 m^3
Classified Waste[a]	Low-level radioactive waste	12-15 m^3
General maintenance, plant materials, laboratory, lubricants, vacuum system components, etc.	Mixed/RCRA	9-11 m^3
General maintenance, plant materials, laboratory, lubricants, vacuum system components, etc.	RCRA-regulated	2-3 m^3
General maintenance, plant materials, laboratory, lubricants, vacuum system components, etc.	Non-regulated[b]	5-6 m^3
General maintenance, plant materials, laboratory, lubricants, vacuum system components, etc.	Low-level radioactive waste	170-340 m^3
Polychlorinated biphenyl waste	TSCA-regulated	none projected
Asbestos waste	TSCA-regulated	none projected
fluorescent bulbs, circuit boards, lead-acid batteries, used oil	Recyclables	57 m^3

Notes:
[a]A Classified Waste is a waste that is classified because of its configuration, composition, contamination, or contained information.
[b]A Non-Regulated Waste is any discarded material that is excluded under the Ohio Administrative Code - OAC 3745-51-04, does not exhibit a characteristic of a hazardous waste under OAC 3745-51-20 to 3745-51-24, or does not meet any of the listing descriptions in OAC 3745-51-31 to 3745-51-33.
m^3 = cubic meters; t = metric tons; RCRA = *Resource Conservation and Recovery Act;* TSCA = *Toxic Substances Control Act.*
To convert m^3 to ft^3 multiply by 35.31.
To convert t to tons multiply by 1.1.
Source: USEC, 2005b.

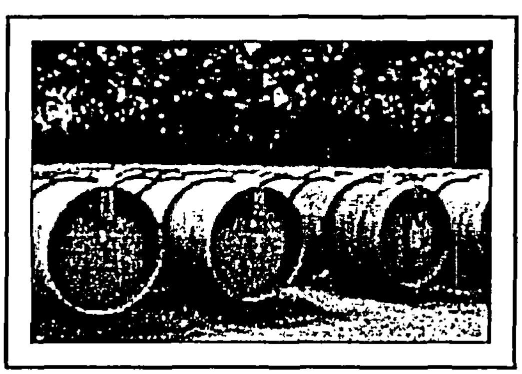

Figure 2-9 Example of Depleted UF_6 Cylinders (Urenco, 2003)

The cylinders primarily used for storage of tails are known as Model 48G cylinders. These cylinders are made of carbon steel and are about 4 feet in diameter, 12 feet long, and weigh about 30,000 pounds when full (USEC, 2005b). While a cylinder is being filled, it is cooled so that the gaseous depleted UF_6 is solidified. Once the depleted UF_6 is solidified, a filled cylinder is then moved to a cylinder yard where it is stacked in place. The cylinders would be inspected and maintained while being stored onsite. Maintenance activities would include periodic inspection for corrosion, valve leakage, or distortion of cylinder shape. Repainting of the cylinders would be conducted as indicated by the inspections. Depleted UF_6 may be transferred into new cylinders during plant operation in the event that cylinder inspection indicates potential loss of cylinder containment.

> ***Depleted UF_6 Conversion Process***
>
> *Depleted UF_6 conversion is a continuous process in which depleted UF_6 is vaporized and converted to triuranium octaoxide (U_3O_8) by reaction with steam and hydrogen in a fluidized-bed conversion unit. The hydrogen is generated using anhydrous ammonia, although an option of using natural gas is being investigated. Nitrogen is also used as an inert purging gas and is released to the atmosphere through the building stack as part of the clean off-gas stream. The depleted powder is collected and packaged for disposition. The process equipment would be arranged in parallel lines. Each line would consist of two autoclaves, two conversion units, a hydrofluoric acid recovery system, and process off-gas scrubbers. Equipment would also be installed to collect the hydrofluoric acid co-product and process it into any combination of several marketable products. A backup hydrofluoric acid neutralization system would be provided to convert up to 100 percent of the hydrofluoric acid to calcium fluoride for storage and/or sale in the future, if necessary.*
>
> *Source: (DOE, 2004a; DOE 2004b).*

DOE has decided to construct and operate a new UF_6 conversion facility at the DOE reservation in Piketon (DOE, 2004b). The facility will convert DOE's inventory of depleted UF_6 now located at the Piketon reservation and at the East Tennessee Technology Park in Oak Ridge, Tennessee to a more stable chemical form (triuranium octaoxide [U_3O_8] or uranium dioxide [UO_2]) acceptable for transportation, beneficial use/reuse, and/or disposal. A related objective is to provide cylinder surveillance and maintenance of the DOE inventory of depleted UF_6, low-enrichment UF_6, natural assay UF_6, and empty and heel cylinders. The location of this conversion facility on the reservation property is directly north of the proposed ACP. The facility will have a construction period of two years, an operational period of 18 years, and a decontamination and decommissioning period of three years. Construction began in the summer of 2004. The environmental impacts of the proposed UF_6 conversion facility are addressed in detail in a separate EIS published by DOE in June 2004 (DOE, 2004b).

USEC proposes to transport the depleted UF_6 generated at the proposed ACP to this new UF_6 conversion facility on the DOE reservation in Piketon. This plan is based on Section 3113 of the *1996 United States Enrichment Corporation Privatization Act* that states the DOE "shall accept for disposal low-level radioactive waste, including depleted uranium if it were ultimately determined to be low-level radioactive waste, generated by [...] any person licensed by the Nuclear Regulatory Commission to operate a uranium enrichment facility under Sections 53, 63, and 193 of the *Atomic Energy Act of 1954* (42 U.S.C. 2073, 2093, and 2243)." On January 18, 2005, the Commission issued its ruling that depleted uranium is considered a form of low-level radioactive waste (NRC, 2005). The Commission also stated that disposal of depleted uranium tails at a DOE facility represents a plausible strategy for the disposition of depleted uranium tails (NRC, 2005).

Once converted to U_3O_8 or UO_2, the depleted uranium from the proposed ACP would be temporarily stored onsite and then shipped offsite for disposal. During its evaluation of disposal of depleted uranium

in a licensed low-level radioactive waste disposal facility, the NRC staff determined that at least one facility (the Envirocare facility in Clive, Utah) is currently licensed to accept the material. Other disposal facilities, such as the DOE-operated Nevada Test Site facility, may also be able to accept this material and additional evaluations of these facilities may be required prior to disposal (DOE, 2004b).

2.1.4.4 Decontamination and Decommissioning

At the end of useful plant life, the proposed ACP would be decontaminated and decommissioned such that the facilities would be returned to DOE in accordance with the requirements of the Lease Agreement with DOE and in accordance with applicable NRC license termination requirements. Decontamination and decommissioning of the proposed ACP would be funded in accordance with the Decommissioning Funding Plan for the proposed ACP (USEC, 2005a). The Decommissioning Funding Plan, prepared by USEC in accordance with 10 CFR 70.25(a), provides information required by 10 CFR Part 70 regarding USEC's plans for funding the decommissioning of the proposed ACP and the disposal of depleted uranium tails generated as a result of plant operations. Funding would be provided by USEC by means of a surety bond or alternate financial assurance mechanism in accordance with NRC guidance in 10 CFR 70 and NUREG-1757 (NRC, 2003).

The intent of decommissioning is to return the proposed ACP site to a state that meets NRC requirements for release for unrestricted use after decontamination and decommissioning is completed (USEC, 2004). It is anticipated that at the end of the useful life of the plant, most of the buildings and outdoor areas of the plant would already meet NRC requirements for unrestricted use in accordance with 10 CFR 20.1402. Any buildings, outdoor areas, or equipment that do not already meet the NRC requirements at the time the ACP ceases operations would be decontaminated and decommissioned in accordance with the Decommissioning Plan for the site. The site decommissioning costs estimated in the Decommissioning Funding Plan are based on decontamination of the plant to the radiological criteria for unrestricted use in 10 CFR 20.1402. The total estimated cost of decommissioning a 7 million SWU plant in 2004 dollars is currently $435 million, not including the cost of disposal of depleted uranium tails generated by plant operations, which will be funded separately by USEC (USEC, 2005a). The surety bond or other financial mechanism would be updated throughout the operating life of the ACP in accordance with 10 CFR 70.25(e).

It is anticipated that the proposed ACP would generate approximately 19,040 metric tons (21,000 tons) per year of depleted UF_6. In total, approximately 42,800 cylinders containing more than 571,200 metric tons (630,000 tons) of depleted UF_6 would be generated by the 7 million separative work unit plant operating full time for 30 years (USEC, 2005b). USEC has assumed that the depleted UF_6 would be processed in a DOE-operated conversion facility and then shipped offsite for disposal. Based on the amount of depleted UF_6 anticipated to be generated over the operating life of the proposed ACP, the estimated financial liability for depleted UF_6 disposal is approximately $1,433 million in 2004 dollars.[2] This financial liability would be incrementally funded by USEC over the course of plant operating life as the depleted UF_6 is generated. The Decommissioning Funding Plan cost estimate for depleted UF_6 disposal is based on the assumption that the depleted UF_6 would be converted to a stable form (U_3O_8 or UO_2) and disposed of in accordance with the *USEC Privatization Act*, other applicable statutory requirements, and requirements applicable to DOE-operated depleted UF_6 conversion facilities and/or other licensed facilities.

[2] USEC's estimate for depleted UF_6 disposal was based on a 1998 agreement. USEC has not yet updated this cost for tails disposition and as a result, the final cost for tails disposition is not available.

Decontamination and decommissioning activities for the proposed ACP are anticipated to occur approximately 30 years in the future, and therefore only a general description of the activities that would be conducted for the proposed ACP can be developed at this time for the Draft EIS. The facility will follow NRC decommissioning requirements in 10 CFR 70.38.

The NRC anticipates that decontamination and decommissioning will involve the following activities:

- Installation of decontamination facilities;
- Purging of process systems and equipment;
- Dismantling and removal of facilities and equipment;
- Decontamination and destruction of confidential materials;
- Decontamination of equipment, facilities, and structures;
- Survey and spot decontamination of outdoor areas;
- Removal and sale of any salvaged materials;
- Removal and disposal of wastes;
- Management and disposal of depleted uranium; and
- Final radiation survey to confirm that the release criteria have been met.

2.1.4.5 Ceasing Operations at Paducah

Enrichment operations at the Paducah Gaseous Diffusion Plant will ultimately cease after the ACP becomes operational. The control and categorization of the land for industrial use within the boundaries of the Paducah site would not change as a result of cessation of enrichment plant operations.

Decommissioning of the Paducah Gaseous Diffusion Plant and any other future use of the enrichment plant buildings, structures, or land are not considered part of the proposed action considered in this Draft EIS. Decisions concerning decommissioning and any other future use of the enrichment plant would be the subject of other decisions and other environmental reviews.

2.2 No-Action Alternative

Under this alternative, the NRC would not approve the license application for the proposed ACP. The no-action alternative would result in USEC not constructing, operating, or decommissioning the proposed ACP at the DOE reservation in Piketon, Ohio. Under the no-action alternative, the uranium fuel fabrication facilities in the United States would continue to obtain low-enriched uranium from the currently available sources. Currently, the only domestic source of low-enriched uranium available to fuel fabricators is from production of the Paducah Gaseous Diffusion Plant and the down blending of highly enriched uranium under the "Megatons to Megawatts" program, as described in Section 1.3.1 of this Draft EIS. Foreign enrichment sources are currently supplying as much as 86 percent of the U.S. nuclear power plants' demand (EIA, 2004).

Currently, the "Megatons to Megawatts" program will expire by 2013, potentially eliminating down blending as a source of low-enriched uranium. Opened in 1952, the Paducah Gaseous Diffusion Plant utilizes gaseous diffusion technology, a process that is more energy intensive and requires higher energy consumption than the newer gas centrifuge technology. Additional domestic enrichment facilities utilizing a more efficient technology in the future could be constructed. In 2003, Louisiana Energy Services submitted a license application to the NRC to construct, operate, and decommission a gas centrifuge uranium enrichment facility near Eunice, New Mexico. The proposed facility, called the National Enrichment Facility, would produce enriched uranium-235 up to 5 weight percent with an annual production level of 3 million separative work units. If the proposed National Enrichment Facility begins operations, this would represent a more efficient and less costly means of producing low-enriched uranium than the current gaseous diffusion technology at the Paducah Gaseous Diffusion Plant.

Another aspect of the no-action alternative specific to the DOE Portsmouth Reservation is that the buildings and land proposed to be used for the ACP would not be available for reindustrialization. The DOE evaluated the land, buildings, and facilities at the DOE Portsmouth Reservation for potential reindustrialization as well as the potential impacts of various reindustrialization programs at the reservation in DOE/EA-1346 (DOE, 2001). DOE concluded that approximately 526 hectares (1,300 acres) or about 35 percent of the reservation is available for transfer and that the facilities that are under lease to USEC are not available for reindustrialization, as such activities are crucial to fulfilling DOE's nuclear energy mission. Appendix C of DOE/EA-1346 contains a list of all the buildings and facilities on the reservation and whether or not they are available for the reindustrialization program. Once the USEC lease would expire, DOE would re-evaluate its mission needs and other considerations (e.g., contamination) and would determine which facilities would become available for the reindustrialization program and which would remain under DOE control. Because for the foreseeable future the buildings and land proposed to be used for the ACP currently are leased by USEC for the development and operation of the Lead Cascade Facility and the impacts associated with reindustrialization have been evaluated in DOE/EA-1346, no reindustrialization activities are associated with the no-action alternative.

2.3 Alternatives Considered but Eliminated

As required by NRC regulations, the NRC staff has considered other alternatives to the construction, operation, and decommissioning of the proposed ACP. The range of alternatives was determined by considering the underlying need and purpose for the proposed action. This analysis led to the following set of reasonable alternatives:

- An alternative of constructing the ACP at the existing Paducah Gaseous Diffusion Plant;
- Alternative sites within the DOE reservation at Piketon;
- Alternative sources from down blending highly enriched uranium;
- Alternative sources of low-enriched uranium;
- Alternative technologies available for uranium enrichment; and
- Alternative conversion and disposition methods for depleted UF_6.

These alternatives were considered but eliminated from further analysis due to economic, environmental, national security, or technological maturity reasons. The following sections discuss these alternatives and the reasons the NRC staff eliminated them from further consideration.

2.3.1 Construction and Operation of the ACP at the Paducah Gaseous Diffusion Plant in Paducah, Kentucky

The construction and operation of the ACP at the Paducah Gaseous Diffusion Plant was considered as a reasonable alternative to the proposed action. Figure 2-10 shows the location of the Paducah Gaseous Diffusion Plant in relation to the DOE reservation in Piketon, Ohio.

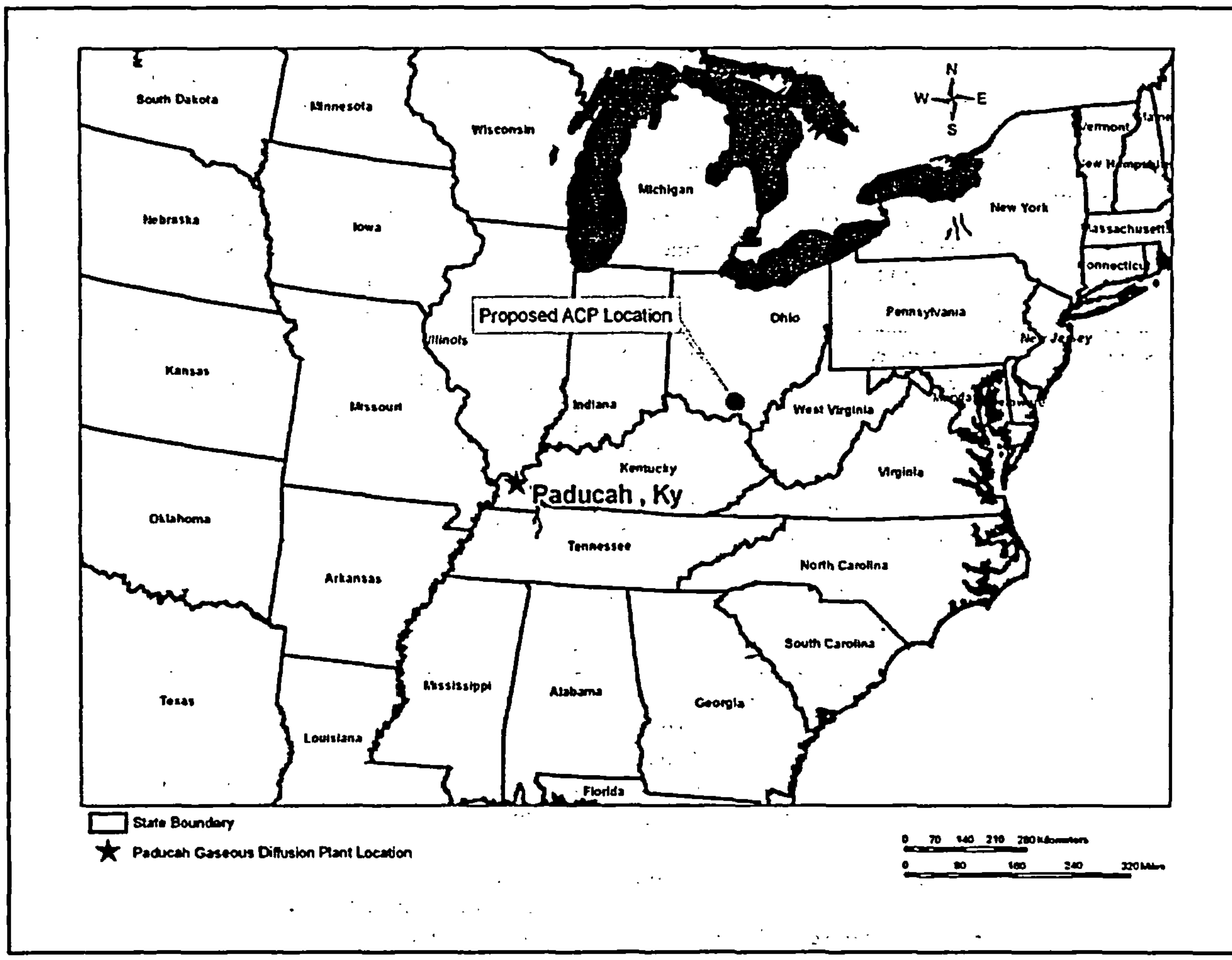

Figure 2-10 Location of the Paducah Gaseous Diffusion Plant

NRC staff concludes that while both sites are suitable on the basis of environmental, socioeconomic, and regulatory factors, the site in Paducah, Kentucky had a number of disadvantages. For example, seismic factors at Paducah would increase the cost of construction, could make the engineering effort more complex, and could make the plant safety considerations more uncertain. Overall, the NRC staff found that the selection of the Paducah site would result in somewhat greater environmental impacts due primarily to the need for construction of all new buildings, and the attendant excavation and land disturbance.

Table 2-7 provides a comparative analysis of the key environmental factors of the Piketon site versus the Paducah site. Based on this comparison, the NRC staff concludes that the Paducah site offers no environmental advantages and can be dropped from more detailed consideration in this Draft EIS.

Table 2-7 Comparison of Environmental Impacts at Alternative Site Locations

Resource Area	Piketon[1]	Paducah	Greater Impact
Land Use	• The ACP would refurbish and use existing buildings and utilities. • Some new process buildings, support facilities, and cylinder yards would be constructed on previously disturbed land.	• All primary and secondary facilities for the ACP would be newly constructed and would disturb previously undeveloped and uncontaminated areas of the Paducah DOE reservation (managed lawns and fields). Utilities are already available onsite.	Paducah
Historic and Cultural Resources	• The impacts to historic and cultural resources identified onsite and around the site's perimeter would be small.	• The State Historic Preservation Officer would be consulted prior to construction at Paducah; however, potential impacts to historic and cultural resources are unknown.	Unknown
Visual/Scenic Resources	• Changes to existing facilities and construction of new buildings would be consistent with existing site architectural features. Neither these changes nor the new construction would alter the existing visual characteristics of the site. • There are no existing State nature preserves or scenic rivers at Piketon.	• Architectural consistency would be maintained to ensure blending of the ACP construction with existing facilities. • There are no existing State nature preserves or scenic rivers at Paducah.	Same
Air Quality	• Pike County and the proposed ACP site are in National Ambient Air Quality Standard (NAAQS) attainment for criteria pollutants. • Air quality impacts associated with construction will have no lasting significant impacts on air quality. • The average calculated hydrogen fluoride (HF) concentration is 2.35×10^{-3} micrograms per cubic meter at the location of the Maximally Exposed Individual. • The maximum emission rate anticipated under normal operations is 1.1 millicuries of uranium per week, or up to 0.057 curies per year.	• McCracken County is in NAAQS non-attainment for 8-hr ozone. The Paducah Gaseous Diffusion Plant site itself, however, is in attainment for all criteria pollutants. • Air quality impacts associated with construction will have no lasting significant impacts on air quality. • The average calculated HF concentration is 2.27×10^{-3} micrograms per cubic meter at the location of the Maximally Exposed Individual. • The projected maximum emission rate for the ACP is 1.86 millicuries per week, or 0.097curies per year of total uranium.	Paducah

Table 2-7 Comparison of Environmental Impacts at Alternative Site Locations (continued)

Resource Area	Piketon[1]	Paducah	Greater Impact
Geology and Soils	• Soil disturbance from project activities would occur in construction lay-down areas, destroying the soil profile and leading to a possible temporary increase in erosion due to storm water runoff and wind. Engineering controls and best management and construction practices would be implemented to minimize the extent of excavation, erosion, and sediment runoff.	• The nature of the impacts would be the same as that for Piketon, except they would be more extensive due to the need for all new construction.	Paducah
Water Resources	• Best management and construction practices and erosion controls would minimize potential impacts to surface and ground water during construction. • The Liquid Effluent Collection system, monitoring of liquid release points, and complying with all NPDES permitting requirements would minimize potential impacts to surface and ground water during plant operation.	• Best management and construction practices and erosion controls would minimize potential impacts to surface and ground water during construction. • Safety procedures, spill prevention plans, and spill response plans would avoid impacts from accidental discharges during plant operation.	Same
Ecological Resources	• Some threatened or endangered species, including the Indiana bat (*Myotis sodalis*), Virginia meadow-beauty (*Rhexia virginica*), and Carolina yellow-eyed grass (*Xyris difformis*) are present or potentially located in the surrounding region. None of the proposed site preparation and construction activities would occur in any of the jurisdictional or nonjurisdictional wetlands on the DOE reservation.	• Some threatened or endangered species including the Indiana bat (*Myotis sodalis*), the tuberculed-blossom pearly mussel (*Epioblasma torulora*), pink-mucket pearly mussel (*Lampsilis orbiculata*), and the orange-footed pearly mussel (*Plethobasus cooperrianus*) are present or potentially located in the surrounding region. Wetlands are in the area, but are not located in the immediate vicinity of the proposed construction area.	Same

Table 2-7 Comparison of Environmental Impacts at Alternative Site Locations (continued)

Resource Area	Piketon[1]	Paducah	Greater Impact
Socioeconomic	• 3,362 direct and indirect jobs per year are expected during the construction phase. • Facility operations are expected to create 1,500 direct and indirect jobs. • No significant impacts to tax revenue, population characteristics, housing availability, or community are expected.	• 3,899 direct and indirect jobs per year are expected during the construction phase. • Facility operations are expected to create 1,860 direct and indirect jobs. • No significant impacts to tax revenue, population characteristics, housing availability, or community are expected.	Paducah
Environmental Justice	• No disproportionately high and adverse impacts to minority or low-income populations within an 80-kilometer (50-mile) radius of the Piketon site.	• No disproportionately high and adverse impacts to minority or low-income populations within an 80-kilometer (50- mile) radius of the Paducah site (DOE, 2004a).	Same
Noise Impacts	• Construction noise levels are estimated to reach a 53 day-night average noise level, which meets the standards for community noise levels at the nearest residence. • No adverse impacts from operational noise are expected at the closest residential receptor due to low operational noise, attenuation from the building, and distance attenuation of over 914 meters (3,000 feet).	• Noise associated with the construction phase would be temporary and not expected to significantly increase overall noise levels at the Paducah site. • Operation of the centrifuge system is not expected to increase the noise levels outside the proposed facilities.	Same

Table 2-7 Comparison of Environmental Impacts at Alternative Site Locations (continued)

Resource Area	Piketon[1]	Paducah	Greater Impact
Transportation	• The proposed action will not significantly change the Level of Service classifications for U.S. Route 23 or SR 32. • During site preparation and construction, the expected number of injuries to workers is 93 and expected number of fatalities is 1.03. For drivers transporting material and equipment to and from the site, the expected number of injuries is 3.61and expected number of fatalities is 0.10. • During facility operation, the expected number of injuries to workers is 7.9 and expected number of fatalities is 0.09. For drivers transporting material and equipment to and from the site, the expected number of injuries is 0.19 and expected number of fatalities is 0.01.	• Transportation impacts during site preparation and construction would be approximately double that of Piketon due to the need for all new facility construction. • All other transportation impacts would be approximately the same.	Paducah
Public and Occupational Health	• Construction and industrial activities would be managed under the OSHA industrial regulations (29 CFR 1910) and in compliance with site licenses and permits. • The use of spill response plans, safety procedures, spill controls, countermeasures plans, and spill response equipment in accordance with Federal and State laws, would minimize the likelihood and severity of potential impacts from accidental discharges. • The radiological risk for all receptor groups is below applicable criteria.	• Construction and industrial activities would be managed under the OSHA industrial regulations (29 CFR 1910) and in compliance with site licenses and permits. • The use of spill response plans, safety procedures, spill controls, countermeasures plans, and spill response equipment in accordance with Federal and State laws, would minimize the likelihood and severity of potential impacts from accidental discharges. • The radiological risk for all receptor groups is below applicable criteria.	Same

Resource Area	Piketon[1]	Paducah	Greater Impact
Waste Management	• The projected annual rate of sanitary/industrial waste is 2,240 tons • The projected annual rate of RCRA and Mixed/RCRA waste is 1,510 cubic feet. • The projected annual rate of LLRW is 313,020 cubic feet. • The projected annual rate of non-regulated waste is 800 cubic feet. • The project annual rate of recyclables is 6,500 cubic feet. • The proposed ACP is expected to generate approximately 571,200 metric tons (630,000 tons) of tails over its 30-year license period (about 42,800 tails cylinders).	• Quantities of waste are assumed be the same as the proposed Piketon site for all activities except construction, which would generate more at Paducah. • Sanitary/industrial waste in the construction phase at Paducah is projected to be double that of Piketon, due to the need for all new buildings.	Paducah

2.3.2 Other Alternative Sites

USEC used a site-selection process to identify viable alternative sites for the construction, operation, and decommissioning of the proposed ACP. The NRC staff has evaluated that process and determined that it is rational and objective, and that its results are reasonable. The candidate sites and the reasons they were not chosen as the preferred site location are described in the following sections.

<u>Alternative Locations at the DOE Reservation in Piketon, Ohio</u>

The DOE reservation in Piketon was evaluated to identify alternative locations for the ACP and three possible sites were identified, as shown in Figure 2-11. Location A is the preferred location for the ACP and is discussed in detail as the proposed action. This location is within the existing footprint of the DOE Gaseous Diffusion Plant facility and would be classified as a "brownfield" site. Further, compared to the other potential site locations, this location is the most isolated from the property boundary, which would likely result in a lower potential dose to the general public from any accidental or operational releases during construction, operation, and decommissioning of the proposed ACP.

Location B is located in the southeast portion of the site. This location consists of a level to very gently rolling grass field to a rolling forested hill. The level area was graded during the construction of the Gaseous Diffusion Plant in the 1950s and has been maintained as grass fields.

Location C is located in the northeast portion of the site and, like Location B, consists of a level to very gently rolling grass field to a rolling forested hill. It too was graded during the construction of the Gaseous Diffusion Plant and has been maintained as grass fields.

Locations B and C were not selected as the preferred alternative primarily due to the lack of existing buildings, extensive site preparation that would be needed, lack of access to utility services, and new construction that would be required. Neither location B or C had an environmental advantage over Location A or afforded the advantages offered by Location A, which is the site of the former Gas Centrifuge Enrichment Plant buildings.

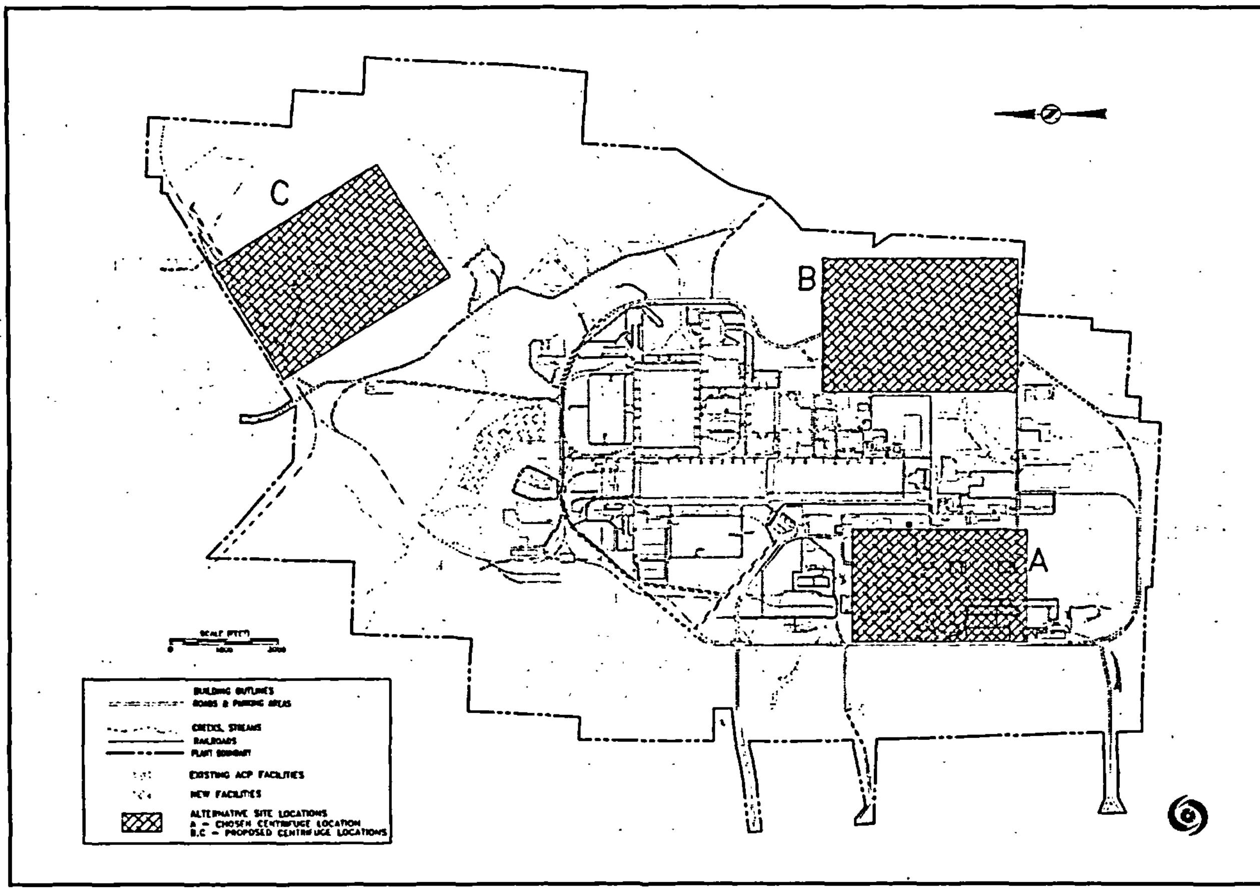

Figure 2-11 Alternative Sites at the DOE Reservation for the Proposed ACP

<u>Construct and Operate the ACP at a Non-Gaseous Diffusion Plant Location</u>

This alternative involves constructing and operating the ACP at an undisturbed "green field" site, or a disturbed site other than one of the existing Gaseous Diffusion Plants in Piketon, Ohio or Paducah, Kentucky. This alternative was not selected as the preferred alternative because it is inconsistent with the DOE-USEC Agreement and because the Gaseous Diffusion Plant sites provide schedule, regulatory, and cost advantages over other sites. The DOE-USEC Agreement stipulates that USEC deploy the ACP at either the DOE reservation in Piketon or Paducah. Also, no other sites offered the unique combination of (1) readily accessible environmental data; (2) past history and experience in uranium enrichment; and (3) the availability of skilled labor with uranium enrichment industry experience. A "green field" situation would not have readily accessible environmental data for the purpose of impact assessment and performance monitoring. Without available skilled labor with uranium enrichment experience, USEC would have to either provide training or relocate trained personnel at added expense. The environmental impact of this alternative would be either to disturb a "green field" site or to possibly introduce emission and effluents associated with uranium enrichment to an existing industrial site.

None of the alternatives considered would be obviously superior to the proposed location for the ACP at the DOE reservation in Piketon, Ohio.

2.3.3 Alternate Sources from Down Blending Highly Enriched Uranium

This alternative involves not constructing a domestic uranium enrichment plant to replace existing Gaseous Diffusion Plant production. Instead, an equivalent amount of separative work units would be obtained from down blending highly enriched uranium from either United States or Russian nuclear States or Russian nuclear warheads, or from the Nuclear Fuel Services facility in Erwin, Tennessee.

This alternative was not selected as the preferred alternative because it does not meet the commitments in the DOE-USEC Agreement, which requires that an ACP be constructed and operated. This alternative was also eliminated since it would be contrary to Congressional intent and common defense and security and does not meet the need as discussed in Section 1.3. USEC is the Executive Agent for a U.S. Government agreement that purchases low-enriched uranium that is derived from down blending of highly enriched uranium from Russian warheads. In February 1993, the U.S. Government agreed to purchase from Russia 500 metric tons (492 tons) of highly enriched uranium extracted from dismantled nuclear weapons over a 20-year period, which expires in 2013 (USEC, 2005b). It is uncertain whether this agreement will be extended beyond 2013.

Currently, the equivalent separative work units from down blended highly enriched uranium complements domestic separative work unit production at the Paducah Gaseous Diffusion Plant. While the U.S. Government may wish to extend this arrangement to continue the reduction of the number of nuclear weapons in the world, it is doubtful that the agreement would replace rather than complement domestic separative work unit production. As discussed in Section 1.3, it is a national priority to increase domestic supplies of enriched uranium to improve national energy security.

2.3.4 Alternative Sources of Low-Enriched Uranium

The NRC staff examined two alternatives to fulfill U.S. domestic enrichment needs. These alternatives, for reasons summarized below, were eliminated from further consideration.

Re-Activate the Portsmouth Gaseous Diffusion Facility at Piketon

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

The NRC staff does not believe that there has been any significant change in the factors that were considered by United States Enrichment Corporation in its decision to cease uranium enrichment at Piketon. In addition, the gaseous diffusion technology is more substantially energy intensive than gas centrifuge. The higher energy consumption results in larger indirect impacts, especially those impacts which are attributable to significantly higher electricity usage (e.g., air emissions from coal-fired electricity generation plants) (DOE, 1995). The age of the existing Gaseous Diffusion Plant also calls into question its overall reliability. Therefore, this proposed alternative was eliminated from further consideration.

Purchase Low-Enriched Uranium From Foreign Sources

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

2.3.5 Alternative Technologies for Enrichment

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

Electromagnetic Isotope Separation Process

Figure 2-12 shows a sketch of the Electromagnetic Isotope Separation Process. In this process, a monoenergetic beam of ions of normal uranium travels between the poles of a magnet. The magnetic field causes the beam to split into several streams according to the mass of the isotope. Each isotope has a different radius of curvature and follows a slightly different path. Collection cups at the ends of the semicircular trajectories catch the homogenous streams. Because the energy requirements for this process proved very high—in excess of 3,000 kilowatt hour per separative work unit—and the production was very slow (Heilbron et al., 1981), electromagnetic isotope separation was removed from further consideration.

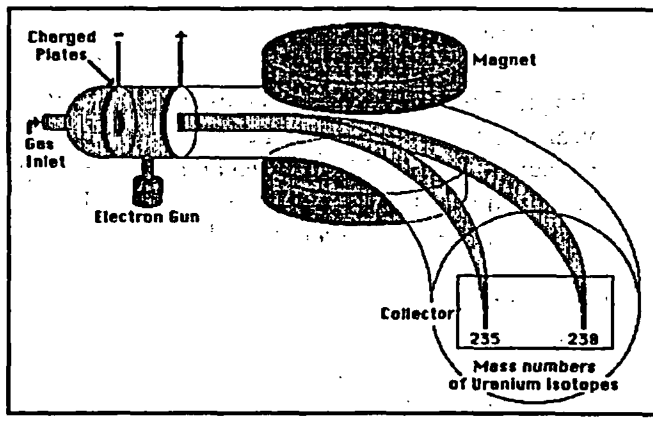

Figure 2-12 Electromagnetic Isotopic Separation Process (Milani, 2005)

Liquid Thermal Diffusion

The liquid thermal diffusion process was investigated in the 1940s. Figure 2-13 is a diagram of this process. It is based on the concept that a temperature gradient across a thin layer of liquid or gas causes thermal diffusion that separates isotopes of differing masses. When a thin, vertical column is cooled on one side and heated on the other, thermal convection currents are generated and the material flows upward along the heated side and downward along the cooled side. Under these conditions, the lighter UF_6 molecules diffuse toward the warmer surface and heavier UF_6 molecules concentrate near the cooler side. The combination of this thermal diffusion and the thermal convection currents causes the lighter uranium-235 molecules to concentrate on top of the thin column while the heavier uranium-238 goes to the bottom. Taller columns produce better separation. Eventually, a facility using this process was designed and constructed at Oak Ridge, Tennessee, but it was closed after about a year of operation because of cost and maintenance concerns (Settle, 2004). Based on high operating costs and high maintenance requirements, the liquid thermal diffusion process has been eliminated from further consideration.

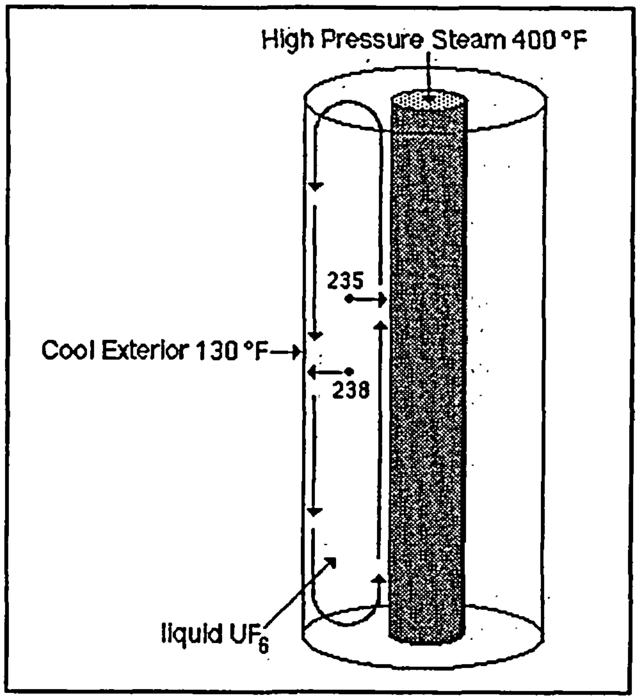

Figure 2-13 Liquid Thermal Diffusion Process (Milani, 2005)

Gaseous Diffusion Process

The gaseous diffusion process is based on molecular effusion, a process that occurs whenever a gas is separated from a vacuum by a porous barrier. The gas passes through the holes because there are more "collisions" with holes on the high-pressure side than on the low-pressure side (i.e., the gas flows from the high-pressure side to the low-pressure side). The rate of effusion of a gas through a porous barrier is inversely proportional to the square root of its mass. Thus, lighter molecules pass through the barrier faster than heavier ones. Figure 2-14 is a diagram of a single gas diffusion stage. The gaseous diffusion process consists of thousands of individual stages connected in series to multiply the separation factor. The gaseous diffusion plant in Paducah, Kentucky, contains 1,760 enrichment stages and is designed to produce UF_6 enriched up to 5.5 percent uranium-235. The design capacity of the Paducah Gaseous Diffusion Plant is approximately 8 million separative work units per year, but it has never operated at greater than 5.5 million separative work units. Paducah consumes approximately 2,200 kilowatt hours per kilogram of separative work unit, which is less than the electromagnetic isotopic separation process or liquid thermal diffusion process but still higher than the 40 kilowatt hours per kilogram of separative work unit possible in modern gas centrifuge plants (DOE, 2000; Urenco, 2004).

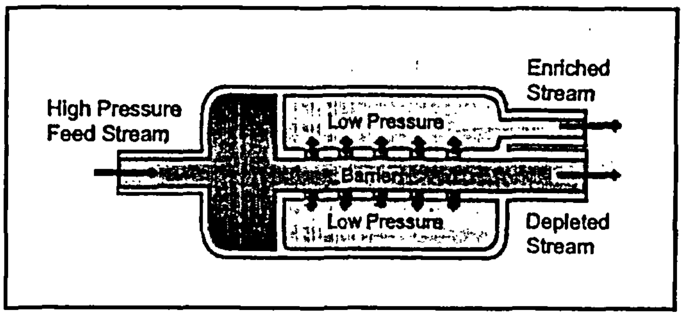

Figure 2-14 Gaseous Diffusion Stage (FAS, 2000)

The gaseous diffusion process is a 50-year-old technology that is energy intensive and has been eliminated from further consideration.

<u>Laser Separation Technology</u>

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

The Atomic Vapor Laser Isotope Separation process, diagrammed in Figure 2-15, is based on different isotopes of the same element. The isotopes, though chemically identical, have different electronic energies and absorb different colors of laser light. The isotopes of most elements can be separated by a laser-based process if they can be efficiently vaporized into individual atoms. In Atomic Vapor Laser Isotope Separation enrichment, uranium metal is vaporized and the vapor stream is illuminated with a laser light of a specific wavelength that is absorbed only by uranium-235. The laser selectively adds enough energy to ionize or remove an electron from uranium-235 atoms while leaving the other isotopes unaffected. The ionized uranium-235 atoms are then collected on negatively charged surfaces inside the separator unit. The collected material (enriched product) is condensed as liquid on the charged surfaces and then drains to a caster where it solidifies as metal nuggets. In June 1999, citing budget constraints, USEC stopped further development of the Atomic Vapor Laser Isotope Separation program (USEC, 1999).

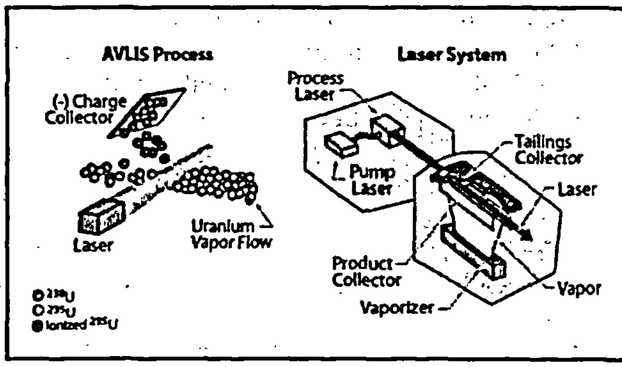

Figure 2-15 Atomic Vapor Laser Isotope Separation Process (Hargrove, 2000)

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

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

<u>Conclusion</u>

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

2.3.6 Depleted UF_6 Management Alternatives

DOE has evaluated the potential impacts of various disposition options in its "Final Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride" (DOE, 1999). These include (1) storage as depleted UF_6 for up to 40 years, (2) long-term storage as depleted U_3O_8, (3) use of depleted U_3O_8, and (4) use of uranium metal. The Programmatic EIS also evaluated the potential environmental impacts of disposal in shallow earthen structures, below-grade vaults, and underground mines.

For the proposed ACP, NRC considered as reasonable alternatives for depleted UF_6 disposition the (1) onsite storage in anticipation of future use as a resource, and (2) conversion at facilities other than the new facility that DOE is now building at Piketon. These alternatives and the reasons they are not evaluated in detail in this Draft EIS are presented in the following subsections.

<u>Use of Depleted UF_6</u>

DOE has evaluated a number of alternatives and potentially beneficial uses for depleted UF_6, and some of these applications have the potential to use a portion of the existing depleted UF_6 inventory (DOE, 1999; Brown et al., 1997). However, the current depleted UF_6 consumption rate is low compared to the depleted UF_6 inventory (DOE, 1999b), and the NRC has assumed that excess DOE and commercial inventory of depleted UF_6 would be disposed of as a waste product (NRC, 1995).

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

If storage of depleted UF_6 beyond 30 years occurs, then the impacts described in Chapter 4 of this Draft EIS would be extended for that storage period. If a use for depleted UF_6 is found, it could reduce the environmental impacts associated with its disposition. However, the likelihood of a significant commercial market for the depleted UF_6 generated by the proposed ACP is considered to be low.

<u>Conversion at Alternate Sites</u>

Other depleted UF_6 management alternatives include conversion at the DOE conversion facility in Paducah, Kentucky, or at an existing fuel fabrication facility. DOE has issued a Final EIS to construct and operate a conversion facility at Paducah (DOE, 2004a; DOE, 2004b). Additionally, DOE has issued its Record of Decision and construction of the Paducah conversion facility began in July 2004 (DOE, 2004c; DOE, 2004d). Since the shipment of the ACP's depleted UF_6 to Paducah for treatment offers no environmental advantage over onsite conversion at the Piketon facility, this alternative will not be analyzed further in this Draft EIS.

Another potential strategy would be to perform the conversion of depleted UF_6 to U_3O_8 at an existing fuel fabrication facility. The existing fuel fabrication facilities are Global Nuclear Fuel-Americas, LLC, in Wilmington, North Carolina; Westinghouse Electric Company, LLC, in Columbia, South Carolina; and Framatome ANP, Inc., in Richland, Washington. These facilities have existing processes and conversion capacities and also use Type 30B cylinders. Therefore, the existing fuel-fabrication facilities would need to install new equipment to handle the larger Type 48G cylinders. The facilities would probably need to install separate capacity to process the depleted UF_6 to avoid quality control issues related to processing

enriched UF_6. The facilities would also need to manage and dispose of the hydrofluoric acid that would be generated from the conversion process. Furthermore, these existing facilities have not expressed an interest in performing these services, and the cost for the services would be difficult to estimate. For these reasons, this alternative is eliminated from further consideration in this Draft EIS.

2.4 Comparison of Predicted Environmental Impacts

Chapter 4 of this Draft EIS presents a more detailed evaluation of the environmental impacts of the proposed action and the no-action alternative. Table 2-8 summarizes the environmental impacts for the proposed and the no-action alternative.

Table 2-8 Summary of Environmental Impacts for the Proposed ACP and the No-Action Alternative

Affected Environment	Proposed Action: *USEC would construct, operate, and decommisison the proposed ACP in Piketon, Ohio.*	No-Action Alternative: *The proposed ACP would not be constructed, operated, and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Land Use	SMALL. Site preparation and construction activities would occur on approximately 22 hectares (55 acres) of land, which comprises about 1 percent of the total 1,497 hectare (3,700)-acre DOE reservation. The changes would occur on previously disturbed land that is not considered prime farmland, and would be consistent with current land use.	SMALL. Under the no-action alternative, no local impact would occur because the proposed ACP would not be constructed or operated. Existing land use would continue and the property would be available for alternative use. There also would be no land disturbances. Existing activities such as enrichment services from existing uranium enrichment facilities (including the possible re-opening of the gaseous diffusion plant at the Piketon site), from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future and would have land use impacts similar to those of the proposed action, depending onsite conditions either at a new location or an existing industrial site. Impacts to land use would be expected to be SMALL.

Table 2-8 Summary of Environmental Impacts for the Proposed ACP and the No-Action Alternative (continued)

Affected Environment	Proposed Action: *USEC would construct, operate, and decommisison the proposed ACP in Piketon, Ohio.*	No-Action Alternative: *The proposed ACP would not be constructed, operated, and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Historical and Cultural Resources	SMALL. Within and adjacent to the area of potential effect (the DOE reservation boundary), there would be no indirect or direct effect on the eligible or potentially eligible sites for the National Register of Historic Places. Also, construction of new buildings and refurbishment of existing buildings would result in buildings of design, size, and function similar to the existing buildings, and therefore would not alter the historic setting of the existing Gaseous Diffusion Plant district. Additional disturbance of the site is not anticipated during decommissioning. Any such changes to buildings or structures would be evaluated by the appropriate agency for historic and cultural resources impacts prior to any implementation.	SMALL. Under the no-action alternative, the site would continue to be used for commercial industrial purposes and historical and cultural resources would be unaffected. The existing activities such as enrichment services from existing uranium enrichment facilities (including the possible re-opening of the gaseous diffusion plant at the Piketon site), from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future and could have potential impacts to historical and cultural resources if at a new location. Impacts to historical and cultural resources at these other sites would have to be controlled in accordance with applicable Federal and State historic preservation laws and regulations. The impacts would be expected to be SMALL if built and operation at an exisiting industrial site. The impacts could be SMALL to MODERATE if additional domestic enrichment facilities were located at a new site, depending on specific site conditions.

Table 2-8 Summary of Environmental Impacts for the Proposed ACP and the No-Action Alternative (continued)

Affected Environment	Proposed Action: ***USEC would construct, operate, and decommisison the proposed ACP in Piketon, Ohio.***	No-Action Alternative: ***The proposed ACP would not be constructed, operated, and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Visual and Scenic Resources	SMALL. The Bureau of Land Management Visual Resources Management rating system classifies the proposed ACP site as Class III or IV, meaning it has moderate to little scenic value. Construction of the ACP would not alter the site's classification. No scenic rivers, nature preserves, or unique visual resources exist in the project area. No impacts are expected from decommissioning. Any such changes would be evaluated by the appropriate agency prior to implementation.	SMALL. Under the no-action alternative, the visual and scenic resources would remain the same as described in the affected environment section. The existing activities such as enrichment services from existing uranium enrichment facilities (including the possible re-opening of the gaseous diffusion plant at the Piketon site), from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future with a possible impact on visual and scenic resources similar to that of the proposed action, depending onsite conditions either at a new location or an existing industrial site. Impacts to visual and scenic resources would be expected to be SMALL.

Table 2-8 Summary of Environmental Impacts for the Proposed ACP and the No-Action Alternative (continued)

Affected Environment	Proposed Action: *USEC would construct, operate, and decommisison the proposed ACP in Piketon, Ohio.*	No-Action Alternative: *The proposed ACP would not be constructed, operated, and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
1 Air Quality	SMALL to MODERATE. Airborne emissions from site preparation and construction should not result in exceedances of air quality standards, with the possible exception of short-term increases in particulate matter. Radiological releases from soil disturbances and decommissioning of the Gas Centrifuge Enrichment Plant would be small and controlled. Emissions from diesel generators would not cause air quality problems and maximum predicted concentrations of hydrogen fluoride resulting from ACP operations are below safe levels. Based on the maximum radiological emission rates for the ACP and the comprehensive site monitoring program, the expected impact to air quality from the plant's radiological emissions is also expected to be SMALL. Impacts from decommissioning could result in the emission of solvents, but in small amounts and only for a short period of time.	SMALL. Under the no-action alternative, air quality in the general area would remain at its current levels described in the affected environment section. The existing activities such as enrichment services from existing uranium enrichment facilities (including the possible re-opening of the gaseous diffusion plant at the Piketon site), from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future. Depending on the construction methods and design of these facilities, the likely impact on air quality would be similar to that of the proposed action. Impacts to air quality would be expected to be SMALL.

Table 2-8 Summary of Environmental Impacts for the Proposed ACP and the No-Action Alternative (continued)

Affected Environment	Proposed Action: *USEC would construct, operate, and decommisison the proposed ACP in Piketon, Ohio.*	No-Action Alternative: *The proposed ACP would not be constructed, operated, and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Geology and Soils	SMALL. Most of the site is an existing industrial facility with altered natural soils. The soils are cohesive and over-consolidated and have low potential for liquefaction. There is little likelihood of impact from soil compaction or subsidence. The flat terrain where the ACP buildings would be located, and the dense soil, low moisture content, and vegetative cover in the area of a new large cylinder storage yard (X-745H), make landslides unlikely. Construction activities would not alter current drainage and would not disturb any soils that qualify for protection as prime farmland. There would be a potential for increased erosion and siltation of streams near the construction site of the new large cylinder storage yard, but both of these potential impacts should be minimized by the use of standard best management practices. The potential for soil contamination during operations would be SMALL. Impacts from decommissioning would not exceed those identified for site preparation and construction. Any removal of contaminated soils would be limited in scope and the impact would be SMALL.	SMALL. Under the no-action alternative, existing land use would remain intact. The geology and soils of the proposed site would remain unaffected because no land disturbance would occur. Natural events such as wind and water erosion would remain as the most significant variable associated with the geology and soils of the site. The existing activities such as enrichment services from existing uranium enrichment facilities (including the possible re-opening of the gaseous diffusion plant at the Piketon site), from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future with a likely impact on geology and soils similar to that of the proposed action, depending on site conditions either at a new location or an existing industrial site. Impacts to geology and soils would be expected to be SMALL.

Table 2-8 Summary of Environmental Impacts for the Proposed ACP and the No-Action Alternative (continued)

Affected Environment	Proposed Action: *USEC would construct, operate, and decommisison the proposed ACP in Piketon, Ohio.*	No-Action Alternative: *The proposed ACP would not be constructed, operated, and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Water Resources	SMALL. Potential stream sedimentation from construction activities would be minimized by the use of silt fences and other best management practices. Any impacts to stream water quality would be of short duration. None of the proposed site preparation and construction activities would occur within a 100-year floodplain. Groundwater withdrawals would increase by 12 percent over current usage rates, but would still be only 31 percent of the total design capacity of the site's well fields, would not affect groundwater availability, and would not pose an increased risk of subsidence. Wastewater would continue to discharge from permitted NPDES outfalls and would not alter the current water quality of the discharge. In addition, the water quality at NPDES outfalls would continue to be monitored. The additional sanitary waste water treated at the onsite water treatment plant would represent up to a 90 percent increase in the volume of sanitary water treated at the plant, but would only increase the total volume up to 75 percent of the plant's design capacity. The potential for leaks or spills that could contaminate water resources would be limited by (1) the leak collection system associated with the ACP; (2) implementation of best management practices; and (3) an approved Spill Prevention Control and Countermeasures Plan. During decontamination and decommissioning, smaller ground water withdrawals needed to support these activities (compared to withdrawals during operations), would cause a SMALL impact. With continued controls in place, the impacts associated with liquid discharges, and the likelihood and severity of potential spills during decontamination and decommissioning would be minimized and any resulting impacts should be SMALL.	SMALL. Under the no-action alternative, water resources would remain the same as described in the affected environment section. Water supply and demand would continue at current rates. The existing flow of stormwaters on the site would continue, and existing potential groundwater contamination pathways would remain the same. The existing activities such as enrichment services from existing uranium enrichment facilities (including the possible re-opening of the gaseous diffusion plant at the Piketon site), from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future. Depending on the construction methods, design, and location of these facilities, the likely impact on water resources (including water usage) would be similar to that of the proposed action. Impacts to water resources would be expected to be SMALL.

Table 2-8 Summary of Environmental Impacts for the Proposed ACP and the No-Action Alternative (continued)

Affected Environment	Proposed Action: *USEC would construct, operate, and decommisison the proposed ACP in Piketon, Ohio.*	No-Action Alternative: *The proposed ACP would not be constructed, operated, and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Ecological Resources	SMALL. Construction of the X-745H Cylinder Storage Yard would result in increased erosion, stormwater runoff, and loss of 25 acres of managed grassland and old fields, but would not require the removal of any upland or riparian forests. Implementation of the best management practices described in section 4.2.5.1 on soil impacts together with the fact that the upland mixed hardwood forest and the riparian forest adjacent to the managed field and old field would not be disturbed would reduce a potentially moderate impact to a SMALL impact. Such measures would reduce erosion and ensure that the existing forested buffer area between the proposed cylinder storage yard and the riparian areas associated with the tributaries and Little Beaver Creek would be preserved. Such measures would reduce the level and amount of sedimentation and erosion that would occur in the adjacent surface waters, and would preserve the existing forested buffer areas. The X-745H Cylinder Storage Yard is located approximately 500 meters (1,640 feet) from suitable summertime habitat for the Indiana bat, although studies have not documented the presence of the bat on the DOE reservation. Because the existing buffer area (upland and riparian forests) would not be removed and it is only considered potential summertime habitat, the impact would be SMALL. Ecological impacts associated with ACP decommissioning are anticipated to be bounded by the ecological impacts associated with ACP site preparation and construction.	SMALL. Under the no-action alternative, the land use would continue as it is currently, and the ecological resources would remain the same as described in the affected environment section. Land disturbances would also be avoided. The existing activities such as enrichment services from existing uranium enrichment facilities (including the possible re-opening of the gaseous diffusion plant at the Piketon site), from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future and would have impacts similar to those of the proposed action, depending on the site conditions either at a new location or an existing industrial site. Impacts to ecological resources would be expected to be SMALL.

Table 2-8 Summary of Environmental Impacts for the Proposed ACP and the No-Action Alternative (continued)

Affected Environment	Proposed Action: *USEC would construct, operate, and decommisison the proposed ACP in Piketon, Ohio.*	No-Action Alternative: *The proposed ACP would not be constructed, operated, and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Socio-economics	SMALL to MODERATE. ACP construction and operation would result in a MODERATE increase in regional employment and a SMALL increase in regional tax revenues. Impacts to population characteristics, housing resources, community and social services, and public utilities are projected to be SMALL. Decontamination and decommissioning of the proposed ACP also would generally have SMALL impacts. An average of 841 direct and indirect jobs are expected to be created. State income tax, State sales tax, and county-level tax revenues would significantly increase as a result of decontamination and decommissioning. Likewise, decontamination and decommissioning activities are not expected to lead to housing shortages or increases in rental rates in the region. The small influx of workers would also have a small effect on public utilities, fire, law enforcement, healthcare, and administrative levels of service.	SMALL to MODERATE. Under the no-action alternative, socioeconomics in the local area would continue as described in the affected environment section. The existing activities such as enrichment services from existing uranium enrichment facilities (including the possible re-opening of the gaseous diffusion plant at the Piketon site), from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future. Depending on the construction methods, design of the facilities, and local demographics, the likely socioeconomic impact would be similar to that of the proposed action. Socioeconomic impacts would be expected to be SMALL to MODERATE. Long-term uncertainty in future supplies of low-enriched uranium could be affected without replacement enrichment capacity for the existing U.S. enrichment facility or from the potential ending of the "Megaton to Megawatts" program in 2013.

Table 2-8 Summary of Environmental Impacts for the Proposed ACP and the No-Action Alternative (continued)

Affected Environment	Proposed Action: *USEC would construct, operate, and decommisison the proposed ACP in Piketon, Ohio.*	No-Action Alternative: *The proposed ACP would not be constructed, operated, and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Environmental Justice	SMALL. Within an 80-kilometer (50-mile) radius around the proposed ACP site, there are 18 Census tracts that have populations qualifying as low-income and two Census tracts that have populations qualifying as minority. The closest of these tracts is 28 kilometers (17 miles) from the proposed site. The proposed action would not result in disproportionately high and adverse impacts to any of these populations.	SMALL. Under the no-action alternative, no changes would occur to environmental justice issues, other than those that already may exist in the community. No disproportionately high and adverse impacts would be expected. The existing activities such as enrichment services from existing uranium enrichment facilities (including the possible re-opening of the gaseous diffusion plant at the Piketon site), from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future, and environmental justice concerns would need to be evaluated on a site-specific basis. The impacts could be similar to those of the proposed action if the location has a similar population distribution or is located at a similar industrial site. Environmental justice impacts would be expected to be SMALL under most likely circumstances.

Table 2-8 Summary of Environmental Impacts for the Proposed ACP and the No-Action Alternative (continued)

Affected Environment	Proposed Action: ***USEC would construct, operate, and decommisison the proposed ACP in Piketon, Ohio.***	No-Action Alternative: ***The proposed ACP would not be constructed, operated, and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
1 Noise	SMALL. Estimated construction noise levels at the site are below acceptable guidelines. No adverse noise impacts from ACP operations are expected at the closest residence due to low operational noise, the attenuation provided by the building façade, and distance attenuation of over 900 meters (3,000 feet). Noise during decommissioning would be generated from operation of heavy construction equipment and vehicles needed to move equipment, scrap metal, and waste. These noise levels are anticipated to be similar to those generated during construction of the proposed ACP. These noise level is within acceptable guidelines and would cause a SMALL impact.	SMALL. Under the no-action alternative, there would be no construction or operational activities or processes that would generate noise. Noise levels would remain as is currently observed at the site. The existing activities such as enrichment services from existing uranium enrichment facilities (including the possible re-opening of the gaseous diffusion plant at the Piketon site), from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future. Depending on the construction methods, design of these facilities, and surrounding land uses, the likely noise impact would be similar to that of the proposed action. Noise impacts would be expected to be SMALL.

Table 2-8 Summary of Environmental Impacts for the Proposed ACP and the No-Action Alternative (continued)

	Affected Environment	Proposed Action: *USEC would construct, operate, and decommisison the proposed ACP in Piketon, Ohio.*	No-Action Alternative: *The proposed ACP would not be constructed, operated, and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
1	Transportation	SMALL to MODERATE. Increased truck and vehicle traffic should result in SMALL changes in current levels of congestion and delays on U.S. Route 23 and Ohio State Road 32, and MODERATE increases in the number of traffic accidents resulting in injuries or fatalities. Radiation exposures resulting from the planned shipments of radioactive materials are estimated to cause 0.02 latent cancer fatalities per year of operation or about one cancer fatality over thirty years of operation. The probability of a severe transportation accident that releases sufficient quantities of UF_6 that could pose a health risk is low, but that the consequences of such an accident, should it occur, are high (resulting in an overall MODERATE rating). Impacts associated with decommissioning should be far less than that for site preparation and construction.	SMALL to MODERATE. Under the no-action alternative, traffic volumes and patterns would remain as described in the affected environment section. The current volume of radioactive material and chemical shipments would not increase. The existing activities such as enrichment services from existing uranium enrichment facilities (including the possible re-opening of the gaseous diffusion plant at the Piketon site), from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future, with a likely impact on transportation similar to that of the proposed action, depending on site conditions at either a new location or an existing industrial facility. Impacts to transportation would be expected to be SMALL to MODERATE.

Table 2-8 Summary of Environmental Impacts for the Proposed ACP and the No-Action Alternative (continued)

Affected Environment	Proposed Action: *USEC would construct, operate, and decommisison the proposed ACP in Piketon, Ohio.*	No-Action Alternative: *The proposed ACP would not be constructed, operated, and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Public and Occupational Health	SMALL. Occupational injuries and illnesses associated with the proposed site preparation and construction are estimated to be 11.7 incidents per 100,000 full-time equivalents (the number of workers per year) and 0.59 fatalities. The total maximum possible dose to construction workers is approximately 0.22 millisieverts per year (22 millirem), which is less than the 10 CFR Part 20 regulatory limit of 1 millisievert (100 millirem). Airborne emissions of uranium from the proposed ACP are predicted to cause radiation doses to the public and airborne concentrations of uranium that are well below applicable National Emission Standards for Hazardous Air Pollutants standards. Impacts from direct gamma radiation exposure above the background to a member of the public are expected to be SMALL, approximately 1 milliRoentgen per year. Occupational injuries and illnesses associated with the proposed facility operation are estimated to be 2.5 incidents per 100,000 full-time equivalents (the number of workers per year) and 0.41 fatalities. The uranium concentration in workplace air is estimated to be approximately 0.7 milligram per cubic meter, which is less than the National Institute of Occupational Safety and Health standard. Occupational radiation exposure is expected to meet USEC's annual administrative limit of 10 millisieverts (1,000 millirem), which is well below the 10 CFR Part 20.1201 limit of 50 millisieverts (5,000 millirem).	SMALL to MODERATE. Under the no-action alternative, the public and occupational health would remain as described in the affected environment section. No additional radiological exposures are estimated to the general public other than from background radiation levels. The existing activities such as enrichment services from existing uranium enrichment facilities (including the possible re-opening of the gaseous diffusion plant at the Piketon site), from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future. Depending on the construction methods and design of these facilities, the likely public and occupational health impacts from normal operations and accidents would be similar to the proposed action. Public and occupational health impacts for additional domestic enrichment facilities would be expected to be SMALL to MODERATE.

Table 2-8 Summary of Environmental Impacts for the Proposed ACP and the No-Action Alternative (continued)

Affected Environment	Proposed Action: *USEC would construct, operate, and decommisison the proposed ACP in Piketon, Ohio.*	No-Action Alternative: *The proposed ACP would not be constructed, operated, and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Waste Management	SMALL. Site preparation, construction, and operations would generate varying amounts of low-level radioactive, low-level mixed, hazardous, sanitary/industrial, and recyclable wastes. All of these wastes would be managed in accordance with existing procedures for controlling contaminant releases and exposures. With the exception of the depleted uranium, all of the wastes would also be generated at volumes that are well within existing management capacities. Over its 30-year lifetime, the ACP would generate approximately 42,800 cylinders of depleted UF_6, containing approximately 571,000 metric tons (630,000 tons) of material. All of this UF_6 could be converted to a more stable form at the new DOE conversion facility at Piketon, which would require DOE to significantly extend the life of this facility. The converted material would then be shipped by rail to an acceptable western disposal site, where sufficient capacity exists and where the disposal impacts should be SMALL.	SMALL. Under the no-action alternative, new wastes including sanitary, hazardous, low-level radioactive wastes, or mixed wastes would not be generated that would require disposition. Local impacts from waste management would be expected to remain SMALL. The existing activities such as enrichment services from existing uranium enrichment facilities (including the possible re-opening of the gaseous diffusion plant at the Piketon site), from foreign sources, and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring. Additional domestic enrichment facilities could be constructed in the future. Depending on the construction methods, design of these facilities, and the status of depleted UF_6 conversion facilities, the likely waste management impacts would be similar to that of the proposed action. For additional domestic enrichment facilities, impacts from waste management would be expected to be SMALL to MODERATE.

2.5 Staff Preliminary Recommendation Regarding the Proposed Action

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

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

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

- The environmental impacts from the proposed action are generally SMALL, although they could be as high as MODERATE in the areas of air quality, socioeconomics, and transportation.

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3. AFFECTED ENVIRONMENT

This chapter describes the existing conditions at and near the proposed American Centrifuge Plant (ACP) site in Piketon, Ohio (see Figure 3-1). After an initial overview of the site location and activities, the chapter presents information on surrounding land use; historic and cultural resources; visual and scenic resources; climatology, meteorology, and air quality; geology, minerals, and soils; water resources; ecological resources; socioeconomic conditions; environmental justice considerations; noise levels; transportation systems; public and occupational health conditions; and current waste generation and management practices. This information forms the basis for assessing the potential impacts (see Chapter 4) of the proposed action (see Chapter 2).

3.1 Site Location and Description

The proposed ACP would be located within the confines of the U.S. Department of Energy (DOE) reservation in Pike County, Ohio, as described in Section 2.1.1. The DOE reservation is approximately 35 kilometers (22 miles) north of the Kentucky/Ohio State line and 113 kilometers (70 miles) southeast of Columbus, Ohio. The largest cities within an approximately 80-kilometers (50-mile) radius are Portsmouth, Ohio, located approximately 43 kilometers (27 miles) to the south, and Chillicothe, Ohio, located approximately 43 kilometers (27 miles) to the north. The reservation occupies approximately 304 security-fenced hectares (750 acres) and is located about 2.4 kilometers (1.5 miles) east of U.S. Route 23, 3.2 kilometers (2 miles) south of Ohio State Road 32, and 3.2 kilometers (2 miles) east of the Scioto River.

Within the DOE reservation, the Portsmouth Gaseous Diffusion Plant occupies approximately 223 hectares (550 acres) of the central area surrounded by the Perimeter Road, as described in Section 2.1.1. This plant began operations in the mid-1950s using gaseous diffusion technology to produce enriched uranium for government and commercial use. In the late 1970s, DOE selected the plant as the site for a new enrichment facility using gas centrifuge technology. Construction of this facility, called the Gas Centrifuge Enrichment Plant, began in 1979, but was halted in 1985 because the projected demand for enriched uranium decreased. In 1991, DOE suspended the production of highly enriched uranium at the Portsmouth plant, but continued to produce low-enriched uranium for use by commercial nuclear power plants. (USEC, 2005)

In accordance with the *Energy Policy Act of 1992*, the United States Enrichment Corporation, a subsidiary of USEC Inc. (USEC), assumed full responsibility for uranium enrichment operations at the Portsmouth Gaseous Diffusion Plant on July 1, 1993. Since that time, DOE has leased the uranium enrichment production and operations facilities to the United States Enrichment Corporation, while retaining certain responsibilities for decontamination and decommissioning, waste management, depleted uranium hexafluoride (UF_6) storage, and environmental remediation. In May 2001, the United States Enrichment Corporation ceased uranium enrichment operations at the Portsmouth plant and consolidated its enrichment operations at the Paducah Gaseous Diffusion Plant in Paducah, Kentucky. The United States Enrichment Corporation continued to operate its transfer and shipping activities at the DOE reservation until July 2002 in support of its enrichment business. At the request of DOE, the gaseous diffusion plant was placed in cold standby, a nonoperational condition in which the plant retains the ability to resume operations within 18 to 24 months. Currently, in accordance with a U.S. Nuclear Regulatory Commission (NRC) Certificate of Compliance, the United States Enrichment Corporation maintains the gaseous diffusion plant in cold standby status, performs uranium deposit removal activities in the cascade facilities, and removes technetium-99 from potentially contaminated uranium feed (USEC, 2005) from fuel reprocessing plants transferred to the United States Enrichment Corporation by DOE prior to privatization.

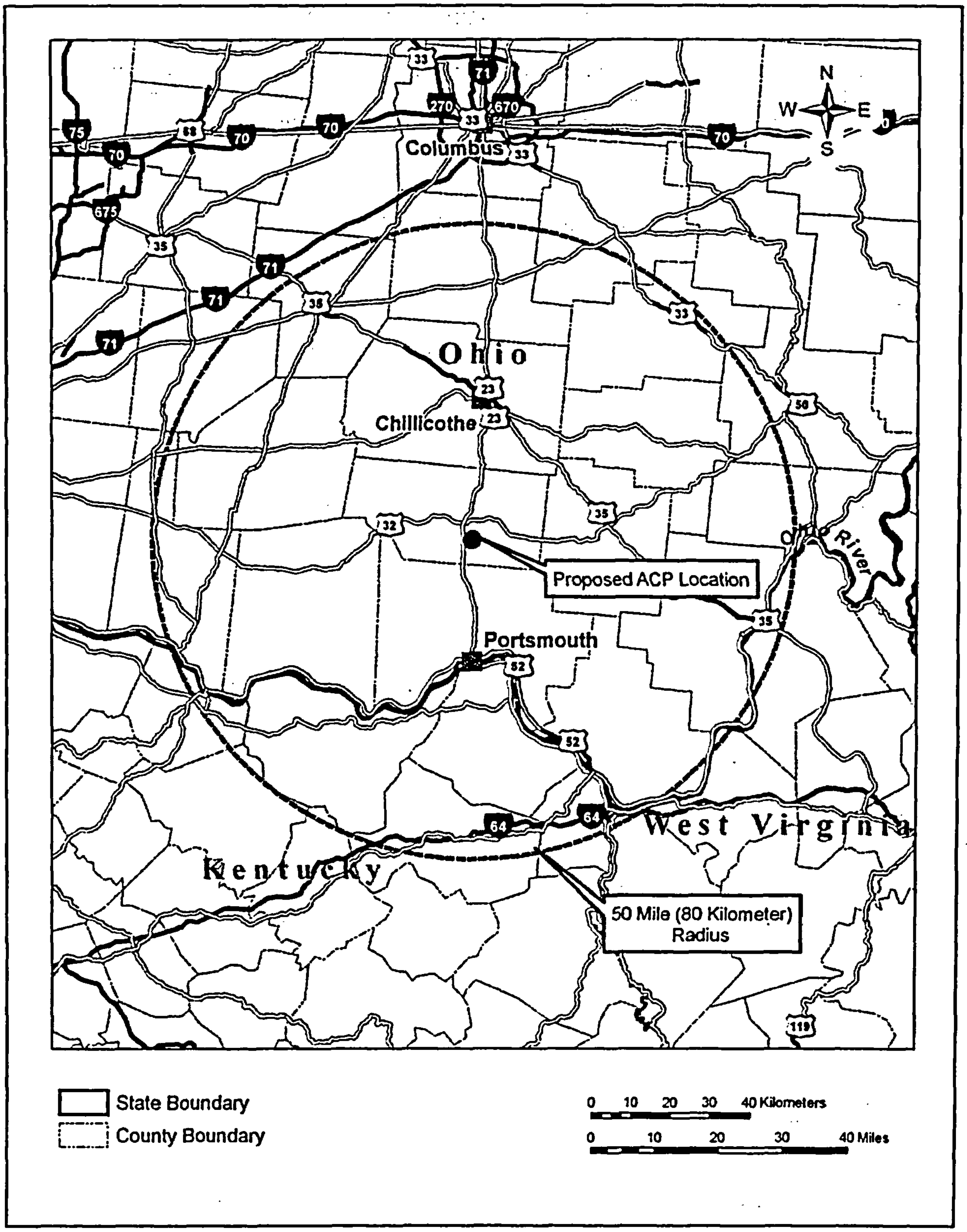

Figure 3-1 Proposed ACP Site and Surrounding Areas

The proposed ACP would be situated on approximately 81 hectares (200 acres) of the southwest quadrant of the controlled access area. In addition to this space, two UF_6 cylinder storage yards (the existing X-745G-2 and proposed X-745H), occupying a total of 11 hectares (27 acres), would be located in the northeast part of the DOE reservation just north of the Perimeter Road. The proposed ACP would consist of refurbished existing buildings and land formerly used for the Gas Centrifuge Enrichment Plant, as well as newly constructed facilities in that same area. This is the same location as the Lead Cascade Demonstration Facility, a test and demonstration facility designed to provide information on the reliability, performance, and cost of the gas centrifuge technology that will be used in the proposed ACP. In accordance with an NRC license issued to USEC on February 24, 2004, the Lead Cascade Demonstration Facility is presently under construction and scheduled to begin operation in late 2005.

The DOE reservation is not listed on the *Comprehensive Environmental Response, Compensation, and Liability Act* National Priorities List (also known as the Superfund List). Investigation and cleanup of hazardous substances (as defined in the *Comprehensive Environmental Response, Compensation, and Liability Act*) and hazardous wastes (as defined in the *Resource Conservation and Recovery Act*) that have been released to air, surface water, groundwater, soils, and solid waste management units as a result of past operational activities at the DOE reservation are being conducted under the provisions of the *Resource Conservation and Recovery Act*; the *Comprehensive Environmental Response, Compensation, and Liability Act*; and/or Ohio State law. The United States Enrichment Corporation maintains permits for the storage, handling, and use of hazardous materials and effluent discharges (air and water), as described in Section 1.5.4.

3.2 Land Use

The DOE reservation is located in Scioto Township of Pike County in south central Ohio. The region is characterized by steep to gently rolling hills in the general range of 130 to 250 meters (427 to 820 feet) above the Scioto River valley. Pike County is one of the State's lesser populated counties, with a population density of 24 people per square kilometer (63 people per square mile). Towns in the vicinity of the reservation include Piketon (6.4 kilometers [4 miles] north), Waverly (13 kilometers [8 miles] north), Jasper (1.9 kilometers [1.2 miles] northwest), and Wakefield (13 kilometers [8 miles] south). Brush Creek State Forest (8 kilometers [5 miles] southwest) and Lake White State Park (9.7 kilometers [6 miles] north) are two public recreational areas located in the vicinity of the reservation.

The general land use adjacent to the DOE reservation includes residential homes, private and commercial farms, light industry, and transportation corridors (rail and highway). Figure 3-2 presents a general land use map for the area surrounding and including the DOE reservation. Land within 8 kilometers (5 miles) of the reservation is used primarily for farms, pastures, forests, and rural residences. Dominant land use within an 8-kilometer (5-mile) radius includes about 10,291 hectares (25,430 acres) of farmland (including cropland, wooded lot, and pasture) and 9,874 hectares (24,400 acres) of forest (including commercial woodlands and recreational forest) (USEC, 2005). There are no State or national parks, conservation areas, or designated wild and scenic rivers within the immediate vicinity of the reservation (DOE, 2001a). Greater regional land use in the counties surrounding the DOE reservation is depicted in Table 3-1.

Farmland that qualifies for protection under the *Farmland Protection and Policy Act of 1981* (prime farmland) is located in Pike County, primarily along the floodplain of the Scioto River. Marginal quality farmland is located within and adjacent to the DOE reservation, and does not qualify as prime farmland under the *Farmland Protection and Policy Act of 1981* (Borchelt, 2003; and Yost, 2005). The Soil Survey for Pike County, Ohio indicates that the soil within and adjacent to the reservation is of low fertility and does not qualify as prime farmland (USDA, 1990).

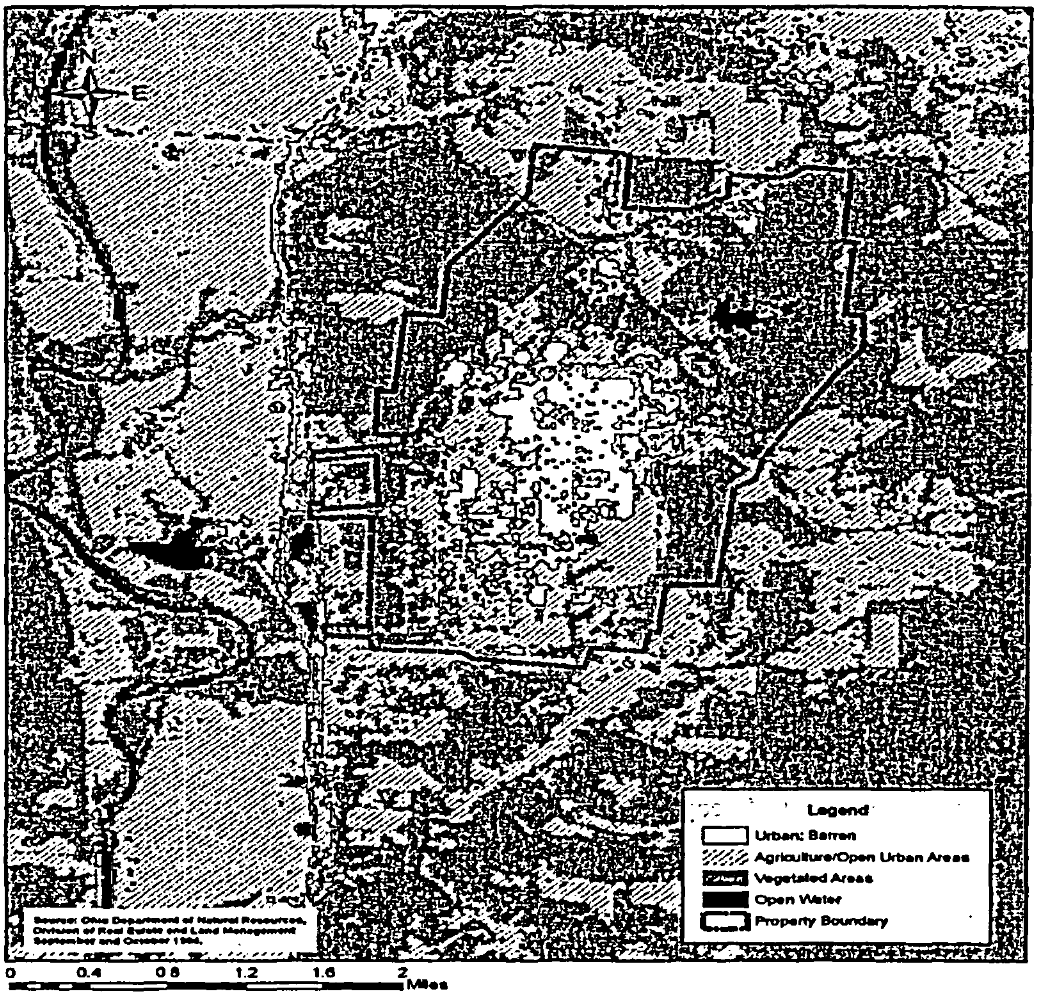

Figure 3-2 Land Use Surrounding the DOE Reservation at Piketon

Table 3-1 Percentage of Different Land Uses in the Region of Influence in 2000

County	Total Hectares[a]	Urban %	Agriculture %	Wooded %	Other %[b]
Jackson	109,126	2	32	60	6
Pike	114,917	1	27	66	6
Ross	179,348	1	48	45	6
Scioto	159,755	2	21	72	5

Notes:
[a] To convert hectares to acres multiply by 2.471.
[b] Other: Water/barren/scrub.
Source: ODOD, 2003.

The DOE reservation is situated on an approximately 1,497-hectare (3,700-acre) parcel of DOE-owned land in Scioto Township. Perimeter Road surrounds a 526-hectare (1,300-acre) central area, which includes a 320-hectare (800-acre) fenced area. Approximately 150 buildings, trailers, and sheds are located within the central area, with the gaseous uranium enrichment facilities (now in cold standby) in the fenced area. The central area is largely devoid of trees except for ornamental trees, with managed lawns, parking lots, and paved roadways dominating the open space. The portion of the reservation land outside of the Perimeter Road, consisting of 1,017 hectares (2,514 acres), is used for a variety of purposes including a water treatment plant, holding ponds, sanitary and inert landfills, cylinder storage yards, parking areas, and open fields and forested buffer areas.

The limited activities that occur on the DOE reservation include the cold standby management of the uranium enrichment facilities, ongoing remediation and waste management activities, the development of the DOE uranium conversion facility (described in the section on Management and Disposal of depleted UF_6 from Facility Operation, within Section 2.1.4.3), and general up-keep and security activities. In addition, DOE leases portions of the reservation to the United States Enrichment Corporation and the Ohio National Guard. The United States Enrichment Corporation also maintains office space at the facility. The Ohio National Guard uses the facility for classroom training/meeting activities and does not store weapons onsite. There are no other military installations located near the DOE reservation at Piketon. Other activities on the reservation that are managed by DOE's contractor, Bechtel Jacobs Company LLC, include environmental remediation, waste management, and management of depleted UF_6. (USEC, 2005)

3.3 Historic and Cultural Resources

"Cultural resources" include any prehistoric or historic district, site, building, structure, or object resulting from, or modified by, human activity. Under Federal regulation (Title 36 of the *Code of Federal Regulations* (36 CFR) Part 800), cultural resources designated as "historic properties" must be considered in assessing impacts of proposed Federal actions. "Historic properties" are cultural resources listed in, or eligible for listing in, the National Register of Historic Places because of their significance, as defined in 36 CFR § 60.4:

> *The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that (a) are associated with events that have made a significant contribution to the broad patterns of our history; or (b) that are associated with the lives of persons significant in our past; or (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant distinguishable entity whose components may lack individual distinction; or (d) that have yielded or may be likely to yield information important in history or prehistory.*

To comply with Federal historic preservation laws and regulations as well as mandates of the *National Environmental Policy Act*, the NRC is required to identify historic properties in the area potentially affected by its actions and to consider potential effects on those properties. The principal driver for this process is Section 106 of the *National Historic Preservation Act*, as amended (16 U.S.C. 470 et seq.), and implementing regulations at 36 CFR Part 800, as amended through August 2004. Under Section 106, Federal agencies are required to consider the effects of their undertakings on historic properties; 36 CFR Part 800 describes the process by which this is done in consultation with the State Historic Preservation Officer. The *National Historic Preservation Act* and 36 CFR Part 800 also require that consultation in the Section 106 process should provide Indian tribes the opportunity to identify concerns about historic

properties on or off Tribal lands, present views about an undertaking's effects on such properties, and participate in the resolution of adverse effects.

The regulation (36 CFR § 800.16) defines the concept of "area of potential effect:"

> *(d) Area of potential effects means the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.*

Historic properties could potentially be affected directly or indirectly by construction or operation of the proposed ACP. In accordance with 36 CFR Part 800, NRC defined the area of potential direct effects to include the footprint of all ground-disturbing activities and the perimeter of all buildings to be refurbished plus a 100-meter (328-foot) buffer around all such areas to account for heavy equipment operations, workers, and temporary staging of construction materials adjacent to the proposed work sites. NRC defined the area of potential indirect effects to include all area within the property boundary of the DOE reservation. This conservative area for indirect impacts accounts for potential indirect impacts, such as vandalism of historic properties or alterations of the setting or other qualities that contribute to the significance of historic properties, that could occur beyond the area of construction disturbance.

As a result of scoping comments that indicated concern that pumping from water supply wells might have an effect on prehistoric earthworks, NRC considered including the supply well locations within the area of potential effects, even though they are not contiguous DOE property. Because there will be no construction activity, increased vehicle traffic, nor subsidence associated with pumping that could directly or indirectly cause alterations in the character or use of prehistoric earthworks that may be located in the vicinity, NRC did not include the well locations within the area of potential effects for historic and cultural resources. Water resource impacts and ground subsidence impacts of pumping from the well locations are considered in Section 4.2.6.

As a result of scoping comments, NRC evaluated the historic properties (eligible or potentially eligible sites, structures or buildings) that are adjacent to the property boundary of the DOE reservation. NRC considers such properties to be outside of the area of potential effects (direct or indirect), but they were reviewed because they are adjacent to the boundary of indirect effects.

3.3.1 Historical Setting

Southern Ohio, where the DOE reservation is located, contains evidence of human presence dating back more than 10,000 years. Archaeologically, the area is best known for the Adena and Hopewell Indian mounds (elaborate geometric earthworks, enclosures, and mounds) that were constructed during the Woodland Period (900 B.C. to A.D. 900) (DOE, 2004a). During the early historic period (A.D. 1500), the Shawnee Indians had villages within the Scioto Valley, in the general area of Portsmouth. There is evidence of European presence in the region around A.D. 1550. European settlement in the region began in the late 1700s, with the first permanent Euro-american settlers arriving in Pike County in 1796 (Schweikert, 1997). The early development and economy in the region was almost entirely based on agriculture. The populations in the Portsmouth region grew slowly, with the growth of the transportation routes in the Scioto Valley as the primary impetus. During the 19th and early 20th centuries, several canals, roads, and, finally, railroads were constructed in the Scioto Valley region, and rural development of the area continued.

Large-scale industrial development began in 1952, when the Atomic Energy Commission, the present day DOE and NRC, selected a 9.3-square kilometer (5.8-square mile) tract of land in the Ohio Valley along the Scioto River in Pike County as the location for the Portsmouth Gaseous Diffusion Plant, to

complement gaseous diffusion facilities at Oak Ridge, Tennessee, and Paducah, Kentucky. Construction of the Portsmouth Gaseous Diffusion Plant began in 1952 and was completed in 1956. During construction, more than 486 hectares (1,200 acres) were cleared and more than 3.44 million cubic meters (4.5 million cubic yards) of earth were removed. The majority of the clearing, grading, and soil removal occurred within the central area of the Portsmouth Gaseous Diffusion Plant within the Perimeter Road (Schweikert, 1997). Since the initial development of the Portsmouth Gaseous Diffusion Plant in the 1950s, other construction activities have been initiated on the reservation to include additional administrative offices, warehouses, and the development of the Gas Centrifuge Enrichment Process facilities from 1979 to 1985 in the southwest portion of the reservation.

3.3.2 Methods

To identify the cultural resources present in and around the DOE reservation, NRC reviewed existing environmental documentation, including documents prepared under the *National Environmental Policy Act*, archaeological and architectural studies, and the National Register of Historic Places. The NRC initiated consultation with the State Historic Preservation Officer and with Indian tribes with possible ties to the reservation vicinity. The NRC also reviewed information about local cultural resources provided by the public. Copies of the consultation letters are provided in Appendix B.

3.3.3 Results of Document Review

An initial survey of the DOE reservation was completed in July and August of 1952, before construction of the facility began. The survey, under the supervision of Dr. Raymond S. Baby, Curator of Archaeology, the Ohio State Historical Society, reportedly found no evidence of archaeological materials within the reservation boundary (ERDA, 1977). In 1996, the DOE initiated additional studies, including an architectural survey and an archeological survey (Coleman, 1997; Schweikert, 1997). Figure 3-3 shows the four quadrants of the DOE reservation that were investigated as part of these surveys. In 2003, test excavations were conducted at one archaeological site (DuVall & Associates, 2003).

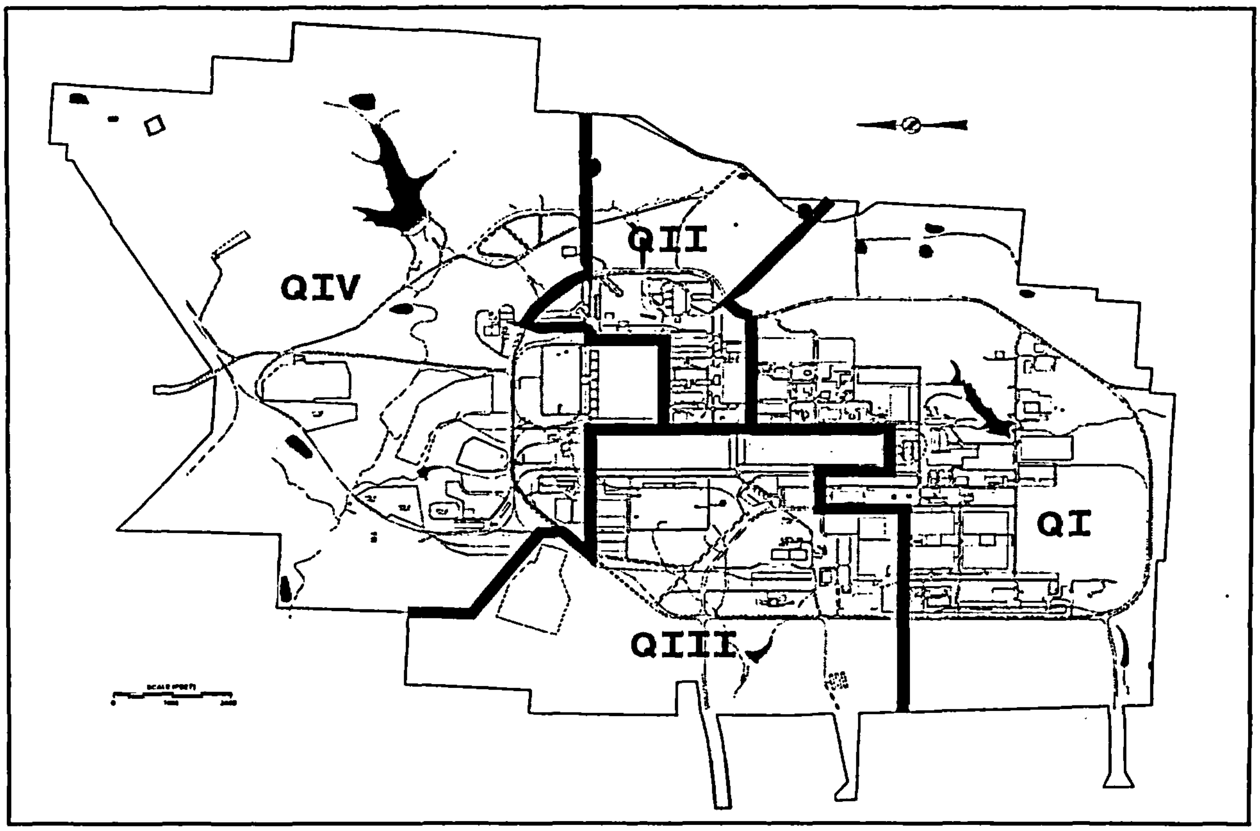

Figure 3-3 Quadrants Investigated at the DOE Reservation at Piketon

As reported by Schweikert (1997), a literature review of the following sources at the Ohio Historical Society and the Genealogy Section of the Pike County Public Library was conducted prior to the archaeological survey: United States Geological Survey 7.5' and 15' series topographic maps, Ohio Historic Preservation Office Archaeological Inventory files, National Register of Historic Places file, Ohio Historical Society Archaeological and Architectural Information files, Ohio Archaeological Council Report files, Pike County maps and histories, and Archaeological Atlas of Ohio (Mills, 1914). In addition, aerial photographs from 1939 and 1951 flights (predating construction of the Portsmouth Gaseous Diffusion Plant) were reviewed. The review focused on an area centered on the reservation, extending out 6.5 kilometers (4 miles) from the center of the reservation.

The search found no sites within reservation boundaries recorded in the State archaeological inventory, although 71 prehistoric sites were recorded within the study area (an area extending 6.5 kilometers [4 miles] from the center of the reservation). Likewise, no buildings within the reservation were listed on the Ohio Historic Inventory. Three buildings were listed within the study area. Of the three, only the Bailey Chapel is directly adjacent to the reservation boundary. The other two, former residences, are located in Seal township north of the reservation. Although not listed in the inventory, 49 other historic structures were observed on maps and photographs.

Three properties within 6.5 kilometers (4 miles) of the reservation are listed on the National Register of Historic Places. The Piketon Mounds (33 Pk 1), located 3.2 kilometers (2 miles) north of the boundary, consist today of a single large mound and two smaller mounds that are the remnants of a mound complex and series of graded ways that descended from one terrace to another and ran towards the banks of the Scioto River (Squire and Davis, 1848, as referenced in Schweikert, 1997).

The Scioto Township Works (33 Pk 22) are located to the southwest of the DOE reservation, approximately 250 meters (820 feet) from the boundary and approximately 1 kilometer (0.6 mile) from the Perimeter Road. The Scioto Township Works:

> *consisted of a circle and square works with gates on the northwest and southeast sides, parallel walls running out from two gateways, and a single mound just north of the works. This complex was surveyed by Squier and Davis in 1847, and excavations were conducted by the Bureau of American Ethnology before 1891. According to Fowke (1902) the square measured 260.3 meters (854 feet) per side east to west and 259.6 meters (852 feet) per side north to south. The parallel walls were 20.7 meters (68 feet) apart and extended 130 meters (427 feet) for the eastern wall and 122 meters (400 feet) for the western wall. Even by 1902, the large circle to the north had been all but obliterated (Fowke 1902). Recent gravel quarrying and cultivation has destroyed virtually all of this earthwork complex.* (Schweikert, 1997)

Currently, the Scioto Township Works (33 Pk 22) consists of two separate areas that have been heavily disturbed adjacent to Route 23 (DuVall & Associates, 2003).

The Van Meter Stone House and Outbuildings, located at a road intersection approximately 3.2 kilometers (2 miles) north of the boundary, dates from the early 1800s, is associated with one of the early farming families in the county, and includes what is thought to be the first school in the county (Schweikert, 1997).

An intensive archaeological reconnaissance was performed in September 1996, April 1997, and May 1997 on the entire DOE reservation, with the exception of areas occupied by plant-related buildings or structures, sanitary landfills, or lagoons. The archaeologist noted that buildings represented a small percentage of the overall reservation area outside of the Perimeter Road, although the Don Marquis power station and sanitary landfills and sludge lagoons outside the Perimeter Road were relatively large areas that were not surveyed because the original ground surface was not accessible. Techniques included overall visual inspection, with some surface collection and shallow shovel probes (to 12.5 centimeters [5 inches]) or tests (to 30 centimeters [12 inches]). (Schweikert, 1997)

The surveys resulted in the identification of 36 previously undocumented archaeological sites within the boundary of the DOE reservation. These were recorded in the Ohio Archaeological Inventory as sites 33 Pk 184 through 33 Pk 219. The 36 sites included 13 remnants of historic farmsteads; seven historic scatters or open refuse dumps; two historic isolated finds; four DOE reservation 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.

Investigators determined that 22 of the sites did not meet National Register eligibility criteria, although the two historic cemeteries within this class were recommended for preservation. One prehistoric lithic scatter (33 Pk 210) and 13 historic farmsteads were found to be potentially eligible for listing on the National Register under Criterion D, "have yielded, or may be likely to yield information important in prehistory or history." All of these sites are located outside the Perimeter Road.

In response to a request after State Historic Preservation Officer review of the 1997 survey report, DOE conducted archaeological testing at the prehistoric lithic scatter, 33 Pk 210. Results indicated that the site is not Register-eligible (DuVall & Associates, 2003; DOE, 2003a), although there is no record of State Historic Preservation Officer concurrence with this finding.

Coleman's 1997 architectural survey report states that the State Historic Preservation Officer indicated in 1994 that the Portsmouth Gaseous Diffusion Plant was eligible for inclusion on the National Register as a historic district because of its association with important events in history, even though it had achieved significance within fewer than 50 years (OHPO, 1994). (Normally, historic properties must be more than 50 years old.) In 1995, the State Historic Preservation Officer added the clarification that the district was eligible because of its exceptional significance in the history of post-World War II U.S., in particular, in U.S. development of nuclear energy (OHPO, 1995). In 1996, DOE initiated an architectural survey of all the architectural locations (buildings and structures) on the reservation to evaluate which might be contributing elements to the historic district. Coleman's survey identified a total of 160 architectural locations that were identified and documented on Ohio Historic Inventory forms.

Coleman evaluated each architectural location against its place in historic periods and thematic groups that characterize the historic district. Historic periods include the following: (1) the period prior to the construction of the DOE reservation; (2) the original reservation period; (3) the DOE reservation facility additions period; and (4) the Gas Centrifuge Enrichment Process period. Five thematic groups were identified: gaseous diffusion process, portals for the gaseous diffusion facility, cooling structures, warehouses, and facilities owned by the Ohio Valley Electric Corporation. This information was used to define the contributing and non-contributing architectural resources of the Portsmouth Gaseous Diffusion Plant historic district. Of the 160 architectural locations, 132 were recommended as contributing resources of the historic district and 28 were recommended as non-contributing resources. All of the structures associated with the Gas Centrifuge Enrichment Process facility, (the buildings to be refurbished under the proposed action) were found to be contributing resources of the historic district. The cylinder storage yards (some of which would be refurbished under the proposed action) were not included in the survey because such features do not contain architectural elements that warranted recording (Coleman, 1997).

3.3.4 Information from the Interested Public

The Barnes House, located adjacent to the southwestern boundary of the reservation, 800 meters (2,625 feet) from the Perimeter Road, may be eligible for listing on the National Register of Historic Places. The property includes or is near the location where the last passenger pigeon was reportedly killed, and the preserved body of that specimen was exhibited for some time in the Barnes House. The Ohio Historic Preservation Office has encouraged the property owner to submit a National Register nomination addressing Criterion A for the historical significance associated with the Sargent's Passenger Pigeon and Criterion C for the property's architectural significance (OHPO, 2004).

3.3.5 Information from Indian Tribes

The Absentee Shawnee Tribe of Oklahoma has identified a number of village sites in its ancestral homelands in the Ohio Valley, including some along the Scioto River. The Tribe considers that it is descendant from the people of the Hopewell culture who built the many earthwork sites in the region. The Tribe refers to "the Barnes Works in Scioto Township" (a reference to the Scioto Township Works, near the Barnes property mentioned above) as "one of the largest sacred sites in North America" (see Appendix B).

3.3.6 Historic Properties and Potential Historic Properties

Based on the results of the information review, one historic property, the Portsmouth Gaseous Diffusion Plant Historic District, is present within the reservation boundary. The State Historic Preservation Officer indicated the eligibility of the district under Criterion A ("associated with events that have made a significant contribution to the broad patterns of our history"). The specific buildings and other elements that contribute to the district's eligibility under Criterion A and the precise boundaries of the district have

not been defined. However, the report by Coleman recommended 132 architectural locations as contributing resources and 28 architectural locations as non-contributing resources.

Outside of the reservation, but near the southwestern boundary, is one historic property, the Scioto Township Works, which today consists of two separate areas that have been heavily disturbed adjacent to Route 23 (DuVall & Associates, 2003). In addition to the archaeological values for which the site was listed on the National Register under Criterion D ("have yielded or may be likely to yield information important to history or prehistory"), the Absentee Shawnee Tribe has indicated that this site has cultural values.

Sites that have not received formal State Historic Preservation Officer concurrence as National Register eligible will be treated as if they are eligible for the purposes of this impact assessment. These include 13 historic farmstead sites within the reservation boundary that were identified by archaeologists as potentially eligible for listing on the National Register under Criterion D, although there is no record of State Historic Preservation Officer concurrence with the finding. In addition, prehistoric lithic scatter 33 Pk 210 will be treated as eligible under Criterion D in the absence of State Historic Preservation Officer concurrence with the finding that it is ineligible.

Adjacent to the reservation boundary is the Barnes House and property, which for the purpose of this review is considered potentially eligible for listing under Criteria A and C, although the State Historic Preservation Officer is awaiting submission of a formal nomination before making a determination.

Another cultural resource of local architectural and historical significance, the Bailey Chapel, is adjacent to the southeast boundary. The building is listed on the Ohio Historic Inventory, though not listed on the National Register.

3.4 Visual and Scenic Resources

The proposed ACP would be located within an existing industrial facility, close to existing production and support facilities, transmission lines, and vacant lots. The facilities are generally not visible off the reservation property or from the highway. Open areas within the facility are maintained as lawns and fields. Open and forested buffer areas, agricultural areas, limited residential areas, and densely forested hills are located adjacent to the proposed site. Rolling hills and small open farmlands dominate the nearby landscape.

The U.S. Bureau of Land Management developed criteria to assist in the protection of visual and scenic resources. Four Visual Resource Classes are used to represent the value of the visual resource, with Class I and II being the most valued, Class III having moderate value, and Class IV being the least valued. The proposed ACP site would be consistent in terms of scenic attractiveness and visual resources when compared with surrounding land within the DOE property, maintaining a Visual Resources Management Class III or IV designation both inside and outside the fenced area. Photographs of the proposed ACP site (existing buildings and future building locations) are shown in Figures 3-4 through 3-7.

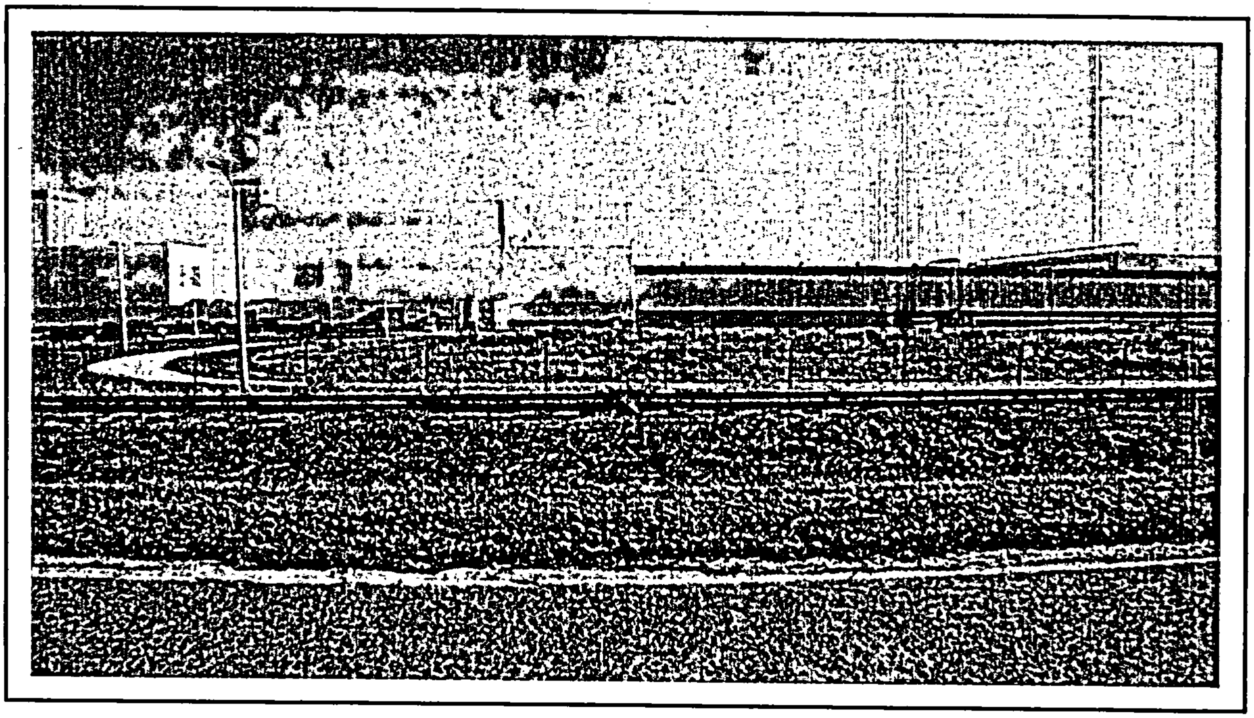

Figure 3-4 View of the X-7725 and X-7727H Facilities [Looking East] (USEC, 2005)

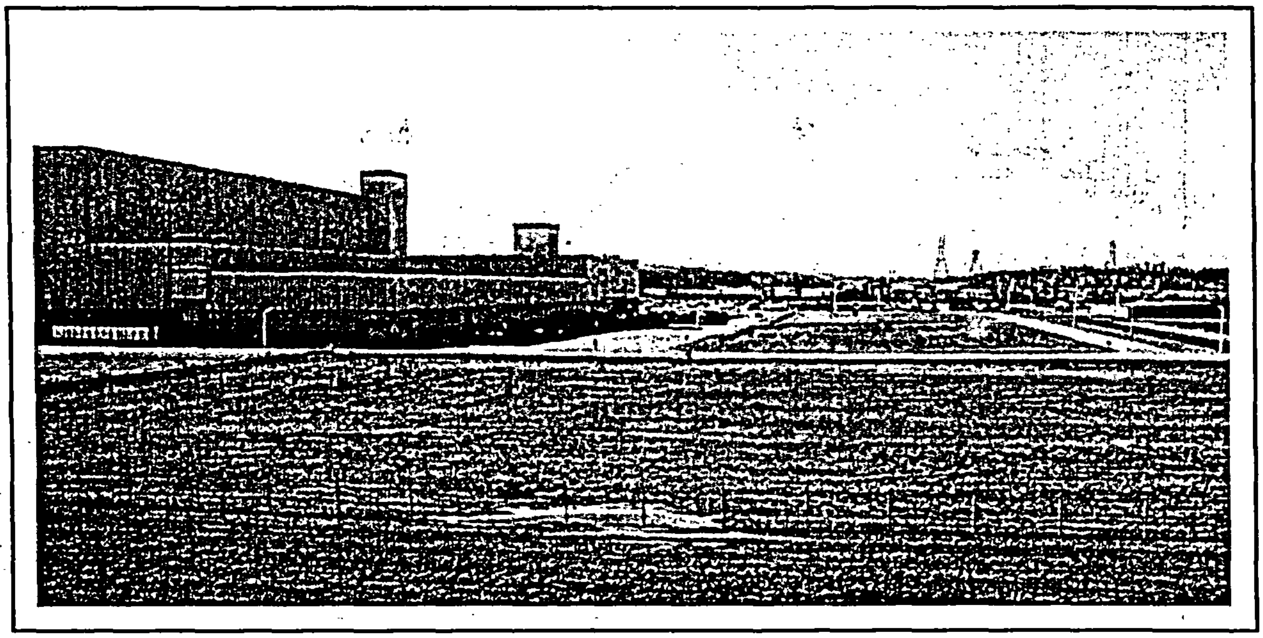

Figure 3-5 View of the X-7725 Facility [Looking Southwest] (USEC, 2005)

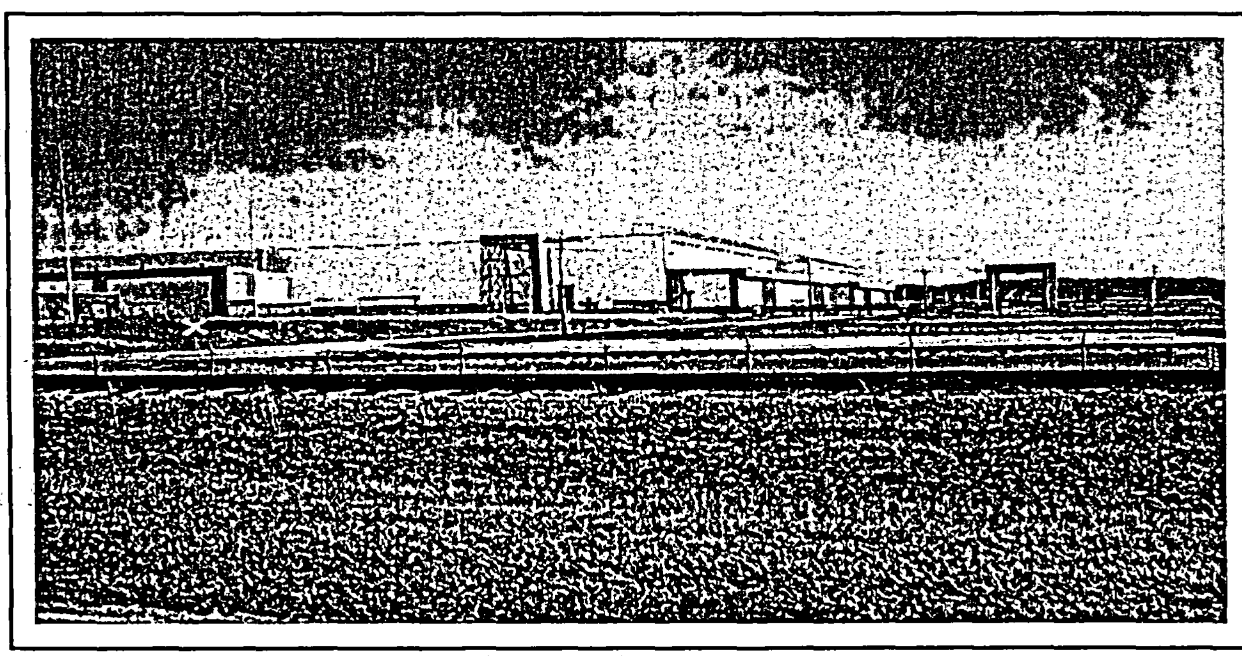

Figure 3-6 View of the X-3001 and X-3002 Process Buildings [Looking Northeast] (USEC, 2005)

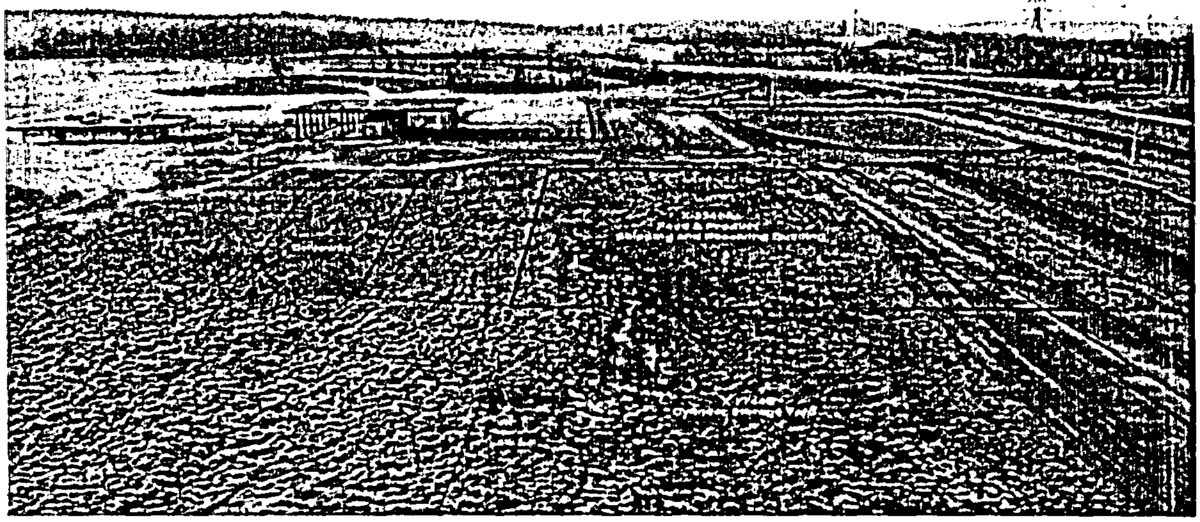

Figure 3-7 Site of X-3346A Feed and Product Shipping and Receiving Building [Looking South] (USEC, 2005)

3.5 Climatology, Meteorology, and Air Quality

This section describes the climatology, meteorology, and air quality in the area surrounding the DOE reservation. This reflects the baseline condition for the Chapter 4 analysis of USEC's emissions under the proposed action.

3.5.1 Regional Climatology

The DOE reservation is located in south-central Ohio, west of the Appalachian Mountains. The area's climate is continental and moist and is characterized by moderate extremes of heat and cold. Summers are warm and humid with about 20 days per year reaching temperatures in excess of 32.2° Celsius (90° Fahrenheit), and winters are cold, with temperatures dipping below -17.7° Celsius (0° Fahrenheit) about two days a year. Precipitation averages about 7.5 to 10 centimeters (3 to 4 inches) per month; the fall months having slightly less precipitation than other months, in the range of 5 to 7.5 centimeters (2 to 3 inches) per month.

3.5.2 Site and Regional Meteorology

For the period 1961 through 1990 in Waverly, Ohio (about 16 kilometers [10 miles] to the north of the site), the mean annual temperature was about 11.6° Celsius (53° Fahrenheit). Average summer and winter temperatures are 23.4° Celsius (74° Fahrenheit) and -1.8° Celsius (29° Fahrenheit), respectively. Recorded extreme maximum and minimum temperatures are 39° Celsius (102° Fahrenheit) and -31° Celsius (-24° Fahrenheit). Moisture in the area is predominantly supplied by air moving northward from the Gulf of Mexico. The average amount of precipitation is about 102 centimeters (40 inches) per year and is usually well distributed throughout the year (DOE, 2001b). Occasionally, heavy amounts of rain

associated with strong thunderstorms or intense low pressure systems will fall in a short periods of time (USEC, 2003). Fall is the driest season. Although snowfall occurrence varies annually, snow is common from November through March, averaging approximately 52 centimeters per year (20 inches per year) (DOE, 2001b).

Surface meteorological data, including wind data, have been collected at the onsite meteorological tower at the 10-, 30-, and 60-meter (33-, 98-, and 197-foot) levels. The tower is in the southern part of the DOE reservation. A comparison of annual wind roses for the period 1995 through 2001 indicates that wind patterns at the 10-meter (33-foot) level are different from those at the 30-meter and 60-meter (98- and 197-foot) levels (DOE, 2002a). Winds at the 10-meter (33-foot) level appear to be influenced by local topographical and/or vegetative features, while wind data at the 30-meter (98-foot) level are believed to be more representative of the site. Accordingly, a wind rose at the 30-meter (98-foot) level is presented in Figure 3-8, which was prepared on the basis of data from the onsite tower from 1998 through 2002 (USEC, 2005). About a third of the time the wind blew from the south-southwest, with the prevailing wind blowing from the south. Average wind speed was about 2.7 meters per second (6.3 miles per hour). Directional wind speed was highest from the south at 3.6 meters per second (8.1 miles per hour), while lowest values were recorded in winds blowing from the east at 1.8 meters per second (4.0 miles per hour).

3.5.2.1 Severe Weather Conditions

According to weather observations from Columbus, thunderstorms occur an average of 35 days per year. Thunderstorms are most frequent during the period May through August, averaging 29 days per year, and the least frequent in winter, averaging only 2.5 days per year. (National Climatic Data Center, 2004)

Tornadoes are rare in the area surrounding the DOE reservation, and those that do occur are less destructive in this region than those occurring in other parts of the Midwest. For the period 1950 through 1995, 656 tornadoes were reported in Ohio, with an average of 14 tornadoes per year (Storm Prediction Center, 2002). Tornadoes are classified using the Fujita scale (F-scale) with classifications ranging from F0 to F5 (Fujita, 1971). F0-classified tornadoes have winds of 64 to 116 kilometers per hour (40 to 72 miles per hour) and F2-classified tornadoes have wind speeds of 182 to 253 kilometers per hour (113 to 157 miles per hour). While three tornadoes were reported in Pike County during the 1950-1995 period, most of these fell below the F2 level of the Fujita tornado scale (Storm Prediction Center, 2002).

3.5.2.2 Mixing Heights

Mixing height is defined as the height above the earth's surface through which relatively strong vertical mixing of the atmosphere occurs. Holzworth (1972) developed mean annual morning and afternoon mixing heights for the contiguous U.S. based on daily upper-air and surface climatological data. According to Holzworth's calculations, the mean annual morning and afternoon mixing heights at the DOE reservation at Piketon are approximately 510 meters (1,673 feet) and 1,700 meters (5,575 feet), respectively. Table 3-2 shows the average morning and afternoon mixing heights for Huntington,West Virginia, where the air station nearest to the DOE reservation is located.

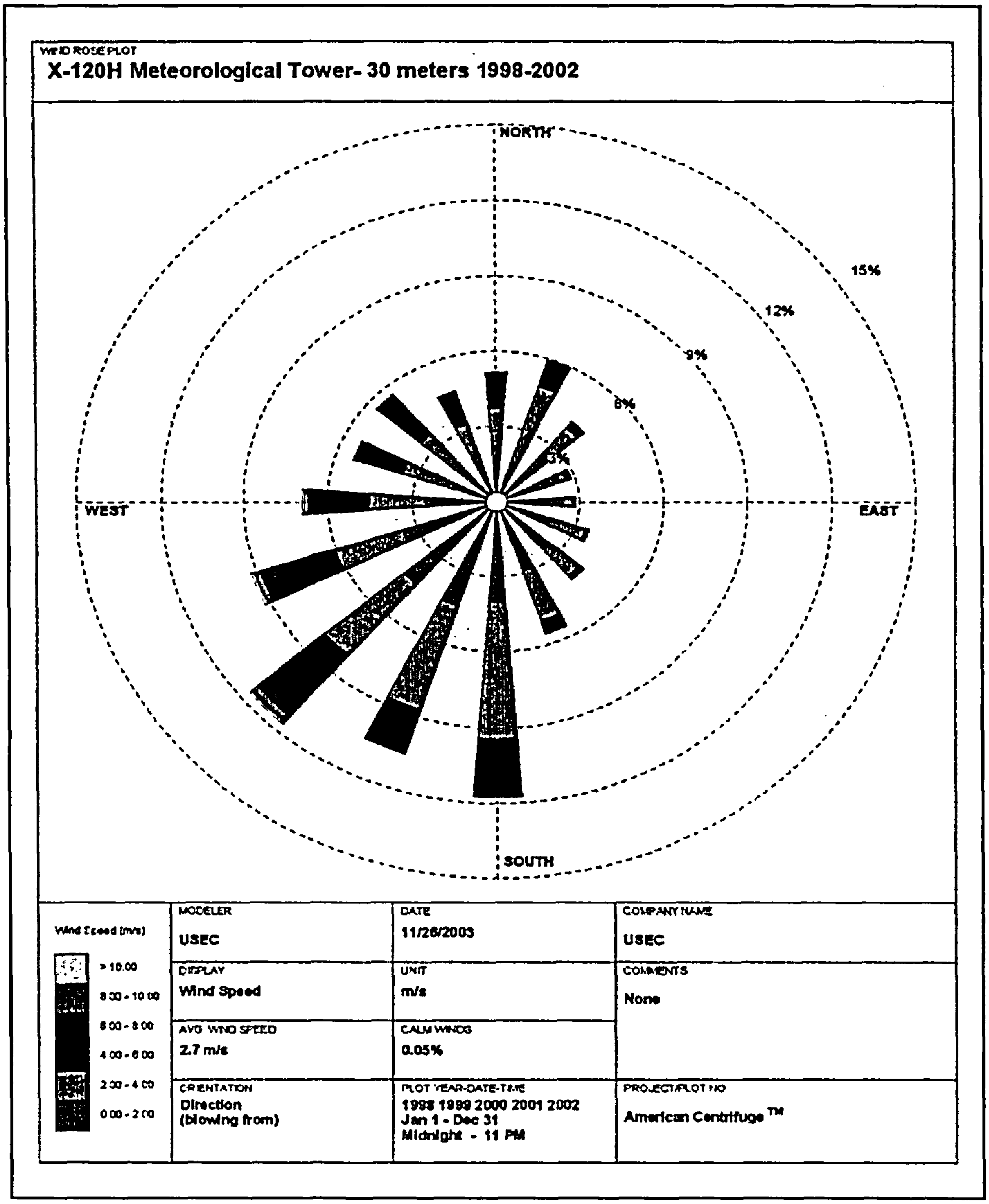

Figure 3-8 Wind Rose at 30 Meters (98 Feet) from the Onsite Meteorological Tower, 1998-2002 (USEC, 2005)

Table 3-2 Average Morning and Afternoon Mixing Heights for Huntington, West Virginia

Time Frame	Average Mixing Heights					
	Units	Winter	Spring	Summer	Fall	Annual
Morning	meters	634	721	338	403	524
	feet	2,080	2,365	1,109	1,322	1,719
Afternoon	meters	1,079	1,986	1,641	1,340	1,511
	feet	3,540	6,516	5,384	4,396	4,957

Source: Holzworth, 1972.

3.5.3 Air Quality

To assess air quality, the U.S. Environmental Protection Agency (EPA) has established maximum concentrations for pollutants that are referred to as the National Ambient Air Quality Standards (EPA, 2004). Table 3-3 presents a list of the National Ambient Air Quality Standards; Ohio State Ambient Air Quality Standards are identical. Six "criteria pollutants" are used as indicators of air quality: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead (see Criteria Pollutants text box). The U.S. EPA has designated areas around the country that do not meet these standards as "nonattainment areas." Areas are designated as attainment/nonattainment for each criteria pollutant. Pike County is in attainment for all criteria pollutants (40 CFR § 81.336). However, nearby Scioto County (5 kilometers [3 miles] from the DOE reservation's southern boundary) has been designated as a nonattainment area for the $PM_{2.5}$ standard (40 CFR § 81.336).

Table 3-3 National Ambient Air Quality Standards

Pollutant	Primary Standard (to Protect Public Health)			Secondary Standard (to Protect Public Welfare)		
	Level [a]	Averaging Time	Form	Level [a]	Averaging Time	Form
Ozone	0.12 ppm	One-hour	More than three days over three years	Same as primary standard		
	0.08 ppm	Eight-hour	Three-year average of annual fourth highest daily maximum			
Particulate Matter 10 microns or smaller (PM_{10})	150 $\mu g/m^3$	24-hour	Three-year average of annual 99th percentiles	Same as primary standard		
	50 $\mu g/m^3$	Annual	Not to be exceeded			

Table 3-3 National Ambient Air Quality Standards (continued)

Pollutant	Primary Standard (to Protect Public Health)			Secondary Standard (to Protect Public Welfare)		
	Level [a]	Averaging Time	Form	Level [a]	Averaging Time	Form
Particulate Matter 2.5 microns or smaller ($PM_{2.5}$)	65 $\mu g/m^3$	24-hour	Three-year average of annual averages	Same as primary standard		
	15 $\mu g/m^3$	Annual	Three-year average of 98th percentile			
Carbon Monoxide	35 ppm	One-hour	More than once per year	No secondary standard		
	9 ppm	Eight-hour	More than once per year			
Sulfur Dioxide	0.14 ppm	24-hour	More than once per year	0.55 ppm	Three-hour	More than once per year
	0.03 ppm	Annual	Not to be exceeded			
Nitrogen Dioxide	0.053 ppm	Annual	Not to be exceeded	Same as primary standard		
Lead	1.5 $\mu g/m^3$	Quarterly	Not to be exceeded	Same as primary standard		

Notes:
[a] ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter.
Source: 40 CFR Part 50.

Criteria Pollutants

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

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

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

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

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

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

Source: EPA, 2004.

3.5.3.1 Current Emissions at the DOE Reservation

Non-Radiological Emissions

Nonradiological air emissions from the DOE reservation are predominant sources in Pike County (EPA 2003a). Currently, the United States Enrichment Corporation has three Ohio EPA operating permits. The Title V permit issued for current operations was effective as of August 21, 2003, and is a sitewide, Federally enforceable operating permit to cover emissions of all regulated air pollutants at the facility. The United States Enrichment Corporation has identified the following criteria pollutant emissions for the year 2001 (see Table 3-4): 54.30 metric tons (59.86 tons) of particulate matter with a mean diameter of 10 micrometers or less, 1.29 metric tons (1.42 tons) of volatile organic compounds, 2,474 metric tons (2,628 tons) of sulfur dioxide, and 328 metric tons (362 tons) of nitrogen oxides. These emissions are

Table 3-4 Nonradiological Air Emissions from United States Enrichment Corporation and DOE Sources at the DOE Reservation in 2001

Major Emission Source	Units	Emission Rate [a]					
		SO_2	NO_x	CO	VOCs	PM_{10}	$PM_{2.5}$
United States Enrichment Corporation facilities [a]	metric tons/year	2,384	328	Not Available	1.3	54.3	Not Available
	tons/year	2,628	362	Not Available	1.4	59.9	Not Available
DOE facilities [b]	metric tons/year	20	85	53	5.2	4.8	Not Available
	tons/year	22	94	59	5.7	5.3	Not Available

Notes:
[a] SO_2 = sulfur dioxide; NO_X = nitrogen oxides; CO = carbon monoxide; VOCs = volatile organic compounds; PM_{10} = particulate matter with a mean diameter of 10 micrometers or less; $PM_{2.5}$ = particulate matter with a mean diameter of 2.5 micrometers or less.
[b] Source: DOE, 2001c.
[c] Proposed maximum annual emissions based on the assumption that two boilers would operate full time.
Source: Bechtel Jacobs Company, 2003.

associated primarily with the boilers at the X-600 Steam Plant (that provides steam for the DOE reservation), a boiler at the X-611 Water Treatment Plant, an emergency generator, and a trash pump(DOE, 2001c). DOE operates numerous small sources that release criteria pollutants and volatile organic compounds. In November 2001, DOE began operation of the X-6002 Recirculating Hot Water Plant to provide heat for the DOE facilities that were formerly heated by hot water from the gaseous diffusion process. Maximum annual emissions from plant operations account for most of the DOE emissions (Bechtel Jacobs Company, 2003; see Table 3-4). Other DOE emissions, including 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 0.9 metric tons (1 ton) per year of conventional air pollutants (on an individual basis).

The largest non-radiological airborne emissions from the DOE reservation are from the coal-fired boilers at the X-600 Steam Plant. These emissions are shown in Table 3-5. The boilers are permitted by Ohio EPA with opacity, particulate, and sulfur dioxide limits. Electrostatic precipitators on each of the boilers control opacity and particulate emissions. In addition, the boilers emit nitrogen dioxide and carbon monoxide. There are also minor contributions of these pollutants from oil-fired heaters, stationary diesel motors, and mobile sources (e.g., cars and trucks). Other air pollutants emitted from the DOE reservation in Piketon, Ohio, include gaseous fluorides, water treatment chemicals, cleaning solvent vapors, and process coolants. (USEC, 2005)

<u>Radiological Emissions</u>

Airborne discharges of radionuclides from the DOE reservation are regulated under the *Clean Air Act*, 40 CFR Part 61, Subpart H, National Emission Standards for Hazardous Air Pollutants. Currently, the United States Enrichment Corporation is responsible for most of the sources that emit radionuclides because DOE leases the production facilities to it. In 2001, United States Enrichment Corporation and DOE reported emissions of 7.40×10^9 and 2.33×10^7 becquerels (0.2 and 0.00063 curies) from their radionuclide emission sources, respectively. (DOE, 2004a)

Table 3-5 United States Enrichment Corporation's Non-Radiological Airborne Emissions

Total Particulate Matter	Air Permit Limit [a]	Stack Test Results [a,b]
Boiler Number 1	0.19 lbs/mmbtu	0.04 lbs/mmbtu
Boiler Number 2	0.19 lbs/mmbtu	0.05 lbs/mmbtu
Boiler Number 3	0.19 lbs/mmbtu	0.05 lbs/mmbtu
Sulfur Dioxide	**Air Permit Limit [a]**	**Analytical Results [a,c]**
Boiler Number 1	6.16 lbs/mmbtu	4.72 lbs/mmbtu
Boiler Number 2	6.16 lbs/mmbtu	
Boiler Number 3	6.16 lbs/mmbtu	

Notes:
[a] lbs/mmbtu = pounds per million British thermal unit.
[b] Boilers 1 and 2 tested in April 2003. Boiler 2 tested in November 2003.
[c] Steam plant total for 2002.
Source: USEC, 2005.

3.5.3.2 Current Air Quality Conditions

<u>Non-Radiological Emissions</u>

Ambient concentration data are not available for criteria pollutants around the site. The nearest monitoring site is in the City of Portsmouth, approximately 43 kilometers (27 miles) to the south of the reservation. On the basis of 1998 through 2003 monitoring data, the highest concentrations for sulfur dioxide, nitrogen dioxide, carbon monoxide, particulate matter with a mean diameter of 10 micrometers or less, and lead are less than 64 percent of their respective National Ambient Air Quality Standards listed in Table 3-3 (EPA, 2003b). It is expected that levels at the DOE reservation are equal to or lower than these reported concentrations. The highest concentrations of ozone and particulate matter with a mean diameter of 2.5 micrometers or less are approaching or are somewhat higher than the applicable standards. These high concentrations are of regional concern and are associated with high precursor emissions from the Ohio Valley region and long-range transport from southern States.

<u>Radiological Emissions</u>

Although not used to measure criteria pollutants, there is a network of 15 air samplers in and around the DOE reservation that primarily collect data on radionuclide concentrations at the site. These data are used to assess whether air emissions from the DOE reservation affect air quality in the surrounding area. In addition to radionuclides, samples for fluoride are collected weekly from 15 ambient monitoring stations in and around the reservation. With only one exception, the average ambient concentrations measured at these stations in 2001 were similar to or less than those collected at a background station located approximately 21 kilometers (13 miles) southwest of the reservation (see Table 3-6). The exception was for the network station that is located within the process area immediately east of the X-326 building.

Table 3-6 Background Air Concentrations

Chemical/ Radionuclide	Units [a]	Number of Samples (Measurement) [b]	Minimum [c]	Maximum [c]	Average [c, d]
Americium-241	pCi/m^3	12 (12)	ND	1.5×10^{-05}	
Fluoride	$\mu g/m^3$	52(8)	1.2×10^{-02}	1.9×10^{-01}	6.3×10^{-02}
Neptunium-237	pCi/m^3	12 (12)	ND	5.9×10^{-06}	
Plutonium-238	pCi/m^3	12 (12)	ND	1.2×10^{-05}	
Plutonium-239/240	pCi/m^3	12 (12)	ND	8.0×10^{-06}	
Technetium-99	pCi/m^3	12 (12)	ND	1.9×10^{-03}	
Uranium	$\mu g/m^3$	12 (1)	4.6×10^{-04}	1.2×10^{-03}	7.5×10^{-04}
Uranium-233/234	pCi/m^3	12 (0)	1.4×10^{-04}	4.6×10^{-04}	2.8×10^{-04}
Uranium-235	pCi/m^3	12 (6)	ND	1.5×10^{-05}	
Uranium-236	pCi/m^3	12 (12)	ND	6.0×10^{-06}	
Uranium-238	pCi/m^3	12 (1)	1.5×10^{-04}	3.9×10^{-04}	2.5×10^{-04}

Notes:
[a] pCi/m^3 = picoCuries per cubic meter, $\mu g/m^3$ = micrograms per cubic meter.
[b] Radiological samples are analyzed monthly, samples for fluoride are analyzed weekly. Number in parentheses is the number of samples that were below the detection limit.
[c] ND = Not detected above method detection limit. Results above the detection limit are provided in scientific notation.
[d] For radionuclides, averages are not calculated for locations that had greater than 15 percent of the results below the detection limit. If the analytical result for a sample was below the detection limit, the ambient air concentration was calculated based on the detection limit for the sample. Averages were calculated for fluoride at all sampling locations.
Source: DOE, 2002b.

3.6 Geology, Minerals, and Soil

This section provides a brief description of the regional and local geology, including bedrock and soil characteristics and seismicity. There are not any economically valuable mineral resources, including oil and gas resources, that could be recovered from the potentially affected area.

3.6.1 Regional Geology, Structure, and Seismicity

The DOE reservation is situated within the Appalachian Plateau Physiographic Province of the Appalachian Highland region near its northwestern terminus at the Central Lowlands Province. The Appalachian Plateau is characterized by deeply dissected valleys and even crested ridge tops. Just east of the Scioto River, the summits of the main ridges rise to an altitude of more than 355 meters (1,160 feet) above mean sea level, with relief of up to 150 meters (490 feet) from the bottom of the valleys. The proposed ACP site would be situated at an elevation of approximately 205 meters (670 feet).

Surface and near-surface geology at the site have been heavily influenced by glaciation and the associated meltwaters. The DOE reservation is located in an abandoned river valley that was later filled with lake sediments deposited during the existence of prehistoric Lake Tight (Rogers et al., 1988). Bedrock at the site is composed of sedimentary rocks, primarily shale and sandstone, deposited in a broad shallow sea during the Paleozoic Era more than 230 million years ago. The rock units of interest at the site are, in ascending order, Ohio Shale, Bedford Shale, Berea Sandstone, Sunbury Shale, Cuyahoga Shale, Gallia Sand, and Minford Clay. Figure 3-9 shows the relationship of the geologic units to the site and region.

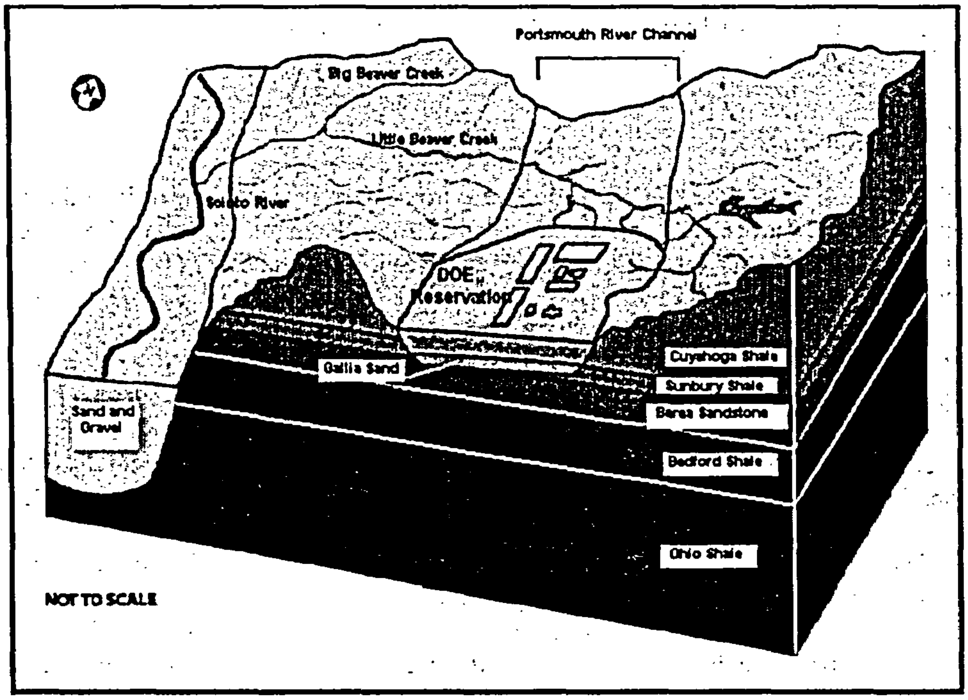

Figure 3-9 Site Geology in the Vicinity of the DOE Reservation at Piketon (NRC, 2004a)

The Ohio Shale is 90 to 120 meters (300 to 400 feet) thick at the site. It is black and thinly bedded and may contain noncommercial quantities of natural gas or oil. The Bedford Shale consists of interbedded thin sandstone and shale. The Berea Sandstone has a larger sand content than the Bedford Shale but is otherwise similar. At the proposed site, the Berea Sandstone forms an aquifer that has an average thickness of about 9 meters (30 feet). The Sunbury Shale is a black carbonaceous shale; this unit thins from east to west and may be completely absent in western portions of the site (DOE, 2004a)). The Teays Formation overlies the Sunbury Shale and is made up of Gallia Sand and Minford Clay, in ascending order. These unconsolidated deposits have a fluvial origin and occupy ancient channels of the Teays River System. The Gallia Sand member is a silty to clayey, coarse to fine-grained sand with a pebble base. The Minford Clay member contains interbedded silts and clays and is divided into two zones: an upper zone of clay and a lower zone of silty clay.

There are no major faults at the site. The nearest fault zone is the Kentucky River Fault Zone located approximately 40 kilometers (25 miles) south of the site. No seismic events have been associated with it. There have been no historical earthquakes within 40 kilometers (25 miles) of the site.

The largest recorded seismic event in the area was the Sharpsburg, Kentucky, earthquake of July 1980. Sharpsburg is located approximately 115 kilometers (70 miles) south of the DOE reservation. That earthquake registered a magnitude of 5.3 on the Richter Scale and a Modified Mercalli intensity of VII.

Ground motion from earthquakes causes damage to buildings and structures. Ground motion is measured as a percent of the acceleration of gravity. At 10 percent gravity (0.1g) some damage may occur in poorly constructed buildings. At 0.1g to 0.2g most people have trouble keeping their footing. In the 1980's DOE studied the historical seismicity of the areas surrounding the Portsmouth plant. Data were developed on probable seismic activity and the intensity levels were converted into acceleration values. They determined that the maximum earthquake likely to occur would produce a ground motion equal to 0.15

gravity, and a recurrence of 1,000 years. The GCEP and ACP were designed based on the Design Basis Earthquake of 0.15 gravity and 1,000 year recurrence. (DOE, 1980 and DOE, 1982)

3.6.2 Soils

A majority of the soils at the DOE reservation are formed on ancient river or lake deposits. Other important soil-forming materials are parent material from the underlying shale bedrock, colluvium, and loess (windblown material) (DOE, 2004a). Approximately 600 hectares (1,500 acres) of the site consist of moderately drained soils of the Urban Land-Omulga silt loam complex. The Omulga soil at the site is a dark grayish brown silt loam about 25 centimeters (10 inches) thick. Beneath this layer is about 137 centimeters (54 inches) of yellowish-brown subsoil. This material is characterized by a friable silt loam, a silty clay fragipan (low-permeability layer), and, near the bottom, a friable silt loam. Within the fragipan, the subsoil has low permeability. Other soils of the reservation include the Clifty and Wilbur silt loams, which occur in stream valleys. The upland areas contain a mixture of Coolville, Blairton, Latham, Princeton, Shelocta, and Wyatt soils. A description of these soils is provided in Hendershot et al. (1990).

Soil samples are collected semianually from nine onsite locations, six off-site locations within 5 kilometers (3 miles) of the site, and 12 remote locations 5 to 16 kilometers (3 to 10 miles) from the site. Samples are analyzed for total uranium, technecium-99, gross-alpha activity, and gross-beta activity. Table 3-7 summarizes the data from 1998 to 2002 and shows that the results from the different sampling locations are not significantly different. There are no soil data specifically from the proposed ACP site.

Table 3-7 Results of Baseline Soil Samples, 1998-2002 [a]

	Total Uranium mg/g	Technetium pCi/g	Gross Alpha pCi/g	Gross Beta pCi/g
Reservation (9 Soil Sampling Locations)				
No. of Samples [b]	117 (0)	117 (93)	117 (59)	117 (64)
Average	2.8	<0.2	<8	<14
Minimum	0.6	<0.1	<2	8
Maximum	4.4	1.5	21	36
Off Reservation (6 Soil Sampling Locations)				
No. of Samples [b]	74 (0)	74 (32)	74 (38)	74 (41)
Average	2.9	<0.2	<7	<14
Minimum	0.7	<0.1	<2	<8
Maximum	4.6	3.8	14	47
Remote (12 Soil Sampling Locations)				
No. of Samples [b]	139 (0)	139 (133)	139 (73)	139 (77)
Average	3.0	<0.2	<7	<14
Minimum	0.7	<0.1	<3	<7
Maximum	5.9	0.8	16	22

Notes:
[a] mg/g = milligrams per gram; pCi/g = picoCuries per gram.
[b] The "number of samples" shows the total number of samples collected, including replicate and duplicate samples collected for quality assurance purposes, followed by the number of samples that were lower than the Minimum Detectable Concentration in parentheses.
Source: USEC, 2004a.

3.7 Water Resources

This section presents a discussion of the surface water and its associated resources (floodplains) and groundwater in the vicinity of the DOE reservation, including the regional and local surface water features (rivers/streams and lakes/ponds) surrounding the reservation, as well as the floodplains located on the reservation. The discussion of surface water describes the existing features, summarizes the existing National Pollutant Discharge Elimination System permitted outfalls from the reservation to such features, and concludes with a discussion of water quality and its designated uses. The discussion of floodplains present the location and attributes of such features on the reservation. The groundwater discussion describes the regional groundwater aquifers, the groundwater well fields associated with the DOE reservation, and the onsite groundwater conditions and remediation activities.

3.7.1 Surface Water Features

The DOE reservation is within the Lower Scioto River watershed, U.S. Geological Survey Cataloging Unit: 05060002. The reservation occupies an upland area at an elevation of 200 meters (670 feet) above mean sea level and is bordered by ridges of low-lying hills. Surface waters drain from the DOE reservation via a network of tributaries to the Scioto River located approximately 3.2 kilometers (2 miles) to the west (Rogers et al., 1988). The average flow in the Scioto River measured at Higby (approximately 32 kilometers [20 miles] northeast and upstream of the reservation) is 133 cubic meters per second (2.1 x 10^6 gallons per minute). The 10-year low-flow discharge at Higby is 8.58 cubic metes per second (1.4 x 10^5 gallons per minute). The Scioto River discharges into the Ohio River approximately 40 kilometers (25 miles) south and downstream of the reservation. There are no known public or private water supplies draw from this section of the Scioto River (USEC, 2005).

Surface water features on the DOE property include streams, ditches, holding ponds, and lagoons as shown on Figure 3-10. There are four lagoons, eight holding ponds, several unnamed tributaries and drainage pathways, and four named streams and ditches on the DOE reservation. The four streams include Little Beaver Creek, Big Run Creek, the West Ditch, and the DOE Piketon Tributary. Little Beaver Creek drains the northern portion of the reservation, Big Run Creek drains the east-central and southern portions of the reservation, the West Ditch drains the west-central portion of the reservation, and the DOE Piketon Tributary drains the south-western portion of the reservation. Storm water at the DOE reservation 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. All of the streams and ditches transport the surface water, including storm water, from the reservation to the Scioto River.

The largest stream on the DOE reservation is Little Beaver Creek, which discharges into Big Beaver Creek, which then discharges into the Scioto River. Upstream of the plant, Little Beaver Creek flows intermittently during the year. Onsite, it receives treated process wastewater from a holding pond (via the east drainage ditch) and storm water runoff from the northwestern and northern sections of the reservation via several storm sewers, water courses, and the north holding pond. The average release to Little Beaver Creek for 1993 was 0.06 cubic meter per second (951 gallons per minute).

The next largest stream, Big Run Creek, receives effluent from the South Holding Pond (X-230K), and flows offsite to the southwest where it joins the Scioto River approximately 6.4 river-kilometers (4 river-miles) from the reservation. Storm sewers in the southern end of the reservation discharge to the South Holding Pond. The DOE Piketon Tributary, is a small intermittent watercourse leading from Holding Pond No. 1 (X-2230M, National Pollutant Discharge Elimination System permit number 612) to the

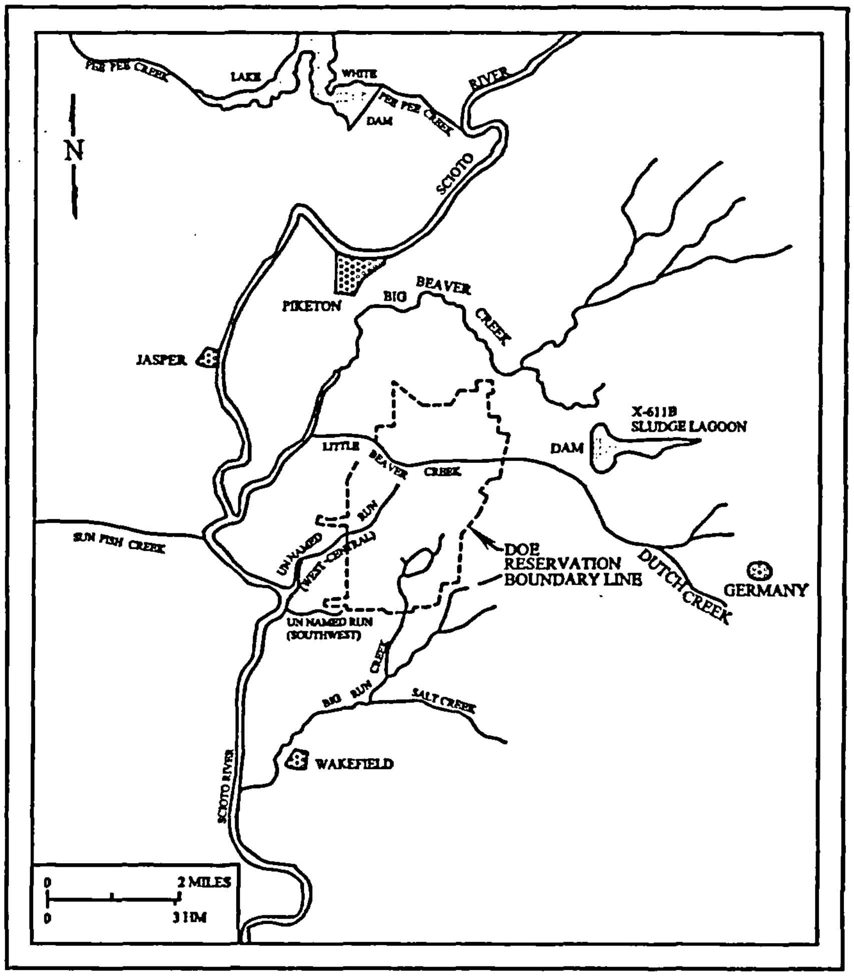

Figure 3-10 Surface Water Features at the DOE Reservation at Piketon (USEC, 2005)

Scioto River, 1.6 stream-kilometers (1 stream-mile) downstream. The West Ditch receives surface water from existing open drainage swales and from Holding Pond No. 2, X-2230N and flows for 6.4 stream-kilometers (4 stream-mile) before discharging into the Scioto River.

The Ohio Administrative Code (3745-1-09) for the Scioto river drainage basin classifies the designated uses of the surface waters within and surrounding the DOE reservation. The aquatic life habitat, water supply, and recreational use designations are defined in rule 3745-1-07 of the Ohio Administrative Code. The State resource water use designation is defined in rule 3745-1-05 of the Ohio Administrative Code. The most stringent criteria associated with any one of the use designations assigned to a water body will apply to that water body.

The surface water features that drain the DOE 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; Secondary Contact Recreation.

- Scioto River: Warm Water Habitat; Public Water Supply; Agricultural Water Supply; Industrial Water Supply; Primary Contact Recreation.

The designated uses of the rivers, streams, and ditches aid in defining the parameters associated with the National Pollutant Discharge Elimination System permits issued by the State of Ohio. Currently, the DOE reservation maintains a total of 19 permits, which are managed by both DOE and the United States Enrichment Corporation. DOE is responsible for eight of the 19 permits, including:

- Three DOE outfalls that discharge directly to surface water (to the DOE Piketon Tributary, the West Ditch, and Little Beaver Creek).

- Three outfalls discharge to USEC building X-6619, Sewage Treatment Plant, which are subsequently discharged through a permit issued to USEC for Outfall 003. These three are Outfalls *608*, *610*, and 611.

- Two outfalls discharge to holding ponds.

The United States Enrichment Corporation is responsible for 11 of the 19 National Pollutant Discharge Elimination System permits, including:

- Eight outfalls that discharge directly to surface water (DOE Piketon Tributary, West Ditch, Little Beaver Creek, Big Run Creek, and the Scioto River).

- Two outfalls that discharge to the X-6619 Sewage Treatment Plant (Outfall 003).

- One outfall that discharges to the X-230K South Holding Pond (Outfall 002). (USEC, 2003)

Table 3-8 lists the 19 outfalls by permit number and includes information on the operator (DOE or the United States Enrichment Corporation), a description of the outfall, and the ultimate receiving water body. These United States Enrichment Corporation outfalls are illustrated in Figure 3-11.

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 2,275,032 liters per day (601,000 gallons per day), and in 2003, the facility operated at 27 percent of that capacity (USEC, 2003). The discharge from the sewage treatment plant is within its National Pollutant Discharge Elimination System permit criteria.

Table 3-8 National Pollutant Discharge Elimination System Permit Operator, Description, and Receiving Water Body

Operator	Outfall	Description	Receiving Water Body
United States Enrichment Corporation	1	X-230J7 - East Holding Pond	Tributary of Little Beaver Creek
United States Enrichment Corporation	2	X-230K - South Holding Pond	Big Run
United States Enrichment Corporation	0.125	Building X-6619, sewage treatment plant	Scioto River
United States Enrichment Corporation	4	Cooling tower blowdown	Scioto River
United States Enrichment Corporation	5	X-611B - lime sludge lagoon	Little Beaver Creek
United States Enrichment Corporation	0.375	X-230L - North Holding Pond	Tributary to Little Beaver Creek
United States Enrichment Corporation	0.4167	X-230J5 - Northwest Holding Pond	West ditch
United States Enrichment Corporation	11	X-230J6 - Northeast Holding Pond	Tributary to Little Beaver Creek
DOE	0	X-2230M pond	DOE Piketon Tributary
DOE	0.042	X-2230N pond	West ditch
DOE	0.125	Groundwater treatment facility	Tributary to Little Beaver Creek
DOE	608 [a]	Groundwater treatment plant	Sewage treatment plant
DOE	610 [a]	Groundwater treatment plant	Sewage treatment plant
DOE	611 [a]	Groundwater treatment plant	Sewage treatment plant
DOE	612 [a]	Groundwater treatment plant discharging to X-2230M pond	DOE Piketon Tributary - inactive
DOE	613	Particulate separator	Not applicable
United States Enrichment Corporation	602	X-621 coal pile runoff treatment facility	Big Run Creek
United States Enrichment Corporation	604	X-700 bio-nitrification facility	Sewage treatment plant
United States Enrichment Corporation	605	X-705 decontamination microfiltration facility	Sewage treatment plant

Notes:
[a] Discharging to receiving waters downstream of the surface water runoff pathway associated with the proposed action.
Note: DOE internal Outfalls 608, 610, and 611 discharge to United States Enrichment Corporation Outfall 003 (X-6619 Sewage Treatment Plant). DOE internal Outfall 612 discharges to DOE Outfall 012.

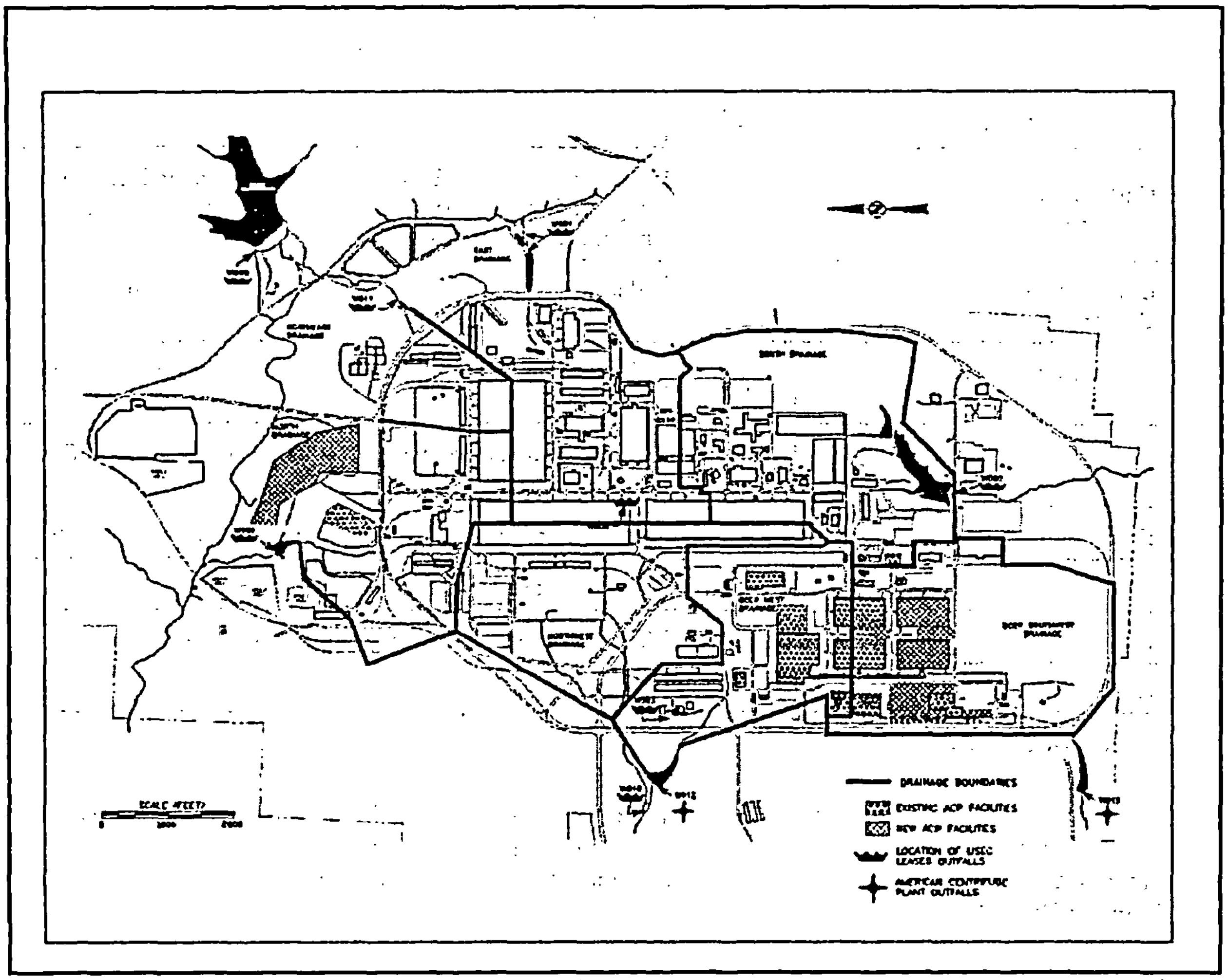

Figure 3-11 United States Enrichment Corporation National Pollutant Discharge Elimination System Outfalls at the DOE Reservation at Piketon

3.7.1.1 Surface Water Quality

At the DOE reservation at Piketon, DOE is responsible for eight permitted outfalls and the United States Enrichment Corporation is responsible for 11 permitted outfalls, as discussed earlier (DOE, 2002c). In addition to monitoring the water quality parameters required by Ohio EPA, DOE monitors radionuclides contained in the discharges. Ohio EPA selects the chemical parameters that must be monitored at each outfall based on the chemical characteristics of the water that flows into the outfall. Table 3-9 lists the parameters required by Ohio EPA for the outfalls that may be used for the development and operation of the proposed ACP.

Permitted outfalls managed by the United States Enrichment Corporation were in compliance with contaminant concentration discharge limits in 2002 (DOE, 2003b; NRC, 2004a). Permitted outfalls managed by DOE were in compliance with contaminant concentration discharge limits in 2003 (DOE, 2004a).

Table 3-9 National Pollutant Discharge Elimination System Permit and Monitoring Parameters

Operator	Outfall	Parameters
United States Enrichment Corporation	003	Ammonia-nitrogen, biochemical oxygen demand, chlorine, copper, fecal coliform (May-October only), mercury, nitrate-nitrogen, oil and grease, silver, suspended solids, zinc
United States Enrichment Corporation	009	Fluoride, manganese, oil and grease, suspended solids, zinc
United States Enrichment Corporation	010	Fluoride, manganese, oil and grease, suspended solids, zinc
DOE	012	Chlorine, iron, oil and grease, suspended solids, total PCBs, and trichloroethene
DOE	013	Chlorine, oil and grease, suspended solids, and total PCBs
DOE	608 [a]	Trichloroethene and trans-1,2-dichloroethene
DOE	610 [a]	Trichloroethene and *trans*-1,2-dichloroethene
DOE	611 [a]	Trichloroethene

Source: DOE, 2002b.

In addition to the characteristics of the water the flows into the outfall, the National Pollutant Discharge Elimination System permits consider the designated use and the associated water quality of the receiving water body. The following uses have been designated for one or more of the surface water features that drain the DOE Reservation:

- <u>Warm Water Habitat</u>. Exhibits typical assemblages of fish and invertebrates belonging to any other than cold or cool water species. Warm water habitats are waters capable of supporting and maintaining a balanced, integrated, adaptive community of warm water aquatic organisms having a diverse species composition and functional organization.

- <u>Limited Resource Water</u>. These are waters that have been the subject of a use attainability analysis and have been found to lack the potential for any resemblance of any other aquatic life habitat as determined by the biological criteria in Table 7-15 of Ohio Administrative Code 3745-1-07. The use attainability analysis must demonstrate that the extant fauna is substantially degraded and that the potential for recovery of the fauna to the level characteristic of any other aquatic life habitat is realistically precluded due to natural background conditions or irretrievable human-induced conditions.

- <u>Agricultural Water Supply</u>. These are waters suitable for irrigation and livestock watering without treatment.

- <u>Primary Contact Recreation</u>. These are waters that, during the recreation season, are suitable for full-body contact recreation such as, but not limited to, swimming, canoeing, and scuba diving with minimal threat to public health as a result of water quality.

- Secondary Contact Recreation. These are waters that, during the recreation season, are suitable for partial body contact recreation such as, but not limited to, wading with minimal threat to public health as a result of water quality.

The specific water quality conditions and parameters associated with each designated use can be found in Ohio Administrative Code 3745-1-07 (water use designations and Statewide criteria).

With the exception of DOE outfall 613, a weekly composite water sample is collected from DOE external outfalls and analyzed for total uranium, uranium isotopes (uranium-233/234, uranium-235, uranium-236, and uranium-238), technetium-99, and transuranic radionuclides (americium-241, neptunium-237, plutonium-238, and plutonium-239/240). Outfall 613 is not monitored for radionuclides because there is no source for radiological contamination of the water discharged from this outfall. A weekly composite water sample is collected from all external United States Enrichment Corporation outfalls and analyzed for total uranium, technetium-99, and transuranic radionuclides (americium-241, neptunium-237, plutonium-238, and plutonium-239/240). (DOE, 2004c)

Total radioactivity released from the DOE external outfalls was 0.0049 curie of uranium isotopes and 0.00004 curie of technetium-99. These values were calculated using monthly monitoring data from the DOE NPDES outfalls. Neptunium-237 was detected at 0.04637 picocurie per liter (pCi/L) in the sample collected from DOE Outfall 015 in the fourth quarter of 2003. Neptunium-237 was not detected at Outfall 015 in the other three quarterly samples collected in 2003. Americium-241, plutonium-238, and plutonium-239/240 were not detected in samples collected from any of the DOE outfalls in 2003. (DOE, 2004c). Total radioactivity released from the United States Enrichment Corporation external outfalls was 1.1×10^9 bequerels (0.0296 curies) of uranium and 1.2×10^9 bequerels (0.0335 curies) of technetium-99. Transuranic radionuclides (americium-241, neptunium-237, plutonium-238, and plutonium-239/240) were not detected in any of the samples collected from USEC NPDES outfalls in 2003. (DOE, 2004c)

In 2003, an estimated 4.3 kilograms (9.5 pounds) of uranium were discharged from DOE National Pollution Discharge Elimination System outfalls and 21 kilograms (46 pounds) were discharged from United States Enrichment Corporation outfalls, for a total of 25.3 kilograms (55.5 pounds). (DOE, 2004c)

The analytical results were compared to the standards included in DOE Order 5400.5, Radiation Protection of the Public and the Environment. DOE Order 5400.5 provides guidance and establishes radiation protection standards and control practices designed to protect the public and the environment from undue radiological risk from operations of DOE and DOE contractors. The order requires that off-site radiation doses do not exceed 100 millirem/year above background for all exposure pathways.

The derived concentration guide for each radionuclide as defined in DOE Order 5400.5 includes the following concentrations (in picocuries per liter):

- Americium-241 = 30
- Neptunium-237 = 30
- Plutonium-238 = 40
- Plutonium-239/240 = 30
- Technetium-99 = 100,000
- Uranium-233/234 = 500
- Uranium-235 = 600
- Uranium-236 = 500

- Uranium-238 = 600
- No derived concentration guide is available for total uranium.

All analytical results from the external NPDES outfalls are well below these DOE standards.

In addition to the external NPDES outfalls, the surface waters are monitored for radioactive contamination at 14 locations, including locations upstream and downstream from the DOE reservation. The surface water monitoring results for 2001 indicated that the measured radioactive contamination was consistently less than the applicable drinking water standards (DOE, 2002b and 2002c). Uranium concentrations were detected at levels similar to those that occurred naturally in the Scioto River. Technetium-99 was detected at 1,591 becquerels per cubic meter (43 picocuries per liter) in a sample collected downstream of Little Beaver Creek; this level is well below the DOE-derived concentration guide of 3.7 x 10^6 becquerels per cubic meter (100,000 picocuries per liter) (DOE, 2002c). The DOE derived concentration guide values given in DOE Order 5400.5 are reference values for radiological protection programs at operational DOE facilities (DOE, 1993b). In addition, in 2001, surface water samples were collected monthly from five locations at the DOE cylinder storage yards and analyzed for total uranium, uranium isotopes, transuranics, and technetium-99. The maximum detected concentration of uranium in these samples was 14 micrograms per liter, which is less than the drinking water Maximum Contaminant Level of 30 micrograms per liter; the maximum technetium-99 concentration was 370 becquerels per cubic meter (10 picocuries per liter), well below the DOE-derived concentration guide of 3.7 x 10^6 becquerels per cubic meter (100,000 picocuries per liter).

Sediment samples are also collected at the locations where surface water samples are collected by the United States Enrichment Corporation, and at the permitted outfalls on the east and west sides of the DOE reservation (DOE, 2002c). In 2001, the maximum uranium concentration in sediment was 5.6 micrograms per gram, at background sampling location (RM-10W). The maximum technetium-99 concentration was 592 becquerels per kilogram (16 picocuries per gram), at location RM-7 downstream on Little Beaver Creek. Several inorganic substances and polychlorinated biphenyls are also monitored; results of the monitoring indicate no major difference between upstream and downstream concentrations. Polychlorinated biphenyls were not detected in sediments.

3.7.2 Floodplains

Floodplains are land areas adjacent to streams or rivers susceptible to being inundated by stream-derived waters. The Federal Emergency Management Agency Flood Insurance Rate Map indicates that the 100-year floodplain for Little Beaver Creek extends from the confluence with the Big Beaver Creek upstream to the rail spur near environmental sampling point X-230J9. This is within the northwestern portion of the DOE reservation. No portion of the floodplain for Big Beaver Creek is located within the reservation boundary, as shown in Figure 3-12.

The DOE 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 174 meters (570 feet) above mean sea level in January 1913. The reservation occupies an upland area at an elevation of 200 meters (670 feet) above mean sea level.

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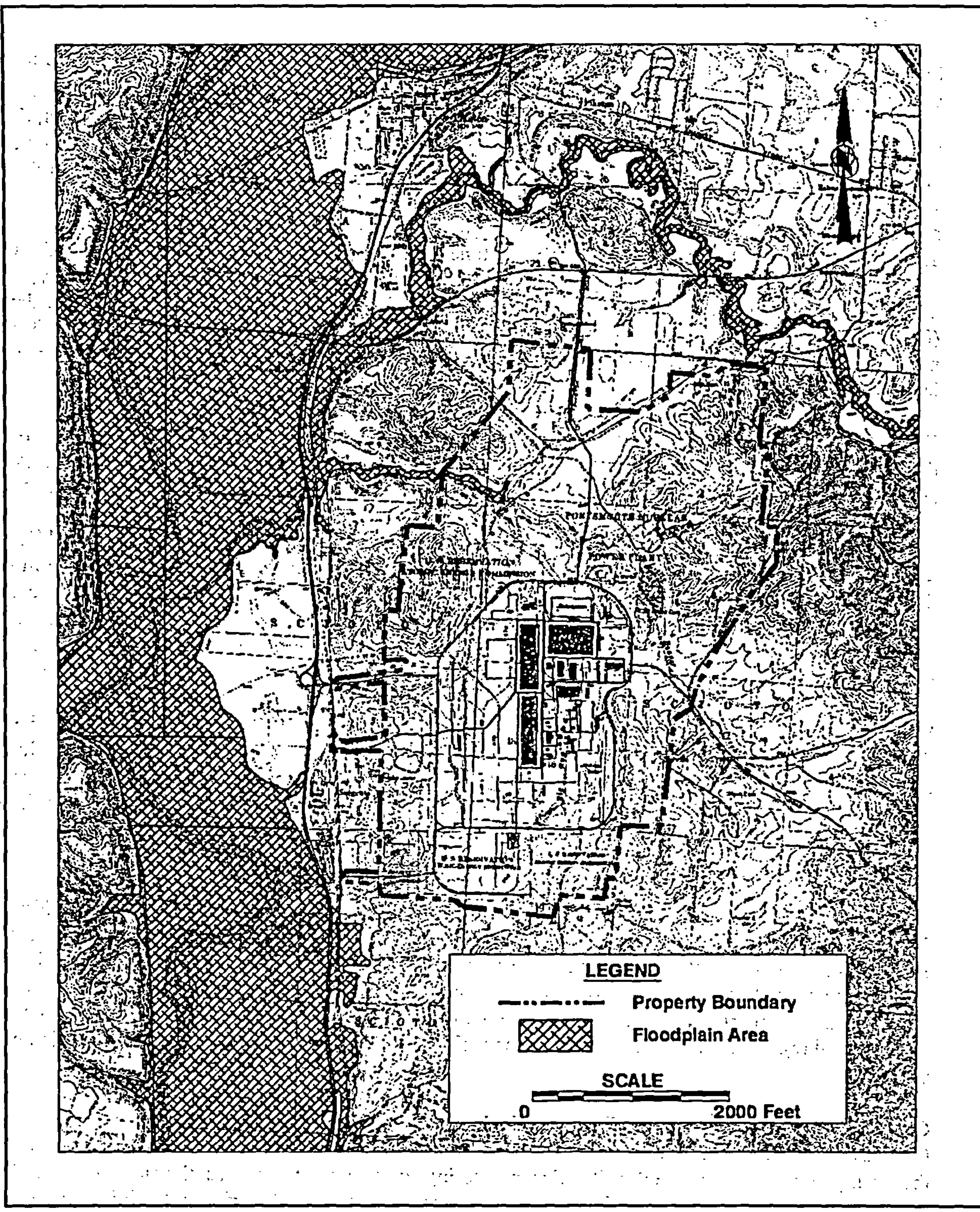

Figure 3-12 Floodplains at the DOE Reservation at Piketon (ODNR, 2005)

3.7.3 Groundwater

Five hydrogeological units are important for groundwater flow and contaminant migration beneath the DOE reservation. These units are: Minford Clay, Gallia Sand, Sunbury Shale, Berea Sandstone, and Bedford Shale. The upper two units form an aquifer in unconsolidated Quaternary aged deposits; the lower three units form a Mississippian-aged bedrock aquifer. At the site, the hydraulic conductivities of all of the units are very low (Geraghty & Miller, Inc., 1989). The most conductive unit is Gallia Sand with a mean hydraulic conductivity of 1 meter per day (3.4 feet per day) and a range of 0.03 to 46 meters per day (0.11 to 150 feet per day); the Gallia Sand acts as the principal conduit for contaminant transport. The next most permeable unit is the Berea Sandstone with a mean hydraulic conductivity of 0.05 meter per day (0.16 foot per day) and a range of 0.0013 to 4.6 meters per day (0.0045 to 15 feet per day). The average conductivity of Minford Clay, the shallowest unit, is estimated to be 7.0×10^{-5} meter per day (0.00023 foot per day) in the upper zone, while the conductivity of the lower zone is about 0.0013 meter per day (0.0042 foot per day). Average groundwater elevation is 196 meters (646 feet) above mean sea level, which is approximately 7.3 meters (24 feet) below ground surface.

Within the upper portion of the bedrock aquifer, permeability is primarily produced by fractures. As depth increases, the presence of fractures decreases, and permeability depends more on porosity, grain size and shape, and packing arrangement (MMES, 1993). At greater depth, the Berea Sandstone is probably more permeable than the shale units, which act as confining layers. The direction of groundwater flow beneath the site is controlled by a complex interaction between the Gallia and Berea units (Geraghty & Miller, Inc., 1989). The flow patterns are also affected by the presence of storm sewer drains and by the reduction in recharge caused by the presence of buildings and paved areas. Groundwater flow patterns in both the Gallia and Berea units are characterized by an east-west-trending groundwater divide. The direction of groundwater flow is generally to the south in the southern sections of the DOE reservation and to the north in the northern sections.

Vertical groundwater flow is generally downward from the Gallia to the Berea. In places where the Sunbury Shale is absent, upward vertical gradients are observed. The extent of the gradient is influenced by the thickness of the Sunbury Shale. Where the Sunbury Shale is thick, the gradient is large. Three main discharge areas exist for the groundwater system beneath the DOE: Little Beaver Creek to the north and east, Big Run Creek to the south, and two unnamed drainages to the west (Geraghty & Miller, Inc., 1989).

The DOE reservation draws its water from three well fields located along the Scioto River (see Figure 3-13). The well fields draw groundwater from the Scioto River buried aquifer and are located in the Scioto River alluvium within the Scioto River floodplain. Recharge of the aquifer occurs from river and stream flow as well as precipitation (annual average rainfall is 103 centimeters [40.7 inches]). The maximum potential production associated with the well fields is 49,000 cubic meters per day (13 million gallons per day). The current production is approximately 19,000 cubic meters per day (5 million gallons per day).

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. For monitoring and treatment purposes, the site was divided into four quadrants roughly corresponding to groundwater flow patterns. The primary facilities for the proposed ACP site are located in Quadrant I; two of the cylinder storage yards are in Quadrant IV. In Quadrant I, groundwater discharges to Big Run Creek and to an unnamed Southwest drainage ditch. In Quadrant IV, groundwater discharges to the Little Beaver Creek and to the East and North drainage ditches.

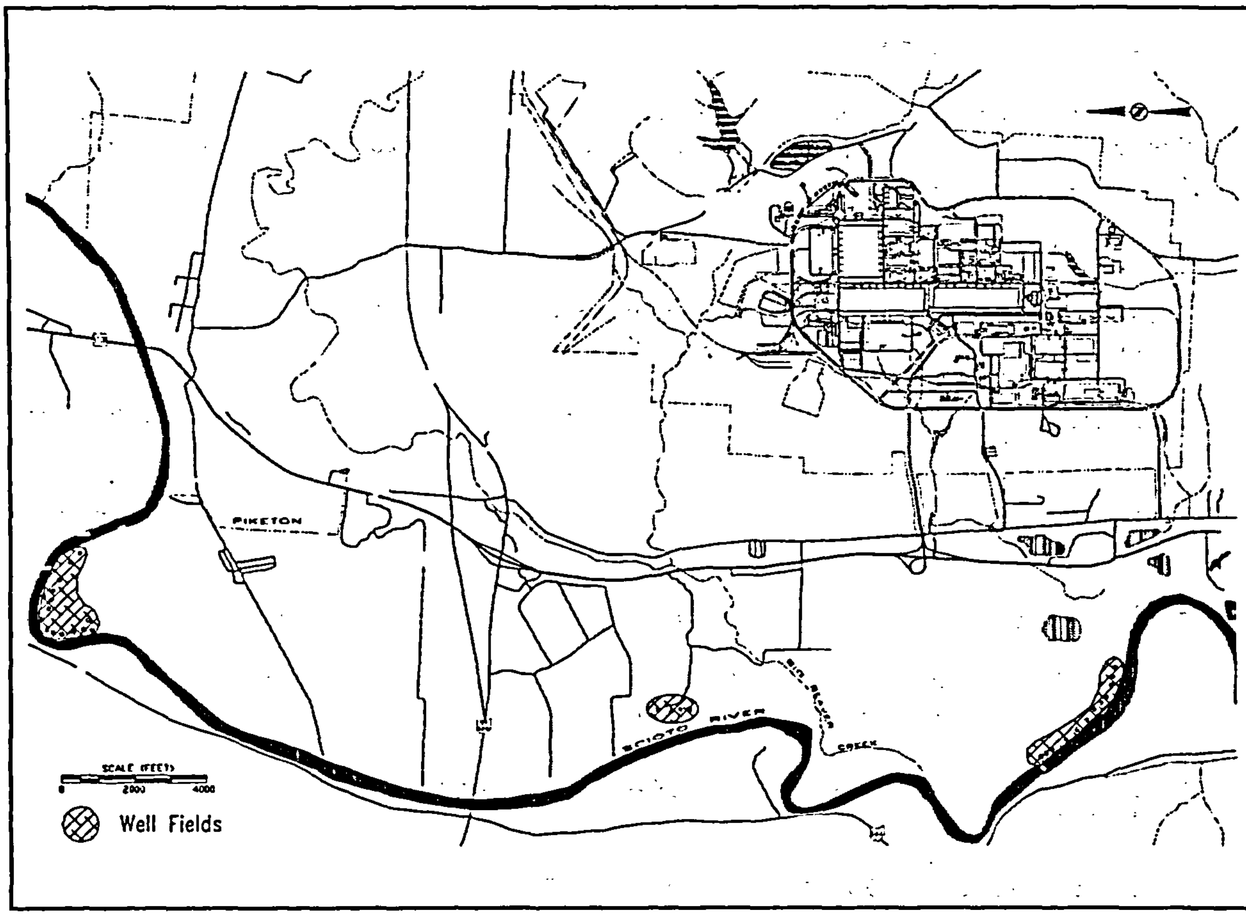

Figure 3-13 Well Fields at the DOE Reservation at Piketon (USEC, 2005)

Onsite, several areas of groundwater contamination have been identified. The main contaminants are volatile organic compounds (mostly trichloroethylene) and radionuclides (e.g., uranium, technetium-99) (DOE, 2002c). Data from the 2000 annual groundwater monitoring showed that five contaminants exceeded primary drinking water standards at the DOE reservation: beryllium, chloroethane, americium, trichloroethylene, and uranium. Alpha and beta activity also exceeded the standards (DOE, 2001a, b). The concentration of contaminants and the lateral extent of the plume did not significantly increase in 2001 (DOE, 2002c).

The primary facilities for the proposed ACP site are located approximately 60 to 90 meters (200 to 300 feet) north of the northern edge of the X-749 trichloroethylene plume. The proposed location for the new cylinder storage yards north of Perimeter Road is between three groundwater monitoring areas: X-533 switchyard, X-734 landfills, and X-735 landfills. Based on 2002 monitoring results, the proposed ACP facilities do not overlie contaminated groundwater. Various monitoring wells are located in the vicinity of the proposed ACP facilities; however, no groundwater extraction wells, phytoremediation areas, or groundwater treatment facilities are located within the footprint of the proposed ACP facilities.

3.8 Ecological Resources

This section describes the ecological resources, including terrestrial resources (flora and fauna); rare, threatened, and endangered species; wetlands; and other environmentally sensitive areas within the DOE reservation at Piketon.

3.8.1 Flora

The vegetative cover in surrounding Pike County consists mostly of hardwood forests and field crops (USEC, 2005). The terrestrial habitat types at the DOE reservation include (DOE, 1997a):

- Old field areas: Early successional stage of disturbed areas dominated by tall weeds, shade-intolerant trees, and shrubs.

- Scrub thicket: Later successional stage covering old field areas dominated by dense thickets of small trees.

- Managed grassland: Open areas actively maintained and dominated by grasses.

- Upland mixed hardwood forest: Mesic to dry upland areas dominated by black walnut, black locust, honey locust, black cherry, and persimmon.

- Pine forest: Advanced successional stage following scrub thicket. The overstory is dominated by Virginia pine.

- Pine plantation: Nearly pure stands of Virginia pines.

- Oak-hickory forest: Well-drained upland soils. White oak and shagbark hickory are the most dominant of the oaks and hickories.

- Riparian forest: Periodically flooded, low areas associated with streams. Dominated by cottonwood, sycamore, willows, silver maple, and black walnut.

- Beech-maple forest: Undisturbed areas dominated by American beech and sugar maple.

- Maple forest: Dominated by sugar maple and other shade-tolerant species.

The habitat types covering the largest area on the reservation are managed grassland (30 percent of total area), oak-hickory forest (17 percent), and upland mixed hardwood forest (11 percent). The areas covered by each habitat type are listed in Table 3-10 and shown in Figure 3-14. Several species of animals have been observed within the DOE reservation property boundary.

Table 3-10 Terrestrial Habitat Types at the DOE Reservation at Piketon

Habitat Type	Approximate Total Area (hectares)	Approximate No. of Communities	Percent of Total Area [a]
Managed grassland	446	Numerous [b]	30
Oak-hickory forest	256	14	17.2
Old field	170	10	11.4
Upland mixed hardwood forest	162	20	10.9
Riparian forest	62	10	4.2
Maple forest	52	7	3.5
Scrub thicket	32	10	2.2
Pine forest	28	10	1.9
Beech-maple forest	38,387	1	0.1
Old white pine plantation with mixed hardwoods	38,387	1	0.1

Notes:
[a] Total site area is 1,486 hectares (3,714 acres). Approximately 252 hectares (629 acres, 16.9 percent) of the total area are covered by buildings, parking lots, and roads. The remainder of the total site area contains aquatic habitat.
[b] This habitat is present in many areas interspersed between buildings and paved areas across the plant site.
To convert hecatares to acres multiply by 2.47.
Source: DOE, 1997b.

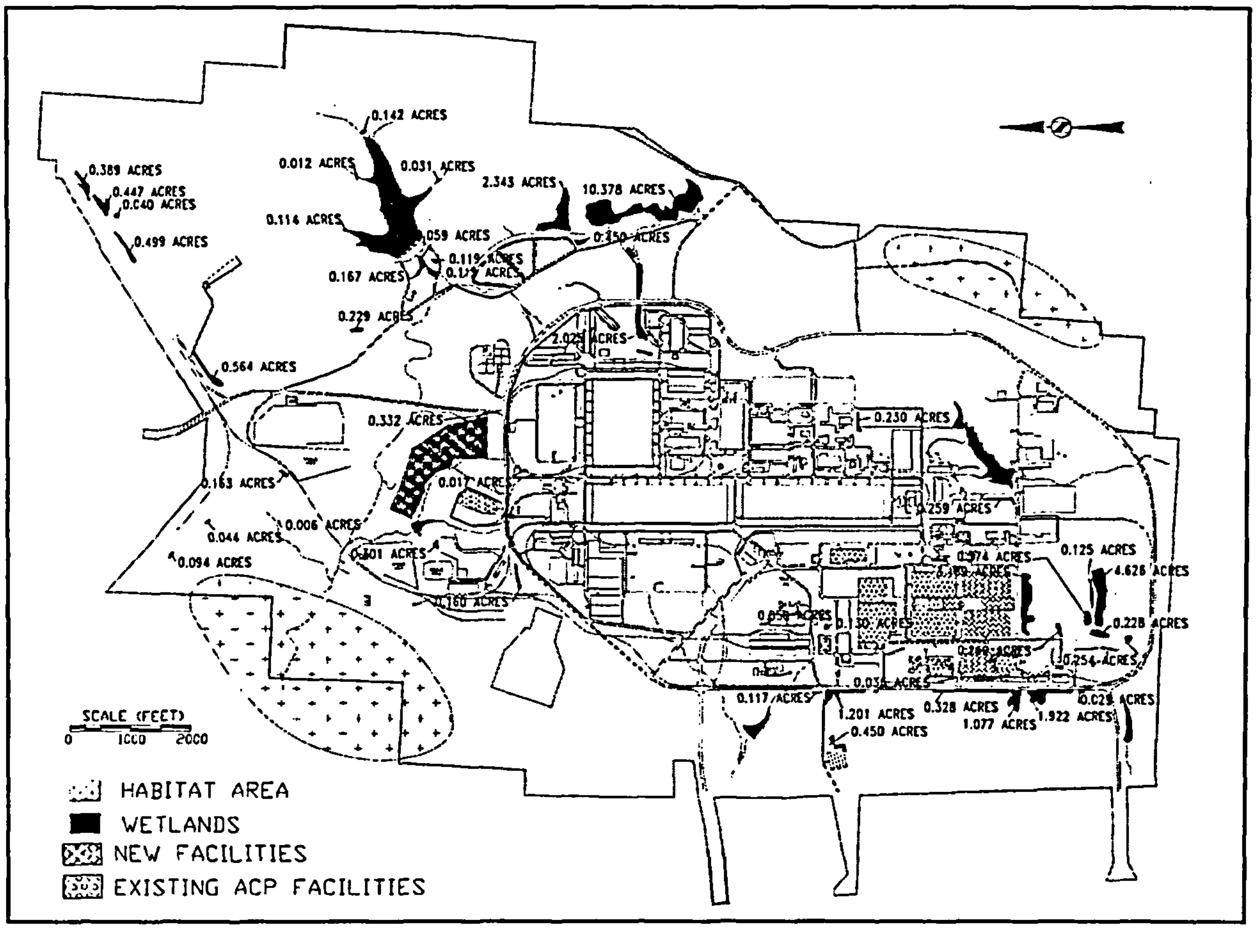

Figure 3-14 Habitat Areas and Wetlands on and Near the Proposed ACP Site (USEC, 2005)

The most common types of vegetation on the DOE reservation include managed grassland, followed by oak-hickory forests, old field communities, and upland mixed hardwood forest, the sum of which make up more than 69 percent of the total area of the reservation. The area in the southwest quadrant of the central area, where the majority of the proposed ACP facilities would be located, is dominated by existing infrastructure (buildings, structures, roads, and parking lots) and managed grasslands. Several wetland communities are also present in the southwest quadrant (see Section 3.8.4). The area where the 745-H Cylinder Storage Yard would be constructed contains managed grasslands, old fields, upland mixed hardwood forest, and riparian forest. Wetlands are also located around the proposed 745-H Cylinder Storage Yard and are associated with the tributaries of Little Beaver Creek.

The flora associated with the wetlands adjacent to the activities associated with the proposed action includes emergent vegetation including sedges, rushes, cat-tails, and various woody species (trees and shrubs) tolerant of the saturated conditions of wetlands.

3.8.2 Fauna

A relatively high diversity of fauna (terrestrial and aquatic species) utilize the various terrestrial and aquatic habitats at the DOE reservation. The reservation is within the home range of approximately 49 mammals, 114 bird species (year-round residents, winter residents, and migratory species), 11 reptile

species, and six amphibian species (USEC, 2005). The most abundant mammals include the white-footed mouse (*Peromyscus leucopus*), short-tailed shrew (*Blarina brevicauda*), opossum (*Didelphis virginiania*), eastern cotton tail rabbit (*Sylvilagus floridanus*), and white-tailed deer (*Odocoileus virginianus*). Common birds found at the reservation include year-round residents, winter residents, and migratory species. The species include red-tailed hawk (*Buteo jamaicensis*); water birds such as the mallard (*Anas platrynchos*) and wood duck (*Aix sponsa*); game birds such as wild turkey (*Meleagris gallopavo*); and non-game birds such as nuthatches (*Sitta* sp.) and wrens (*Troglodytes* sp.). The most common of the 11 reptile species and six species of amphibians observed on the site include the eastern box turtle (*Terrapene carolina*), black rat snake (*Elaphe obsolete*), northern black racer (*Coluber constrictor constrictor*), American toad (*Bufo americanus*) and northern dusky salamander (*Desmognathus fuscus*) (DOE, 1996a).

Common species occurring in open grassland areas like those at the proposed ACP site include eastern cottontail (*Lagomorpha Leporidae*), meadow vole (*Rodentia muridae*), and eastern meadowlark (*Sturnella magna*). Small wooded areas, such as those in the vicinity of the proposed ACP site, support numerous woodland and forest edge species such as raccoon (*Procyon lotor*), gray squirrel (Sciurus carolinensis), red-headed woodpecker (*Melanerpes erythrocephalus*), cardinal (*Cardinalis cardinalis*), white-breasted nuthatch (*Sitta carolinensis*), and yellow-rumped warbler (*Dendroica coronata*). Species that occur in the open grasslands and forest edges that are either actively managed (mowed) or adjacent to developed areas are tolerant of human activities and disturbances.

The aquatic habitats on the DOE reservation include the various holding ponds, intermittent streams, and streams that flow from or through the reservation. The aquatic habitats downgradient of the activities associated with the proposed action include Little Beaver Creek, the West Ditch, and the DOE Piketon Tributary, all of which discharge into the Scioto River. Little Beaver Creek and the West Ditch are designated warm water habitats. Warm water habitats are capable of supporting and maintaining a balanced, integrated, adaptive community of warm water aquatic organisms having a diverse species composition and functional organization. The aquatic habitat associated with Little Beaver Creek supports good to exceptional fish communities downstream of the X-230-J7 discharge from the DOE reservation, and fair fish communities upstream due to intermittent stream flow (OEPA, 1998). The most common of the 34 total fish species and four hybrids found in Little Beaver Creek are the Bluntnose Minnow (*Pimephales notatus*), Central Stoneroller (*Campostoma anomalum*), Creek Chub (*Semotilus atromaculatus*), Rainbow Darter (*Etheostoma caeruleum*), Spotfin Shiner (*Cyprinella spiloptera*), and Striped Shiner (*Luxilus chrysocephalus*). The aquatic habitat associated with the DOE Piketon Tributary is a limited resource water, which does not meet one or more of the warm water habitat characteristics. and provides limited aquatic habitat.

3.8.3 Rare, Threatened, and Endangered Species

The potential existence of Federal and State rare, threatened, and endangered species as well as candidate species in the vicinity of the DOE reservation was determined through a review of previously prepared *National Environmental Policy Act* documents, reviewing the results of previous site-specific studies, and through consultation with the Ohio Department of Natural Resources, Division of Wildlife and Division of Natural Areas and Preserves, and the U.S. Fish and Wildlife Service.

The review of the previous documents and site-specific studies, as well as the consultations indicated that the Indiana bat (*Myotis sodalis*) a Federally listed endangered species; the Carolina yellow-eyed grass (*Xyris difformis*) and the sharp-shinned hawk (*Accipiter striatus*), both Ohio State-listed endangered species; the Virginia meadow-beauty (*Rhexia virginica*), an Ohio State-listed potentially threatened plant; and the rough green snake (*Opheodrys aestivus*), an Ohio State-listed special interest species may occur or have been found on the DOE reservation. Other species that have been identified in the region, but not

on the DOE reservation include the Timber rattlesnake (*Crotalus horridus*), and the long-beaked arrowhead (*Sagittaria australis*). Table 3-11 lists the threatened, endangered, rare, and species of concern in the vicinity of the DOE reservation.

Table 3-11 Federal and State Listed Endangered, Potentially Threatened, and Special Concern Species near the DOE Reservation at Piketon

Category and Scientific Name	Common Name	Status [a]	
		Federal	State
Mammals			
Myotis sodalis	Indiana bat	E	E
Birds			
Accipiter striatus	Sharp-shinned hawk	NL	E
Reptiles			
Crotalus horridus horridus [b]	Timber rattlesnake	NL	E
Opheodrys aestivus	Rough green snake	NL	S
Plants			
Rhexia virginica	Virginia meadow-beauty	NL	P
Xyris difformis	Carolina yellow-eyed grass	NL	E
Sagittaria australis [b]	Long-beaked arrowhead	NL	T

Notes:
[a] E = endangered; P = potentially threatened; S = special concern; T = threatened, NL = not listed.
[b] Not located on the DOE reservation; located in the region.
Source: DOE, 1993a; DOE, 1996b.

Past and current consultations with the U.S. Fish and Wildlife Service indicate that some of the riparian areas on the DOE reservation may be suitable summer habitat for the Indiana bat. In 1994 and 1996, DOE conducted an onsite surveys to identify suitable habitat and then conducted mist netting in those areas to determine if Indiana bats were present. The surveys identified two potential riparian areas for Indiana bats and the mist netting results documented four different species of bats in the two riparian areas, but no Indiana bats were identified.

Past isolated sightings of State-listed species on the DOE reservation include the sharp-shinned hawk and the rough green snake, but no recent sightings have been reported (DOE, 1993a; DOE, 1996b).

The Virginia meadow-beauty has been found near X-611a, a former sludge lagoon, and the Carolina yellow-eyed grass has been tentatively identified at the X-611b sludge lagoon. The Virginia meadow-beauty is associated with the wetlands of the former sludge lagoon and its preferred habitat is on wet, sandy soils, particularly in sandy swamps. The Carolina yellow-eyed grass was observed in 1994; however, formal documentation of the species could not be performed as the grass was not in fruit or flower. Carolina yellow-eyed grass prefers wet peaty or sandy soils typically found in marshes or bogs.

The Ohio EPA determined that two State endangered fish species and four State threatened fish species exist near the DOE reservation, but are restricted to the Scioto River. Little Beaver Creek, the main body of water running through the site, does not provide sufficient habitat to support threatened or endangered species of fish. (OEPA, 1997)

3.8.4 Wetlands

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (U.S. ACE, 1987). Wetlands generally include swamps, marshes, bogs, and similar areas. The DOE reservation contains 45 wetlands (41 jurisdictional and 4 non-jurisdictional wetlands) totaling 14 hectares (34 acres), excluding retention ponds and streams (DOE, 2003b). Jurisdictional wetlands fall under the protection of Section 404 of the *Clean Water Act*, while non-jurisdictional wetlands do not fall under Federal protection. The locations of these onsite wetlands are shown in Figure 3-14. The majority of the wetlands are associated with wet fields, areas of previous disturbance, drainage ditches, or wet areas along roads and railway tracks. Wetlands on the proposed site primarily support emergent vegetation like cattail, great bulrush, and rush. Palustrine forested wetlands occur along Little Beaver Creek (DOE, 1996c). Table 3-12 lists the jurisdictional wetlands, their size, current status and location in relation to the activities associated with the proposed action.

Table 3-12 Wetlands on the DOE Reservation Associated with the Proposed Action

Hectares	Location	Associated With
Wetlands in proximity to proposed primary facilities		
0.13	West Perimeter Road	Drainage swale
0.44	West Perimeter Road	Drainage swale
0.78	West Perimeter Road	Drainage swale
0.11	X-2207 Parking	Drainage ditch
1.3	Former Gas Centrifuge Enrichment Process site	Wet field
0.11	Former Gas Centrifuge Enrichment Process site	Wet field
0.15	Former Gas Centrifuge Enrichment Process site	Wet field
0.05	Former Gas Centrifuge Enrichment Process site	Wet field
1.9	Former Gas Centrifuge Enrichment Process site	Wet field
0.10	Former Gas Centrifuge Enrichment Process site	Wet field
0.10	Former Gas Centrifuge Enrichment Process site	Wet field
Wetlands in proximity to the two proposed cylinder storage yards		
0.13	North Access Road	Drainage ditch
0.01	X-7456 Cylinder Yard	Drainage ditch
0.07	X-752 Warehouse	Man-made ditch
0.08	X-747H landfill	Radioactive area

Notes:
Q1 corresponds to the southwest quadrant of the DOE reservation; Q4 corresponds with the northwest quadrant of the reservation.
To convert hectares to acres multiply by 2.47.

Although there are wetlands directly south and west of the proposed ACP site, as shown in Figure 3-14, there are no wetlands directly on the proposed ACP site where there would be new construction and operations. The wetlands near the proposed ACP site have poorly drained soils from previous grading activities and receive the surface runoff from the surrounding landscape. Along the southern border of the proposed ACP site is a large palustrine emergent wetland (1.3 hectares [3.2 acres]), composed

primarily of cattails, and one small wetland (0.12 hectare (0.3 acre)). To the west of the proposed ACP site, across the Perimeter Road are six additional wetland areas, each with an area of approximately 0.5 hectare (1 acre) or less. One extremely small wetland (0.05 hectare [0.13 acre]) is located farther to the north of the proposed ACP site. As discussed above, drainage from the proposed site would exit via the southwest drainage ditch via the Southwest Holding Pond in the vicinity of the wetlands to the south of the proposed ACP.

The proposed ACP site in the southwest quadrant of the reservation includes five of the seven proposed cylinder storage yards that would support the ACP. The remaining two proposed cylinder storage yards, X-745G-2 and X-745H, would be located just north of the Perimeter Road. X-745G-2 is an existing yard, while X-745H would require new construction prior to its use. Three isolated wetlands, each less than 0.5 hectare (1 acre) and a number of small tributaries to Little Beaver Creek are located in the vicinity of these two proposed cylinder storage yards. Drainage from these yards would exit via the X-230L North Holding Pond, which discharges into Little Beaver Creek.

3.8.5 Environmentally Sensitive Areas

There are no State or national parks, conservation areas, wild and scenic rivers, or other areas of recreational, ecological, scenic, or aesthetic importance at the proposed ACP site or within a 1.6-kilometer (1-mile) radius of the DOE reservation (ODNR, 2003)

3.9 Socioeconomic Conditions and Local Community Services

This section describes current socioeconomic conditions and local community services within the region of influence of the proposed action. The region of influence is defined as a four-county area in southern Ohio comprising Jackson, Pike, Ross, and Scioto counties. This region encompasses the area in which workers are expected to spend most of their salary, and in which a significant portion of site purchase and non-payroll expenditures from the construction, manufacturing, operation, and decontamination and decommissioning phases of the proposed ACP are expected to take place. The counties included in the region of influence were selected primarily on the basis of the current residential locations of United States Enrichment Corporation and USEC workers at the DOE reservation in Pike County, where the proposed ACP would be located. Currently, approximately 92 percent of these workers reside in the four selected counties (USEC, 2005). Geographically, Ross, Jackson, and Scioto counties bound Pike County to the North, East and South, respectively (see Figure 3-1).

3.9.1 Population Characteristics

The population in the region of influence is characterized in terms of the major population centers around the proposed site, population growth trends, residential locations of current workers on the DOE reservation, and significant transient and special populations. The extent to which surrounding populations qualify as minority or low-income is discussed in the environmental justice evaluation in Section 3.10.

3.9.1.1 Major Population Centers

The major population centers in the region of influence are as follows (see Figure 3-15):

- **Piketon** is the nearest residential center to the DOE reservation. Located in Pike County, this town is approximately 6.4 kilometers (4 miles) north of the DOE reservation on U.S. Route 23. In 2000, the population of Piketon was 1,907 (ODOD, 2003).

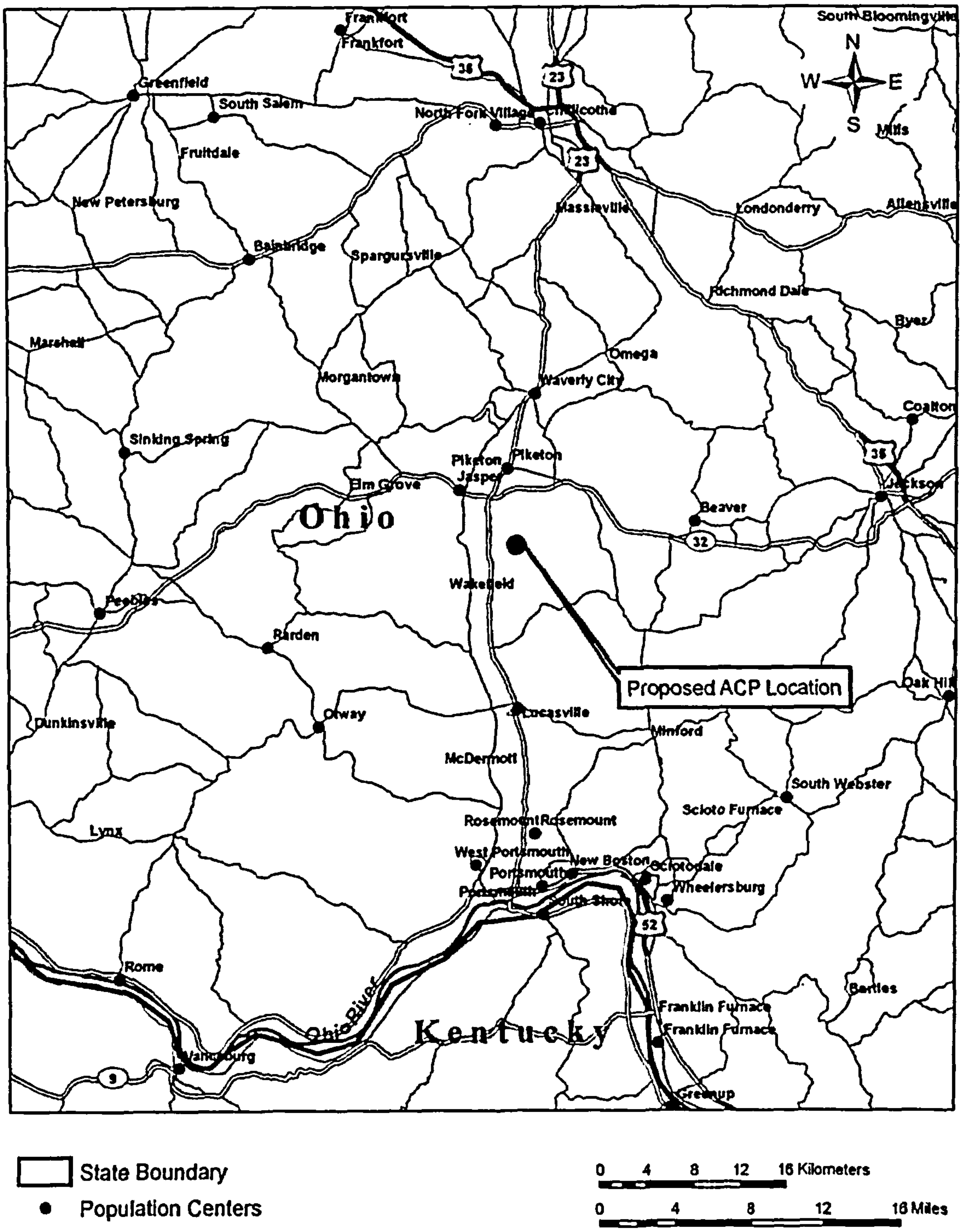

Figure 3-15 Population Centers in the Vicinity of the DOE Reservation

- Waverly is the largest town in Pike County. Located 13 kilometers (8 miles) north of the DOE reservation, the population of Waverly was 4,433 in 2000 (ODOD, 2003).

- The largest population center in the region of influence is Chillicothe, which is located in Ross County. Chillicothe is 43 kilometers (27 miles) north of the DOE reservation, and had a population of 21,796 in 2000 (ODOD, 2003).

- Other surrounding population centers include Portsmouth, which is in Scioto County and is 43 kilometers (27 miles) south of the DOE reservation. The population of Portsmouth was 20,909 in 2000 (ODOD, 2003).

- The town of Jackson is located in Jackson County and is 42 kilometers (26 miles) east of the DOE reservation. In 2000, Jackson's population was 6,184 (ODOD, 2003).

Figure 3-16 shows the population density surrounding the DOE reservation.

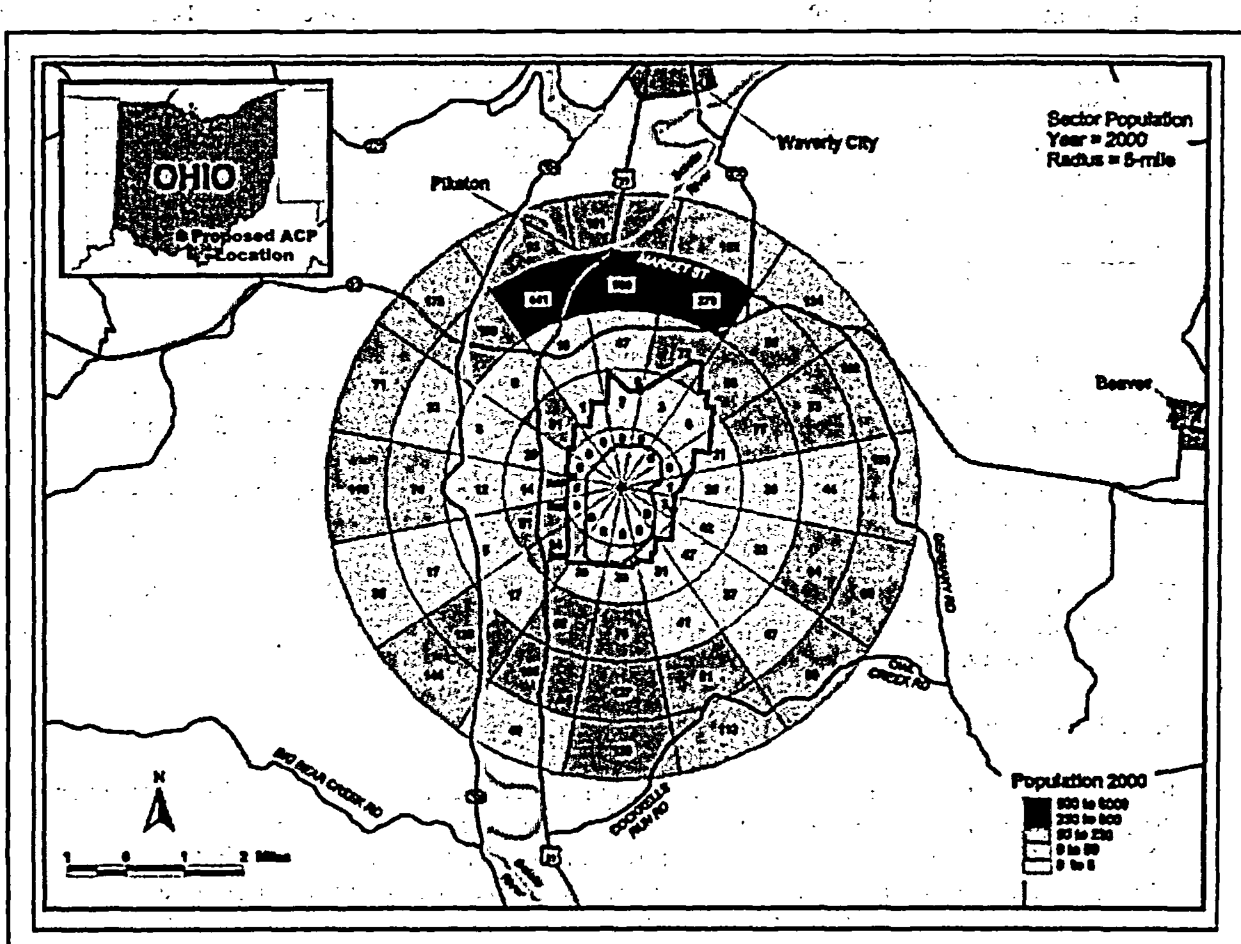

Figure 3-16 Population Density Surrounding the DOE Reservation at Piketon (USEC, 2004a)

3.9.1.2 Population Growth Trends

Table 3-13 presents historic and projected populations in the region of influence and State as a whole. As shown, the population of the region of influence was 212,876 people in 2000, having grown 4.3 percent since 1990 (ODOD, 2003). This growth was marginally lower than the Ohio population growth rate of 4.7 percent in the same decade.

Table 3-13 Population in the Proposed ACP Region of Influence and Ohio in 1990, 2000, and 2010

Location	1990	2000	Average Annual Percent Growth Rate 1990-2000	2010 (Projected)	Percent Growth 1990-2000	Percent Growth 2000-2010 (projected)
Pike County	24,249	27,695	1.3	29,766	14.2	7.5
Scioto County	80,327	79,195	-0.1	78,823	-1.4	-0.5
Jackson County	30,230	32,641	0.8	34,022	8	4.2
Ross County	69,330	73,345	0.6	78,380	5.8	6.9
Region of Influence	204,136	212,876	0.4	220,991	4.3	3.8
Ohio	10,847,120	11,353,140	0.5	11,666,850	4.7	2.8

Source: ODOD, 2003.

During the 1990s, each of the counties in the region of influence, with the exception of Scioto County, experienced a growth in population. Pike County recorded a population growth rate of 14.2 percent between 1990 and 2000, while Jackson and Ross counties grew by 8 percent and 5.8 percent, respectively, in the same decade. The growth rates for these three counties exceeded Ohio's overall growth rates in that period. In contrast, Scioto County registered a marginal decline (-1.4 percent) in population between 1990 and 2000.

The area population is expected to increase by 3.8 percent by the year 2010, compared to a projected overall Ohio growth rate of 2.8 percent in the same period. All counties in the region of influence, except for Scioto County, are projected to experience positive population growth between 2000 and 2010.

3.9.1.3 Residential Locations of Workers

In January 2004, there were 1,223 United States Enrichment Corporation and USEC workers employed at the DOE reservation (reflecting the current cold standby status) (USEC, 2005). Of these workers, 49 percent live in Scioto County, 22 percent live in Pike County, 12 percent live in Ross County, and 10 percent live in Jackson County (USEC, 2005). The remaining eight percent of United States Enrichment Corporation and USEC workers live outside the region of influence (USEC, 2005).

3.9.1.4 Significant Transient and Special Populations

In addition to the residential population, there are institutional, transient, and seasonal populations in the area. Institutional populations include school and hospital populations and are described in Sections 3.9.3.2 and 3.9.3.3.

The transient population consists of visitors participating in various seasonal, social, and recreation activities within the local area. Seasonal populations are also present. For example, usage of Lake White State Park, located approximately 9.7 kilometers (6 miles) north of the DOE reservation, is occasionally heavy and concentrated on the 37 hectares (92 acres) of land closest to the lake. Most of the land surrounding the lake is privately owned. The 136-hectare (337-acre) Lake White offers recreation (i.e., boating, fishing, water skiing, and swimming). There are 10 non-electric campsites for primitive overnight camping (USEC, 2005). These populations are likely to be unaffected by the proposed action due to the distance from the proposed ACP.

3.9.2 Economic Trends and Characteristics

This section describes employment in the region of influence, and at the DOE reservation in particular. It also describes per capita income in the region.

3.9.2.1 Employment in the Region of Influence

The past decade has seen a slight employment shift from the government, construction, and farm sectors towards the service, wholesale and retail trade, and manufacturing sectors within the region of influence. The service sector provides the highest percentage of employment in the region, at 24.7 percent, followed closely by the wholesale and retail trade with 21.7 percent, manufacturing with 17.9 percent, and government enterprises with 16.6 percent (BEA, 2002a).

Tables 3-14 through 3-17 summarize county-specific trends in employment in the region of influence. Pike County shows a substantially higher rate of manufacturing employment than other counties; and Scioto County shows the highest rate of services employment.

Table 3-14 Employment in Pike County by Industry in 1990 and 2000

Sector	No. of People Employed in 1990	Percentage of County Total	No. of People Employed in 2000	Percentage of County Total	Growth Rate 1990-2000
Services	1,666	16.5	2,410	16.1	44.7
Wholesale and Retail Trade	1,498	15.6	2,450	16.4	55.3
Government and Government Enterprises	1,556	15.4	1,859	12.4	19.5
Manufacturing	3,567	35.3	5,748	38.5	61.1
Construction	483	4.8	869	5.8	79.9
Finance, Insurance, and Real Estate	244	2.4	556	3.7	127.9
Transportation and Public Utilities	365	3.6	501	3.4	37.3
Farm Employment	548	5.4	551	3.7	0.5
Mining	32	0.3	Not Available	Not Available	Not Available
Other Sectors	52	0.5	Not Available	Not Available	Not Available
Total	10,091	100	14,944	100	48.1

Source: BEA, 2002a.

Table 3-15 Employment in Scioto County by Industry in 1990 and 2000

Sector	No. of People Employed in 1990	Percentage of County Total	No. of People Employed in 2000	Percentage of County Total	Percent Growth Rate 1990-2000
Services	7,810	28.2	10,134	31.1	29.8
Wholesale and Retail Trade	6,739	24.3	7,816	24	16
Government and Government Enterprises	5,370	19.4	6,120	18.8	14
Manufacturing	2,299	8.3	2,714	8.3	18.1
Construction	1,640	5.9	1,861	5.7	13.5
Finance, Insurance, and Real Estate	1,333	4.8	1,367	4.2	2.6
Transportation and Public Utilities	1,443	5.2	1,390	4.3	-3.7
Farm Employment	844	3	823	2.5	-2.5
Mining	43	0.2	23	0.1	-46.5
Other Sectors	189	0.7	289	0.9	52.9
Total	27,710	100	32,537	100	17.4

Source: BEA, 2002a.

Table 3-16 Employment in Jackson County by Industry in 1990 and 2000

Sector	No. of People Employed in 1990	Percentage of County Total	No. of People Employed in 2000	Percentage of County Total	Percent Growth Rate 1990-2000
Services	2,481	21.6	2,867	20.4	15.6
Wholesale and Retail Trade	2,472	21.5	3,196	22.7	29.3
Government and Government Enterprises	1,455	12.7	1,585	11.3	8.9
Manufacturing	2,661	23.2	4,027	28.6	51.3
Construction	556	4.8	Not Available	Not Available	Not Available
Finance, Insurance, and Real Estate	467	4.1	714	5.1	52.9
Transportation and Public Utilities	500	4.4	570	4.1	14
Farm Employment	694	6	736	5.2	6.1
Mining	149	1.3	362	2.6	143
Other Sectors	48	0.4	Not Available	Not Available	Not Available
Total	11,483	100	14,057	100	22.4

Source: BEA, 2002a.

Table 3-17 Employment in Ross County by Industry in 1990 and 2000

Sector	No. of People Employed in 1990	Percentage of County Total	No. of People Employed in 2000	Percentage of County Total	Percent Growth Rate 1990-2000
Services	6,191	21.7	8,763	25.2	41.5
Wholesale and Retail Trade	5,998	21	7,855	22.6	31
Government and Government Enterprises	6,052	21.2	6,762	19.4	11.7
Manufacturing	5,395	18.9	5,119	14.7	-5.1
Construction	1,401	4.9	1,728	5	23.3
Finance, Insurance, and Real Estate	1,001	3.5	1,378	4	37.7
Transportation and Public Utilities	1,055	3.7	1,978	5.7	87.5
Farm Employment	1,218	4.3	1,226	3.5	0.7
Mining	40	0.1	Not Available	Not Available	Not Available
Other Sectors	170	0.6	Not Available	Not Available	Not Available
Total	28,521	100	34,809	100	22.1

Source: BEA, 2002a.

The unemployment rate in the region of influence is higher than for the State as a whole. The regional unemployment rate, which was 7.8 percent in 1998, was 7.7 percent as of 2002, as shown in Table 3-18. The average unemployment rate for the State of Ohio was 5.7 percent in 2002, up from 4.3 percent in 1998 (ODOD, 2003).

Table 3-18 Unemployment Rates (percent)

Area	1998	2002
Jackson County	7	7.9
Pike County	8.8	8.9
Ross County	5.8	6.2
Scioto County	9.5	7.8
Region of Influence Total	7.8	7.7
Ohio	4.3	5.7

Source: ODOD, 2003.

The region of influence experienced stable growth in employment levels in recent years. Employment growth outpaced labor force growth, increasing from 86,900 in 1998 to 88,500 in 2002, for a growth rate of 1.8 percent for that period (ODOD, 2003). The labor force grew from 94,100 in 1998 to 95,500 in 2002, for a growth rate of 1.5 percent for that period (ODOD, 2003).

Although the overall region of influence unemployment rate decreased between 1998 and 2002, there are cross-county differences in employment trends within the region. Only Scioto County experienced a decline in unemployment levels between 1998 and 2002. Jackson, Pike, and Ross counties registered increases in unemployment rates in the same period.

3.9.2.2 Reservation Employment

As reported in Section 3.9.1.3, United States Enrichment Corporation and USEC employed a total of 1,223 workers at the site, as of January 2004. This number is approximately 11 percent of the total individuals working within Pike County. In addition, the DOE Bechtel Jacobs Company, LLC, subcontractors, and the Ohio Army National Guard employ an additional 374 workers at the DOE reservation (USEC, 2005).

3.9.2.3 Income

Table 3-19 summarizes personal income data for the region of influence for the years 1990, 2000, and 2002.

Table 3-19 Personal Income in the Region of Influence 1990, 2000, and 2002

Location and Type of Income	1990	2000	Percent Nominal Income Growth Rate 1990-2000	2002
Jackson County				
Total Personal Income (thousands of 2002$)	385,323	632,003	64	663,557
Personal per Capita Income (2002$)	12,743	19,362	52	20,112
Pike County				
Total Personal Income (thousands of 2002$)	300,851	547,173	82	574,226
Personal per Capita Income (2002$)	12,355	19,714	60	20,491
Ross County				
Total Personal Income (thousands of 2002$)	977,594	1,631,847	67	1,711,909
Personal per Capita Income (2002$)	14,086	22,219	58	23,015
Scioto County				
Total Personal Income (thousands of 2002$)	1,030,961	1,558,985	51	1,631,353
Personal per Capita Income (2002$)	12,827	19,716	54	20,890
Total Region of Influence				
Total Personal Income (thousands of 2002$)	2,694,729	4,370,008	62	4,581,045
Average Personal per Capita Income (2002$)	13,003	20,252	56	21,127

Source: BEA, 2002b.

Key conclusions that can be drawn from these data include:

- Per capita income in the region was $20,255 in 2000. This is 28.2 percent lower than the State of Ohio's average per capita income of $28,208 in the same year (BEA, 2002b).

- Per capita income in 2000 in the region of influence recorded a 56 percent nominal increase (not adjusted for inflation) from the 1990 level of $13,003 (BEA, 2002b). After adjusting for inflation, this equates to a 26.6 percent increase in real income in the region over that period.

- Per capita incomes in the region of influence vary significantly from one county to the next, ranging from a low of $20,449 in Jackson County to a high of $23,123 in Ross County in 2002 (BEA, 2002b).

For the purposes of quantifying socioeconomic impacts in Section 4.2.10, the analysis uses an average per capita income estimate of $25,317 (2004$) (USEC, 2005).

3.9.3 Housing Resources and Community and Social Services

This section describes housing and social services in the region, including: schools; hospitals and nursing homes; law enforcement, fire fighting, and other public services; and infrastructure and utilities. The social service centers located within 8 kilometers (5 miles) of the DOE reservation are shown in Figure 3-17.

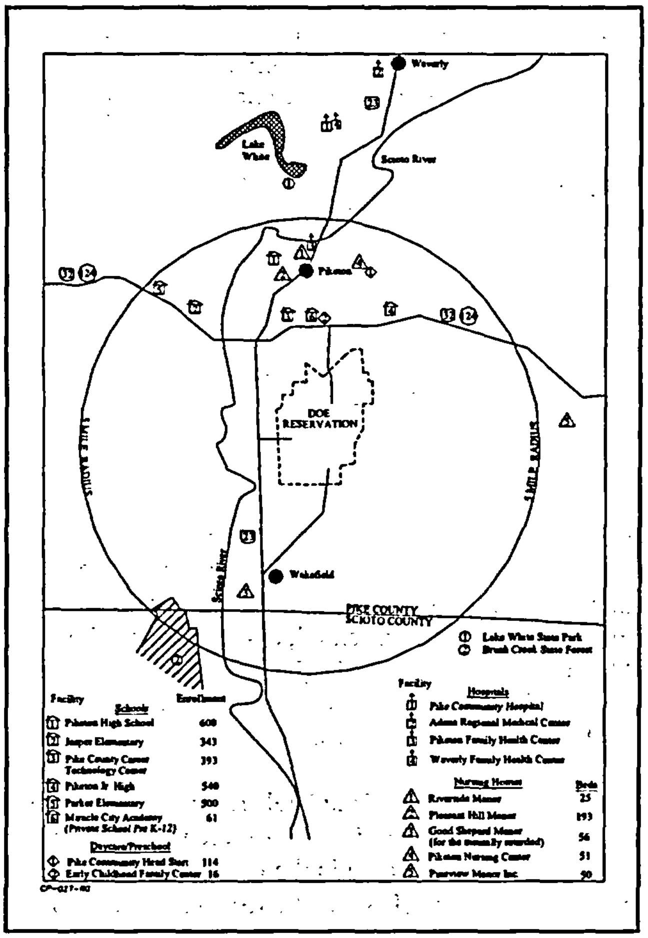

Figure 3-17 Social Service Centers within 8 Kilometers (5 Miles) of the DOE Reservation at Piketon (USEC, 2005)

3.9.3.1 Housing

Detailed housing characteristics for the region of influence are presented in Table 3-20. Between 1990 and 2000, all four counties registered an increase in the total number of owner-occupied and rental housing units (ODOD, 2003). Vacancy rates among rental units rose in each county during this period. As of 2000, there was an 8.6 percent vacancy rate among rental units (amounting to 1,963 vacant rental units) and an 1.8 percent vacancy rate among owner occupied units (amounting to 1,048 vacant owner-occupied units) in the region (U.S. Bureau of the Census, 2000). Housing density in the region of influence averages 106.7 units per square kilometer (41.2 units per square mile), and the median value is $74,550 (ODOD, 2003). In contrast, the Ohio State average housing density is 302.5 units per square kilometer (116.8 units per square mile), and the median value is $103,700 for the State (ODOD, 2003).

Table 3-20 Region of Influence Housing Characteristics, 2000

Location	Number of Owner-Occupied Units	Percent Vacancy Rate Owner-Occupied Units	Number of Rental Units	Percent Vacancy Rate Rental Units	Housing Density (units per square kilometer/units per square mile)	Median Value (2000$)
Jackson County	9,328	1.7	3,291	8.6	85.7/33.1	$70,400
Pike County	7,314	2	3,130	8.5	68.1/26.3	$77,400
Ross County	19,958	1.8	7,178	7.5	109.6/42.3	$87,000
Scioto County	21,646	1.9	9,225	9.5	144.0/55.6	$63,400
Region of Influence Total	58,246	1.8	22,824	8.6	106.7/41.2	$74,550

Source: U.S. Bureau of the Census, 2000 and ODOD, 2003.

3.9.3.2 Schools

The two school systems in the area are the Pike County Schools and the Scioto County Schools. However, only Pike County has school facilities within 8 kilometers (5 miles) of the DOE reservation: one private school that includes preschool through grade 12; two elementary schools, both of which include a preschool program; one junior high school; and one high school. The combined enrollment for the school year 2003-2004 is approximately 2,437 (USEC, 2004b). The total school population within 8 kilometers (5 miles), including faculty and staff, is 2,718 (USEC, 2005). The proximity of these schools to the DOE reservation and their enrollments are shown in Figure 3-17.

Four facilities within 8 kilometers (5 miles) of the DOE reservation provide daycare or schooling for preschool-aged children and after-school care for school-aged children. One facility has 114 registered children and is located in Piketon. The children in the remaining three facilities are consolidated in the numbers provided in the above paragraph (USEC, 2004b). The locations of these facilities are shown in Figure 3-17.

Table 3-21 presents school district data for the region of influence (ODOD, 2003). It is apparent that the student-to-teacher ratio in Jackson, Ross, and Pike counties is higher than the Ohio average.

Table 3-21 School District Data for the Region of Influence in 2000

Location	Number of Teachers	Student-to-Teacher Ratio
Jackson County	330	17.1
Pike County	364	15
Ross County	828	15.1
Scioto County	895	14.8
State of Ohio	117,955	14.8

Source: *ODOD, 2003.*

3.9.3.3 Hospitals and Nursing Homes

Pike Community Hospital is the hospital closest to the DOE reservation, and is located approximately 12 kilometers (7.5 miles) north of the DOE reservation on State Route 104 south of Waverly. USEC's onsite health protection program provides services for individuals to meet regulatory requirements and to *maintain a high level of employee health. The X-1007 Fire Station maintains a first aid room and* provides ambulance service for emergency conditions. Pike Community Hospital will provide healthcare services to ACP workers (USEC, 2005). The facility has 66 licensed beds. No other acute care facilities are located in Pike County. Adena Health Center operates as an urgent care facility, located approximately 12 kilometers (7.5 miles) north of the DOE reservation. Piketon and Waverly Family Health Centers, both located north of the DOE reservation, are also available during working hours for minor emergencies. The locations of these facilities are shown in Figure 3-17.

Three licensed nursing homes are located in the Piketon area, an additional one is in Wakefield, and another in Beaver. Four of these five nursing homes are located within 8 kilometers (5 miles) of the DOE reservation. The largest of these facilities is a 193-bed facility in Piketon. The combined licensed capacity of the facilities neighboring the DOE reservation is approximately 375. Figure 3-17 depicts these facilities and shows the number of beds per facility.

Table 3-22 provides data on the number of physicians, level of service (number of physicians per 1,000 persons), and hospitals in the region of influence counties in the year 2000. These data indicate that all counties in the region had a lower level of service than the Ohio average, which is 3.3 physicians per 1,000 persons (ODOD, 2003).

Table 3-22 Physicians and Hospitals in the Region of Influence in 2000

County	Physicians		Hospitals	
	Number of Physicians	Level of Service [a]	Number of Registered Hospitals	Number of Beds
Jackson	27	0.83	1	24
Pike	28	0.99	1	66
Ross	135	1.84	1	262
Scioto	139	1.76	1	421

Notes:
[a] Level of service denotes the number of physicians per 1,000 persons.
Source: ODOD, 2003.

3.9.3.4 Law Enforcement, Fire Fighting, and Other Public Services

Several State, county, and local police departments provide law enforcement in the region of influence. Pike County, which is where the DOE reservation is located, has 19 officers and will provide law enforcement services to the site. Other counties in the region have a total of 101 full-time officers, 16 in Jackson, 32 in Ross, and 53 in Scioto (FBI, 2000).

According to the U.S. Fire Administration's National Fire Department Census Database, there are 43 career and volunteer fire departments in the region of influence (USFA, 2005). The career fire departments include Portsmouth Fire Department, which has three engine houses comprising four engines, two ladders, and one rescue vehicle (PFD, 2005). In addition, the Chillicothe Fire Department consists of three units, each with 13 firefighters; three emergency medical service vehicles; and one 100-foot platform (CFD, 2005).

3.9.3.5 Infrastructure and Utilities

Historically, there has been very little overlap between utilities providing services to communities in the region of influence and those supporting the Portsmouth Gaseous Diffusion Plant. With the exception of natural gas and landfill services, dedicated utilities were developed to support the needs of the Portsmouth Gaseous Diffusion Plant. These dedicated utilities are expected to have more than adequate capacity to continue serving the ACP under the proposed action. Currently, there is a 5-centimeter (2-inch) diameter natural gas supply line to the Portsmouth Gaseous Diffusion Plant; the proposed action will not require augmentation of this supply line. For most utilities, therefore, the communities in the region of influence and the proposed action draw on a mutually exclusive set of suppliers. For this reason, no further details are provided on the capacity and structure of utility markets in the region of influence.

The proposed action is likely to share landfill facilities with the communities in the region of influence. The Pike County landfill is expected to be the primary endpoint for sanitary/industrial waste disposal and the Rumpke Beach Hollow landfill will be an alternative destination for these wastes. The project capacities and use of each are presented in Table 3-23.

Table 3-23 Capacity of Landfills in the Region of Influence

Landfill	Capacity	Space	Municipalities Using Landfill
Pike County Landfill	1,800 metric tons/day	34 more years	Jackson, Scioto, Pike, Lawrence, Adams, Brown, Highland and Ross
Rumpke Beach Hollow Landfill	240 metric tons/day	82 more years	Jackson, Wellston and Oak Hill

Notes:
To convert metric tons to tons multiply by 1.1.
Source: USEC, 2005.

3.9.4 Tax Structure and Distribution

The average property tax rates for Ohio cities are divided into three separate classifications: Class I Real (residential and agricultural), Class II Real (commercial, industrial, mineral, and public utility), and Class III Tangible Personal (general and public utility). For Waverly, in Pike County, the rate is $0.07412 per $1,000 for all three classifications; for Portsmouth, in Scioto County, the rate is $0.06663 per $1,000 for all three classifications; for Jackson, in Jackson County, the rate is $0.04864 per $1,000 for all three classifications; and in Chillicothe, in Ross County, the Class I rate is $0.05401, the Class II rate is $0.05386, and the Class III rate is $0.05405 per $1,000 (Ohio Department of Taxation, 2003).

The State of Ohio has a graduated personal income tax. For example, the tax rate for incomes ranging from $20,000 to $40,000 is $445.80 plus 4.5 percent of excess over $20,000. For incomes ranging from $40,000 to $80,000, the tax rate is $1,337.20 plus 5.2 percent of excess over $40,000. And for incomes ranging from 80,000 to 100,000, the tax rate is $3,417.60 plus 5.943 percent of excess over $80,000. Ohio also has a 6.0 percent sales tax rate that was raised temporarily from 5.0 percent on July 1, 2003, with the present rate authorized until June 30, 2005 (Ohio Department of Taxation, 2003). In addition to the State sales tax, each county in Ohio has a county sales tax. Jackson, Ross, and Scioto Counties have a county sales tax rate of 1.5 percent and Pike County has a county sales tax rate of 1.0 percent (Ohio Department of Taxation, 2003).

3.10 Environmental Justice

On February 11, 1994, the President signed Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," which directs all Federal agencies to develop strategies for considering environmental justice in their programs, policies, and activities. Environmental justice is described in the Executive Order as "identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." On December 10, 1997, the Council on Environmental Quality issued "Environmental Justice Guidance Under the National Environmental Policy Act" (CEQ, 1997). The Council developed this guidance to "...further assist Federal agencies with their *National Environmental Policy Act* procedures." As an independent agency, the Council's guidance is not binding on the NRC; however, the NRC has committed to evaluate environmental justice issues as part of its *National Environmental Policy Act* reviews. To guide such evaluations, the NRC has issued a final policy statement on the "Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions" (69 FR 52040; August 24, 2004) and environmental justice procedures to be followed in NEPA documents prepared by the NRC's Office of Nuclear Material Safety and Safeguards (NRC, 2003).

This section summarizes data from the 2000 U.S. Census (specifically the 2000 decennial U.S. Census Summary File 3) on minority and low-income populations within an 80-kilometer (50-mile) radius of the proposed ACP site. This area includes a total of 191 census tracts, including 139 in Ohio, 38 in Kentucky, and 14 in West Virginia.

To determine if environmental justice will have to be considered in greater detail, the NRC staff compared the percentage of minority and low-income populations in Census tracts in the area being assessed to the State and county percentages. If the minority or low-income population in a given tract exceeds 50 percent or is significantly greater than the State or county percentage, environmental justice will have to be considered in greater detail. Generally, the NRC staff considers differences greater than 20 percentage points to be significant. The following sections summarize the results of this analysis within 80 kilometers (50 miles) of the proposed ACP, first for minority populations, and then for low-income populations. This summary is supported by detailed tables that provide the results for each Census tract in Appendix F.

3.10.1 Minority Populations

The Council on Environmental Quality guidelines on environmental justice recommend "minority" being defined as members of American Indian or Alaska Native, Asian or Pacific Islander, Black non-Hispanic, and Hispanic populations (CEQ, 1997). The 2000 Census includes the data necessary to identify minority populations, according to both race and Hispanic origin (U.S. Census Bureau, 2002), and identifies individuals claiming multiple racial identities, up to six races. To remain consistent with the Council's guidelines and NUREG-1748, the phrase "minority population" in this Draft EIS refers to persons who identified themselves in the 2000 Census as follows:

- Partially or totally Black (including Black or Negro, African American, Afro-American, Black Puerto Rican, Jamaican, Nigerian, West Indian, or Haitian);
- American Indian or Alaska Native;
- Asian;
- Native Hawaiian or other Pacific Islander;
- Multiple Races; or
- Other Race.

In accordance with NUREG-1748, individuals identifying themselves as White and a minority were counted as that particular minority group. In addition, for the purpose of this Draft EIS, minority populations were taken to include White individuals of Hispanic origin. To avoid double counting, tabulations include only White Hispanics since the above racial groups already account for non-White Hispanics. Therefore, the minority population considered in this environmental justice evaluation consists of all non-White persons (including those of multiple racial affiliations) plus White persons of Hispanic origin.

Figure 3-18 identifies Census tracts within a 80-kilometer (50-mile) radius of the proposed ACP site that contain minority populations in excess of the criteria outlined above. As shown in the figure, there are two Census tracts in which minority populations either exceed 50 percent and/or are significantly greater

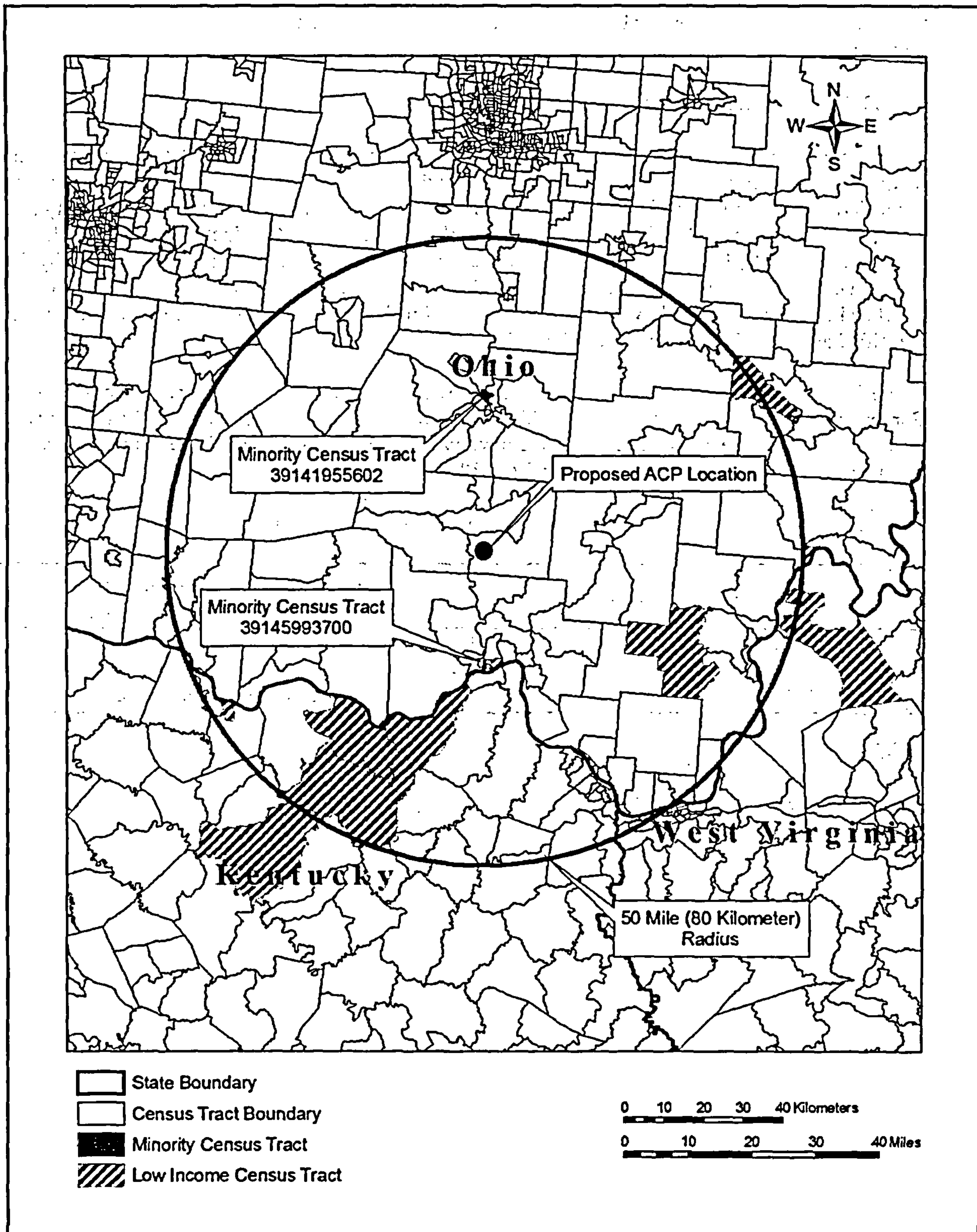

Figure 3-18 Census Tracts with Minority and Low-Income Populations within an 80-Kilometer (50-Mile) Radius of the Proposed ACP Site

than the State or county percentage. These tracts and their locations relative to the proposed ACP site are detailed in Table 3-24.

3.10.2 Low-Income Populations

In accordance with the Council on Environmental Guidelines and NUREG-1748, this environmental justice analysis identifies low-income populations as those falling below the statistical poverty level identified annually by the U.S. Census Bureau in its Series P-60 reports on income and poverty (NUREG-1748, Appendix C, p. C-4). Following the Office of Management and Budget's Statistical Policy Directive 14 (OMB, 1978), the U.S. Census Bureau uses a set of income thresholds that vary by family size and composition to define who falls below the poverty threshold. If the total income for a family or unrelated individual falls below the relevant poverty threshold, then the family or unrelated individual is classified as being "below the poverty level."

Table 3-25 shows the Poverty Thresholds in 2004 by family size and number of related children under 18. For example, in 2004, the poverty threshold for a family of three with one related child younger than 18 was an annual income of $15,205, while the poverty threshold for a family of five with one related child younger than 18 was an annual income of $23,838.

Table 3-24 Census Tracts Exceeding Minority Criteria [a]

Census Tract	County, State	Approximate Distance and Direction from the DOE Reservation
39141955602	Ross, Ohio	40 kilometers to the north
39145993700	Scioto, Ohio	28 kilometers to the south

Notes:
[a] See Appendix F for more detail.
km = kilometer
To convert kilometers to miles multiply by 0.62.

Table 3-25 Poverty Thresholds in 2004 (Annual Income in $)

Size of Family Unit	Weighted Average Threshold	Related Children Under 18 years								
		None	One	Two	Three	Four	Five	Six	Seven	Eight or More
One person	96,43									
Under 65 years	9,827	9,827								
65 years and over	9,060	9,060								
Two people	12,335									
Householder under 65 years	12,714	12,649	13,020							
Householder 65 years and over	11,429	11,418	12,971							
Three people	15,071	14,776	15,205	15,219						
Four people	19,311	19,484	19,803	19,157	19,223					
Five people	22,837	23,497	23,838	23,108	22,543	22,199				
Six people	25,791	27,025	27,133	26,573	26,037	25,241	24,768			
Seven people	29,304	31,096	31,290	30,621	30,154	29,285	28,271	27,159		
Eight people	32,430	34,778	35,086	34,454	33,901	33,115	32,119	31,082	30,818	
Nine or more people	38,659	41,836	42,039	41,480	41,010	40,240	39,179	38,220	37,983	36,520

Source: U.S. Census Bureau, 2005a, b.

Figure 3-18 identifies Census tracts within an 80-kilometer (50-mile) radius of the proposed ACP site that contain low-income populations in excess of the threshold criteria. 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. These 16 tracts and their locations relative to the proposed ACP site are detailed in Table 3-26.

Table 3-26 Census Tracts Exceeding Low-Income Criteria [a]

Census Tract	County, State	Approximate Distance and Direction from the DOE Reservation
21019030300	Boyd, Kentucky	66 km to the southeast
21069980400	Fleming, Kentucky	78 km to the southwest
21135990100	Lewis, Kentucky	32 km to the southwest
21135990200	Lewis, Kentucky	50 km to the southwest
21135990400	Lewis, Kentucky	62 km to the southwest
21161960200	Mason, Kentucky	75 km to the southwest
39009972800	Athens, Ohio	75 km to the northeast
39009972900	Athens, Ohio	80 km to the northeast
39053953700	Gallia, Ohio	40 km to the southeast
39087050300	Lawrence, Ohio	60 km to the southeast
39105964400	Meigs, Ohio	80 km to the east
39145993200	Scioto, Ohio	28 km to the south
39145993600	Scioto, Ohio	34 km to the south
54011000600	Cabell, West Virginia	80 km to the southeast
54011000900	Cabell, West Virginia	80 km to the southeast
54011001000	Cabell, West Virginia	80 km to the southeast
54011001100	Cabell, West Virginia	80 km to the southeast
54053954900	Mason, West Virginia	77 km to the east

Notes:
[a] See Appendix F for more detail.
km = kilometer; mi = mile.
To convert km to mi multiply by 0.62.

3.11 Noise

As described earlier, the proposed ACP site is located in an industrial area within the DOE reservation in Piketon. The nearest actual resident that may hear noise from the site is currently 914 meters (3,000 feet) away to the southwest.

The DOE EIS (DOE, 2004a) for the depleted UF_6 conversion facility being constructed on the reservation just north of the proposed ACP site determined that ambient noise levels in this area would be approximately 40 day-night average noise level. However, construction of the conversion facility is now underway, so the existing noise environment at the proposed ACP would include this construction noise. The same EIS estimates noise levels from the construction of the depleted UF_6 conversion facility to be 91.5 decibels at 15 meters (50 feet). Because noise from a point source, such as a single piece of construction equipment, drops off at 6 decibels per doubling of distance, construction noise would be approximately 50 decibels at the closest residence. This assumes distance attenuation from the conversion facility to the residence closest to the proposed ACP. The distance from the conversion facility to this residence is approximately 1,829 meters (6,000 feet). The noise level would be 45 day-night average noise level if construction activities were limited to an eight-hour daytime shift. Consequently, the existing ambient noise level at the nearest residence would be 45 day-night average noise level during the conversion facility construction period and would drop back to 40 day-night average noise level after completion of construction. This noise level estimate is probably an upper bound since it does not account for other types of attenuation, such as air absorption and ground effects due to terrain and vegetation.

The U.S. Department of Housing and Urban Development has standards for community noise levels. It also has developed land use compatibility guidelines (HUD, 2002) for acceptable noise levels versus the specific land use. Table 3-27 shows these guidelines. The estimated ambient noise level of 45 day-night average noise level at the site is below these guidelines.

Table 3-27 U.S. Department of Housing and Urban Development Land Use Compatibility Guidelines for Noise

Land Use Category	Sound Pressure Level (dBA) [a]			
	Clearly Acceptable	Normally Acceptable	Normally Unacceptable	Clearly Unacceptable
Residential	<60	60-65	65-75	>75
Livestock Farming	<60	60-65	75-80	>80
Office Buildings	<65	65-75	75-80	>80
Wholesale, Industrial, Manufacturing & Utilities	<70	70-80	80-85	>85

Notes:
[a] dBA = decibels, A-weighted; DNL = day-night average noise level.
DNL is a 24 hour average with a 10 dBA nighttime penalty. DNL is measured in dBA, which is A-weighted decibels.
Source: HUD, 2002.

3.12 Transportation

The DOE reservation is served directly by road and rail. Nearby air and water transportation routes also serve the site area. Figure 3-19 shows the various transportation routes for roads, rail, water, and air.

3.12.1 Roads

The site is 5.6 kilometers (3.5 miles) south of the intersection of the U.S. Route 23 and Ohio SR 32 interchange. Both routes are four lanes with U.S. Route 23 traversing north-south and Ohio SR 32 traversing east-west (USEC, 2005). Principal access to the proposed ACP site area is by the Main Access Road (also called the West Access Road), a security-controlled access, four-lane road connecting with U.S. Route 23. The Main Access Road is closed to general public access and connects to the Perimeter Road that encircles the fenced portion of the DOE facility. Employees of the proposed ACP would utilize the Main Access Road for access from and traveling to U.S. Route 23. USEC anticipates that construction workers and delivery of construction material will use the Southwest Access Road to U.S. Route 23 or the North Access Road to Ohio SR 32.

U.S. Route 23 intersects I-270, I-70, and I-71 approximately 113 kilometers (70 miles) north of the site. Trucks also may access I-64 approximately 32.2 kilometers (20 miles) southeast of Portsmouth. SR 32 runs east-west from Cincinnati and through Piketon to Parkersburg, West Virginia. To the west, SR 32 provides access to Cincinnati's three interstate highways, I-71, I-4, and I-75. To the east, SR 32 is linked with I-77. (USEC, 2005)

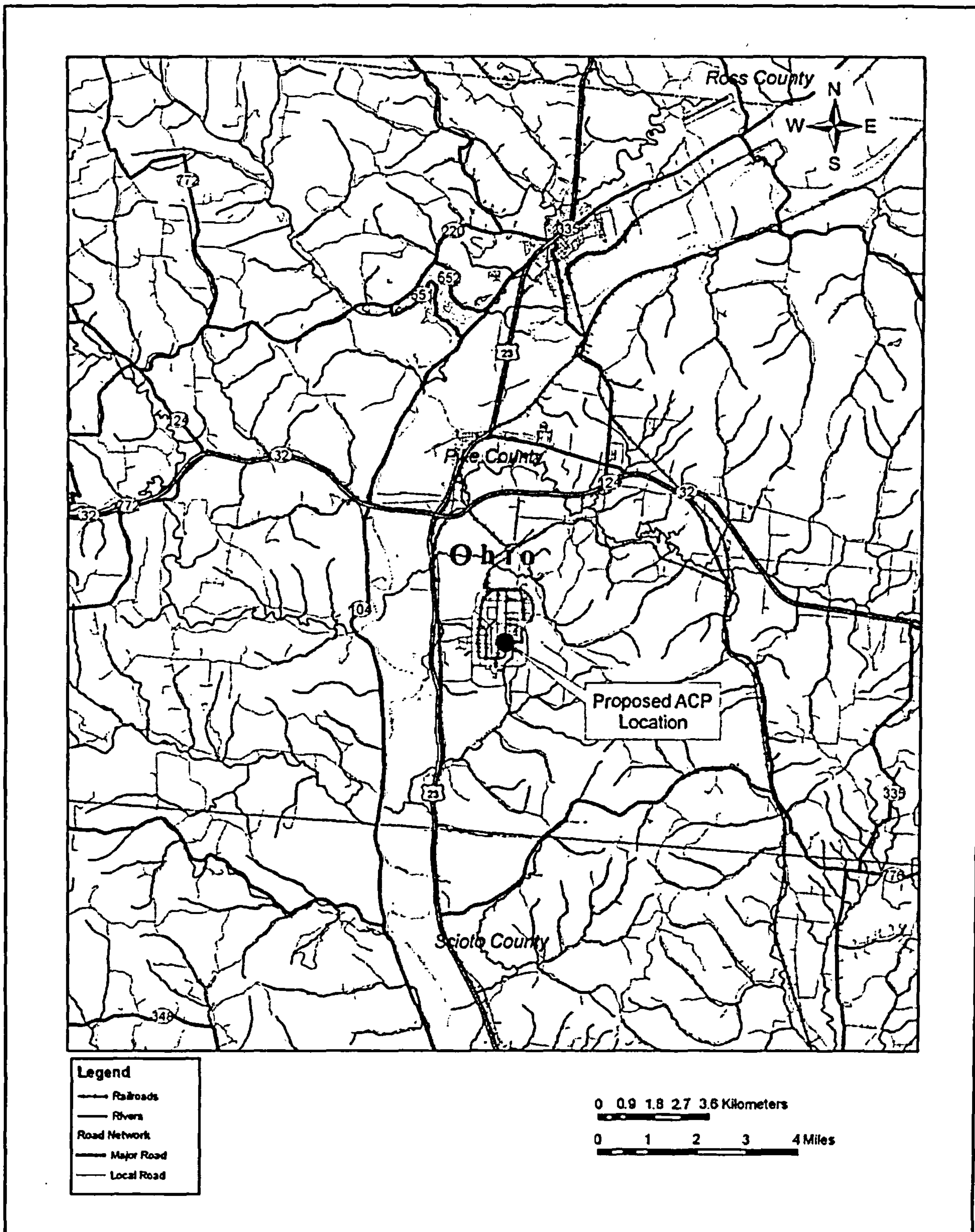

Figure 3-19 Transportation Routes In and Out of the DOE Reservation

U.S. Route 23 has an average daily traffic volume of 13,990 vehicles, while Ohio SR 32 has an average daily volume of 7,420 vehicles (traffic in both directions is included in these values). U.S. Route 23 is at 60 percent of design capacity with Ohio SR 32 at 40 percent of design capacity. The Ohio Department of Transportation supplied these data from a 1999 traffic study. Load limits on these routes are controlled by the Ohio Revised Code (38,556 kilograms [85,000 pounds]) gross vehicle weight. Special overload permitting is available. (USEC, 2005)

The DOE reservation road system is in generally good condition due to road repaving projects. Except during shift changes, traffic levels on the site access roads and Perimeter Road are low. Peak traffic flows occur at shift changes, and the principal traffic problem areas during peak morning/afternoon traffic are at locations where parking lot access roads meet the Perimeter Road. The site has 12 parking lots varying in capacity from approximately 50 to 800 vehicles. Total parking capacity is for approximately 4,400 vehicles. (USEC, 2005)

3.12.2 Rail

A rail system is located on the site with several track configurations possible. Two rail carriers, CSX and Norfolk Southern, service Pike County. The Norfolk Southern rail line is connected to the CSX Transportation Inc. line via a rail spur entering the northern portion of the site. The onsite system is used infrequently. The primary facilities for the proposed ACP site are connected to the existing rail configuration. Rail access is also available near the cylinder storage areas that would be located to the north, just outside the Perimeter Road. Track in the vicinity of Piketon allows a maximum speed of 96.6 kilometers per hour (60 miles per hour). The CSX Transportation Inc. line also provides access to other rail carriers. (USEC, 2005)

3.12.3 Water

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. All heavy unit loading is by mobile crane or barge-mounted crane at an open-air terminal. The Ohio River provides barge access to the Gulf of Mexico via the Mississippi River or the Tennessee-Tombigbee Waterway. Travel time to New Orleans is 14 to 16 days; to St. Louis, seven to nine days; and to Pittsburgh, three to four days. The U.S. Army Corps of Engineers maintains the Ohio River at a minimum channel width of 243.8 meters (800 feet) and a depth of 2.74 meters (9 feet). (USEC, 2005)

3.12.4 Air

The nearest airport is the Greater Portsmouth Regional Airport located approximately 24 kilometers (15 miles) south of the site. The airport has dual runways and T-hangars, and is operated by Chasteen Aviation, Inc. The airport serves mostly private aircraft owners and business travelers. There are no regularly scheduled commercial flights; however, charter service is available. (Scioto County Government, 2005) Another nearby airport, the Pike County Airport, is located just north of Waverly. This facility is similar in size and makeup to the Greater Portsmouth Regional Airport. In addition, 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. (USEC, 2004a)

3.13 Public and Occupational Health

As described in Sections 3.5 through 3.7, several different media in and around the DOE reservation contain radionuclides and chemicals that are both naturally occurring and anthropogenic (i.e., human

made) from historical and current operations at the site. These media include soil, surface water, sediment, groundwater, and air. This section describes these radiological and chemical background and anthropogenic levels in terms of public and occupational exposure and health, as well as historical exposure levels for activities similar to the proposed action. It also summarizes public health studies performed in the region which were sufficient to establish baseline information for the Chapter 4 analysis of impacts to public and worker health that may be due to the proposed action.

3.13.1 Background Radiological Exposure

Humans are exposed to ionizing radiation from many naturally occurring and anthropogenic sources in the environment. Radioactivity from naturally occurring elements in the environment is present in soil, rocks, and living organisms. A major proportion of natural background radiation comes from naturally occurring airborne sources such as radon. Such natural radiation sources contribute approximately 3 millisieverts per year (300 millirem per year) to the radiation dose that a member of the U.S. population receives annually. The majority of this exposure - approximately 2 millisieverts per year (200 millirem per year) - is from naturally occurring radon gas from soil, rock, and water. Anthropogenic sources not attributable to the DOE reservation also contribute to the average amount of dose a member of the U.S. population receives. These sources include X-rays for medical purposes (0.39 millisieverts per year (39 millirems per year)), nuclear medicine (0.14 millisieverts per year [14 millirems per year]), and consumer products (0.05 to 0.13 millisieverts per year [5 to 13 millirems per year]) (e.g., smoke detectors). A person living in the U.S. receives a current average dose of about 3.6 millisieverts per year (360 millirems per year) (NRC, 2004b).

Air releases of radionuclides from current operations at the DOE reservation result in radiation exposures to people in the vicinity of the site. Both air monitoring and modeling data have been examined in detail. In terms of air monitoring, DOE collected data from a network of 15 air samplers in 2002 (DOE, 2003b). Data were collected both onsite and in the area surrounding the reservation. The monitoring network is intended to assess whether air emissions from the reservation affect air quality in the surrounding area. A background ambient air monitoring station is located approximately 21 kilometers (13 miles) southwest of the site. The analytical results from air sampling stations closer to the plant are compared to background measurements. Uranium-233/234 and uranium-238 were routinely detected at the stations and in most of the samples collected from each station. Uranium-235 was detected in slightly less than half of the samples collected in 2002. Uranium-236 was detected in one or two samples at eight of the 15 stations. Americium-241, neptunium-237, and plutonium-238 were detected once each at stations A28, A36, and A24, respectively. Technetium-99 was detected once at three sampling stations in 2002. Detections of the transuranic radionuclides, technetium-99 and uranium-236 were usually near the detection limit for the analytical method.

To confirm that air emissions are within regulatory requirements and are not harmful to human health, ambient air monitoring data were used in a separate study to calculate a dose to a hypothetical person living at the monitoring station. The highest net dose calculation is 1.9×10^{-5} millisieverts per year (0.0019 millirem per year) (Station A9), which is well below the U.S. EPA National Emissions Standards for Hazardous Air Pollutants limit of 0.1 millisieverts per year (10 millirem per year), and the NRC total effective dose equivalent limit of 1 millisievert per year (100 millirem per year) (DOE, 2003b).

Based on modeling of total radionuclide releases to the air for the year 2002 from United States Enrichment Corporation operations at the site, the estimated radiation dose to the maximum exposed individual—a hypothetical individual who is assumed to reside at the most exposed point on the plant boundary—is 2.60×10^{-4} millisieverts per year (0.026 millirem per year) (USEC, 2005). DOE operations contributed an additional 4.20×10^{-5} millisieverts per year (0.0042 millirem per year) to the maximum exposed individual, resulting in a combined dose of 3.10×10^{-4} millisieverts per year (0.031 millirem per

year). These estimated maximum exposed individual doses are well below the U.S. EPA limit of 0.1 millisieverts per year (10 millirem per year) and the NRC limit of 1 millisievert per year (100 millirem per year). These results also are comparable to those estimated in an EIS for the affected environment of a separate, depleted uranium conversion facility proposed on the DOE reservation (DOE, 2004a). That EIS reports a combined dose (USEC and DOE sources) of 6 x 10^{-4} millisieverts per year (0.060 millirem per year) for air, which also is well below the U.S. EPA limit of 0.1 millisieverts per year (10 millirem per year) and the NRC limit of 1 millisievert per year (100 millirem per year). Note that while this conversion facility dose estimate is approximately double the dose estimated for the proposed ACP's affected environment, this can be explained by the different location that was evaluated on the DOE reservation.

The depleted uranium conversion EIS (DOE, 2004a) also states that the maximum radiation dose to an offsite member of the public as a result of current onsite facility operations is estimated to be 2.0 millirem per year. This dose, while still lower than the U.S. EPA and NRC standards, includes several other exposure pathways as part of the assessment: waterborne (drinking, swimming, fishing), at 0.00039 millisieverts per year (0.039 millirem per year); ingestion (sediment, soil, locally produced vegetation and crops), at 0.0088 millisieverts per year (0.88 millirem per year); and direct gamma radiation, at 0.0098 millisieverts per year (0.98 millirem per year). This latter exposure, direct radiation, was estimated for a person driving slowly on the Perimeter Road and passing close to the edge of the cylinder yards two times a day for 185 days per year. This road, however, was closed to the public after September 11, 2001 and thus this exposure is a significant over-estimate of actual doses if the road remains closed.

According to USEC (USEC, 2005), on-reservation worker average whole body dose is less than 0.1 millisieverts per year (10 millirem per year). In the depleted uranium conversion facility EIS cylinder yard worker exposure is estimated (from monitored external radiation) at 0.64 millisieverts per year (64 millirem per year) (DOE, 2004a). Both estimates are significantly less than the NRC and DOE worker dose standards of 50 millisieverts per year (5,000 millirem per year).

3.13.2 Background Chemical Exposure

As discussed in Section 3.5.3, existing air quality on and around the site is in attainment with the criteria pollutants under the National Ambient Air Quality Standards and the standards adopted by the State of Ohio. These pollutants include particulate matter less than 10 microns (3.94 x 10^{-4} inches) in diameter, sulfur dioxide, carbon monoxide, nitrogen dioxide, lead, and ozone.

For other non-radiological pollutants and other possible exposure pathways, the depleted uranium conversion EIS (DOE, 2004a), specifically Section 3.1.7.2, provides a useful summary of health indicators using estimated hazard quotients (a comparison of estimated maximum potential human intake levels with intake levels below which adverse effects are very unlikely to occur). In all media assessed, air, soil, surface water, sediment, and groundwater, the hazard quotients are less than one, meaning adverse effects are very unlikely to occur as a result of non-radiological chemicals present in the environment around the site. Furthermore, only groundwater has a hazard quotient approaching one (i.e., 0.26), yet the monitoring wells resulting in this value are onsite wells that are not used for drinking water.

Regarding occupational exposure, DOE recently authorized Bechtel Jacobs Company, LLC to initiate characterization of potential beryllium contamination at the Portsmouth Gaseous Diffusion Plant. In December 2003, under contract to Bechtel Jacobs Company, LLC, the United States Enrichment Corporation began performing surface wipes, surface bulk, and destructive analysis sampling in various locations throughout the plant. Low levels of beryllium have been found in aluminum parts machined and used in several facilities, and these levels are significant based on initial surface characterization results in comparison with DOE beryllium contamination limits in 10 CFR Part 850. At least one credible

exposure pathway has been identified with machining of aluminum parts, and several more have been suggested by professionals within the beryllium processing industry; these include grinding, buffing, welding, and chemical treatment/cleaning of beryllium-containing materials.

The Occupational Safety and Health Administration has issued permissible exposure limits for chemicals emitted into the air at this site (some of these limits are final, while others have only been proposed). Two of the key chemicals of concern—soluble and insoluble uranium compounds and hydrogen fluoride—are below those limits (DOE, 2004a). Other chemicals have been measured over the years at various levels at the Portsmouth Gaseous Diffusion Plant. Some of these levels have approached or exceeded occupational health benchmarks. For example, arsenic levels ranged up to 2.1 milligrams per cubic meter, which is higher than the permissible exposure limit of 0.01 milligrams per cubic meter, and lead levels ranged up to 19.5 milligrams per cubic meter, which is higher than the permissible exposure limit of 0.050 milligrams per cubic meter. 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.

Another occupational health issue is the potential risk from exposure to chemicals in the onsite subsurface soil, groundwater, and surface water. Estimates of excess lifetime cancer risks to hypothetical workers range as high as 1.5×10^{-2}, and estimates of hazard quotients for noncarcinogens range as high as eight (DOE, 2004b). Note that these exposures are hypothetical and are based on unmitigated risks.

One final issue regarding occupational health is the potential for large quantities of highly hazardous material to be stored onsite. No threshold quantities, however, are present at the proposed ACP site, based on the Occupational Safety and Health Administration Process Safety Management Standard (29 CFR § 1910.119) and the U.S. EPA Risk Management Program Standard (40 CFR Part 68).

3.13.3 Public Health Studies

In 1992, Pike and Scioto County residents petitioned the Centers for Disease Control and Prevention to conduct an epidemiological health study. Residents expressed their desire for a health study on radiation-related diseases, and they raised questions about excessive cancer rates in Scioto County (which is south of the site), excessive birth defects, and other adverse health effects (such as heavy metal toxicity) believed to be related to environmental releases from the site. The petition was forwarded to the Agency for Toxic Substances and Disease Registry with a request to perform a public health assessment to determine what follow-up health activities, such as a health study (designed to evaluate whether disease in the community could be associated with exposure to site contaminants), were appropriate.

The public health assessment included an analysis of mortality data obtained specifically for the assessment from the Centers for Disease Control and Prevention's National Center for Health Statistics, Office of Analysis and Epidemiology and an analysis of 11 other sets of data or studies (ATSDR, 1996). The National Center for Health Statistics' data that were examined were from the Wide-ranging ONline Data for Epidemiologic Research Database for the years 1979 to 1991. A detailed look at all causes of death for Pike, Ross, and Scioto counties in Ohio shows significantly higher rates of cardiovascular disease for Pike County. The age-adjusted rate for childhood cancer mortality in Pike County was found to be roughly twice the national and State rates, but the number was too small to give a statistically reliable result. For example, this rate is based on only five cancer deaths for the 13-year period from 1979 to 1991, and none of the childhood cancers were of the same type and therefore could not be related to a common cause, both statistically and because different cancers suggest different causes.

The public health assessment also noted that if there were significant uranium exposure in the community surrounding the plant, a measurable increase in the rate of renal failure would be expected. No increase in the renal failure rate was identified in surrounding communities, and no other trends were found for the area for the years 1979 to 1991.

One of the 11 other data sets or studies analyzed in the public health assessment was the National Cancer Institute Report "Cancer in Populations Living Near Nuclear Facilities. Volume 2: Individual Facilities Before and After Startup" (1953-1984). Among the facilities examined in this report was the Portsmouth Gaseous Diffusion Plant. Relative risks (i.e., the ratio of the risk of a disease in an exposed person compared to the risk in an unexposed person) for a number of types of cancer—including bladder and stomach cancer, which were mentioned as cancers of concern by a member of the public during the July 9, 2004 public meeting in Piketon, Ohio, on the proposed ACP—all clustered around one, thus indicating that the populations living near the Portsmouth facility were at approximately the same risk of developing these cancers as populations not living nearby.

The Agency for Toxic Substances and Disease Registry concluded, through its public health assessment process, that exposure data could not be found to support a health study, and furthermore, available information about health outcomes did not suggest any adverse health impact from site operation (ATSDR, 1996). Because the Agency for Toxic Substances and Disease Registry's public assessment was published in 1996, however, more recent data regarding cancer mortality were compiled for this Draft EIS using the Wide-ranging ONline Data for Epidemiologic Research Database (the same database used for the public health assessment).

The new cancer data compiled for this Draft EIS are shown in Table 3-28. These data indicate that Pike County is similar to the rest of Ohio and the U.S. in terms of overall cancer mortality. New data also were sought for three specific cancers of interest—childhood cancer, stomach cancer, and bladder cancer—either because they were of interest in the public health assessment or a subsequent public meeting. The annual mortality counts from these cancers, however, were five or fewer for both Pike County and the nearby Ross and Scioto Counties and thus are not reported due to patient confidentiality concerns. Had they been available, the low rates also would have rendered them statistically unreliable.

New data also were compiled (Table 3-29) for mortality due to renal failure, a health endpoint of interest in the public health assessment because of uranium metal's role as a heavy metal in renal toxicity. The new data cover two date ranges: 1995 to 1998 and 1999 to 2001.[1] As seen by these data, there may have been an increase subsequent to the public health assessment in renal failure rates in the selected counties, particularly Pike County, when compared to all of Ohio or the U.S.; however, it cannot be concluded that this rise was solely due to uranium toxicity. While high levels of uranium can be a risk factor for renal failure, other risk factors, such as diabetes and hypertension, may be even more important. For 1999 to 2001, the Centers for Disease Control and Prevention's Wide-ranging ONline Data for Epidemiologic Research data show that age-adjusted annual mortality per 100,000 from diabetes in Pike County was 51 while in Ohio this rate was only 31 and in the U.S. was 25.

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[1] The beginning year of the first range, 1995, was selected rather than 1992 (i.e., the year that would have followed the end of the original public health assessment date range of 1979 to 1991) because most of the gross annual mortality counts from 1992 to 1994 were five or fewer and thus not reported due to patient confidentiality concerns. Also, the cutoff between 1998 and 1999 is due to changes in the international classification of diseases codes (see Footnote 3 of Table 3-29).

3.13.4 Occupational Injury and Illness Rates

There have been no industrial fatalities on the DOE reservation. Nevertheless, the National Institute for Occupational Safety and Health conducted an epidemiologic study at the reservation to examine the causes of death among workers employed by the facility between September 1, 1954 and December 31, 1991. Deaths among the workers were compared with rates for the general U.S. population. Possible relationships were evaluated for deaths from several types of cancer and exposures to ionizing radiation and certain chemicals (fluoride, uranium metal, and nickel). Based upon previous health studies of nuclear facility workers, including an earlier National Institute for Occupational Safety and Health investigation at the DOE facility, deaths from cancers of the stomach, lung, and the lymphatic and the hematopoietic systems including leukemia, were evaluated in more detail. The announcement of findings by the National Institute for Occupational Safety and Health, published in October 2001, stated that overall cohort mortality was significantly less than that of the U.S. population, as was mortality from all cancers. (USEC, 2005)

Table 3-28 Death Rate/Trend Comparison, All Cancers, Death Years Through 2001

Area	Death Rate Compared to US Rate (1)	Annual Death Rate over rate period	Lower 95% Confidence Interval for Death Rate	Upper 95% Confidence Interval for Death Rate	Rate Period	Rate Ratio (2) County to US	Recent Annual Percent Change (3) in Death Rates	Recent Trend (4)	Recent Trend Period (3,4)
United States	-	199.8	199.6	200	1997-2001	-	-1.1	falling	1993-2001
Ohio	similar	212.4	211.2	213.6	1997-2001	1.1	-1.2	falling	1995-2001
Pike County	similar	200.5	177.9	225.2	1997-2001	1	0.7	stable	1977-2001

Notes:
All rates are per 100,000 persons.
When the population size for a denominator is small, the rates may be unstable. A rate is unstable when a small change in the numerator (e.g., only one or two additional cases) has a dramatic effect on the calculated rate. Suppression is used to avoid misinterpretation when rates are unstable.
(1) Rate Comparison
"above" = when 95% confident the rate is above and Rate Ratio > 1.10.
"similar" = when unable to conclude above or below with confidence.
"below" = when 95% confident the rate is below and Rate Ratio < 0.90.
(2) Rate ratio is the county rate divided by the US rate.
(3) Recent trend in death rates were calculated using the Joinpoint Regression Program and are expressed as the annual percent change over the recent trend period. Recent trend period is the period since last change in trend as determined by Joinpoint.
(4) Trend
"rising" = when 95% confidence interval of annual percent change is above 0.
"stable" = when 95% confidence interval of annual percent change includes 0.
"falling" = when 95% confidence interval of annual percent change is below 0.
Source: Death data provided by the National Vital Statistics System public use data file. Death rates calculated by the National Cancer Institute using SEER*Stat. Death rates are age-adjusted to the 2000 US standard population by 5-year age groups. Population counts for denominators are based on Census populations as modified by NCI.

Table 3-29 Age-Adjusted Mortality Rates for Renal Failure

Year Range	United States	State of Ohio	Pike County	Ross County	Scioto County
1979 to 1991	8.3	8.4	6.4U(1)	8.8U(1)	8.8U(1)
1995 to 1998	8.8	11.2	32.2U	14.3U(2)	14.2U
1999 to 2001(3)	13.2	15.3	43.7U	14.6U(4)	12.9U

Notes:
All Rates are per 100,000 persons.
"U" indicates the data are statistically unreliable because they are based on fewer than 20 deaths.
(1) These rates are from ATSDR (1996), though the original source is as described below. They were not previously applied the "U" designation but they appear to require it based on the definition above. Furthermore, these exact numbers could not be duplicated from the source below and are slightly lower than the recalculated numbers. This discrepancy may be due to factors such as updated data or the year that was selected for the standard population used for the age-adjustment (the year 2000 for the new date range).
(2) The years averaged are 1994, 1997, and 1998 because the data for 1995 and 1996 are suppressed for confidentiality (i.e., deaths are five or fewer).
(3) Beginning in 1999, cause of death in the data source (below) is specified with the International Classification of Diseases 10th Revision rather than 9th revision codes. The two revisions differ substantially, which may account for some or all of the difference seen between the 1999 to 2001 group and the previous groups. This difference should have no effect, however, between the different locations or areas within the same year range group.
(4) The years averaged are 1999 and 2001 because the data for 2000 are suppressed for confidentiality (i.e., deaths are five or fewer).
Source: CDC, 2004.

The lower mortality among these workers is consistent with the "healthy work effect," which is found in most occupational epidemiologic studies. No statistically significant excesses in mortality from any specific cause were identified. Analyses of possible relationships between causes of death and the identified exposures failed to reveal any dose-response trends. For leukemia, no effect of cumulative exposure to either external or internal radiation was identified. Additionally, no dose-response relationships were observed for cancers of the stomach, lung, Hodgkin's disease, lymphoreticulosarcoma, and all cancers combined. Workers deaths from cancers of the lympho-hematopoietic tissue, including leukemia, equaled U. S. rates of matched controls. Stomach cancer deaths were greater than expected, but this difference was not statistically significant. Deaths from these cancers had been found to be slightly elevated in a previous National Institute for Occupational Safety and Health study of the site.

The Department of Labor has documented eight cases of beryllium sensitization and 14 cases of Chronic Beryllium Disease among current and former workers at the Portsmouth Gaseous Diffusion Plant. It has been estimated that about 1,200 of a total of 28,000 personnel (including subcontractors) who have worked at the DOE reservation have received a medical test to determine beryllium sensitivity. Likely exposure pathways are being or recently have been identified by Bechtel Jacobs Company, LLC, as authorized by DOE.

The United States Enrichment Corporation maintains a log and summary of recordable occupational injuries and illnesses under the guidance of the Occupational Safety and Health Administration's 29 CFR Part 1910, Part 1904, Recording & Reporting Occupational Injuries & Illnesses. The proposed ACP Environmental Report summarizes a comparison of year-to-date monthly Recordable Injury/Illness rates per 100 full-time workers for fiscal years 2002 and 2003. Calendar year 2002 and 2003 Recordable Injury/Illness rates are 2.95 and 1.94. For comparison, the U.S. Department of Labor, Bureau of Labor Statistics compiles annual injury and illness data including the incidence rates by industry. United States Enrichment Corporation standard industrial classification is 2819, "Industrial Inorganic Chemicals, not elsewhere classified." Calendar year 2003 Bureau of Labor Statistics' average incidence rate of nonfatal occupational injuries and illnesses are not currently published. The Bureau of Labor Statistics' national

average incidence rate of nonfatal occupational injuries and illnesses for standard industrial classification 2819 for calendar year 2002 is 3.4, which is higher than the rates of 2.95 and 1.94 for the United States Enrichment Corporation.

3.14 Waste Management

This section describes the solid, hazardous, radioactive, and mixed (i.e., hazardous plus radioactive) wastes currently generated and managed by the United States Enrichment Corporation at the DOE reservation in Piketon. This reflects the baseline condition and is in contrast to the wastes that USEC would generate and manage under the proposed action, which are described in Chapter 2. This section also describes the existing waste management practices used by the United States Enrichment Corporation at the DOE reservation, most of which would also be used to manage wastes from the proposed ACP.

3.14.1 Current Waste Management Program

The United States Enrichment Corporation's Waste Management Program directs the storage, treatment, and disposal of waste generated by its operations at the DOE reservation at Piketon. The company must satisfy NRC, U.S. EPA, Ohio EPA, and Ohio Department of Health regulations as part of these activities. Waste generated by United States Enrichment Corporation operations at the DOE reservation and then transferred to DOE for storage, treatment, or disposal is subject to DOE Orders. Additional policies have been implemented by the United States Enrichment Corporation for management of radioactive, hazardous, and mixed wastes generated at the site. The United States Enrichment Corporation is currently operating in accordance with an NRC Certificate of Compliance issued under 10 CFR Part 76.

Waste collection and segregation activities are completed in accordance with applicable State and Federal rules and regulations and site procedures (see Table 1-3 in Chapter 1). Wastes are collected and packaged, where feasible, at the location where the waste is generated. Wastes are also segregated into the various waste streams and handled accordingly to minimize the generation of hazardous, low-level mixed waste, and low-level radioactive waste.

3.14.2 Baseline Waste Generation

Table 3-30 summarizes the projected baseline waste generation for the DOE reservation at Piketon, as reported in DOE's EIS supporting the proposed depleted UF_6 conversion facility at the reservation (DOE, 2004a). Volumes include operational and environmental restoration (i.e., cleanup) wastes projected from 2002 to 2025, not including the proposed ACP.

The waste volumes generated and managed by the United States Enrichment Corporation at the DOE reservation are much smaller than those reported above for operational and cleanup activities for the reservation as a whole. During 2003, the United States Enrichment Corporation disposed of approximately 0.1 cubic meter (3.5 cubic feet) of low-level radioactive waste and 15 cubic meters (530 cubic feet) of low-level mixed waste, and recycled approximately 76 cubic meters (2,684 cubic feet) of non-hazardous waste. The projected annual waste generation rates range from 182 to 355 cubic meters (6,420 to 12,520 cubic feet) of low-level radioactive waste and from 8 to 11 cubic meters (300 to 400 cubic feet) of low-level mixed waste (USEC, 2005).

Table 3-30 Projected Waste Generation Volumes for the DOE Reservation at Piketon [a]

Waste Category	Waste Treatment Volume, m^3/yr [b]
Low-level radioactive waste	73,000
Low-level mixed waste	5,600
Transuranic waste	none projected
Hazardous waste	110
Non-hazardous waste [b]	
Solids	3,200
Wastewater	145,000

Notes:
[a] Volumes include operational and environmental restoration wastes projected from FY 2002 to FY 2025.
[b] m^3/yr = cubic meters per year; ft^3/yr = cubic feet per year.
To convert m^3/yr to ft^3/yr multiply by 35.3.
Source: DOE, 2004a.

3.14.3 Current Waste Streams and Management Practices

Wastes generated by existing United States Enrichment Corporation operations at the DOE reservation at Piketon and/or managed onsite at the reservation include:

- Depleted uranium;
- Low-level radioactive waste;
- Non-radioactive hazardous waste;
- Low-level mixed waste;
- Recyclable waste;
- Classified/sensitive waste; and
- Sanitary/industrial waste.

The following sections summarize each of these waste streams from United States Enrichment Corporation activities at the DOE reservation along with the current facilities and procedures for managing these wastes.

3.14.3.1 Depleted Uranium

Regulatory Framework

Approximately 177,600 metric tons (195,800 tons (16,190 containers)) of depleted UF_6 were being stored at the DOE reservation as of June 2004 (DOE, 2004a). All of the depleted uranium is the responsibility of DOE under signed memoranda of agreement between the United States Enrichment Corporation and DOE. The depleted UF_6 stored at the reservation is managed in accordance with 40 CFR Part 266 and Ohio Administrative Code 3745-266. Section 3113(a) of the *USEC Privatization Act* (Public Law 104-134) requires DOE to accept low-level radioactive waste, including depleted uranium that has been determined to be low-level waste, for disposal, upon the request of, and reimbursement of costs by, the United States Enrichment Corporation. To date, this provision has not been invoked, and the form in which the depleted uranium would be transferred to DOE has not been specified. Depleted UF_6 has been classified by the NRC as a Low-Level Radioactive Waste (NRC, 2005). It is assumed that depleted uranium from the proposed ACP that is transferred under this provision of law in the future would be in

the form of Depleted UF_6. This would add to the inventory needing conversion at the depleted UF_6 conversion facility, as discussed further in Section 4.2.12.3.

<u>Waste Management Facilities and Practices</u>

The DOE reservation has a total of 16,109 DOE-managed cylinders containing depleted UF_6 equivalent to approximately 177,627 metric tons (195,800 tons) (see Table 3-31). The cylinders are located in two storage yards that have concrete bases. The cylinders are stacked two high to comply with Defense Nuclear Facility Safety Board recommendations. All 9- and 13-metric ton (10- and 14-ton) cylinders stored in these yards have been, or are being, inspected and repositioned. They have been placed on new concrete saddles with sufficient room between cylinders and cylinder rows to permit adequate visual inspection of cylinders. (DOE, 2004a)

Table 3-31 DOE-Managed Depleted Uranium Hexafluoride Cylinders at the DOE Reservation at Piketon

Cylinder Type	Number of Cylinders
Full	16,018
Partially Full	42
Heel	49
Total	16,109

Source: DOE, 2004a.

The cylinder storage yards at the DOE reservation are sources of only a very small amount of waste compared with the volume of waste generated from ongoing plant operations. Cylinder yard waste consists of small amounts of metal, scrapings from cylinder maintenance operations, potentially contaminated soil, and miscellaneous items.

3.14.3.2 Low-Level Radioactive Waste

<u>Waste Characteristics</u>

Low-level radioactive waste is radioactively contaminated waste that is not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or byproduct materials as defined in Section 11e(2) of the *Atomic Energy Act*. Low-level radioactive wastes have radionuclide concentrations that typically range from the minimum detectable activity of 0.2 to 0.5 micrograms per gram for total uranium and 37 becquerels per kilogram (1 picoCurie per gram) for technetium up to 0.5 milligram per gram for total uranium and 1,110 becquerels per kilogram (30 picoCuries per gram) for technetium. Higher concentrations do occasionally occur. Low-level radioactive waste includes dry active waste, radioactively contaminated metal, trap material, and used oil. Trap material consists of alumina, magnesium, and sodium fluoride pellets. Activities in trap material will typically range from the minimum detectable activity of 0.2 to 0.5 micrograms per gram for total uranium and 37 becquerels per kilogram (1 picoCurie per gram) for technetium up to 10.0 milligrams per gram for total uranium and 3.7×10^6 becquerels per kilogram (100,000 picoCuries per gram) for technetium. Magnesium trapping material from the feed stock decontamination project at the reservation has had technetium levels of up to 1.77×10^8 becquerels per kilogram (4.78 microCurie per gram). Depleted UF_6 is also considered a

category of low-level radioactive waste, but is considered a separate waste stream for the purposes of this Draft EIS, as discussed above.

Waste Management Facilities and Practices

Low-level radioactive wastes generated by United States Enrichment Corporation operations at the DOE reservation are generally transferred to the XT-847 Waste Management Staging Facility for temporary storage pending shipment to offsite treatment and disposal facilities. Such waste is stored onsite until shipment to an offsite treatment, storage, and disposal facility can be scheduled. During 2003, offsite treatment, storage, and disposal facilities that managed low-level radioactive waste generated by United States Enrichment Corporation operations at the DOE reservation included Envirocare, DSSI, and GTS Duratek. During 2003, approximately twice as much low-level radioactive waste was generated (283 cubic meters (10,016 cubic feet)) as was shipped offsite for disposal (155 cubic meters (5,465 cubic feet)).

The XT-847 facility consists of a steel structure with concrete floors and is divided into three storage areas, including a 90-day hazardous waste storage area. The XT-847 Facility is used to accumulate, stage, and prepare hazardous waste, radioactive and hazardous mixed waste, low level radioactive waste, and non-hazardous recyclable material prior to shipment off the reservation. The XT-847 Facility is equipped with truck and rail loading/unloading facilities. The facility also supports nuclear measuring activities.

3.14.3.3 Hazardous Waste

Waste Characteristics

The hazardous waste category is comprised of: (1) *Resource Conservation and Recovery Act* waste listed in 40 CFR Part 261, Subpart D or exhibits any hazardous waste characteristics reported in 40 CFR Part 261, Subpart C; (2) *Toxic Substances Control Act* waste; or (3) any waste defined as hazardous under equivalent State regulations. Hazardous wastes currently generated by the United States Enrichment Corporation at the DOE reservation include aerosol cans, solvents, and laboratory waste.

Waste Management Facilities and Practices

Hazardous wastes generated by the United States Enrichment Corporation at the DOE reservation are stored at the XT-847 Waste Management Staging Facility prior to transfer offsite for treatment and disposal. The company does not store hazardous waste for periods greater than 90 days. All hazardous waste is transferred to a *Resource Conservation and Recovery Act* Part B permitted "greater than-90-day" storage facility operated by DOE at the reservation within 90 days of generation in accordance with the Ohio EPA Director's Final Findings and Orders, issued to the United States Enrichment Corporation on October 5, 1995. The DOE reservation then provides long term onsite storage for hazardous waste at the X-7725 and X-326 hazardous waste storage areas. Several additional 90-day satellite storage areas are available for temporary storage of hazardous waste. Hazardous wastes are stored onsite at the reservation under DOE control until shipment to an offsite treatment, storage, and disposal facility can be scheduled. In 2003, offsite treatment, storage, and disposal facilities used for management of hazardous waste included LWD, DSSI, and Perma-Fix.

3.14.3.4 Low-Level Mixed Waste

<u>Waste Characteristics</u>

Low-level mixed waste is a waste that contains both low-level radioactive waste and *Resource Conservation and Recovery Act* hazardous waste, as defined in Ohio Administrative Code 3745-266-210. Such waste currently generated by the United States Enrichment Corporation at Piketon includes laboratory waste, solvents, and decontamination solutions.

<u>Waste Management Facilities and Practices</u>

Low-level mixed waste generated by the United States Enrichment Corporation at the DOE reservation is generally transferred to the XT847 facility for temporary storage prior to transfer off site for treatment and disposal. Such waste is exempted from the storage requirements for hazardous waste as defined in Ohio Administrative Code 3745-51-03, since it is a hazardous waste and is generated and managed by the United States Enrichment Corporation, as described in 40 CFR Part 266, Subpart N and Ohio Administrative Code 3745-266.

All low-level mixed waste generated from United States Enrichment Corporation operations at the site is transferred to a *Resource Conservation and Recovery Act* Part B permitted "greater than-90-day" storage facility operated by DOE at the reservation in accordance with the Ohio EPA Director's Final Findings and Orders, issued to the United States Enrichment Corporation on October 5, 1995. The wastes are stored onsite until shipment to an offsite treatment, storage, and disposal facility can be scheduled. In 2003, mixed wastes were shipped offsite to facilities managed by LWD, DSSI, and Perma-Fix.

3.14.3.5 Recyclable Waste

<u>Waste Characteristics</u>

Recyclable waste includes waste that is:

- Not radioactively contaminated;
- Not regulated as hazardous under the *Resource Conservation and Recovery Act*;
- Not regulated under the *Toxic Substances Control Act*;
- Not categorized as classified/sensitive; and
- Is not acceptable for disposal at a sanitary landfill.

Some examples of recyclable waste currently generated by the United States Enrichment Corporation at Piketon include used oil, fluorescent bulbs, incandescent bulbs, High Intensity Discharge bulbs, circuit boards, and scrap metal.

<u>Waste Management Facilities and Practices</u>

Recyclable wastes generated by existing United States Enrichment Corporation operations at the DOE reservation are segregated and stored onsite until off-reservation shipment to a treatment, storage, and disposal facility can be scheduled. In 2003, offsite facilities that were used for recycling such waste included AERC, DOE-Run, and Safety-Kleen.

3.14.3.6 Classified/Sensitive Waste

Waste Characteristics

Classified/sensitive waste is any waste considered as such for security reasons. These materials may be classified due to configuration, composition, contamination, or contained information. Classified waste may be categorized as non-hazardous waste or as low-level radioactive depending upon its point of and method of generation.

Waste Management Facilities and Practices

Classified waste is stored onsite prior to disposal in classified offsite disposal facilities.

3.14.3.7 Sanitary/Industrial Waste

Waste Characteristics

Sanitary/industrial waste includes non-hazardous solid waste generated by industrial processes and manufacturing and conventional waste material that is no longer usable for plant operations. Some examples of sanitary/industrial waste generated by the United States Enrichment Corporation at the DOE reservation include sludge from wastewater treatment, alkaline batteries, trash, paper, wood, metal, glass, and cafeteria/office refuse.

Waste Management Facilities and Practices

Sanitary/industrial solid wastes generated by existing United States Enrichment Corporation operations at the DOE reservation are disposed at the offsite Pike Sanitary Landfill. Sanitary wastewater (e.g., from showers and toilets) generated at the site are discharged to the plant sanitary sewer system and ultimately to the X-6619 sewage treatment plant. Treated sanitary wastewaters are discharged from X-6619 directly to the Scioto River through an underground pipeline via a permitted outfall. As discussed in Section 3.7, storm water runoff from the proposed ACP area drain to a pair of holding ponds (X-2230N West Holding Pond and X-2230M Southwest Holding Pond) to allow settling of suspended solids, dissipation of chlorine, and oil diversion and containment prior to discharge to unnamed tributaries of the Scioto River. The only intentional process wastewater discharge resulting from plant operations is blow down from the Tower Cooling Water system.

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4. ENVIRONMENTAL IMPACTS

4.1 Introduction

This chapter evaluates the potential environmental impacts of the proposed action and the no-action alternative. Other reasonable alternatives that have been considered, including the construction and operation of the American Centrifuge Plant (ACP) at the Paducah Gaseous Diffusion Plant in Paducah, Kentucky, have been eliminated from detailed study for reasons explained in Chapter 2 and are not evaluated further in this chapter.

The chapter analyzes the four ACP life-cycle stages, as well as the corresponding cessation of uranium enrichment operations at the Paducah Gaseous Diffusion Plant, as described in Section 2.1. Even though the cessation of operations at Paducah is not part of the U.S. Nuclear Regulatory Commission's (NRC's) proposed action, it is evaluated in this Draft Environmental Impact Statement (EIS) because it would eventually result from the proposed action (USEC, 2005a). For the purpose of this analysis, cessation of uranium enrichment operations at Paducah would include stopping uranium enrichment plant operations, but would not include decommissioning of the Paducah Gaseous Diffusion Plant, changes to any other activities at that site, or any alternate uses of the site in the future. Those other actions at Paducah would be the subject of subsequent decisions and environmental reviews.

Section 4.2 analyzes the proposed action, which would include construction, operation, and decommissioning of the proposed ACP in Piketon, Ohio. This section starts with 13 different sections that evaluate the potential impacts to different resource areas (land use, transportation, geology and soils, water resources, etc.). Within each of these resource areas, potential impacts are evaluated for: (1) ACP site preparation and construction; (2) ACP operation; and (3) cessation of uranium enrichment operations at the Paducah Gaseous Diffusion Plant.

Determination of the Significance of Potential Environmental Impacts

A standard of significance has been established for assessing environmental impacts. Based on the Council of Environmental Quality's regulations, each impact is to be assigned one of the following three significance levels:

- *Small: The environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.*
- *Moderate: The environmental effects are sufficient to noticeably alter but not destabilize important attributes of the resource.*
- *Large: The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.*

Source: NRC, 2003.

Section 4.2 also evaluates the potential impacts associated with the proposed manufacturing of centrifuges necessary for the ACP, much of which is expected to occur offsite. The impacts associated with shipping centrifuges or centrifuge components into the U.S. Department of Energy (DOE) reservation by truck are evaluated in different parts within Section 4.2 dealing with transportation (see Sections 4.2.2 and 4.2.11.1). However, because many of the details of the proposed centrifuge manufacturing process itself

are either proprietary or controlled for security reasons, this phase of the proposed action is discussed more generally in this Draft EIS at the end of the 13 resource areas evaluated for site preparation and construction and facility operation (see Section 4.2.14).

The last part of Section 4.2 (Section 4.2.15) provides an initial evaluation of the potential environmental impacts of the decontamination and decommissioning of the ACP. Because decommissioning would take place well in the future, it is not possible to predict exactly how the plant would be decommissioned. For this reason, the NRC staff requires that an applicant for decommissioning of a uranium enrichment facility submit a License Termination Application and Decommissioning Plan to the NRC at least 12 months prior to the expiration of the NRC license (Title 10 of the *Code of Federal Regulations* [10 CFR] § 70.38). The staff will conduct a separate and more detailed review of the potential environmental impacts associated with the ACP decommissioning at that time, in support of its review of the applicant's submittal, and before making any decisions regarding license termination.

Section 4.3 evaluates anticipated cumulative impacts associated with the proposed action. It recaps the specific impacts of the proposed action as presented in Section 4.2, describes past, present, and reasonably foreseeable future actions that relate to the proposed action, and evaluates the magnitude and significance of potential "cumulative effects," meaning effects of the proposed action combined with effects of reasonably foreseeable future actions.

Finally, Section 4.4 evaluates the potential impacts of the no-action alternative, which would involve continuing to operate the Paducah Gaseous Diffusion Plant and not developing the ACP at any site. This evaluation serves as a baseline for comparison to the potential impacts of the proposed action.

4.2 Impacts of the Proposed Action

Under the proposed action, USEC, Inc. (USEC) would construct and operate the ACP at Piketon and cease uranium enrichment plant operations at the Paducah Gaseous Diffusion Plant. At the end of its life, the ACP would be decontaminated and decommissioned. The potential environmental impacts of this proposed action are evaluated below for each of the potentially affected environmental resources.

4.2.1 Land Use Impacts

This section reviews the potential land use impacts associated with site preparation and construction activities, facility operation, and ceasing operations at the Paducah Gaseous Diffusion Plant.

4.2.1.1 Site Preparation and Construction

As described in Section 2.1, the majority of the site preparation and construction activities associated with the proposed ACP would occur within the 526-hectare (1,300-acre) central area of the DOE reservation. The proposed ACP would be situated on approximately 81 hectares (200 acres) in the southwest quadrant of the central area. The only facilities associated with the ACP that would be outside the central area would be a newly constructed 10-hectare (24-acre) cylinder storage yard (X-745H) and an existing 1.3-hectare (3-acre) cylinder storage yard (X-745G-2) located in the northern portion of the reservation, just outside of Perimeter Road. In addition to these facilities, approximately 1 hectare (2.5 acres) of new roads and parking areas would be constructed. Figure 2-5 in Chapter 2 presents the location of the proposed primary and secondary new facilities and proposed primary and secondary refurbished facilities associated with the proposed ACP. As discussed in Section 2.1.3, primary facilities are those that are critical to the enrichment process, while secondary facilities provide indirect support to the process. As shown in Table 2-1, 18 new facilities (including buildings and cylinder storage yards) and 16 existing or refurbished facilities would be associated with the proposed ACP.

All of the proposed ACP facilities in the southwest quadrant of the central area would be located adjacent to each other, and the X-745G-2 and X-745H Cylinder Storage Yards would be located adjacent to one another in the northern portion of the reservation. The total footprint for the proposed new and refurbished facilities in the southwest quadrant of the central area of the reservation would occupy approximately 24 hectares (60 acres). The remaining 57 hectares (140 acres) occupied by the proposed ACP in this area would be maintained as lawn or open space. Site preparation and construction activities within this central area would result in a small impact on land use because there would be no change in the overall land use of the central area. In addition, the soil types present in the southwest quadrant are non-prime soils, so this construction would not affect prime farmland (Borchelt, 2003).

The construction of the X-745H Cylinder Storage Yard in the northern part of the reservation just north of Perimeter Road would remove 10 hectares (25 acres) of managed grassland and old fields and convert it into part of the developed infrastructure associated with the DOE reservation (USEC, 2005a). This cylinder storage yard would be located approximately 600 meters (1,969 feet) southeast from the nearest reservation boundary and would be surrounded by existing forested land to the north, east, and west, and by the central area to the south. The conversion of 10 hectares (25 acres) of managed grassland and old fields into a paved cylinder storage yard would result in a small impact on land use at the reservation because approximately one percent of the area outside of Perimeter Road (10 hectares [25 acres]) would change from its current land use.

The proposed location of the X-745H Cylinder Storage Yard contains two soil types, Urban land-Omulga complex and Omulga silt loam. While some Omulga soils are considered prime farmland, the soils at this location do not qualify as such because of the slope and because Urban land-Omulga complex soils in particular are not prime farmland. Therefore, construction of the new X-745H Cylinder Storage Yard would not affect prime farmland (Yost, 2005).

The other cylinder storage yard north of Perimeter Road, X-745G-2 consisting of 1.3 hectares (3 acres), already exists but might require some minor refurbishment for use by the proposed ACP. Because this yard is already paved and intended for this purpose, any minor refurbishment for the proposed ACP should result in no new land use impacts.

The proposed action would not impact land use outside of the DOE reservation at Piketon. The nearest reservation boundary is approximately 800 meters (2,625 feet) to the west of the X-3001 Building, and 600 meters (1,969 feet) from the proposed cylinder storage yard. The site preparation and construction activities would not preclude or alter any of the existing land uses outside of the reservation. Because there are no State parks or national parks, conservation areas, or designated wild and scenic rivers within the immediate vicinity of the reservation, such areas would not be affected. Moreover, during construction of the proposed ACP, all equipment, supplies, temporary structures (construction trailers), and staging and storage areas would be located on previously disturbed land (parking lots or managed lawns) and would not require the removal or modification of any buffer areas or structures (USEC, 2005a).

In total, site preparation and construction would physically change approximately 22 hectares (55 acres) of land on the DOE reservation. These physical changes would be minor, because: (1) the area to be occupied by the proposed ACP would be only a small portion of the 1,497-hectare (3,700-acre) reservation; (2) the majority of the proposed land has been previously disturbed; (3) no prime farmland would be affected; and (4) site preparation and construction would not affect or preclude any existing land uses on the property that surrounds the DOE reservation. The changes would simply convert the land use on the DOE reservation from managed lawns, fields, and limited forest buffer to developed areas, resulting in an overall SMALL impact.

4.2.1.2 Facility Operation

The operation of the proposed ACP, including the new cylinder storage yards, would not result in any additional changes in land use on the DOE reservation, would not preclude any foreseeable land uses on the reservation, and would not affect or preclude any existing land uses on the property that surround the reservation. A recent DOE Environmental Assessment, which considered the land use impacts of the proposed ACP, found that the new facility would present no land use conflicts with any proposed future land use planning efforts on the DOE reservation or the surrounding area (DOE, 2001a). Therefore, the land use impacts of facility operation would be SMALL.

4.2.1.3 Ceasing Operations at Paducah

Ceasing enrichment plant operations at Paducah would not result in any change in land use. It is anticipated that after the Paducah enrichment plant is shut down, the existing buildings and structures would remain on the site and the site would remain categorized for industrial use, pending any later decisions on decommissioning and future use. Therefore, land use impacts associated with ceasing operations at Paducah would be SMALL.

4.2.2 Historic and Cultural Resources Impacts

The NRC staff evaluated potential effects of the proposed action on historic and cultural resources in accordance with the Advisory Council on Historic Preservation Regulations (specifically 36 CFR Part 800) (see Appendix B, Consultation Letters). As defined in 36 CFR § 800.16(i), "*Effect* means alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register." This may include direct effects such as disturbance or destruction of buildings or archaeological deposits; as well as indirect effects such as alteration of setting or vandalism of buildings and sites by workers.

Under 36 CFR § 800.4, once a Federal agency identifies and evaluates properties to determine whether they are eligible, it considers project effects. It may determine that there are "no historic properties affected" if there are no historic properties present or there are historic properties present but the undertaking will have no effect upon them as defined in 36 CFR § 800.16(i). If an adverse effect is found that will be resolved by redesign or mitigation measures, the agency may determine that there is "no adverse effect." In considering effect, the agency applies the criteria of adverse effect to historic properties within the area of potential effects (see text box in this subsection). The criteria of adverse effect are defined at 36 CFR § 800.5(a):

> *An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.*

Properties within the Area of Potential Effect

The area of potential effect for direct effects includes the footprint of all ground disturbing activities and the perimeter of all buildings to be refurbished plus a 100-meter (328-foot) buffer around such areas (see Chapter 3 for more discussion). There is one historic property within the area of potential effect for direct effects, the Portsmouth Gaseous Diffusion Plant historic district considered by the State Historic Preservation Officer to be eligible under Criterion A for listing on the National Register. There are no other properties within the area of potential effect for direct effects that were identified as potentially eligible for listing on the National Register.

The area of potential effect for indirect effects includes all lands and structures within the reservation boundary (see Chapter 3 for more discussion). In addition to the Register-eligible historic district, there are 13 historic farmsteads and one prehistoric lithic scatter within the area of potential effect for indirect effects that the NRC staff considered as potentially eligible for listing under Criterion D, although State Historic Preservation Officer concurrence has not been received on their status as historic properties. In addition, the NRC staff included in the consideration of effect three properties located outside the area of potential effect for indirect effects, but close to its boundary. One is the Scioto Township Works site that is listed on the National Register under Criterion D and that has cultural value to the Absentee Shawnee Tribe. This site extends to within 250 meters (820 feet) of the area of potential effect boundary. A second property, the Barnes House, which may be eligible for listing under Criteria A and C, is immediately adjacent to the area of potential effect boundary. A third property, the Bailey Chapel, listed on the Ohio Historic Inventory but not the National Register, is also adjacent to the area of potential effect boundary.

The following sections evaluate potential effects for site preparation and construction activities for the proposed ACP operations, and for the corresponding cessation of uranium enrichment activities at the Paducah Gaseous Diffusion Plant.

4.2.2.1 Site Preparation and Construction

Site preparation and construction activities have the potential to directly affect the Portsmouth Gaseous Diffusion Plant historic district by destroying or altering contributing elements. If not properly controlled, these activities could indirectly affect the district by altering the setting, feeling, or association of the district. However, in consultation with the State Historic Preservation Officer, the NRC staff has determined that the construction of new buildings and refurbishment of the existing buildings under the proposed action would result in buildings of design, size, and function similar to the existing buildings (OHPO, 2004; OHPO, 2005). While there might be a short-term alteration in the feeling of the district during site preparation and construction, the net result would be no effect on the historic property.

Site preparation and construction activities also have the potential to indirectly affect the 14 potentially Register-eligible sites within the area of potential effect for indirect effects by exposing them to vandalism by workers that might remove information important to history or prehistory. However, because the surface materials on these sites were recorded and portable artifacts were collected during prior study, and because workers would be expected to remain within designated work areas, the NRC staff considers that the likelihood of damage from vandalism would be small. Based on these factors, the NRC staff concludes that there would be no effect on these properties. However, USEC may elect to provide education programs and implement formal constraints on worker movements that would further minimize the likelihood of vandalism affecting a potentially register-eligible site.

Because the Scioto Township Works site is located one kilometer (0.62 mile) from the construction area and outside the fenced reservation boundary, vandalism from project construction workers would be even less likely than for sites within the area of potential effect. Consequently, the NRC staff considers that there would be no project effect on the information values that make the site eligible under Criterion D. The setting and feeling of the site that may contribute to its cultural importance to the Shawnee have been previously affected by agricultural activities, quarrying, and construction and use of U.S. Route 23. The appearance of the proposed ACP complex on the DOE reservation as viewed from the site would not change substantially as a result of construction; as indicated above and discussed in more detail in Section 4.2.3, the new and refurbished buildings would be similar to existing buildings. Thus, the proposed action would not change the existing setting or feeling of the site, and the NRC staff finds that the proposed construction activities on the reservation would have no effect on the Scioto Township Works.

The NRC staff also finds that there would be no effect on the potentially eligible Barnes House. Given its location approximately 800 meters (2,600 feet) from Perimeter Road and the closest construction activities, site preparation and construction would not directly affect attributes of the property that may contribute to its architectural significance under Criterion C. Because the appearance of the industrial complex on the reservation would not be altered substantially by the construction, the project would not alter the existing setting, feeling, or association of the site that may contribute to its historic significance under Criterion A.

The Bailey Chapel is located even farther from the proposed site preparation and construction activities than the Barnes House, well away from any potential direct effect on the chapel building. The new construction would not change the character of the industrial complex or its current contribution to the existing setting. Thus, NRC finds no effect associated with the proposed action on this property.

In the unlikely event that human remains are encountered during site preparation and construction activities (excavation), USEC would comply with the Native American Graves Protection and Repatriation Act regulations. This includes up to a 30-day work stoppage, notice to management, and screening of the find by a qualified archaeologist. If determined to be necessary, work would be stopped until completion of consultations that may be required under the *National Historic Preservation Act* or the *Native American Graves Protection and Repatriation Act*. (USEC, 2005a)

Based on this evaluation and the procedures that USEC would implement, the effects of proposed site preparation and construction activities on historic and cultural resources would be SMALL.

4.2.2.2 Facility Operation

Facility operation would involve the regular presence of personnel on the DOE reservation and movement of trucks in and out and within the reservation. These activities would be consistent with the activities that characterized the Portsmouth Gaseous Diffusion Plant historic district during earlier operations, as well as current site activities to a more limited extent. In consultation with the State Historic Preservation Officer, the NRC staff has determined that these proposed new activities for the ACP would have no effect on the historic district (Epstein, 2004).

Operations could have an indirect effect if workers vandalized the potentially eligible farmstead sites and lithic scatter sites outside of Perimeter Road. However, as with the potential effects of site preparation and construction, the NRC staff considers that the likelihood of damage from vandalism would be small, should it occur, because the surface materials on these sites were recorded and portable artifacts were collected during prior study and because workers would be expected to remain within designated work areas. Based on these factors, the NRC staff concludes that there would be no adverse effect on these properties from facility operation.

Because the Scioto Township Works site is located outside the fenced reservation boundary, vandalism from operations workers would be even less likely than for sites within the area of potential effect. Consequently, the NRC staff considers that there would be no effect on the information values that make the site eligible under Criterion D. Operation of the proposed facility would cause no change in existing setting or feeling of the site. The NRC staff thus finds that the operation of the new and refurbished facilities on the reservation would have no effect on the Scioto Township Works.

Operation of the facility also would cause no change in the existing setting or feeling of either the Barnes House or Bailey Chapel. Facility operation would involve the regular presence of personnel on the DOE reservation and movement of trucks in and out and within the reservation. These activities would be consistent with the current operations on the reservation. Consequently, NRC finds that the operation of the new and refurbished facilities on the reservation would have no effect on these properties.

The NRC staff also finds that there would be no effect on potential earthworks located near the DOE wellfields. As indicated in Section 4.2.6.2, additional pumping from water supply wells is not expected to cause subsidence for several reasons:

- The increase in consumption would be only 10 percent higher than current withdrawal rates and would represent only 31 percent of the total design capacity (and currently permitted rate) of the well field groundwater withdrawal system.

- The three well fields are located approximately 8, 11, and 24 kilometers (5, 7, and 15 miles) from the DOE reservation boundary along the Scioto River, and are spaced between 16 to 24 kilometers (10 to 15 miles) apart. The wells within each well field (between 4 and 15 individual wells) are located within 2 to 6 kilometers (1 to 3 miles) of each other. Therefore, the increased withdrawals will come from several spaced-out locations, rather than being all concentrated in one location.

- The wells produce water from the shallow saturated sand and gravel layers adjacent to the Scioto River. The sand and gravel layers are recharged from water in the river. Computer models have shown that 50 to 88 percent of the water drawn from the wells is from the river, and the chemical character of the groundwater is influenced by the river (Nortz et al., 1994). Therefore, any water withdrawn from the ground would be replaced by water from the river, and there would not be a decline in groundwater levels.

- Conversations with the Ohio EPA have confirmed that subsidence and sink holes from groundwater withdrawal are not an issue in the region, as water would be drawn down from the Scioto River, rather than create a void (Ohio EPA, 2005).

Based on this evaluation, the effects of proposed ACP operations on historic and cultural resources are expected to be SMALL.

4.2.2.3 Ceasing Operations at Paducah

Cessation of operations at the Paducah enrichment plant would not involve any excavation or disturbance of soils or the subsurface, or removal or external modification of buildings or structures. There would generally be a decrease in airborne emissions, a decrease in liquid and solid wastes generated and disposed, a decrease in the onsite workforce, and a decrease in surrounding traffic. Therefore, the impacts on historic or cultural resources associated with ceasing operations at Paducah would be SMALL.

4.2.3 Visual and Scenic Impacts

As described in Section 3.4, the DOE reservation currently has a Class III or IV designation under the U.S. Bureau of Land Management's classification system. This means that the existing scenic value of the reservation is moderate to low, as the dominant viewshed consists of buildings, cylinder storage yards, transmission lines, and open and forested buffer areas. No scenic rivers, nature preserves, or unique visual resources exist in the project area.

4.2.3.1 Site Preparation and Construction

About half of the facilities needed for the proposed ACP, including two of the four large process buildings (28,242 square meters [304,000 square feet]), already exist in the southwest quadrant of the reservation's central area. While the new buildings and cylinder storage yards needed in this area would result in the loss of approximately 12 hectares (30 acres) of fields and lawns, the new facilities would be architecturally similar and would blend in with the existing facilities at this location. When driving on Perimeter Road surrounding the central area, the proposed ACP facilities in the southwest quadrant would be difficult to discern and would not in any way change the existing industrial setting of the site. Moreover, the existing and new facilities would generally not be visible from off the DOE reservation, because views along the property line are limited by distance, rolling terrain, and heavy forests and vegetation. Therefore, the proposed ACP facilities in the southwest quadrant of the reservation's central area would cause SMALL impacts on visual and scenic resources.

Site preparation and construction activities needed for the new 10-hectare (25-acre) cylinder storage yard (X-745H) north of Perimeter Road would occur within managed grasslands and old fields adjacent to tributaries of Little Beaver Creek. As described in Section 4.2.7.1, USEC would convert managed grasslands and old fields to a flat paved surface and would not remove any of the adjacent upland mixed hardwood forest or riparian forest. This would change the visual and scenic quality of this particular location, but it would not substantially alter the present look and feel of the area or of the reservation as a whole. The area in the vicinity of the new cylinder storage yard already contains other storage yards that are smaller but look the same (including the roughly 2.6-hectare [6.2-acre] X-745G Cylinder Storage Yard, half of which would be used for the proposed ACP). The new cylinder storage yard also would be right across the Perimeter Road from the reservation's industrialized central area and would not be visible from off the reservation, for reasons stated above. Therefore, although a more noticeable change than the new facilities within the central area, the new yard would also cause SMALL impacts to visual and scenic resources.

4.2.3.2 Facility Operation

All operations would be conducted within the proposed ACP buildings, at the cylinder storage yards, and along the existing roadway network. These operations would not create any new visual impacts (e.g., they would not result in the release of a visible plume to the air) and would not generate much new or different looking activity than already exists. Therefore, the impacts of facility operations on visual and scenic resources would be SMALL.

4.2.3.3 Ceasing Operations at Paducah

Cessation of operations at the Paducah enrichment plant would not involve any excavation or disturbance of soils, or removal or external modification of buildings or structures. Therefore, the impacts on visual or scenic resources would be SMALL.

4.2.4 Air Quality Impacts

This section analyzes airborne emissions of non-radiological and radiological contaminants and compares those emissions to air permit limits and/or air quality standards. The public and occupational exposures and health impacts associated with these emissions are addressed in Section 4.2.12.

4.2.4.1 Site Preparation and Construction

The following subsections discuss the non-radiological emissions and the radiological emissions associated with the site preparation and construction phase of the proposed action.

<u>Non-Radiological Emissions</u>

Table 2-1 in Chapter 2 of this Draft EIS identifies the primary facilities that would be constructed to support the proposed ACP at the 7 million separative work unit (SWU) capacity. That construction would disturb a footprint of approximately 21 hectares (52 acres). In addition to the area needed for buildings and cylinder storage yards reported in Table 2-1, another 1 hectare (2.5 acres) of earth would be disturbed in preparation for roads and parking areas. Taken together, site preparation and construction activities would disturb approximately 22 hectares (55 acres).

Estimates of fugitive dust that would be emitted from land disturbance over this area were determined based on information using AP-42 emission factors (EPA, 1995a) for construction or, where more detailed information was available, by using fugitive dust emission factors based on the *2004 WRAP Fugitive Dust Handbook* (WRAP, 2004) as appropriate for a mid-west based location. Fugitive dust emissions were estimated for construction and demolition, materials handling, and traffic along paved roads. Because the new buildings identified in Table 2-1 previously had their foundations prepared, soil disturbance was assumed to be limited to construction activities associated with the installation of the utilities.

Exhaust emissions associated with heavy earth-moving equipment would also result in short-term increases in the release of nitrogen oxides, sulfur oxides, carbon monoxide, and particulates, including particulate matter equal to or less than 10 micrometers in diameter and equal to or less than 2.5 micrometers in diameter.[1] The NRC staff estimated these emissions by using information provided in the Environmental Report (USEC, 2005a) on the estimated total fuel consumption for construction activities, the anticipated diesel and gas powered construction equipment and the estimated daily fuel consumption, and reasonable assumptions made by USEC that influence the amount of fuel that would have to be used during construction (see Tables 4.6.3.1-2, 4.6.3.1-3, and 4.6.3.1-4 in USEC, 2005a). This information was used in combination with the U.S. Environmental Protection Agency's (EPA's) Non-Road emission factors from EPA's NR-009c, 010d, 012b (EPA, 2004a; EPA, 2004b; EPA, 2004c) to develop exhaust emissions estimates, assuming use of "Tier 1 equipment" (typically late 1990s to early 2000s model-year equipment depending on engine horsepower rating). Also included in the emission estimates were the emissions associated with construction crew trips to and from the facility each day. As estimated by USEC in its Environmental Report (USEC, 2005a), those trips include 2,612 one-way construction worker trips (1,306 commuting round trips) and an average of approximately 10 round trips of heavy-duty delivery trucks associated with construction material and building supplies. USEC assumed that each

[1] In evaluating impacts relating to the criteria pollutants, the NRC staff did not review potential impacts relating to ozone, including emissions of volatile organic compounds that are precursors to the production of ozone. Pike County is in attainment for ozone, which is generally recognized as a regional-scale air quality problem; therefore, the potential site-specific increases in the emission of volatile organic compounds would not affect regional ozone concentrations.

worker would arrive as a single-occupant vehicle and that half the vehicles would be light-duty trucks and half would be light-duty vehicles.

Once the estimates of airborne emissions were developed, the NRC staff then input those values into an air dispersion model to estimate the air quality impacts from the proposed site preparation and construction activities. The Industrial Source Complex Long-Term (EPA, 1995b) air dispersion model was used to estimate quarterly and annual average air concentrations at the facility boundary. Short term peak concentrations were then estimated by using scaling factors based on the maximum modeled concentration (EPA, 1992). In developing these estimates, the NRC staff used meteorologic data obtained from the 30-meter (98-foot) tower at the DOE reservation at Piketon as inputs to the model, combined with selected other meteorological data from the nearest archived meteorological data locations (in Waverly, Ohio and Huntington, West Virginia). Additional modeling details included the following: emission sources were modeled as uniform area sources at their site-specific locations; emissions were assumed to occur eight hours per day, 250 days per year; and emissions were estimated on a quarterly basis for each of the five years needed for the majority of the proposed site preparation and construction activities.

The results from this analysis are summarized in Table 4-1. This table shows predicted concentrations of the criteria pollutants over different time frames at the reservation property boundary. These predicted concentrations are added to concentrations measured at the nearest air quality monitoring station, which are reported in Table 4-1 as "background" values. Since ambient air quality data for the pollutants reported in Table 4-1 are not measured at the proposed ACP site, the NRC staff used monitoring data from the nearest monitoring site, located in Portsmouth, Ohio, as representative background values. The table then compares the sum of the maximum modeled and measured concentrations to the National Ambient Air Quality Standards.

As shown in Table 4-1, all modeled concentrations from site preparation and construction activities are below the National Ambient Air Quality Standard for each criteria pollutant with the exception of the annual average concentration of particulate matter with a mean diameter of 2.5 micrometers or less. The predicted annual average concentration of particulate matter with a mean diameter of 2.5 micrometers or less is 16.1 micrograms per cubic meter, which slightly exceeds the National Ambient Air Quality Standard of 15 micrograms per cubic meter up to a distance of 1,000 meters (3,280 feet) beyond the fenceline. While emissions from soil disturbance and burning of fossil fuel associated with proposed ACP site preparation and construction contribute to this exceedance, the vast majority of the exceedance is the result of high background concentrations for particulate matter with a mean diameter of 2.5 micrometers or less in the area. The site is located in a county that is exempt from restrictions on emissions for fugitive dust specified in Ohio Administrative Code 3745-17-08. However, to avoid nuisance conditions and particulate matter concerns, USEC intends to use dust suppression techniques (e.g., water sprays and speed limits on dirt roadways) to mitigate releases of dust during excavation under dry conditions (USEC, 2005a). As a result, the non-radiological air quality impacts from site preparation and construction of the proposed ACP facility are considered MODERATE.

The NRC staff recommends additional mitigation measures to reduce the predicted impacts associated with particulate matter emissions. The staff's modeling results indicate that the majority of emissions are expected to come from construction vehicle exhaust, rather than automobile (worker vehicle) exhaust or fugitive dust from land disturbance activities. To reduce particulate emissions from construction vehicle exhaust, the NRC staff recommends that USEC: (1) use Tier 2 construction-related vehicles (2001 to 2006-model year equipment), which would reduce diesel particulate matter emissions by about 40 percent; and (2) use ultra-low sulfur diesel fuel (15 parts per million versus the current typical fraction of 500 parts per million), which would reduce particulate matter emissions by about 20 percent. If USEC implements these two additional mitigation measures, the NRC expects that the non-radiological air quality impacts from site preparation and construction would be reduced to SMALL.

Table 4-1 Predicted Property Boundary Air Concentrations from Site Preparation and Construction Activities and Applicable National Ambient Air Quality Standards (µg/m³) [a]

Species [b]	Value [c]	1-hr	3-hr	8-hr	24-hr	Annual
CO	Modeled	262	236	184	105	26
	Background	8,360	----	6,070	----	----
	Model + Background	8,622	----	6,254	----	----
	NAAQS	40,000	----	10,000	----	----
NO_2	Modeled	36.5	32.9	25.6	14.6	3.7
	Background	177	----	----	----	32
	Model + Background	214	----	----	----	36
	NAAQS	----	----	----	----	100
PM_{10}	Modeled	23	21	16	9.2	2.3
	Background	----	----	----	49	19.7
	Model + Background	----	----	----	58	22
	NAAQS	----	----	----	150	50
$PM_{2.5}$	Modeled	23	20	16	9.1	2.3
	Background	----	----	----	41.3	13.8
	Model + Background	----	----	----	50.4	16.1
	NAAQS	----	----	----	65	15
SO_2	Modeled	4.2	3.8	3	1.7	0.4
	Background	----	309	----	110	10
	Model + Background	----	313	----	112	10.4
	NAAQS	----	1,300	----	365	80

Notes:
[a] µg/m³ = microgram per cubic meter.
[b] CO = carbon monoxide; NO_2 = nitrogen dioxide; PM_{10} = particulate matter with a mean diameter of 10 micrometers or less; $PM_{2.5}$ = particulate matter with a mean diameter of 2.5 micrometers or less; SO_2 = sulfur dioxide.
[c] NAAQS = National Ambient Air Quality Standard.

Radiological Emissions

Airborne radiological emissions from the proposed ACP would be regulated by the U.S. EPA under 40 CFR Part 61 Subpart H, the National Emissions Standards for Hazardous Air Pollutants. The limits imposed by these standards are based upon the estimated radiation dose to the public, not the quantity of material released.

During site preparation and construction activities, the decontamination and decommissioning of the existing Gas Centrifuge Enrichment Plant enrichment train could result in the release of airborne contamination. The residual contamination level in these old enrichment centrifuges is low, and two levels of airborne contamination control would be applied to minimize releases. First, best management practices would be employed, including temporary containment structures and localized air filtration to minimize the consequence of any release. Second, the buildings in which the work would be performed utilize air filtration and trapping systems in order to capture any releases. This dual containment system

combined with the small quantity of uranium present in the Gas Centrifuge Enrichment Plant train ensure that any air quality impact from decontamination and decommissioning of the existing gas centrifuge facilities would be SMALL.

Radiological emissions could also occur during construction activities when soil is excavated. If the soil contains radioactive material, this material could be included in any dust suspended during construction. USEC plans to excavate approximately 146,956 cubic meters (192,099 cubic yards) of soil; the low concentration of radioactive materials in the soil to be excavated could result in a maximum expected release of radionuclides from this excavation of 2,760 grams of uranium-238, 6.7 grams of uranium-235, 0.038 grams of uranium-234, and 0.014 grams of technetium-99. Based on these small expected releases, the air quality impact of any radiological dust emissions during construction is expected to be SMALL.

Based on this analysis, the radiological impacts to air quality from site preparation and construction would be SMALL. The public health impacts of these radiological emissions are examined in Section 4.2.12.2.

4.2.4.2 Facility Operation

<u>Non-Radiological Emissions</u>

During routine operation of the proposed ACP, principal non-radiological pollutants would come from the exhaust of stationary diesel generators used for emergency power if supplied power is lost. Each of the 26 aboveground fuel storage tanks proposed for the proposed ACP would have a 900-horsepower, 600-kilowatt emergency diesel generator. These generators would be operated periodically for testing purposes and for scheduled preventive maintenance. Because the emergency diesel generators are expected to operate for less than 500 hours per year, they are exempt from Federal and Ohio air permitting. Airborne emissions are also possible from the 26 aboveground tanks themselves, each of which would have the capacity to store up to 4 cubic meters (1,000 gallons) of fuel except for two tanks that would have a capacity of 151 cubic meters (40,000 gallons) each. Emissions from these tanks, however, would be very small because they would hold diesel and No. 2 fuel oil, which are not significant sources of volatile organic emissions (emissions from the tanks should be less than the emissions associated with the firing of the diesel generators).

The NRC staff's quantitative analysis, therefore, focused on the long-term and short-term air quality impacts from the operation of the 26 generators. This analysis used emissions estimated by USEC assuming the generators were operated at full power, consuming 0.19 cubic meter per hour (50 gallons per hour) of low sulfur number two diesel (0.05 percent sulfur) (USEC, 2005a). These emissions estimates were then input into the same air dispersion model by using the same meteorological data described in Section 4.2.4.1. Modeling was performed for continuous operation and then scaled using a factor of 500/8760. Short-term concentrations were based on continuous operations. Emissions were modeled as point sources using stack parameters from a 1,109 horsepower diesel generator described in Appendix 7 of the California Air Resources Board's Diesel Risk Reduction Plan (CARB, 2000), except that a 10-meter (33-foot) stack was used to minimize any building downwash effects.

Table 4-2 shows the results of this modeling analysis, including the modeled concentrations expected to result from the generator operations plus representative background values compared to the National Ambient Air Quality Standard (as in Table 4-1 in Section 4.2.4.1). As presented in Table 4-2, all air concentrations expected to result from the operation of the 26 emergency diesel generators are well below the National Ambient Air Quality Standard for each criteria pollutant. Therefore, the non-radiological air quality impacts from operation of the proposed ACP are expected to be SMALL.

Table 4-2 Predicted Property-Boundary Air Concentrations from Operation of 26 Emergency Diesel Generators and Applicable National Ambient Air Quality Standards (μg/m³)[a]

Species[b]	Value[c]	1-hr	3-hr	8-hr	24-hr	Annual
CO	Modeled	142	128	99	57	0.3
	Background	8,360	——	6,070	——	——
	Model + Background	8,502	——	6,169	——	——
	NAAQS	**40,000**	——	**10,000**	——	——
NO_2	Modeled	204	184	143	82	1.2
	Background	177	——	——	——	32
	Model + Background	381	——	——	——	34
	NAAQS	——	——	——	——	**100**
PM_{10}	Modeled	3.7	3.3	2.6	1.5	<0.1
	Background	——	——	——	49	19.7
	Model + Background	——	——	——	50.5	19.8
	NAAQS	——	——	——	**150**	**50**
$PM_{2.5}$	Modeled	3.5	3.2	2.5	1.4	<0.1
	Background	——	——	——	41.3	13.8
	Model + Background	——	——	——	42.7	13.9
	NAAQS	——	——	——	**65**	**15**
SO_2	Modeled	3.2	2.9	2.2	1.3	<0.1
	Background	——	309	——	110	10
	Model + Background	——	312	——	111	10.1
	NAAQS	——	**1,300**	——	**365**	**80**

[a] μg/m³ = micrograms per cubic meter.
[b] CO = carbon monoxide; NO_2 = nitrogen dioxide; PM_{10} = particulate matter with a mean diameter of 10 micrometers or less; $PM_{2.5}$ = particulate matter with a mean diameter of 2.5 micrometers or less; SO_2 = sulfur dioxide.
[c] NAAQS = National Ambient Air Quality Standard.

The primary non-radiological air pollutant associated with the operation of the proposed ACP is hydrogen fluoride (HF). When UF_6 is released to the air, it reacts with atmospheric moisture to form particulate uranium (in the form of uranyl fluoride) and HF fumes. For this Draft EIS, airborne concentrations of HF at various downwind locations were modeled using the stoichiometry of the UF_6 reaction with atmospheric moisture, as described in Section 4.2.12.3 on the public dose from routine airborne releases of radioactive material. As shown in Table 4-21 in that section, the maximum predicted HF concentration is 2.35×10^{-3} microgram per cubic meter at the Ohio National Guard building located onsite 555 meters (1,820 feet) east of the proposed ACP buildings. This concentration is more than six orders of magnitude below the Occupational Safety and Health Administration Permissible Exposure Limit (as an eight-hour average) of 2,500 micrograms per cubic meter for HF. Therefore, the impacts associated with anticipated HF concentrations in the air resulting from proposed ACP operations should be SMALL

Radiological Emissions

Potential sources of airborne radiological releases for the proposed ACP are:

- X-3346 Feed and Customer Services Building;
- X-3001, X-3002, X-3003, and X-3004 Process Buildings;
- X-3356 Product and Tails Withdrawal Building;
- X-3012 Process Support Building;
- X-7725 Recycle/Assembly Facility;
- X-7726 Centrifuge Training and Test Facility;
- X-710 Laboratory; and
- X-7727H Interplant Transfer Corridor.

Ventilation air from the first seven locations listed above would be monitored under the site Radiation Protection Program. Environmental Compliance personnel would review summaries of the monitoring data at least quarterly to verify that ventilation exhausts are insignificant as defined in NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility*, which is a value less than 1.11×10^{-8} becquerels per milliliter (3×10^{-13} microcuries per milliliter) of uranium.

The eighth location listed above, the X-7727H Interplant Transfer Corridor, would never be exposed to open centrifuges or components, but does have some air transfer from the process buildings and X-7725 Facility. At worst, the airborne uranium concentration in the X-7727H Corridor would not exceed that in the process buildings or X-7725 Facility.

Each process vent in the X-3001, X-3002, X-3003, X-3004, X-3346, X-3356, and X-7725 Buildings would have gas flow monitoring instrumentation with local readout as well as analytical instrumentation to continuously sample, monitor, and alarm UF_6 breakthrough in the effluent gas stream. The continuous vent sampler would draw a flow proportional sample of the vent stream through two alumina traps in series by way of an isokinetic probe. Both vent and sampler flows would be monitored by the sampler's electronic controller. The controller adjusts a control valve in the sample line to maintain a constant ratio between the vent and sample flows. The flow instruments would be calibrated at least annually. The primary sample trap would be equipped with an automated radiation monitor to continuously monitor the accumulation of uranium in the sampler.

Detailed emission calculations would be based on laboratory analysis of the collected samples. Each vent sampler would have two traps permanently dedicated to each trap position, with one in-service and the other either being processed or standing by to replace the in-service trap. Normally, the primary sample traps would be replaced weekly and the secondary traps replaced quarterly. In the event of an unplanned or seriously elevated release, the involved sampler traps would be collected for immediate analysis as soon as the situation has stabilized. Alternatively, the sampling period may be extended, provided the sampler is operating continuously while the vent is operating. A hydrated alumina would be used in the vent samplers to convert absorbed UF_6 to uranyl fluoride for laboratory analysis.

Vent samples would be analyzed for uranium-234, uranium-235, uranium-238, and technetium-99 (technetium-99 is a fission product that has contaminated much of the fuel cycle as a result of past recycling of reprocessed uranium). Experience at the gaseous diffusion plant has shown that these three uranium isotopes account for more than 99 percent of the public dose due to uranium emissions. Feed material that meets the American Society of Testing and Materials specification for recycled feed may be used in the proposed ACP, which may contain additional radionuclides (i.e., uranium-236 and technetium-99). The proposed ACP would monitor process vent samples for technetium as a

precautionary measure since experience at the gaseous diffusion plant indicates the potential for technetium-99 to eventually appear in some gaseous effluents.

The maximum gaseous effluent anticipated under normal operations is 9.6×10^{7} becquerels (0.003 curies) of uranium over a week, or up to 5.1×10^{9} becquerels per year (0.14 curies per year) (USEC, 2005a). The NRC staff estimated that the projected maximum airborne concentration of total uranium due to proposed ACP operations is only 2.0×10^{-10} becquerels per milliliter (5.4×10^{-15} microcuries per milliliter). This uranium concentration is less than one percent of the applicable concentration limit in 10 CFR Part 20, Appendix B, Table 2. Average emission rates are expected to be much lower.

Radiological releases to air would be routinely monitored to ensure that releases are at or below the expected quantities. DOE collects data from a monitoring network of 15 ambient air samplers; this network is described in the DOE site environmental report for 2002 (DOE, 2003), among other places. The monitoring network is intended to assess whether radiological air emissions from the DOE reservation affect air quality in the surrounding area. Data are collected both onsite and in the area surrounding the DOE reservation. A background ambient air monitoring station is located approximately 21 kilometers (13 miles) southwest of the site. The analytical results from air sampling stations closer to the plant are compared to background measurements (DOE, 2003).

Based on the maximum radiological emission rates for the proposed ACP and the comprehensive site monitoring program, the expected impact on air quality from radiological emissions is expected to be SMALL.

4.2.4.3 Ceasing Operations at Paducah

Ceasing operations at Paducah would decrease airborne emissions from those associated with current operation of the Paducah enrichment plant. Air quality impacts from non-radiological and radiological process and fugitive air emissions sources would be largely eliminated after cessation of operations. Air emissions after enrichment operations are shut down would be limited to combustion emissions from onsite utilities (e.g., boilers), combustion emissions from the operation of vehicles and equipment by the maintenance and security workforce, and fugitive particulate emissions from plant property and operation of vehicles on paved roads.

Fugitive particulate emissions would not be directly affected by cessation of enrichment plant operations. Existing fugitive dust management systems and procedures would be maintained after cessation of plant operations. Other than fugitive dust potentially containing radionuclides, no radiological air emissions are anticipated to occur once the enrichment operations are ceased. Air emissions of hazardous air pollutants could potentially result from maintenance activities, but such emissions would be lower than those associated with current plant operations.

Based on this analysis, the air quality impacts associated with the cessation of operations at Paducah are expected to be SMALL.

4.2.5 Geology and Soil Impacts

This section assesses potential impacts on geologic resources and soils during site preparation and construction and operation of the proposed ACP, along with the corresponding impacts associated with the cessation of gaseous diffusion operations at Paducah (centrifuge manufacturing and decommissioning of the proposed ACP are discussed separately in Sections 4.2.14 and 4.2.15, respectively). Impacts could result from planned excavation activities for the proposed ACP or spills that could cause soil contamination. There are no known mineral deposits on the proposed ACP site; therefore, there would be

no impacts to mineral resources. Chapter 3 describes site soil, which is heavily altered due to past construction activities. The soils at and nearby the site are not considered prime farmland due to low fertility, previous disturbance, and slope (Borchelt, 2003; Yost, 2005).

4.2.5.1 Site Preparation and Construction

Site preparation and construction activities for the proposed ACP would occur primarily within the southwest quadrant of the DOE reservation's central area, as described in Section 2.1. In total, activities needed to construct new facilities in the central area would disturb approximately 12 hectares (30 acres). All of these activities would occur within an existing industrial facility with natural soils already altered as a result of mixing from previous cut and fill activities. The terrain in this area is flat and the new construction would not alter existing drainage patterns. Soils exposed during construction would be temporarily susceptible to increased erosion caused by wind or rain, but any such erosion would be very minor and short lived.

Cylinder Storage Yard X-745H, occupying 10 hectares (25 acres), would be constructed just north of Perimeter Road in an area containing managed grasslands and old fields with a small portion of upland forest. It has approximately 15 meters (50 feet) of topographical expression and is located between two tributaries to Little Beaver Creek. The majority of the topography and soils in this area have been previously disturbed and altered (USEC, 2005a). Construction of this yard would include cut and fill of approximately 10,000 cubic yards during a construction period of 24 months. During excavation and grading, the steep slopes would be more susceptible to soil erosion and the streams at the bottom of the slopes may receive an increased amount of silt. Engineering controls and best management practices would be implemented to minimize the extent of excavation. Disturbed areas would, to the extent practicable, be controlled to minimize erosion and sediment runoff; for example, USEC would implement best management practices, such as minimizing the area of disturbance, erosion control ditches, temporary vegetation seeding, and silt fencing, during construction to minimize erosion and siltation of streams (USEC, 2005a).

Site preparation and construction activities could also result in spills of oils, lubricants, and other materials from construction equipment. USEC would take precautions in accordance with applicable laws and best management practices to avoid accidental releases to the environment; this would include the use of liquid effluent tanks, holding ponds with oil diversion devices, and spill response equipment and procedures (USEC, 2005a). In addition, in accordance with best management practices, all USEC employees would be provided with required training to ensure that personnel adequately understand the hazards associated with the materials they are handling and understand procedures for spill response (USEC, 2005b). Spill response equipment, such as patch kits, sewer plugs, vacuum trucks, storage tankers, oil skimmers, spill response trailers, portable pumps, and portable lighting would also be maintained onsite (USEC, 2005b). Because of such precautions, spills should be small and occasional, and the response to such spills would be prompt and would contain and remove material that had been released or contaminated.

In summary, most of the site is an existing industrial facility with altered natural soils. Natural soils are cohesive and over-consolidated and have low potential for liquefaction. There is little likelihood of impact from soil compaction or subsidence. The flat terrain in the central area, and the dense soil, low moisture content, and vegetative cover in the majority of the X-745H Cylinder Yard Area make landslides unlikely. Construction activities would not alter current drainage and would not disturb any soils that qualify for protection as prime farmland (Yost, 2005). There would be a potential for increased erosion and siltation of streams near the construction site of Cylinder Storage Yard X-745H, as well as the potential for soil contamination from spills or leaks from construction equipment, but both of these potential impacts should be minimized by the use of standard best management practices, such as

minimizing the area of disturbance, erosion control ditches, temporary vegetation seeding, and silt fencing, during construction to minimize erosion and siltation of streams (USEC, 2005a). The overall impacts on soils during site preparation and construction activities would therefore be SMALL.

4.2.5.2 Facility Operation

Operations potentially impacting soils include spills from production activities in the Feed and Customer Services Building and the Product and Tails Withdrawal Building, both of which would be located within the central area of the DOE reservation. Floors inside these buildings would be sealed and spill containment systems would be in place. Gaseous releases associated with cylinder connections and equipment upsets would quickly convert to solid uranyl fluoride, which typically would be collected via a gulper system that filters out the particulates; however, some uranyl fluoride may settle onto the floor (USEC, 2004c). Any such contamination would be collected in the liquid effluent collection system, which would consist of a series of tanks located throughout the ACP. Because the building construction and spill control systems make it unlikely that any spills inside these buildings will reach outside soils, the potential for soil impacts from this scenario is SMALL.

Normal operations would also release small amounts of uranium and fluoride to the air, which may be deposited onto soils downwind of the facility. Section 4.2.4.2 describes the potential releases from facility operations to air. Because these anticipated release and deposition rates are expected to be very minor, the potential for soil contamination at downwind locations would be SMALL.

UF_6 transfer and storage activities would occur at cylinder storage yards within the central area of the reservation and at the X-745G-2 and X-745H Cylinder Storage Yards north of Perimeter Road. These storage yards would be constructed of thick high-pressure concrete with a smooth troweled surface. The surface of the concrete would be sealed to prevent infiltration of materials. Cylinders in the storage yards would contain solid UF_6; therefore, there is no potential for liquid UF_6 release. Spills of other hazardous material, such as oils or lubricants from the cylinder handling equipment, would be isolated and cleaned up using spill containment and control equipment located at the storage pads. Because the yards are flat, any spilled liquids or any contamination suspended in storm water runoff could travel to the edge of the pad and migrate onto adjacent soil. If such contamination did reach the soil, mitigation measures would consist of delineating the extent of the contamination and removing it. Therefore, any resulting soil impacts would be temporary, localized, and SMALL.

There are no major geologic faults in the vicinity of the proposed ACP and there have been no historical earthquake epicenters within 40 kilometers (25 miles) of the site. For the Gas Centrifuge Enrichment Plant design in the 1980s, the maximum earthquake was defined as one with a mean recurrence interval of 1,000 years. The general design-basis earthquake for the proposed ACP is also based on a 1,000-year return period. Building X-3346A was designed at a higher safety margin with a design basis earthquake of 10,000-year return period. As a result of the probability of an event occurring and the large distance of a potential event to the site, any potential impacts from seismicity are expected to be SMALL.

4.2.5.3 Ceasing Operations at Paducah

Ceasing operations at the Paducah enrichment plant would not involve any excavation or disturbance of soils or the subsurface. Therefore, the impacts to geology and soils associated with this action would be SMALL.

4.2.6 Water Resource Impacts

This section assesses potential impacts of the proposed action on water resources, not including wetlands. Potential impacts to wetlands are covered in the ecological impact assessment included in Section 4.2.7.

4.2.6.1 Site Preparation and Construction

The following subsections discuss the potential impacts on surface water, floodplains, and groundwater associated with the site preparation and construction phase of the proposed action.

Surface Water

During the site preparation and construction activities, 15 buildings and one cylinder storage yard would be refurbished, and a total of 12 hectares (30 acres) of new buildings, facilities, and storage yards would be constructed within the southwest quadrant of the central area. In addition to these facilities, a new 10-hectare (25-acre) cylinder storage yard would be constructed outside of the central area, just north of Perimeter Road, in the northern portion of the DOE reservation. Because land disturbance activities would involve more than 2 hectares (5 acres), a National Pollutant Discharge Elimination System permit that would specify and regulate the quality of storm water runoff would need to be issued by the Ohio EPA. The site preparation and construction activities within the central area would drain to the DOE Piketon Tributary and the West Ditch, as those two surface water features are downgradient from the proposed land disturbing areas. The site preparation and construction activities associated with the 10-hectare (25-acre) X-745H Cylinder Storage would drain to two unnamed tributaries as well as Little Beaver Creek, which are immediately downgradient of the proposed storage yard. All of these surface waters discharge into the Scioto River.

Site preparation and construction activities in the southwest quadrant of the central area would involve land clearing, excavation, and minimal additional grading (the land in this area has already been leveled as part of earlier site preparation and construction activities). Such disturbances would result in a temporary increase in soil erosion and sedimentation in adjoining ditches during the 24-month construction period, which could increase turbidity and alter other water quality parameters (e.g., dissolved oxygen, pH, hardness levels, and chemical concentrations). However, because the onsite runoff and associated sediments would discharge into holding ponds, which have been designed to reduce such impacts, and would then discharge into the regulated portion of the West Ditch and the DOE Piketon Tributary, such impacts would be considered SMALL. The erosion and resulting sedimentation would not alter or preclude the designated uses of the West Ditch or Piketon Tributary, as presented in Section 3.7, nor would it affect the designated use and associated water quality criteria of the Scioto River.

Site preparation and construction activities for X-745H Cylinder Storage Yard outside of the Perimeter Road in the northern portion of the reservation would result in more extensive soil disturbances, as described in Section 4.2.5.1. The X-745H Cylinder Storage Yard would be located on a relatively flat grasslands and old fields bounded on the south by the Perimeter Road; on the east by an unnamed tributary to Little Beaver Creek (adjacent to the North Access Road); on the west by the eastern drainage channel to, and the discharge from, the X-230L North Holding Pond; and on the north by the valley of Little Beaver Creek. The proposed cylinder storage yard would be located in an upland area at approximately 660 feet above mean sea level at its southern end dipping to 640 feet above mean sea level at the northern elevation. While this area is adjacent to riparian and upland forests and wetland areas of the Little Beaver Creek and its tributaries, the proposed construction would not require removal of or disturbance in those areas (USEC, 2005c).

Nevertheless, site preparation and construction activities for the new cylinder storage yard would result in a temporary increase in erosion and sedimentation during the 24-month construction period. The runoff, if not controlled, would directly enter the unnamed tributaries as well as Little Beaver Creek. Because of the size of the area to be disturbed (10 hectares [25 acres]), the steep topography, the extent of cut and fill activities needed, and the proximity to Little Beaver Creek, which is a State Resource Water that exhibits exceptional ecological values and/or exceptional recreational values (as defined in OAC 3745-1-09 for the Scioto River Drainage Basin), the erosion and sediments that could enter the creek could result in a MODERATE impact. Implementation of the best management practices described in Section 4.2.5.1 on soil impacts, together with USEC's plan to not disturb the upland mixed hardwood forest and the riparian forest adjacent to the managed field and old field (USEC, 2005c), would reduce this potentially MODERATE impact to a SMALL impact. Such measures would reduce the level and amount of erosion and sedimentation that would occur in the adjacent surface waters. With the implementation of these mitigation measures, the site preparation and construction activities needed for X-745H Cylinder Storage Yard also would not affect the designated use and associated water quality criteria of the Scioto River.

Sanitary wastewater associated with the site preparation and construction activities (up to 814 cubic meters per day [215,000 gallons per day]) would be treated at the Sewage Treatment Plant (Building X-6619). Currently, this plant treats approximately 909 cubic meters per day (240,000 gallons per day) and has a design capacity of 2,275 cubic meters per day (601,000 gallons per day). Effluent from the sewage treatment plant would discharge directly to the Scioto River via a pipeline that is regulated under a National Pollutant Discharge Elimination System permit. The additional 814 cubic meters per day (215,000 gallons per day) would represent a 90 percent increase in the wastewater currently processed at the sanitary treatment plant; however, the total processed wastewater would represent 75 percent of the plant's total design capacity (USEC, 2005a). The additional wastewater would not affect the status or water quality criteria of the permit. As a result, the additional wastewater discharge during site preparation and construction activities would cause an overall SMALL impact on surface water resources.

Finally, small and occasional spills or leaks of petroleum-based products (e.g., diesel fuel or oil) or hazardous materials associated with construction equipment could cause SMALL impacts to surface waters adjacent to site preparation and construction activities. To prevent such impacts, all temporary storage tanks or sheds that contain such material would have secondary containment features (berms or dikes to contain spilled contents), and would have appropriate spill response equipment appropriate for the materials present. In addition, trained and qualified spill response and clean-up professionals would respond to incidental or accidental releases of petroleum-based products or hazardous materials in accordance with the United States Enrichment Corporation's Spill Prevention Control and Countermeasures Plan and best management practices (United States Enrichment Corporation, 2004; and USEC, 2005b). The Spill Prevention Control and Countermeasures Plan would be revised to explicitly address the proposed ACP (USEC, 2005a).

<u>Floodplains</u>

None of the proposed site preparation and construction activities would occur within a 100-year floodplain. The clearing of 22 hectares (55 acres) of managed lawns, fields, and forested areas would result in increased storm water runoff; however, the DOE reservation has a storm water management system of open and closed culverts and ditches, as well as a series of holding ponds that have been designed to control storm water runoff (USEC, 2005a; USEC, 2004c). Because none of the proposed site preparation and construction activities would occur within a 100-year floodplain, and the DOE reservation has an existing storm water management system, the impacts on floodplains would be SMALL.

Groundwater

Groundwater is approximately 9 meters (30 feet) below ground surface within the proposed site preparation and construction areas. Because this depth would be well below the depth of excavation needed for the proposed new facilities, groundwater would not be directly impacted during site preparation or construction activities. As presented in Section 3.7.3, the proposed site preparation and construction activities would not occur in areas directly overlying contaminated groundwater.

If they occur, spills or leaks of petroleum-based products (e.g., diesel fuel or oil) or hazardous materials associated with construction equipment could be potential sources of groundwater contamination. Implementation of the best management practices described in Section 4.2.5.1 on soil impacts, as well as providing for secondary containment features for all temporary storage tanks or sheds, and maintaining spill response equipment appropriate for the materials present, would reduce the potential impact of a release. In addition, trained and qualified spill response and clean-up professionals would respond to incidental or accidental releases of petroleum-based products or hazardous materials in accordance with the site's Spill Prevention Control and Countermeasures Plan and best management practices (United States Enrichment Corporation, 2004; USEC, 2005b).

The water that would be used during site preparation and construction activities would be drawn from water supply lines present on the DOE reservation, which is drawn from a series of well fields located along the Scioto River. The increased use of water during site preparation and construction (approximately 814 cubic meters per day [215,000 gallons per day]) would be less than that during facility operation (up to 1,995 cubic meters per day [527,000 gallons per day]) and would not impact the regional groundwater supply (see Section 4.2.6.2 for additional information).

In summary, groundwater would not be directly encountered during excavation activities, should not be contaminated by any new spills or leaks, and should not be depleted as a supply. As a result, any impacts to groundwater caused by site preparation and construction activities are expected to be SMALL.

4.2.6.2 Facility Operation

The following subsections discuss the potential impacts on surface water, floodplains, and wetlands associated with the proposed ACP operations.

Surface Water

The liquid discharges associated with operation of the proposed ACP facility include sanitary wastewater, discharge from the tower water cooling system, storm water runoff, and any incidental leaks or spills. The centrifuges used in the proposed ACP would be cooled via a closed-loop machine cooling water system and would not result in any discharges. The heat from the machine cooling water system would be transferred via a heat exchanger to the tower water cooling system. USEC does not anticipate any liquid discharges of licensed radioactive materials from the proposed ACP (i.e., from sanitary wastewater, cooling water, or storm water runoff). Any effluents potentially containing radioactive material would have to meet the NRC standards in 10 CFR Part 20 (Standards for Protection Against Radiation) prior to being discharged or would have to be disposed at a licensed facility (USEC, 2004c).

The flow from sanitary wastewater during facility operation (approximately 361 cubic meters per day [95,400 gallons per day]) would feed into the onsite sewage treatment plant, which in turn discharges to the Scioto River. This additional flow would represent a 40 percent increase in wastewater currently processed at the plant; however, the total processed wastewater would still represent only 56 percent of the plant's total design capacity (USEC, 2005a). This additional wastewater would not affect the status or

water quality criteria of the National Pollutant Discharge Elimination System permit and would represent a SMALL impact on surface water quality.

The tower water cooling system would discharge approximately 273 cubic meters per day (72,000 gallons per day) of wastewater to the DOE reservation recirculating cooling water system, which discharges to the Scioto River in accordance with a National Pollutant Discharge Elimination System permit (United States Enrichment Corporation Outfall 004) (see Figure 3-11 in Chapter 3). This wastewater from the proposed ACP would be non-contact cooling water and would not alter the properties or quality of the current wastewater discharge. The volume would be the only attribute of the wastewater that would be altered relative to the current recirculating cooling water system discharge. Currently, 4,543 cubic meters per day (1.2 million gallons per day) are discharged from the cooling system, so the proposed additional discharge would represent a less than six percent increase in discharge rates. As such, the tower water cooling discharges associated with the proposed ACP would have a SMALL impact on surface water quantity and quality.

Storm water runoff from the ACP area would drain to a pair of existing holding ponds: the X-2230N West Holding Pond (National Pollutant Discharge Elimination System Outfall 012) and the X-2230M Southwest Holding Pond (National Pollutant Discharge Elimination System Outfall 013) (see Figure 3-11 in Chapter 3). Both of these ponds provide a quiescent zone for settling suspended solids, dissipation of chlorine, and oil diversion containment. The ponds discharge to an unnamed tributaries to the Scioto River. An automated sampler currently collects a weekly composite sample of the liquid effluent for radiological analysis as well as samples for the National Pollutant Discharge Elimination System-mandated analyses (USEC, 2005a). Because discharges through these ponds would continue to be regulated under the National Pollutant Discharge Elimination System, and because the existing monitoring systems would continue to be implemented once the ACP becomes operational, storm water discharges associated with ACP operations should result in a SMALL impact on surface water quality.

Any leakage from the machine cooling water system and incidental spills of water elsewhere in the ACP would be collected by the Liquid Effluent Collection system. This system would consists of a set of drains and underground collection tanks for the collection and containment of leaks and spills of chemically treated water. The drains would be located throughout the ACP. The tanks would have a capacity of 550 gallons each and would be monitored by liquid level gauges mounted above grade on pipe stands. USEC would sample and analyze the water accumulated in the Liquid Effluent Collection tanks prior to disposal. If the contents meet the requirements of 10 CFR 20.2003 (which include concentration limits specified in Table 3 of Appendix B to 10 CFR Part 20), they may be pumped to the reservation sanitary sewer system. Otherwise the tank contents would be containerized for offsite disposal. An integrity assurance plan developed by USEC would assure the integrity of the tanks and inventory monitoring of the tank contents would be used to detect leaks from the Liquid Effluent Collection System. (USEC, 2004c)

A total of 26 aboveground fuel supply tanks with a total capacity of 394 cubic meters (104,000 gallons) would be installed to support backup generators and boilers. These tanks would be constructed of materials compatible with the product to be stored and with the conditions of storage (e.g., pressure and temperature), and would meet all operational regulatory requirements, including those outlined in the Spill Prevention Control and Countermeasures Plan (United States Enrichment Corporation, 2004). A secondary means of containment for tanks storing petroleum products, as required by 40 CFR § 112.8, would provide for the entire capacity of each aboveground storage tank, with sufficient freeboard to contain precipitation in addition to any spilled fuel. All associated piping systems would conform to standards for fuel distribution pressure piping, would be designed to minimize abrasion and corrosion, and would allow for expansion and contraction. (USEC, 2005a)

Special precautions would also be taken to make sure fuel is transferred into the tanks in a way that minimizes the potential for accidental spills. For example, all fuel lines and tanks would be labeled in accordance with regulatory standards. Spill cleanup materials, such as absorbent pads and/or spill pallets, would be available at all hose connections. Standard fuel-oil delivery procedures would be followed by truck drivers and receiving personnel during unloading operations at each tank. Precautions also would be taken to avoid impacts from accidental releases, such as the use of safety procedures, spill prevention plans, and spill response plans in accordance with Federal and State laws. Drainage from the area of the aboveground tanks also runs directly to the X-2230M and X-2230N Holding Ponds, which are equipped with diversion systems to prevent spilled material from reaching the Scioto River (USEC, 2005a). These systems aid in preventing degradation of the overall water quality of the Scioto River because of the DOE reservation activities. Based on all of these measures, the likelihood and severity of potential impacts from accidental releases from the aboveground storage tanks would be minimized, and any resulting impact should be SMALL.

In addition to possible releases from the storage tanks described above, incidental spills and accidental releases associated with operation of the proposed ACP facility have the potential to adversely impact surface waters. Such spills or releases within a building would be contained within the building via the Liquid Effluent Collection system, and would be cleaned up before escaping outside. Likewise, any such spills or releases outside of a building (e.g., at a cylinder storage yard) are expected to be infrequent and small, would be contained within the area, and would be managed in accordance with applicable Federal and State regulations. In addition, any contaminated storm water runoff would be diverted to holding ponds and released through outfalls controlled under the National Pollutant Discharge Elimination System. Therefore, any impacts to surface waters caused by incidental spills and accidental releases should be SMALL.

As stated at the beginning of this section, USEC does not anticipate any liquid discharges of licensed radioactive materials from the proposed ACP. Such releases would be controlled through plant design, operations, and monitoring. Based on historical operating experience at the Portsmouth reservation, USEC has established maximum effluent concentrations expected under normal operations of the ACP. Table 4-3 lists these anticipated concentrations along with the corresponding release limits from 10 CFR Part 20 for comparison. As discussed above, the Liquid Effluent Collection system contents will be sampled and compared to the Table 3 limits prior to discharge. As shown, the anticipated radionuclide releases are well below the NRC's limits.

Table 4-3 Anticipated Radionuclide Concentrations in Liquid Effluents from Normal Operations

Effluent Source	Total Uranium[a] µCi/mL	Technetium µCi/mL
Liquid Effluent Control System Discharge[b]	<0.0000003 and <0.1 Ci/yr	<0.00000002 (<MDA)
Tower Water Cooling System Blowdown	<0.00000003	<0.00000002 (<MDA)
X-2230N West Holding Pond (NPDES Outfall 012)[c]	<0.00000001	<0.00000002 (<MDA)
X-2230M Southwest Holding Pond (NPDES Outfall 013)[c]	<0.00000001	<0.00000002 (<MDA)
Sanitary wastewater (excluding discharge from the Liquid Effluent Control System)	<0.00000003	<0.00000002 (<MDA)
North Cylinder Pad Runoff	<0.00000001	<0.00000002 (<MDA)
10 CFR Part 20, App. B, Table 2 limits	0.0000003	0.00006
10 CFR Part 20, App. B, Table 3 limits	0.000003	0.0006

Notes:
MDA = Minimum detectable activity; µCi/mL = microcurie per milliliter; Ci/yr = curies per year.
[a] Since uranium isotopes present at the ACP would have the same discharge limit, uranium isotope activities are combined into a Total Uranium activity to simplify comparison to the Table 2 limits.
[b] Liquid Effluent Control effluents are characterized prior to discharge. The single Ci/yr limit reported in the table applies to combined uranium and technetium activities.
[c] Anticipated concentrations are annual averages based on monthly grab samples from 1995 through 2000.
Source: USEC, 2004c.

If there are any spills or leaks containing licensed radioactive material at the ACP, they would be collected in the Liquid Effluent Control system. If the effluent concentration is below the 10 CFR Part 20, Appendix B requirements, as anticipated as shown in Table 4-3, then the effluent could be discharged into the Scioto River with no significant adverse consequences. If the effluent concentration does not meet the Part 20 requirements, then the effluent would be containerized for offsite disposal. Any discharges to the Scioto River would be well below regulatory limits prior to any dilution provided by the river.

In addition, with the exception of DOE outfall 613, a weekly composite water sample would be collected from all DOE National Pollutant Discharge Elimination System outfalls discharging to offsite waters and analyzed for total uranium, uranium isotopes (uranium- 233/234, uranium-235, uranium-236, and uranium-238), technetium-99, and transuranic radionuclides (americium-241, neptunium-237, plutonium-238, and plutonium-239/240). Outfall 613 would not be monitored for radionuclides because there is no potential source for radiological contamination of the water discharged from this outfall. A weekly composite water sample is also currently collected from all United States Enrichment Corporation outfalls discharging to offsite waters and analyzed for total uranium, technetium-99, and transuranic radionuclides; uranium isotopes are not analyzed (DOE, 2004b). All of this existing monitoring would continue once the ACP becomes operational.

Based on this analysis, the potential surface water impacts associated with ACP effluent containing radioactive material would be SMALL. Plant design, operation, and monitoring would ensure that any such discharge would meet the 10 CFR Part 20 requirements, and the current and future monitoring (all DOE and United States Enrichment Corporation outfalls) would ensure that such levels would be maintained.

Floodplains

The operation of the proposed ACP would not impact floodplains, as none of the operations would be located in a floodplain or would alter the characteristics of the floodplain.

Groundwater

The DOE reservation draws its potable and process water from three well fields in the Scioto River Valley Aquifer. The maximum potential water production from the well fields is 76,000 cubic meters per day (20 million gallons per day), which is also the permitted withdrawal volume. Current water use, in the gaseous diffusion plant's standby mode, is less than 21,000 cubic meters per day (5.5 million gallons per day). The proposed ACP would require an additional 2,500 cubic meters per day (0.65 million gallons per day) for drinking, hygiene, and tower water cooling makeup (non-contact cooling water) (USEC, 2005a). This additional groundwater withdrawal would result in a SMALL impact on the availability of groundwater in the Scioto River Aquifer and a corresponding small risk of subsidence caused by depressed groundwater levels. This conclusion is based on the following four reasons:

- The increase in consumption would be only 10 percent higher than current withdrawal rates and would represent only 31 percent of the total design capacity (and currently permitted rate) of the well field groundwater withdrawal system.

- The three well fields are located approximately 8, 11, and 24 kilometers (5, 7, and 15 miles) from the DOE reservation boundary along the Scioto River, and are spaced between 16 to 24 kilometers (10 to 15 miles) apart. The wells within each well field (between 4 and 15 individual wells) are located within 2 to 6 kilometers (1 to 3 miles) of each other. Therefore, the increased withdrawals will come from several spaced-out locations, rather than being all concentrated in one location.

- The wells produce water from the shallow saturated sand and gravel layers adjacent to the Scioto River. The sand and gravel layers are recharged from water in the river. Computer models have shown that 50 to 88 percent of the water drawn from the wells is from the river, and the chemical character of the groundwater is influenced by the river (Nortz et al., 1994). Therefore, any water withdrawn from the ground would be replaced by water from the river, and there would not be a decline in groundwater levels.

- Conversations with the Ohio EPA have confirmed that subsidence and sink holes from groundwater withdrawal are not an issue in the region, as water would be drawn down from the Scioto River, rather than create a void (Ohio EPA, 2005).

DOE is currently performing groundwater remediation activities at the X-749/X-120/Peter Kiewit Landfill area approximately 152 meters (500 feet) south of the proposed ACP site. As a result of previous landfill operations, the groundwater in the Gallia aquifer is contaminated with trichloroethene. A horizontal groundwater extraction well was installed between the proposed ACP site and the Peter Kiewit landfill to collect and treat contaminated groundwater. The groundwater remediation activities are not located within the construction or operational footprint of the proposed ACP or its associated utilities; therefore, the proposed action would not impact the ongoing groundwater remediation activities. Two

monitoring wells are located between the contaminated area and the proposed ACP site. The wells are monitored annually and did not show trichloroethene contamination in 2002.

Two existing underground fuel storage tanks with a total capacity of under 42 cubic meters (11,000 gallons) would be used in addition to the aboveground tanks described above. These tanks are currently in compliance with all applicable regulations covering leak detection, corrosion protection, and spill/overflow prevention. Therefore, any future impacts associated with the continued use of the underground storage tanks are expected to be SMALL.

Spills and accidental releases associated with other operations of the proposed ACP facility also have the potential to adversely impact groundwater. Any spills or releases within a building would be contained within the building and would be cleaned up before escaping outside. Likewise, any such spills or releases outside of a building (e.g., at a cylinder storage yard or an aboveground tank) are expected to be infrequent and small, would be contained within the area, and would be managed in accordance with applicable Federal and State regulations, as described in preceding sections. Therefore, any impacts on groundwater caused by other potential spills and accidental releases should be SMALL.

4.2.6.3 Ceasing Operations at Paducah

Ceasing operations at Paducah would decrease impacts to water resources from those associated with operation of the Paducah enrichment plant. Impacts to water resources from potable water utilization and impacts to water quality from wastewater discharges would be largely eliminated after cessation of operations. The enrichment plant operations consume approximately 98,000 cubic meters (26 million gallons) of potable water per day. After cessation of operations, potable water utilization at the site would be limited to domestic and sanitary water use by the maintenance and security workforce and use of water in onsite utility systems. Therefore, potable water use and associated impacts to water resources would decrease.

Wastewater discharges and associated impacts to water quality would also decrease upon cessation of Paducah enrichment plant operations. Wastewater discharges would be limited to sanitary wastewater discharge associated with the maintenance and security workforce, as well as potential discharge of blowdown of heating and cooling water from onsite utility systems. These should be far less than current discharge levels.

Potential impacts to water quality from storm water runoff to surface water from plant property would not be directly affected by cessation of enrichment plant operations. Existing storm water management systems and procedures would be maintained in operation after cessation of plant operations.

Based on this analysis, the water resource impacts of ceasing operations at Paducah are expected to be SMALL.

4.2.7 Ecological Impacts

This section evaluates the potential impacts of site preparation and construction activities, facility operations, and ceasing operations at Paducah on flora and fauna; rare, threatened, and endangered species; and wetlands. Impacts on environmentally sensitive areas are not evaluated because such areas are not located within a one-mile radius of the reservation and are not expected to be impacted (see Section 3.8.5).

4.2.7.1 Site Preparation and Construction

The following subsections discuss the potential impacts of the proposed site preparation and construction activities on flora and fauna; rare, threatened, and endangered species; and wetlands.

Flora and Fauna

Site preparation and construction for the proposed ACP facilities in the central area of the DOE reservation would be adjacent to existing structures. The proposed new buildings in this area would result in the loss of approximately 12 hectares (30 acres) of landscaped area (fields and lawns). Such areas provide habitat for a limited number of wildlife species that are tolerant of active human disturbance and would result in SMALL impacts on flora and fauna.

Site preparation and construction activities for X-745H Cylinder Storage outside of the Perimeter Road in the northern portion of the reservation would result in more extensive soil disturbances, as described in Section 4.2.5.1. This cylinder storage yard would be bounded on the south by the Perimeter Road; on the east by an unnamed tributary to Little Beaver Creek (adjacent to the North Access Road); on the west by the eastern drainage channel to and the discharge from the X-230L North Holding Pond; and on the north by the valley of Little Beaver Creek. The yard would be located in a relatively flat upland area made up of grasslands and old fields adjacent to riparian and upland forests and wetland areas of the Little Beaver Creek and its tributaries. However, the site preparation and construction activities would not require removal of, or disturbance of, vegetation in these adjacent areas (USEC, 2005c). The site preparation and construction activities within the grassland and old field area would result in a temporary increase in erosion and sedimentation during the 24-month construction period. The runoff, if not controlled, would directly enter the unnamed tributaries as well as Little Beaver Creek. Because of the size of the area to be disturbed (10 hectares [25 acres]), the steep topography, the extent of cut and fill activities needed, and the proximity to Little Beaver Creek, which is a State Resource Water that exhibits exceptional ecological values and/or exceptional recreational values (as defined in OAC 3745-1-09 for the Scioto River Drainage Basin), the erosion and sediments that could enter the creek could result in a MODERATE impact.

Implementation of the best management practices described in Section 4.2.5.1 on soil impacts, together with USEC's plan not to disturb the upland mixed hardwood forest and the riparian forest adjacent to the managed field and old field (USEC, 2005c), would reduce this potentially MODERATE impact to a SMALL impact. Such measures would ensure that the existing forested buffer area between the proposed cylinder storage yard and the riparian areas associated with the tributaries and Little Beaver Creek would be preserved. Such measures would also reduce the level and amount of sedimentation and erosion that would occur in the adjacent surface waters.

Rare, Threatened, and Endangered Species

Table 3-11 in Chapter 3 of this Draft EIS lists the Federal and State Listed endangered, potentially threatened, and special concern species near the DOE reservation. Of the wildlife species, none would be impacted by the proposed site preparation and construction activities in the central area. The central area of the DOE reservation is a highly disturbed and managed area that does not provide suitable habitat for any of the species, and the nearest suitable habitats are over 1.5 kilometers (0.9 mile) away (USEC, 2005a).

Activities associated with the two cylinder storage yards outside of the central area would not impact the birds, reptiles, or plants listed in Table 3-11. The sharp-shinned hawk and the rough green snake have not been observed on the reservation for several years, and the timber rattlesnake has never been documented

on the reservation. The plant species located on the reservation are associated with lagoon systems located more than 1 kilometer (0.6 mile) from all the proposed site preparation and ground disturbing activities (USEC, 2005a)

There is a small potential for site preparation and construction activities at the cylinder storage yards outside of the central area to affect the potential summertime habitat for the Indiana bat. Previous studies have not documented the presence of the Indiana bat on the DOE reservation at Piketon, but have identified suitable summertime habitat on the reservation (USEC, 2005a). The proposed site preparation and construction activities for X-74H Cylinder Storage Yard, and any refurbishment activities needed at the X-745G-2 Cylinder Storage Yard, would be located approximately 500 meters (1,640 feet) from the suitable summer habitat for the Indiana bat. The construction noise, up to 94 decibels, could temporarily disrupt the activities or preclude Indiana bats from their potentially suitable habitat. However, the construction of the proposed X-745H Cylinder Storage Yard would only remove grassland and old field habitats and would preserve the existing upland mixed hardwood and riparian forests that act as a buffer between the proposed storage yard and the potential summertime habitat (USEC, 2005c). In addition, USEC may implement the following mitigation measures:

- If trees (either live or dead) with exfoliating bark are encountered in the construction area, they should be saved if possible to avoid destroying potential habitat for the Indiana bat. If necessary, trees should be cut before April 15 or after September 15.

- Flexible construction schedules should be followed to avoid sensitive wildlife breeding or rearing periods.

- Temporarily disturbed areas should be revegetated with native vegetation.

- Bat habitat should be enhanced by installing bat houses.

- Natural material should be used for slope stabilization instead of engineered materials (concrete retaining walls). (USEC, 2005a)

The potential impacts on the Indiana bat and its potential habitat would be SMALL because, in addition to the potential mitigation measures, the Indiana bat habitat is only potential summertime bat habitat located approximately 500 meters (1,640 feet) away, and USEC would preserve the existing upland mixed hardwood and riparian forests around the proposed Cylinder Storage yard X-745H, which would act as a buffer. Because the Indiana bat habitat is only potential summertime bat habitat and is located approximately 500 meters (1,640 feet) away, because no forested habitat would be removed, and because USEC may implement the other mitigation measures listed above, the potential impact on the Indiana bat and its potential habitat would be SMALL.

<u>Wetlands</u>

None of the proposed site preparation and construction activities would occur in any of the jurisdictional or nonjurisdictional wetlands on the DOE reservation; however, such activities would be adjacent to jurisdictional wetlands regulated by the U.S. Army Corps of Engineers. The proposed site preparation and construction activities would not require the dredging or filling of any wetlands, but as discussed in the surface water section above, a temporary increase in erosion and sedimentation associated with construction would increase the turbidity for a short time and would alter water quality parameters of the surface flow that may enter wetlands adjacent to the land disturbing activities. Because no wetlands acreage would be lost and no Section 404 permit would be required, there is no need to develop a mitigation plan to enhance or replace any wetlands. However, standard erosion control best management

practices would be implemented, as described in Section 4.2.5.1 on soils, and existing upland vegetative buffers would be maintained, as described in the immediately preceding section on rare, threatened, and endangered species. With these mitigation measures, the impacts on wetlands would be SMALL.

4.2.7.2 Facility Operation

This section evaluates the potential impacts of proposed ACP operations on flora and fauna; rare, threatened, and endangered species; and wetlands.

<u>Flora and Fauna</u>

Operation of the proposed ACP would result in an increase in personnel traveling to and from the facility and in minor increases in noise emitted from the facility. Because the active operation of the proposed ACP is within an existing highly industrialized area with ongoing activities, the additional personnel and noise would result in a SMALL impact on the flora and fauna in the area, to the limited extent they are present in this area.

The proposed ACP operations would also result in minor increases in air emissions and point source water discharges. The additional air emissions and liquid discharges (effluent), as described in Sections 4.2.4 and 4.2.6, respectively, would result in SMALL impacts on the flora and fauna downwind or downstream of the facility. In terms of radiological air emissions and effluent releases, the small discharge rates from the proposed ACP are projected to result in ambient concentrations of radionuclides that are safe for humans (see Section 4.2.12). Since the level of radiation safety required for the protection of humans is adequate for other animals and plants (IAEA, 1992), no additional mitigation efforts would be necessary beyond those required to protect humans.

In terms of nonradiological releases, the primary pollutant of potential concern is HF in surrounding air. The chemical toxicity of airborne uranium (as opposed to its radiological hazard) is also of possible interest. As presented in Section 4.2.12.3, routine airborne emissions from the proposed ACP are projected to result in a maximum HF concentration of 2.35×10^{-3} micrograms per cubic meter and a maximum uranium concentration of 6.09×10^{-3} micrograms per cubic meter, both at the point of the Ohio National Guard building located onsite 555 meters (1,820 feet) from the proposed ACP buildings. No criteria exist to evaluate safe levels of HF and uranium exposures of plants and animals, but these predicted concentrations are orders of magnitude below criteria designed to ensure safe human exposures. Therefore, any impacts to flora and fauna are also expected to be SMALL.

<u>Rare, Threatened, and Endangered Species</u>

Normal operations for the proposed commercial centrifuge project would not affect any Federally listed threatened and endangered animal and plant species or critical habitat. The closest identified Indiana bat habitats on the DOE reservation is approximately 1,700 meters (5,600 feet) from the proposed ACP process facilities in the central area and is approximately 500 meters (1,640 feet) from the cylinder storage yards outside of Perimeter Road. During the summer months, airborne emissions from facility operations would be occurring at the same time when Indiana bats may be present. However, because of the distance from the actively used ACP facilities in the central portion of the facility, the low ambient levels of HF and total uranium as discussed above, and limited activity that would occur at the cylinder storage yards outside of the central area but closer to suitable summer habitat, the operation of the proposed ACP would not affect a listed species or critical habitat. Therefore, there would be a SMALL impact.

Wetlands

The operation of the proposed ACP would not encroach on wetlands. The operations would not involve activities in, releases to, or filling of wetlands. Therefore, the impacts would be SMALL.

4.2.7.3 Ceasing Operations at Paducah

Cessation of operations at the Paducah enrichment plant would not involve any excavation or disturbance of habitat. Potential impacts to ecological resources from storm water runoff to surface water from plant property would not be directly affected by cessation of enrichment plant operations. Existing storm water management systems and procedures would be maintained in operation after operations ceased. For the reasons, the impacts to ecological resources would be SMALL.

4.2.8 Socioeconomic Impacts

Major industrial projects have the potential to affect the socioeconomic dynamics of the communities in or around which they are situated. Capital expenditures and the migration of workers and their families into a community may influence factors such as regional income; employment levels; local tax revenue; housing availability; area community services such as healthcare, schools, and law enforcement; and the availability and cost of public utilities such as electricity, water, sanitary services, and roads. The objective of a socioeconomic impact analysis is to assess the likely beneficial and adverse impacts of a project on these and other factors important to the social and economic well-being of local communities, and to suggest measures to mitigate potentially adverse impacts if necessary.

This section provides a detailed analysis of the socioeconomic impacts of the proposed action. The impacts are evaluated over a region of influence covering four counties in southern Ohio – Pike, Scioto, Ross, and Jackson Counties. As described in Section 3.9 of this Draft EIS, this region encompasses the area in which workers employed by the project are expected to live and spend most of their salary, and in which a significant portion of site purchase and non-payroll expenditures are expected to occur.

4.2.8.1 Methodology

This analysis examines the socioeconomic impacts of the proposed site preparation and construction activities at Piketon, the proposed ACP operations, decommissioning of the ACP, and the cessation of uranium enrichment activities at Paducah. Each of these activities is assessed for its potential impact on the following socioeconomic factors: (1) regional employment; (2) tax revenues; (3) population characteristics; (4) housing; (5) community and social services (including education, healthcare, law enforcement, and fire services); and (6) public utilities (including electricity, water, sanitary wastewater, and solid waste disposal).

Employment impacts are evaluated by estimating the level of direct and indirect employment created by the proposed action. Direct employment refers to jobs created by the proposed site preparation and construction activities and facility operations. Indirect employment refers to jobs created in the region of influence to support the needs of the workers directly employed by the proposed action and jobs created to support site purchase and non-payroll expenditures. The number of direct jobs created in each stage is estimated based on anticipated labor inputs for various engineering and construction activities. Indirect employment is estimated using an economic model known as an input-output model. This analysis uses RIMS-II, an input-output model developed by the Bureau for Economic Analysis, to estimate the indirect employment impacts of the proposed action. Input-output models such as RIMS-II rely on regional input-output multipliers to account for inter-industry relationships within regions. Inputs into the model include information on the initial changes in output, earnings, or employment that are associated with the

project. A detailed description of the impact analysis methodology is provided in USEC's Environmental Report (USEC, 2005a). The relative magnitude of the impact on regional employment is assessed by comparing total project-generated employment to current regional employment levels.

Impacts to State income tax revenues are estimated by assuming appropriate remuneration rates for project-related jobs and applying Ohio State income tax rates. Sales tax revenues are estimated by applying appropriate assumptions about the fraction of after-tax income generated by construction-phase jobs that will be spent within the region of influence and applying Ohio sales tax rates. Impacts to local tax revenues are estimated by applying appropriate assumptions about the fraction of after-tax income generated by project-related jobs that will be spent within each county and applying county-specific sales tax rates. The relative magnitude of the impact on regional tax revenues is assessed by comparing total project-generated tax revenues to current regional tax revenues.

Impacts to population characteristics are evaluated by estimating the fraction of direct and indirect jobs that will be filled by migration of workers from outside the region of influence. The average family size and age profiles of migrating families are estimated using appropriate demographic assumptions based on U.S. Census Bureau statistics. These estimates of potential migration are compared to existing regional population levels to assess the relative magnitude of impacts to population characteristics.

Impacts to area housing resources are estimated by a quantitative comparison of current housing vacancy statistics for rental and owner-occupied houses to the estimated population influx into the region of influence.

Impacts to community and social services are estimated using a level-of-service assessment approach. Level-of-service indicators typically measure the ratio of service providers to the recipient population for a particular service; examples include the student-to-teacher ratio for educational services and the number of physicians per 1,000 people for healthcare services. The most recent data on existing levels-of-service for education, healthcare, law enforcement, and fire services in the region of influence, if available, are combined with estimates of population influx and standard demographic assumptions to derive expected new levels-of-service. These are compared to State average levels-of-service for each community service to identify potentially adverse impacts.

Impacts to public utilities (such as water, sanitary wastewater, solid waste, and transportation and road services) are estimated by identifying any stages of the proposed action that would procure utilities from offsite vendors that service communities in the region of influence. Where applicable, the levels of potential procurement under the proposed action are compared to the existing capacities of the utilities and existing demand levels to assess whether the procurements are likely to affect the availability and pricing of services to local communities.

4.2.8.2 Site Preparation and Construction

As described in Chapter 2, several existing buildings from the former Gas Centrifuge Enrichment Plant would be refurbished. In addition, two new process buildings and associated feed, withdrawal, and customer service facilities, and several cylinder storage yards, would be built. All of these site preparation and construction activities for the 7 million SWU plant would occur between calendar years 2006 and 2010, and are estimated to cost $1.45 billion.

<u>Impacts to Regional Employment</u>

In each year between 2006 and 2010, average annual employment as a result of site preparation, refurbishment, and construction activities is estimated at 3,362 full-time jobs. This estimate includes both

direct and indirect employment. Thus, the total number of full-time worker-years of employment generated as a result of site preparation, refurbishment, and construction activities is estimated as the product of 3,362 full-time workers multiplied by a total of five years, resulting in 16,810 full-time worker years of employment. USEC developed this estimate from the RIMS-II model using appropriate assumptions about the number of direct jobs created, construction-related expenditures, and regional input/output multipliers. (USEC, 2005a).

The total number of persons employed in the four counties of the region of influence in the year 2000 was 96,347 (BEA, 2002a). The total number of persons employed in Pike County, the site of the proposed action, in the year 2000 was 14,944 (BEA, 2002a). The employment expected to be generated by the site preparation and construction phase of the proposed action therefore represents 3.5 percent of the total employment in the region of influence and 22.5 percent of Pike County employment at the year 2000 levels.

Based on these figures, the impacts to regional employment of the site preparation and construction activities are considered MODERATE.

Impacts to Tax Revenue

Impacts to regional tax revenues are calculated by using per capita income levels in the region of influence as an estimate of the average salary associated with jobs created by the site preparation and construction phase of the proposed action. USEC estimates that the region's per capita income in 2004 dollars is $25,317 (USEC, 2005a).

Ohio State income tax rates for incomes between $20,000 and $40,000 are structured as a flat payment of $445.80 plus 4.5 percent of income over $20,000 (Ohio Department of Taxation, 2003). The State income tax payable by a worker earning $25,317 (the per capita income in the region of influence) at these rates would be $685.07. The proposed action would create 3,362 jobs each year during the site preparation and construction phase; this level of employment remunerated at the per capita income in the region translates to State income tax revenues of $2.3 million per year for each year of the 5-year construction phase. Ohio's cumulative individual State income tax revenues for fiscal year 2003 were $8.3 billion (Ohio Department of Taxation, 2003). Income tax revenues resulting from the incomes generated by the site preparation and construction phase can therefore be expected to account for approximately 0.03 percent of Ohio's cumulative annual individual income tax receipts at fiscal year 2003 levels.

Ohio State sales tax revenues are estimated to rise by $3.7 million (2004 dollars) per year for the site preparation and construction phase of the proposed action, using the current six percent sales tax rate. The estimate is based on the assumption that 75 percent of earnings after State income taxes are spent in State. Federal income taxes are not considered in computing disposable income; if Federal income taxes were included, it is likely that sales tax revenues would be lower than estimated here. Ohio's cumulative State sales and use tax revenues for calendar year 2003 were $6.7 billion. Sales tax revenues resulting from incomes generated by the construction phase of the proposed action can therefore be expected to account for approximately 0.06 percent of cumulative Ohio annual sales tax receipts at calendar year 2003 levels.

Pike County's annual sales tax revenues, derived from the county's one percent sales tax rate, are expected to rise by approximately $414,000 as a result of the new employment generated by the proposed site preparation and construction phase. This estimate is based on the assumption that half the after-tax income arising from jobs generated is spent on transactions within Pike County. This amount represents less than nine percent of Pike County's general fund budget in 2005 (Pike County Auditor, 2005).

As demonstrated above, it is unlikely that State income tax, State sales tax, and county-level tax revenues would significantly increase as a result of the site preparation and construction phase of the proposed action. Overall, the impacts to regional tax revenues may therefore be considered SMALL.

Impacts to Population Characteristics

Of the 3,362 estimated jobs that are expected to be created during the site preparation and construction phase, a total of 900 direct jobs are expected to be filled by USEC employees transitioned from the Portsmouth Gaseous Diffusion Plant; these jobs are to support management, design, licensing, assembly, testing and evaluation, quality assurance, nuclear and radiological safety, and operational readiness assessments. An estimated 2,088 indirect jobs are expected to support the 900 positions filled by transitioned USEC workers. Thus, a total of 2,988 jobs generated through construction activities represent jobs that are a continuation of already existing jobs generated or supported by current USEC activities. These jobs are therefore expected to be filled from within the region. (USEC, 2005a)

Using these numbers, 374 new jobs (direct and indirect) are expected to be created through construction-related activities between the years 2006 and 2010. Commonly, an average of 75 percent of construction-related employment derives from within the region of influence (DOE, 1999a). If 25 percent of the 374 construction-related jobs are filled from outside the region, a total of 94 workers may be expected to move into the region. If all workers are assumed to move in as family households, and the average national family household size is assumed to be 3.13 (U.S. Census Bureau, 2003), the population influx into the region of influence would be 293 persons. This represents 0.13 percent of the region population in the year 2000 (U.S. Census Bureau, 2000). The estimate used for household size is conservative because it represents the average size of a family household (3.13), rather than the average size of all households (2.57). This conservative assumption may result in an overestimate of the impacts on social services.

Based on this analysis, the impacts to population characteristics of the site preparation and construction activities are expected to be SMALL.

Impacts to Area Housing Resources

The average rental vacancy rate in the region of influence is 8.6 percent for rental property and there are approximately 22,824 rental units in all. This equates to an availability of approximately 1,963 rental housing units, based upon 2000 census data. Of the additional 374 jobs created by the site preparation and construction phase of the proposed action, only 25 percent are expected to be filled by migration from outside the community. Therefore, site preparation and construction activities are likely to increase the demand for rental housing by only 94 units out of a total of 1,963 rental units. Even accounting for seasonal increases in the demand for housing created by recreational activities, this influx of workers is not likely to cause housing shortages or increases in rental rates.

Therefore, the impacts to area housing resources of the site preparation and construction phase may be considered SMALL.

Impacts to Community and Social Services

A total of 94 family households may be expected to migrate to the region of influence as a result of employment opportunities generated in the site preparation and construction phase of the proposed action, as discussed above. According to the U.S. Census Bureau (2003), the average national family household size is 3.13 with an average of 0.95 individuals under the age of 18. Thus, the maximum influx of school-aged children is not expected to exceed 89, which is 0.24 percent of the region of influence school

population in the year 2000. The region contains 24 public school districts with a total of 95 schools serving approximately 37,000 students (ODOD, 2003). The region's student-to-teacher ratio stood at 15.3 in 2000 (ODOD, 2003). This ratio would not change after the expected influx of school-age children into the region resulting from construction-phase employment. The average student-to-teacher ratio in the State of Ohio was only slightly lower at 14.8 in the year 2000. As a result, the impacts to education services in the region may be considered SMALL.

Levels of service of fire, law enforcement, healthcare, and administrative services in the region of influence are lower than the State average, but are consistent with those typical in rural counties. The influx of 293 persons represents an augmentation of the region's population of 0.13 percent and will have a SMALL effect on fire, law enforcement, healthcare, and administrative levels of service.

<u>Impacts to Public Utilities</u>

As described in Section 3.9.3.5, there has historically been very little overlap between utilities providing services to communities in the region of influence and those supporting the Portsmouth Gaseous Diffusion Plant. Dedicated utilities were constructed in the 1950s solely to support the needs of the Portsmouth Gaseous Diffusion Plant. The communities in the region of influence have never had access to these utilities. Under the proposed action, utilities would continue to be procured through existing resources. With the exception of natural gas and landfill services, these dedicated utilities are expected to have more than adequate capacity to continue serving the ACP under the proposed action. Historically, the Portsmouth Gaseous Diffusion Plant has had no impact on the availability or cost of these utilities to communities in the region. It is therefore unlikely that the proposed action would affect the cost or availability of public utility supplies in the region of influence.

With regard to natural gas usage, the proposed action would not require any more natural gas than can be supplied through the existing two-inch diameter supply line. The proposed action is expected to have no impact on the offsite availability or cost of natural gas.

The Pike County landfill would be the primary endpoint for sanitary/industrial waste disposal and the Rumpke Beach Hollow landfill is an alternative. The projected capacities and use of each are described in Section 3.9.3.5. As is apparent from Table 2-3 and Table 3-23, industrial/sanitary wastes from the construction phase of the proposed action will account for a minor fraction of the capacity of these facilities.

Although the site preparation and construction phase of the proposed action may result in migration of people into the region, the level of migration is expected to be well below the rental vacancy rate in the area, as discussed in the preceding section on housing resources. Therefore, the population influx due to construction phase jobs is not expected to affect either the pricing or availability of public utilities in the region.

Considering all of these factors, the impacts to public utilities caused by the proposed site preparation and construction activities would be SMALL.

4.2.8.3 Facility Operation

Depending on the timing for NRC licensing and other factors, USEC is proposing to begin commercial centrifuge plant operations in 2009 and to reach the 3.5 million SWU annual capacity by 2011. Expansion to the 7 million SWU per year capacity would not occur until sometime after 2011, likely around 2013. The overall period of operation for the proposed ACP is projected to be 30 years.

Impacts to Regional Employment

The operations phase of the proposed ACP is expected to create 600 full-time jobs and 900 indirect jobs in the region of influence (USEC, 2005a). The total number of persons employed in the four counties of the region in the year 2000 was 96,347. The total number of persons employed in Pike County, the site of the proposed ACP, in the year 2000 was 14,944. The employment expected to be generated by the operations phase therefore represents 1.6 percent of the total employment in the region and 10 percent of Pike County employment. Given these results, the impacts to regional employment of the facility operation phase are considered MODERATE.

Impacts to Tax Revenue

USEC estimates that the average income in 2013 dollars will be $36,226 per year for 900 direct jobs and 600 indirect jobs, the operations phase of the proposed action would generate $54.3 million in income (USEC, 2005a).

Income from these jobs will generate $1.8 million (2013 dollars) in State income tax revenue at the Ohio State income tax rates described in Section 4.2.8.2. Ohio's cumulative State income tax revenues for 2003 were $8.3 billion. Income tax revenues resulting from incomes generated by the proposed ACP operations phase can therefore be expected to account for less than 0.02 percent of Ohio's annual individual income tax receipts at 2003 levels.

Ohio State sales tax revenues are estimated to rise by $2.4 million (2013 dollars) per year as a result of the new income generated by 1,500 jobs during the operations phase of the proposed action, assuming a six percent rate of sales tax. This estimate is based on the assumption that 75 percent of earnings after State income taxes are spent in State. Federal income taxes are not considered in computing disposable income; if Federal income taxes were included, it is likely that sales tax revenues resulting from the proposed action would be lower than estimated here. Ohio State's sales and use tax revenues for 2003 were $6.7 billion. Incremental sales tax revenues resulting from incomes generated by the operations phase of the proposed action can therefore be expected to account for less than 0.04 percent of Ohio's annual sales tax receipts at 2003 levels.

Pike County's annual sales tax revenues are expected to rise by approximately $263,000 as a result of the new employment generated by the proposed ACP operations phase, based on a county sales tax of one percent. This estimate is based on the assumption that half of the after-tax income from jobs generated by the operations phase is spent on transactions within Pike County. This amount represents less than six percent of Pike County's general fund budget in 2005 (Pike County Auditor, 2005).

As demonstrated above, it is unlikely that State income tax, State sales tax, and county-level tax revenues would significantly increase as a result of the operations phase of the proposed action. Therefore, the impacts to area tax revenues of the proposed ACP operation phase are considered SMALL.

Impacts to Population Characteristics

Most of the direct and indirect jobs resulting from operations at the proposed ACP are expected to be filled from within the region of influence (USEC, 2005a). No substantial population influx is expected during the operations phase of the proposed action. Therefore, the impacts to regional population characteristics of the operations phase are considered SMALL.

Impacts to Area Housing Resources

As previously mentioned, most of the direct and indirect jobs resulting from operations at the proposed ACP are expected to be filled from within the region of influence (USEC, 2005a). No substantial population influx is expected during the operations phase. Therefore, the impacts to area housing resources of proposed ACP operations are also considered SMALL.

Impacts to Community and Social Services

Since most of the direct and indirect jobs resulting from proposed ACP operations are expected to be filled from within the region, no substantial population influx is expected during the operations phase (USEC, 2005a). The impacts to community and social services of the facility operation phase are therefore be considered SMALL.

Impacts to Public Utilities

As described in Section 3.9.3.5, there has historically been very little overlap between utilities providing services to communities in the region of influence and those supporting the Portsmouth Gaseous Diffusion Plant. The communities in the region have never had access to dedicated utilities that were constructed in the 1950s solely to support the needs of the Portsmouth reservation. For the proposed ACP operations, utilities would continue to be obtained through these existing resources. With the exception of natural gas and landfill services, these dedicated utilities are expected to have more than adequate capacity to continue serving the proposed ACP operations. Historically, the Portsmouth Gaseous Diffusion Plant has had no impact on availability or cost of these utilities to communities in the region. It is therefore unlikely that the proposed action would affect the cost or availability of public utility supplies in the region.

With regard to natural gas usage, the proposed ACP operations would not require any more natural gas than can be supplied through the existing two-inch diameter supply line. The proposed operations are expected to have no impact on the offsite availability or cost of natural gas.

The Pike County landfill will be the primary endpoint for sanitary/industrial waste disposal and the Rumpke Beach Hollow landfill is an alternative. The projected capacities and use of each are described in Section 3.9.3.5. Based on a comparison of the existing landfill capacities reported in Table 3-23 and the anticipated volumes of sanitary/industrial waste from proposed ACP operations reported in Table 2-6, sanitary/industrial wastes from the operations phase of the proposed action would account for a minor fraction of the capacity of these facilities.

Most of the direct and indirect jobs resulting from proposed ACP operations are expected to be filled from within the region of influence. No substantial population influx is expected during the operations phase. Therefore, the population influx on account of proposed ACP operations is not expected to affect either the pricing or availability of public utilities in the region.

For all of these reasons, the impacts to public utilities of the operations phase of the proposed action are expected to be SMALL.

4.2.8.4 Ceasing Operations at Paducah

The socioeconomic region of influence for the Paducah site is identified in the *Programmatic Environmental Assessment for Disposition of Potentially Reusable Uranium Materials* (DOE, 1999a).

This region includes McCracken County, Kentucky, where the Paducah Gaseous Diffusion Plant is located. McCraken County had a population of 64,407, per capita personal income of $23,227, and a total person income of $1.8 billion in 1999 (BEA, 2002b). Wage and salary employment for the region was more than 41,859 in 2000 (BEA, 2002a). Total site employment in 1998 was 2,209 (DOE, 2001a).

Decommissioning of the Paducah Gaseous Diffusion Plant and any other further use of the enrichment plant buildings, structures, or land are not considered part of the proposed action considered in this Draft EIS. Decisions concerning decommissioning and any other future use of the enrichment plant would be the subject of other decisions and other environmental reviews.

Cessation of operations at the Paducah enrichment plant would result in direct and indirect socioeconomic impacts associated with the termination of the operations workforce at the plant and associated reduction in payroll. It also would result in the loss of local expenditures for goods and services associated with current plant operations. The anticipated impacts of these changes are assessed below.

Impacts to Regional Employment

After cessation of operations, the workforce would be reduced to a smaller maintenance and security workforce, which would substantially reduce the number of full-time workers employed from current levels of 1,868 full-time employees. Also, the average wage of the workers once operations have ceased would decrease from that under plant operations, as the required skill level of the operations workers would generally be greater than that of the maintenance and security workers when there are no plant operations.

For the purpose of this Draft EIS, the NRC staff did not perform comprehensive economic input-output modeling to estimate indirect jobs associated with employment and expenditures for operations at the Paducah facility. However, in the most conservative assessment, all the operations phase jobs and associated indirect jobs at the Paducah facility would be terminated. These losses would be temporarily mitigated to some extent by hiring of decommissioning workers in the event that the Paducah plant was to be decontaminated and decommissioned. In the event that the plant was decommissioned and then refurbished for future economic use, impacts to regional employment from the shutdown of the plant would be further mitigated. Based on this analysis, the impacts to regional employment of cessation of operations at the Paducah facility may be considered MODERATE.

Impacts to Tax Revenue

The cessation of operations at the Paducah facility is likely to have a negligible impact on Kentucky State income and State sales tax based on the fact that employment levels associated the facility account for a small fraction of total State employment. The impact on local tax revenues are also likely to be small but could be as high as moderate. The overall impacts to tax revenues are therefore expected to be SMALL.

Impacts to Population Characteristics

The loss of jobs associated with the Paducah Gaseous Diffusion Plant operations may result in migration out of the community. In the most conservative estimate, all the direct and indirect jobs associated with the Paducah facility would terminate after cessation of operations. However, not all of the indirect jobs associated with the facility are likely to terminate after direct employment at the Paducah facility ceases. Some of the indirect employment would continue through servicing other members of the region of influence and neighboring communities, and by diversifying into other lines of business. Furthermore, some direct jobs would continue at the Paducah facility, such as the jobs associated with maintaining the site in cold stand-by status. In the event that the plant was decommissioned and then refurbished for

some other future economic use, impacts to population characteristics in the region from the shutdown of the plant would be further mitigated.

Based on these considerations, and the phased nature of any likely migration trends, the impacts to population characteristics of the cessation of operations at the Paducah facility may be considered SMALL.

Impacts to Area Housing Resources

Loss of employment and migration out of the region of influence resulting from cessation of operations at the Paducah facility are likely to increase vacancy rates in the rental market and increase the number of houses for sale. This could potentially lead to a downward trend in rents and housing values. However, these trends could be mitigated by the possible creation of new economic opportunities in the area such as if the plant was decommissioned and then refurbished for future economic use. Based on these considerations, and the phased nature of any likely migration trends, the impacts to area housing resources may be considered SMALL.

Impacts to Community and Social Services

The demand for community and social services is likely to decline following the potential loss of employment and migration out of the region resulting from cessation of operations at the Paducah facility. This may result in a temporary improvement in levels of service followed by a correction in the level of supply of community and social services. The levels of potential migration out of the region of influence are not considered significant enough to affect the viability of any community or social services. Based on these considerations, and the phased nature of any likely migration trends, the impacts to community and social services of the cessation of operations at the Paducah facility may be considered SMALL.

Impacts to Public Utilities

The demand for public utilities is also likely to decline following the potential loss of employment and migration out of the region of influence resulting from cessation of operations at the Paducah facility. This would potentially create some small level of overcapacity for certain services; however, most utilities are likely to employ any redundant capacities in servicing regional markets. The levels of potential migration out of the region are not considered significant enough to affect the viability or price structure of any public utilities. Based on these considerations, and the phased nature of any likely migration trends, any impacts to public utilities from the cessation of uranium enrichment activities at Paducah are also expected to be SMALL.

4.2.9 Environmental Justice Impacts

As described in Sections 4.2.1 through 4.2.8 and Sections 4.2.10 through 4.2.15, the impacts of the proposed action are expected to be SMALL for almost all of the resource areas evaluated. In these cases, the impacts to all human populations would be small, so there would not be any disproportionately high and adverse impacts to minority or low-income populations.

The NRC staff has concluded that potential impacts could be as high as MODERATE in eight cases. However, in each of these cases, the impacts would not appear to be disproportionately high and adverse for minority or low-income populations, for reasons outlined below.

- As described in Section 4.2.4.1, site preparation and construction activities are projected to cause a temporary increase in the concentrations of particulate matter with a mean diameter of 10

micrometers or less in the ambient air that slightly exceed the air quality standard up to a distance of 1,000 meters (3,280 feet) beyond the fenceline. However, there are no populations that qualify as minority or low-income this close to the site.

- As described in Section 4.2.8.2, the impacts to regional employment of the site preparation and construction activities are considered MODERATE. These impacts are generally considered positive.

- Similarly, as described in Section 4.2.8.3, the impacts to regional employment of the facility operation phase are considered MODERATE. These impacts are generally considered positive.

- As described in Section 4.2.8.4, the impacts to regional employment of cessation of operations at the Paducah Gaseous Diffusion Plant are considered MODERATE. In this case, the employment impacts would be adverse, and while they would not be so high as to significantly affect employment in the region, the impacts would be high to affected individuals. Because the demographics of the existing workforce that could be downsized at Paducah have not be studied in detail for this Draft EIS, it is not clear that the impacts would disproportionately affect low-income or minority populations. It is likely that the potentially affected workforce at Paducah does not qualify as low-income, assuming that the average annual income level of $36,226 for operations workers at the proposed ACP reasonably represents the income of current employees at Paducah (for comparison, the per capita income for workers in the region surrounding Paducah is $23,227). Although the minority percentage in McCracken County where the Paducah Gaseous Diffusion Plant is located is more than 25 percent higher than the minority percentage in the State of Kentucky as a whole, the minority status of workers potentially downsized at Paducah is not known.

- As described in Section 4.2.11.1, the substantially greater transportation requirements during the construction phase could result in MODERATE impacts during the five-year period in which most of the construction activity is projected to occur. These impacts could include an increase in traffic congestion on U.S. Route 23 and, to a lesser extent, on Ohio State Road 32 in the vicinity of the ACP. It is also expected that construction traffic accidents would result in about 18 injuries a year on these roads, but only one fatality over the entire construction period. These impacts would be experienced by everyone traveling on U.S. Route 23 and Ohio State Road 32 and would not disproportionately affect minority or low-income populations.

- As described in Section 4.2.12.1, the probability of a severe transportation accident that releases sufficient quantities of UF_6 that could pose a health risk is low, but the consequences of such an accident, should it occur, are high. Based on this analysis, the public health impacts associated with such an accident as part of the proposed action are considered MODERATE. Such an accident could occur anywhere along the proposed routes for shipping UF_6 feed to Piketon (from Metrolpolis, Illinois; Port Hope, Ontario, Canada; and Wilmington, Delaware) and the proposed routes for shipping UF_6 product from Piketon to customers or other distribution points (to Richland, Washington; Columbia, South Carolina; Wilmington, North Carolina; and Seattle, Washington). Since these transportation routes cover an extremely broad area that includes much of the United States as well as parts of Canada, and since all populations along these transportation routes would be subject to the same risk, no disproportionately high and adverse effects are expected for any particular segment of the population, including minority and low-income populations that could live along the proposed transportation routes.

- As described in Section 4.2.12.3, accidents associated with proposed ACP operations could result in SMALL to MODERATE impacts to the surrounding public. However, the impacts of such accidents are not expected to extend as far away as 28 kilometers (17 miles), where the closest minority and

low-income Census tracts are located. Therefore, populations in those Census tracts are not expected to experience disproportionately high and adverse effects.

- As described in Section 4.2.13.2, the added inventory of depleted UF_6 coming from the proposed ACP should not change the nature or magnitude of the impacts from the DOE conversion facility operations; however, it would extend those impacts for several additional years, resulting in overall MODERATE impacts to DOE conversion facility operations. The DOE EIS for the conversion facility at Piketon concluded that the operations of that facility should not result in any environmental justice impacts because of a lack of high and adverse impacts (DOE, 2004a). Therefore, extending those operations for additional years should also not result in any disproportionately high and adverse impacts.

4.2.10 Noise Impacts

This section analyzes the potential noise impacts from proposed ACP site preparation, construction, and operation, along with the noise impacts associated with the corresponding cessation of enrichment plant operations at Paducah.

4.2.10.1 Site Preparation and Construction

USEC's Environmental Report (USEC, 2005a) estimates that construction noise levels would be around 73 to 94 A-weighted decibels (dBA) at 15 meters (50 feet). Assuming a drop-off rate of 6 decibels per doubling of distance, which is typical for construction noise equipment, the noise level at the nearest residence (914 meters [3,000 feet] from the proposed ACP) would be 58 dBA. This level would be 53 day-night average noise level (DNL), recognizing that most construction activities would occur during the day (USEC, 2005a).

The U.S. Department of Housing and Urban Development has standards for community noise levels. It has developed land use compatibility guidelines (HUD, 2002) for acceptable noise levels versus the specific land use (see Table 3-27 in Section 3.11 of this Draft EIS). Because the estimated construction noise level of 53 DNL at the site is below these guidelines, the noise impacts from proposed site preparation and construction activities are expected to be SMALL.

4.2.10.2 Facility Operation

Once in operation, the centrifuges themselves would be very quiet since the centrifuge "floats" on a magnetic bearing and spins within a vacuum. Noise generation occurs when moving metal parts are in contact with each other, and when air molecules are available to transmit sound. Some noise occurs upon centrifuge start up and shut down, which are assumed to be infrequent and brief activities since USEC plans to run the centrifuges continuously.

Catastrophic failure of the centrifuges could cause a sudden but brief loud noise, due to the high rotational speed of the centrifuge. However, the likelihood of a single centrifuge catastrophically failing is very low.

No adverse noise impacts are expected at the closest residential receptor due to low operational noise, the attenuation provided by the building facade, and the distance attenuation of over 914 meters (3,000 feet). Therefore, the noise impacts from the proposed ACP operations are expected to be SMALL.

4.2.10.3 Ceasing Operations at Paducah

Ceasing operations at Paducah would decrease noise levels from those associated with current operation of the Paducah enrichment plant. Noise associated with the operation of enrichment plant equipment would be largely eliminated after cessation of operations. Remaining noise sources would be limited to operation of equipment (e.g., boilers, pumps, compressors) associated with onsite utilities, operation of vehicles and equipment by the maintenance and security workforce, and the conduct of maintenance activities. These activities are anticipated to be intermittent and of short duration as compared to the those associated with continuous operation of enrichment plant equipment.

4.2.11 Transportation Impacts

Transportation impacts of interest are the potentials for delays, accidents, injuries, or fatalities associated with the movements of people and goods into and out of the proposed ACP. These impacts may occur during site preparation and construction, facility operations, and cessation of activities and decommissioning in the future. In each of these stages, raw materials and equipment would be brought to the site, wastes of various types would leave the site, and workers would travel back and forth to their places of residence. During facility operations, enriched UF_6 would also leave the site.

The sections below analyze two main categories of transportation impacts associated with site preparation and construction, facility operation, and cessation of operations at Paducah. The first is the potential for the proposed action to affect the "level of service" of – or cause traffic congestion and delays on – local roadways.[2] The second is the potential for traffic accidents and resulting injuries and fatalities. The potential injuries and fatalities that are estimated below would arise from traffic accidents in which there are no releases of radioactive materials. The additional impacts associated with the small fraction of accidents that might yield some level of release, as well as radiological exposures that are not associated with accidents, are presented in the analysis of public and occupational health impacts in Section 4.2.12.

4.2.11.1 Site Preparation and Construction

The following sections analyze the level of service impacts and the non-radiological accident impacts associated with increased road traffic from the proposed site preparation and construction activities. Impacts associated with rail, water, and air transport are not reviewed because the proposed site preparation and construction activities would not affect such modes of transportation.

<u>Level of Service Impacts</u>

This section forecasts the traffic impacts of the proposed construction of the proposed ACP, including the shipment of centrifuges and other required equipment into the site. The primary impact considered is the effect of vehicle trips generated by the facility on the level of service provided by U.S. Route 23 and Ohio State Road 32.

The proposed ACP would generate vehicle trips during site preparation and construction both through the movement of materials and through workers traveling to and from the site. This analysis starts with current traffic volumes and estimates the impact of the incremental change in traffic volume to the level

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[2] The concept of level of service is a qualitative measure that describes operational conditions with a traffic stream and their perception by motorists. A level-of-service definition describes these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety. The Highway Capacity Manual defines six levels of service, designated A through F.

of service of the roadways. The Highway Capacity Software from McTrans (McTrans Center, 2003) was used to estimate the effect of new traffic generated by the proposed ACP on the roadway level of service during peak conditions. This software uses a number of planning data inputs to calculate the level of service for a given road. These inputs include roadway characteristics and the following factors:

- The "average annual daily traffic," which provides an estimate of the typical daily volume of vehicles on a particular road segment.

- The "K factor," which measures what proportion of daily traffic occurs during the "design hour." The design hour values used for this analysis are the 30th highest traffic volume hour of the year.[3] For instance, if the K factor is 10.1, this means that for the 30th highest volume hour in the year, 10.1 percent of the traffic for the day occurred during that hour.

- The "D factor," which measures what percent of the traffic is moving in the peak direction during the design hour.

- The "30-hour volume of the roadway," which is obtained by multiplying the K factor by the average annual daily traffic.

The NRC staff obtained data on the 2004 traffic volumes for U.S. Route 23 and State Road 32 from the Ohio Department of Transportation Traffic Survey Reports (Ohio DOT, 2004a). Values for the K and D factors and 30-hour volume were obtained from the Ohio Department of Transportation's K and D factors report (Ohio DOT, 2004b). The data used to characterize current traffic conditions are shown in Table 4-4.

Table 4-4 2004 Traffic Conditions on Routes Adjacent to the Proposed ACP

Volume Characteristic	U.S. Route 23	State Road 32
Average annual daily traffic (number of vehicles)	15,110	8,830
Percent commercial truck	16%	19%
K factor	10.1%	10.1%
D factor	62.3%	62.3%
30-hour volume (number of vehicles)	1,526	892
Hour of the day for the 30-hour volume	4:00 PM	4:00 PM

Sources: Ohio DOT, 2004a; Ohio DOT, 2004b.

Current traffic conditions are not congested for the design hour. Ohio State Road 32 operates at Level of Service A, while U.S. Route 23 operates at Level of Service B (McTrans Center, 2003). For reference, these and the other four levels of service defined by the Highway Capacity Manual can be described as follows:

- Level of Service A describes completely free-flow conditions. Individual users are virtually unaffected by the presence of others in the traffic stream.

[3] The Highway Capacity Manual suggest the use of the 30th highest hour as the design hour for rural highways.

- Level of Service B also indicates free flow, but the presence of other vehicles becomes more noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within the traffic stream from Level of Service A.

- Level of Service C is in the range of stable flow, but marks the beginning of the range of flow in which operation of individual users becomes significantly affected by interactions with others in the traffic stream. The selection of speed is now affected by others, and maneuvering requires substantial vigilance on the part of the user.

- Level of Service D represents high density but stable flow. Speed and freedom to maneuver are severely restricted, and the driver experiences a generally poor level of comfort and convenience.

- Level of Service E represents operating conditions at or near capacity level. All speeds are reduced to a low but relatively uniform value.

- Level of Service F is used to define forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. Queues form behind such locations. Operations within the queue are characterized by stop-and-go waves, and they are extremely unstable.

The NRC staff estimated potential impacts of proposed ACP site preparation and construction to these baseline traffic conditions. The staff estimated the volume of daily and peak hour trips that would be generated during site preparation and construction using information submitted by USEC in its Environmental Report (USEC, 2005a). Table 4-5 shows the results of this analysis.

Table 4-5 Highway Trips Generated by Proposed ACP Site Preparation and Construction

Trip Type	Number of Daily Vehicle Trips	Number of Peak Hour Vehicle Trips
Centrifuges, equipment, materials, etc.	27	3
Workers	2,612	1,306
Total	2,639	1,309

Source: USEC, 2005a.

The NRC staff estimates that the movement of centrifuges, equipment, and other materials needed for the proposed ACP would require no more than 17,870 truckloads, which would result in about 27 trips per day and approximately three trips during peak hours (assuming each truckload generates two trips). This estimate is based on information provided by USEC in its Environmental Report that indicates that site preparation and construction would occur over a period as long as six years (USEC, 2005a). For the purpose of this analysis, however, the NRC staff assumed that the period would be only five years, since the proposed construction schedule shows peak activity over a five-year period. Using five years rather than six years in this analysis provides a reasonable upper-bound estimate of likely traffic impacts. USEC's Environmental Report also provides a yearly breakout of the centrifuge components to be shipped to the proposed ACP site. To be conservative, the NRC staff used the highest number of shipments reported for any single year, which was 2,286 truckloads, to estimate the number of trips needed to transport centrifuges and related components to the site. Since the total volume of materials needed is relatively large, the staff assumed that shipments would be spread out over 261 business days within a year, and within an 8-hour business day.

USEC's Environmental Report indicates that as many as 1,306 construction workers may be required to build the proposed ACP (USEC, 2005a). Using this peak number of workers to be conservative, rather than the average number of 900 workers per year over the entire construction period, the NRC staff assumed that as many as 1,306 commuting trips could occur during the peak hour and twice as many trips (to account for round trips) could occur each day. As shown in Table 4-5, these commuter trips are estimated to have the largest traffic impact.

Based on these estimated increases in traffic volumes, the NRC staff calculated the effect on the roadway level of service during peak hour traffic for site preparation and construction. The staff estimated the level of service impacts for both Ohio State Road 32 and U.S. Route 23 assuming that all of the new trips generated by the project would occur on both roads, although the actual traffic volumes produced on these roads are likely to be lower. For U.S. Route 23, site preparation and construction traffic would temporarily change the level of service from B to C. In Level of Service C, the influence of traffic density on operations becomes marked, the ability to maneuver within the traffic stream is affected by other vehicles, and the travel speeds reduce somewhat. Also, minor disruptions in Level of Service C can cause serious local deterioration in service and queues could form behind any significant traffic disruption. For State Road 32, the staff estimated that site preparation and construction would temporarily change the level of service of the roadway from A to B, which still represents uncongested roadway conditions. These changes would last only as long as the construction period (peak period limited to five years). However, because the increased traffic would be sufficient to noticeably change the level of service for this timeframe, the NRC concludes that the impacts would be MODERATE.

<u>Non-Radiological Accident Impacts</u>

Motor vehicle safety is typically measured through accident rates, whether for trucks or passenger vehicles. To obtain estimates of injuries or fatalities associated with the movement of workers, materials and equipment needed for site preparation and construction, NRC staff gathered information on all the trips that would need to occur for this phase of the project, including the number of trips and the overall distance traveled.

Based on the information provided by USEC in its Environmental Report (USEC, 2005a), the overall results shown in Table 4-6 were compiled. In some instances, only total kilometers are presented in order to preserve the proprietary nature of certain information on quantities of equipment or preferred suppliers. The number of shipments listed includes all those made during the five-year preparation and construction phase, with one- or two-way trips considered as specified in the Environmental Report (USEC, 2005a).

Table 4-6 Transportation Requirements During Site Preparation and Construction[a]

Item or Material	Total Number of Shipments or Trips	Distance in Kilometers	Total Kilometers	Comments
Building Materials	12,105	45	545,456	Trucks; one-way trips
Electrical Materials			245,405	Trucks
Process Materials			2,515,029	Trucks; one-way trips
Feed/Withdrawal Equipment	382	4,001	1,528,275	Trucks; the number of miles from USEC's "Scenario 3" was used for conservatism.
Machines	10,884	4,001	43,543,834	Trucks; the number of miles from USEC's "Scenario 3" was used for conservatism.
Balance Stands			86,426	Trucks; three separate supply locations combined
Total Truck Kilometers			48,464,425	
Workers	3,408,660	40	137,138,913	Cars; 40 kilometers estimated one-way travel

Notes:
[a] Some cells are left blank to preserve the proprietary nature of certain information.
To convert kilometers to miles multiply by 0.62.
Source: USEC, 2005a.

Given the variety of routes traveled and the number of States involved, national injury and fatality rates were applied. As demonstrated by data from the Insurance Information Institute (III, 2005) and from the National Highway Traffic Safety Administration (NHTSA, 2005), fatal accident rates for Ohio have been slightly lower than the national average in recent years, making this a slightly conservative approach for travel within the State.

The National Highway Traffic Safety Administration's *Traffic Safety Facts 2003* (NHTSA, 2005) give the injury and fatality rates per vehicle mile traveled shown in Table 4-7. Such rates per vehicle mile traveled reflect the activity levels of a project better than those that are per vehicle or per registered driver.

Table 4-7 Injury and Fatality Rates Per Vehicle Mile Traveled

Type of Vehicle	Injury Rate	Fatality Rate
Large Trucks	12/100 million vehicle miles traveled	0.33/100 million vehicle miles traveled
Light Trucks	85/100 million vehicle miles traveled	1.18/100 million vehicle miles traveled
Passenger Cars	109/100 million vehicle miles traveled	1.21/100 million vehicle miles traveled

Source: NHTSA, 2005.

Given the similarity between light trucks and passenger cars, it was assumed that all workers use passenger cars. Large trucks are defined by the National Highway Traffic Safety Administration as those over 4,536 kilograms (10,000 pounds), so all material and equipment deliveries or shipments were assumed to be in large trucks.

Combining the total mileage data with these accident rates gives the estimated numbers of fatalities and injuries shown in Table 4-8. Over the course of the work to prepare the site and construct the necessary facilities, it is expected that there would be slightly less than one injury per year associated with the drivers bringing materials and equipment onto the site and about 18 injuries a year involving employees traveling to or from their jobs. If employees travel less than 40 kilometers (25 miles) each way, this estimate would decrease accordingly. These same impacts would be expected if the same employees were driving to different employers. The overall injury impact is therefore considered MODERATE.

Table 4-8 Transportation Impacts From Site Preparation and Construction

Item or Material	Total Miles	Injury Rate per Vehicle Mile Traveled	Fatality Rate per Vehicle Mile Traveled	Number of Injuries	Number of Fatalities
Materials and Equipment	30,115,220	1.2×10^{-7}	0.33×10^{-8}	3.61	0.10
Workers	8,521,650	1.09×10^{-6}	1.21×10^{-8}	93	1.03

Notes:
To convert miles to kilometers multiply by 1.61.

In terms of fatalities, only one fatality is expected for all the workers over the full site preparation and construction period. For drivers transporting material and equipment to and from the site, the expected number of fatalities is less than one. The overall fatality impact is therefore considered SMALL.

4.2.11.2 Facility Operation

The following sections describe the level of service impacts and non-radiological accident impacts associated with increased road traffic during ACP operations. Impacts on water and air transport are not reviewed because the proposed facility operation would not affect such modes of transportation. Impacts on rail transport are also not reviewed because facility operations are estimated to require only one train every three months to ship converted depleted uranium to an offsite disposal facility (see Section 4.2.12). This small increase in train traffic should not cause any impacts.

Level of Service Impacts

This section forecasts the traffic impacts of the proposed ACP operations. The primary impact analyzed is the effect of an increase in the number of vehicle trips on the level of service provided by U.S. Route 23 and Ohio State Road Route 32, using the same basic approach as described above for level of service impacts during site preparation and construction. The proposed ACP would generate vehicle trips during operations through new workers employed at the site, through the movement of supplies to the site, and through the movement of product and waste from the site.

This analysis starts with current traffic volumes and estimates the impact of an incremental change in traffic volume on the level of service of the two roadways. The Highway Capacity Software from McTrans (McTrans Center, 2003) was used to estimate level of service impacts. Section 4.2.11.1 on site

preparation and construction impacts contains a description of the current traffic conditions that were used as inputs to the software.

The NRC staff estimated the volume of daily and peak hour trips that proposed ACP operations would generate, using information submitted by USEC in its Environmental Report (USEC, 2005a). Table 4-9 shows the estimated increases in traffic volumes.

Table 4-9 Highway Trips Generated by the Operation of the Proposed ACP

Trip Type	Number of Daily Vehicle Trips	Number of Peak Hour Vehicle Trips
Materials, wastes, etc.	24	3
Workers	1,113	199
Total	1,137	202

The staff conservatively assumed that the movement of materials and wastes due to the operation of the facility would be spread throughout the 216 business days of the year and across eight hours of the day. USEC's Environmental Report estimated that there would be approximately 3,134 truckloads associated with the movement of feed material, product, heels, and waste (USEC, 2005a). The staff assumed that each truckload generates a delivery trip and a return trip. This results in 24 trips per day and three trips during the peak hour.

In addition to shipments for materials and wastes, a peak of 795 employees would be needed to operate the proposed ACP (USEC, 2005a). Of these, 75 percent, or 596, would be shift workers with rotating 7:00 AM-7:00 PM shifts, spread across five shift schedules. For any given day, three of the five shifts would be working and two shifts would be off, meaning that 358 of these shift employees would work on any particular day. In addition, 25 percent of the employees required for proposed ACP operations (or 199 people) would be administrative employees, working a 7:30 AM to 4:00 PM shift. Each of these employees would generate two trips per day. Taken together, these employees would generate 1,113 trips during a typical day, but only 199 trips would be likely to occur during the peak hours, from 4:00 PM to 6:00 PM.

Based on these estimated increases in traffic volumes, the NRC staff calculated the effect on the roadway level of service during peak hour traffic. The staff estimated the level of service impacts for both Ohio State Road 32 and U.S. Route 23 assuming that all of the new trips generated by the project would occur on both roads, although the actual traffic volumes produced on these roads are likely to be lower. This analysis showed no level of service impacts from the operation of the facility to either State Road 32 or Route 23.[4] As a result, excess capacity presently exists on these roadways and the traffic impacts due to proposed ACP operations are considered to be SMALL.

[4] There would be some overlap in the proposed ACP site preparation and construction activities and the facility operations activities, but site preparation and construction activities would be slowly phased out as operations are brought online. This Draft EIS assesses the traffic impacts from site preparation and construction separately from those impacts from facility operation, but the NRC staff also estimated the effect of simultaneous construction and operation to provide an upper bound of possible traffic impacts. Considering both impacts together did not change the results of the analysis.

Non-Radiological Accident Impacts

Table 4-10 shows the overall transportation requirements for the proposed ACP operations phase, based on information provided by USEC in its Environmental Report (USEC, 2005a). The number of shipments listed are made annually for as long as facility operations are underway, and represent one- or two-way trips as specified in the Environmental Report (USEC, 2005a).

Table 4-10 Transportation Requirements During Facility Operations

Item or Material	Number of Shipments or Trips Each Year	Distance in Kilometers	Total Kilometers	Comments
Uranium Feed	1,300	789 to 896	1,133,317	Trucks; three locations
Heeled Cylinders	600	782 and 3,837	1,385,628	Trucks; two locations
Radiological Waste	22	1,344 to 3,355	62,611	Trucks; three locations
Various Supplies	216	a	a	No sources indicated
Total Truck Kilometers (Miles)			2,581,556	
Workers	290,493	40	11,687,260	Cars; 40 kilometers (25 miles) estimated one-way travel

Notes:
To convert kilometers to miles multiply by 0.62.
[a] This text is withheld pursuant to 10 CFR 2.390(a)(4).
Source: USEC, 2005a.

Table 4-11 combines the total mileage data with historical accident rates to estimate the numbers of fatalities and injuries. During facility operations, it is expected that there would be about eight injuries per year associated with employees traveling to or from their jobs. If employees travel less than 40 kilometers (25 miles) each way, this estimate would decrease accordingly. These same impacts would be expected if the same employees were driving to different employers. In addition, there would be another injury roughly every five years involving the trucks transporting materials to and from the site. The overall injury impact is therefore considered SMALL.

Table 4-11 Transportation Impacts Per Year From Facility Operations

Item or Material	Total Miles	Injury Rate per Vehicle Mile Traveled	Fatality Rate per Vehicle Mile Traveled	Number of Injuries	Number of Fatalities
Materials and Equipment	1,604,149	1.2×10^{-7}	0.33×10^{-8}	0.19	0.01
Workers	7,262,325	1.09×10^{-6}	1.21×10^{-8}	7.9	0.09

Notes:
To convert miles to kilometers multiply by 1.61.

In terms of fatalities, one fatality would be expected every 10 years for the combination of the trucks transporting materials and workers traveling to and from the site. The overall fatality impact is therefore considered SMALL.

4.2.11.3 Ceasing Operations at Paducah

Ceasing operations at Paducah would decrease transportation impacts from those associated with current operation of the Paducah enrichment plant. Transportation impacts would be largely eliminated upon cessation of operations, as there would be no transportation of raw materials to the plant, of products from the plant, or routine operations wastes from the plant. Also, the workforce at the plant would be greatly reduced and the number of workers commuting to and from the site would decrease accordingly, thereby reducing traffic. A smaller workforce would remain after cessation of operations to secure and maintain the buildings and structures pending a decision on decommissioning and future site use. This workforce would continue commuting to and from the site. However, this traffic would be much lower than that associated with the existing operations workforce, resulting in an overall decrease in transportation impacts.

Short-term transportation impacts may result from transportation of ancillary equipment into the plant that is needed to shut the plant down. Any such impacts are anticipated to be small and of short duration.

Based on this analysis, the transportation impacts associated with ceasing operations at Paducah are expected to be SMALL.

4.2.12 Public and Occupational Health Impacts

This section evaluates the potential public and occupational health impacts associated with all of the transportation needed to bring people and materials in and out of the proposed ACP site. It also evaluates the public and occupational health impacts associated with the proposed site preparation and construction activities and the proposed ACP operations, separate from the transportation associated with those activities.

4.2.12.1 Transportation

Potential public and occupational health impacts could arise from airborne emissions from routine transportation associated with the proposed action, from radiation emitted during routine transportation, and from postulated transportation accidents resulting in the release of radiological and non-radiological materials. Each of these potential impacts is addressed below.

<u>Airborne Emissions from Routine Transportation</u>

Incoming and outgoing shipments associated with site preparation and construction activities, centrifuge manufacturing, and facility operation would result in increased emissions of vehicle exhaust to the air. This section evaluates the potential impacts of these emissions, based on the following assumptions.

- *Site Preparation and Construction.* Transportation associated with site preparation and construction (including the refurbishment of existing facilities) includes incoming truck shipments of building supplies and concrete, all of which were assumed to originate within 80 kilometers (50 miles) of the Piketon site. Incoming truck shipments of other equipment, such as electrical equipment, process equipment, and feed and withdrawal equipment, are also included in the site preparation and construction phase, but are assumed to originate at distances greater than 80 kilometers (50 miles). In addition, site preparation and construction shipments are assumed to include the truck shipment of wastes generated from the cleanup of the former Gas Centrifuge Enrichment Plant to an offsite disposal facility more than 80 kilometers (50 miles) from Piketon.

- *Centrifuge Manufacturing.* For the purpose of this analysis, centrifuge components and centrifuge stands were assumed to be manufactured offsite, at a distance more than 80 kilometers (50 miles) away, and shipped to Piketon by truck. Annual average emission rates were estimated assuming a centrifuge assembly rate of 16 centrifuges per day (USEC, 2005a).

- *Facility Operation.* Transportation associated with facility operation was assumed to include the transportation of natural UF_6 feed material to the proposed ACP, enriched UF_6 product from the proposed ACP, radioactive waste to various disposal sites, and "heeled cylinders" (cylinders containing small quantities of UF_6 left after being emptied) to two possible vendor sites. This analysis includes the offsite shipment of depleted uranium that is generated from facility operations and converted in DOE's onsite conversion facility, but not the voluminous other wastes that would be generated during facility decontamination and decommissioning (those shipments are considered separately in Section 4.2.15). The analysis also includes shipments of assorted chemicals used for operations, solid (non-hazardous waste), and hazardous waste. All impacts were assessed assuming a plant capacity of 7 million SWUs per year and assuming all shipments would be by truck, except for the offsite shipment of converted depleted uranium, which is assumed to occur by rail.

Site Preparation and Construction and Centrifuge Manufacturing

Because some centrifuge manufacturing is likely to occur at the same time as site preparation and construction activities, the analysis combines these two activities to determine maximum potential impact. In all cases, the incremental increase in average daily traffic emissions was estimated for two types of trucks: long-haul and medium-haul. The trucks associated with the building supplies and concrete were assumed medium-haul and all others long-haul. The number of truck trips was taken from USEC's Environmental Report (USEC, 2005a). In addition to emissions from the trucks, emissions would also increase as a result of the construction workers' personal vehicles. As many as 1,306 construction workers may be required to build the facility (USEC, 2005a). USEC assumed that each worker would arrive as a single-occupant vehicle and that half the vehicles would be light-duty trucks and half would be light-duty vehicles. Emissions were determined near the beginning of the active site preparation and construction period, since heavy-duty truck emissions are expected to be substantially reduced over the next ten years starting in 2007 with the introduction of catalyst-equipped and particulate trap heavy-duty diesel trucks (see 40 CFR Parts 80 and 86). Emission factors used in this analysis for the heavy-duty trucks, light-duty trucks, and light-duty vehicles are shown in Table 4-12.

Table 4-12 2010 U.S. Long- and Medium-Haul Heavy-Duty Trucks, Light-Duty Trucks, and Light-Duty Vehicles Fleet Average Emission Factors [a,b]

Truck Type	Road Type	VOC (g/mi)	CO (g/mi)	NOx (g/mi)	PM_{10} (g/mi)	SO_2 (g/mi)
Long-Haul Heavy-Duty	Arterial/ Highway	0.36	1.25	5.61	0.11	0.011
Medium-Haul Heavy Duty	Arterial/ Highway	0.44	1.85	8.32	0.16	0.011
Light-Duty Trucks	Arterial	0.91	11.7	0.78	0.025	0.0089
Light-Duty Vehicles	Arterial	0.74	9.49	0.54	0.025	0.011

Notes:
[a] VOC = volatile organic compound; CO = carbon monoxide; NO_X = nitrogen oxides; PM_{10} = particulate matter with a mean diameter of 10 micrometers or less; SO_2 = sulfur dioxide.
[b] g/mi = grams per mile.
To convert miles to kilometers multiply by 1.61.
Source: EPA, 2003.

The NRC staff compared the estimated incremental emissions from the trucks and construction worker trips to the current annual average emissions associated with all vehicles along U.S. Route 23 near the DOE reservation entrance. The current (2004) average 24-hour traffic volume near the entrance is 15,110 vehicles (average daily traffic), with 16 percent of the vehicles classified as heavy-duty trucks (Federal Highway Administration Class 5-13), as reported in the Ohio Department of Transportation's Traffic Survey Report (Ohio DOT, 2004a). Construction activity was assumed to occur over a five-year period. The increase in emissions associated with this increase in traffic volume was then calculated for each criteria pollutant and is reported in Table 4-13 on a grams per day basis near the entrance to the facility. The results reported in Table 4-13 are for 2010, which is the year expected to have the greatest volume of traffic coming in and out of the proposed site.

Table 4-13 Vehicle Emissions Associated with Construction-Related Traffic at the DOE Reservation Entrance (in 2010) [a,b,c]

	VOC (g/mi/day)	CO (g/mi/day)	NOx (g/mi/day)	PM_{10} (g/mi/day)	SO_2 (g/mi/day)
Current Baseline					
2004 Traffic	12,088	145,623	19,482	704	137
Increment					
Long-Haul	3.1	10.6	47.6	1.0	0.1
Medium-Haul	8.4	35.2	158.8	3.0	0.2
Worker Vehicles	2,160	27,648	1,725	65	26
Total Emissions	2,172	27,694	1,932	69	26
Percent Change over Baseline	18%	19%	10%	10%	19%

Notes:
[a] Includes incoming shipments of centrifuge components.
[b] VOC = volatile organic compound; CO = carbon monoxide; NO_X = nitrogen oxides; PM_{10} = particulate matter with a mean diameter of 10 micrometers or less; SO_2 = sulfur dioxide.
[c] g/mi = grams per mile.
To convert miles to kilometers multiply by 1.61.

As shown in Table 4-13, the largest estimated impact is a 19 percent increase in carbon monoxide and sulfur dioxide emissions, while the smallest estimated impact is a 10 percent increase for nitrogen oxides and particulate matter with a mean diameter of 10 micrometers or less. These changes are likely to be sufficiently large to be detected through ambient air quality monitoring. However, they would occur only temporarily during the construction phase and are unlikely to be large enough to cause an exceedance of the National Ambient Air Quality Standards. Because the National Ambient Air Quality Standards are designed to protect human health, the changes are unlikely to cause any adverse health impacts within the surrounding population. Therefore, for the purpose of this analysis, the potential health impacts associated with increased emissions from construction-related traffic are expected to be SMALL.

Facility Operation

The analysis of facility operations was similar to that described above for site preparation and construction and centrifuge manufacturing. Emission estimates were developed for truck activity associated with all incoming and outgoing materials, and for the rail shipments of depleted uranium to a suitable offsite disposal facility, after being converted to a non-reactive form in DOE's onsite conversion facility at Piketon. The number of truck trips was taken from USEC's Environmental Report (USEC, 2005a). Estimates of emissions from the rail shipments of converted depleted uranium were developed based on an estimate of approximately 42,800 cylinders of depleted uranium being generated over the 30-year license period.[5] Approximately one train with 100 railcars would be needed every three months to ship this depleted uranium to an offsite disposal facility. In addition to increased emissions from the truck and rail shipments, emissions would increase from the proposed ACP workers' personal vehicles. As discussed in Section 4.2.11.2, workers needed to support proposed ACP operations would on average

[5] USEC estimates that approximately 42,800 cylinders of depleted uranium tails would be generated if product is enriched to 5 percent by weight of uranium-235, as is expected most of the time. If the ACP were to produce enriched uranium at the maximum licensed assay of 10 weight percent of uranium-235, the tails generation rate would be about 87 percent of the rate analyzed in this Draft EIS (USEC, 2005a).

generate 1,113 trips per day. USEC assumed that each worker would arrive in a single-occupant vehicle and that half the vehicles would be light-duty trucks and half would be light-duty vehicles. As in the preceding section, emissions were estimated starting in 2010, since heavy-duty truck emissions are expected to have substantially reduced emissions over the next ten years starting in 2007 (see 40 CFR Parts 80 and 86). Emission factors used in this analysis were the same as reported in Table 4-12. Rail emission factors were based on EPA's Regulatory Support Document, Appendix O, line-haul fleet average emission factor for 2010 (EPA, 1998).

Table 4-14 compares the incremental increase in emissions from the combined truck, rail, and employee trips during proposed ACP operation to the current annual average emissions associated with all vehicles along U.S. Route 23 near the DOE reservation entrance. The largest impact is an estimated 11 percent increase in sulfur dioxide emissions, while the smallest impact is an estimated increase of almost five percent for nitrogen oxides and particulate matter with a mean diameter of 10 micrometers or less. These changes are highly unlikely to be large enough to cause an exceedance of ambient air quality standards and are sufficiently small that the change would be difficult to detect through ambient air quality monitoring. As a result, the health impacts associated with vehicle traffic during the proposed ACP operations phase are expected to be SMALL.

Table 4-14 Vehicle Emissions Associated with Operations-Related Traffic at the DOE Reservation Entrance (in 2010) [a, b]

	VOC (g/mi/day)	CO (g/mi/day)	NOx (g/mi/day)	PM_{10} (g/mi/day)	SO_2 (g/mi/day)
Current Baseline					
2004 Traffic	12,088	145,623	19,482	704	137
Increment					
Train Activity	2.1	6.8	37.2	1.4	4.2
Long-Haul	8.7	30.2	135.2	2.7	0.3
Worker Vehicles	920.5	11,781.1	735.1	27.9	11.1
Total Emissions	931.3	11,818.1	907.5	32.0	15.5
Percent Change over Baseline	7.7%	8.1%	4.7%	4.5%	11.4%

Notes:
[a] VOC = volatile organic compound; CO = carbon monoxide; NO_X = nitrogen oxides; PM_{10} = particulate matter with a mean diameter of 10 micrometers or less; SO_2 = sulfur dioxide.
[b] g/mi/day = grams per mile per day.
To convert miles to kilometers multiply by 1.61.

Radiological Impacts from Routine Transportation and Transportation Accidents

Transportation of radiological materials would include shipments of feed material to the proposed ACP, shipments of product materials (enriched UF_6) from the proposed ACP, and shipments of radioactive waste from the proposed ACP. Depleted UF_6 is assumed to be stored onsite until it is converted from UF_6 to triuranium octaoxide (U_3O_8), a more stable chemical form, at the new DOE conversion facility at Piketon and then transported by railcar to a low-level waste disposal site. According to USEC's Environmental Report (USEC, 2005a), feed materials would be transported from Metropolis, Illinois; Port Hope, Ontario, Canada; and Wilmington, Delaware in Type 48Y, Type 48X , and Type 30B cylinders, respectively. Product materials would be shipped to Richland, Washington; Columbia, South Carolina; Wilmington, North Carolina; and Seattle, Washington in Type 30B cylinders if the product is enriched to 5 percent or less, or another suitable 2.5-ton cylinder if the product is enriched to a higher percent.[6] Wilmington, Delaware is the shipping port for feed materials from Russia, while Seattle is the port for product shipments to Korea and Japan. Low-level radioactive waste would be shipped to Gainsville, Florida; Clive, Utah; and/or the Nevada Test Site. The transportation of radiological materials is subject to NRC regulations (10 CFR Part 71) and U.S. Department of Transportation regulations (49 CFR Parts 171-180). All the materials shipped to or from the proposed ACP would be shipped in Type A containers. The product material is regulated by the NRC as fissile material and would require additional fissile packaging considerations such as using an overpack surrounding the shipping container.

Exposure to radiation from radioactive shipments is assumed to result in an increased risk of latent cancer to crews operating the truck or train, persons sharing the route with the shipment (on-link public), persons living alongside the route (off-link public), and persons at rest stops and inspection stops. These latent cancers do not occur immediately after exposure, but instead occur a number of years after the exposure. The radiological impacts to occupational workers and the general public from the transport of the above-mentioned radioactive materials were estimated using RADTRAN 5, a computer code for analyzing the consequences and risks of radioactive material transportation. RADTRAN 5 estimates the number of latent cancer fatalities from accidents and the incident free transport of the materials, where the term "incident-free" means that no traffic accident or other incident resulted in the release of radioactive material to the surrounding environment. In this context, accidents refer only to incidents that result in the release of radioactive material.

NRC classifies accidents into eight severity categories, based on the mechanical (impact) and thermal (fire) forces involved (NRC, 1977). Category I is the least severe and Category VIII is the most severe. Less severe accidents occur more frequently, but have relatively mild consequences. More severe accidents happen less frequently, but have more significant consequences, including the release of some or all of the radioactive material in the shipment. For this Draft EIS, the NRC staff has estimated the fraction of accidents for truck and rail transport that fall within each category. Additionally, the staff has estimated the fraction of accidents in each category that occur in rural, suburban, and urban areas. Less severe accidents are most likely to occur in urban areas, where driving speeds are typically lower, while more severe accidents are more likely to occur in rural areas where driving speeds are higher (NRC, 1977). These estimates when combined with average accident rates are used to estimate the number of latent cancer fatalities due to exposure to radiation and radioactivity from transportation accidents. For

[6] No 2.5-ton cylinder is currently certified to ship uranium enriched to higher than 5 weight percent of uranium-235. Although it is currently believed to be unlikely, USEC may enrich product up to 10 weight percent of uranium-235. In the event this higher enrichment occurs, USEC would have to gain the appropriate certification before it shipped 10 percent product in either an existing 2.5-ton cylinder or in a new 2.5-ton cylinder. This Draft EIS's analysis of direct radiation surrounding Type 30B cylinders containing enriched product is considered reasonable for shipping scenarios involving higher-enriched product in another type of approved 2.5-ton cylinder (i.e., direct radiation levels for such alternate containers are expected to be similar).

purposes of this analysis, all releases of material are assumed to be airborne and respirable, which is very conservative. Fatalities due to chemical effects and bodily injury are addressed separately.

The RADTRAN 5 results presented in Table 4-15 are based on a number of input parameters, including the number of trips per year, the quantity of material transported per trip, the route used, the average accident rates for the route, and the population density along the route. The results in Table 4-15 are also based on the most likely scenario in which the enriched product contains approximately 5 percent by weight of uranium-235. Routes and population densities were determined using the Transportation Routing Analysis Geographic Information System model developed by Oak Ridge National Laboratory for the Department of Energy's National Transportation Program. Radioactive shipments were treated as Highway Route Controlled Quantities for route determination. More detail on the methods and inputs used for this analysis are provided in Appendix D of this Draft EIS.

As shown in Table 4-15, the transportation of feed material, product, heel cylinders, radioactive waste, and the converted depleted uranium results in some increased risk of cancer to both the occupational workers transporting and handling the material and to members of the public driving on the roads or living along the transportation routes. The transport of all materials is estimated to result in approximately 0.014 latent cancer fatalities per year of operation from exposure to direct radiation during incident-free transport, and an additional 0.008 latent cancer fatalities per year from accidents that result in the release of radioactive material into the environment. The total latent cancer fatalities is estimated to be 0.02 per year of operation or less than one cancer fatality over 30 years of operation.

The results presented above are for product materials enriched to approximately 5 weight percent of uranium-235. Although it is currently believed to be unlikely, USEC may in the future enrich product up to 10 weight percent of uranium-235. There are currently no 2.5-ton cylinders certified for the shipment of this higher enriched material. In the event this higher enrichment occurs, USEC would have to gain the appropriate certification before it shipped 10 product in either an existing 2.5-ton cylinder or in a new 2.5-ton cylinder. External exposure rates surrounding such a cylinder would likely be similar to those around the 30B cylinders presently used to ship 5 percent product and less than the external dose equivalent rates used in this assessment. For this reason, the risks associated with the incident-free transport of the 10 percent enriched product would not be significantly different than that of the 5 percent enriched product.

However, the accident-related radiological risks associated with the transport of the 10 percent enriched product would be somewhat greater than that of the 5 percent enriched product. This is primarily due to the higher activity of uranium-234 in the 10 percent enriched product. Uranium-234 does not contribute significantly to the external dose rate, but is an inhalation hazard if released. Table D-16 in Appendix D shows the calculated latent cancer fatalities from the transport of the higher enriched product for the same routes analyzed previously. The number of expected latent cancer fatalities associated with accidents involving only the transport of the 10 percent enriched product – not considering the other materials that would also be shipped – would be approximately three times greater than that for the 5 percent enriched product (i.e., 0.0087 latent cancer fatalities per year rather than the 0.0029 latent cancer fatalities per year reported in Table 4-15). When this higher number is added to the risks reported in Table 4-15 for incident-free shipping and transportation accidents involving the other materials, the total estimated latent

cancer fatalities becomes 0.03 per year of operation, which still equates to less than one cancer fatality over 30 years of operation. It should be noted that this analysis for 10 percent enriched product is conservative in that it assumes all the product material is enriched to 10 percent and it does not account for the decreased accident risks associated with the corresponding lower activities of uranium-234 in shipments of the conversion products (since uranium-234 activity would be higher in the 10 percent product it would be lower in the accompanying tails).

Based on these results, the public and occupational health impacts associated with the proposed transport of radioactive materials are expected to be SMALL.

Table 4-15 Estimated Latent Cancer Fatalities from the Transportation of Radioactive Materials for One Year of Operation

Material	Incident Free								Accidents
	General Population			Occupational Workers			Total	Maximally Exposed Individual	
	Off-Link	On-Link	Rest Stops	Crew	Inspection Stops	Loading Crew			
Feed Material	2.3×10^{-3}	1.7×10^{-3}	2.3×10^{-3}	2.9×10^{-3}	2.0×10^{-3}	9.1×10^{-4}	1.0×10^{-2}	9.4×10^{-9}	4.2×10^{-3}
Product[a]	4.5×10^{-5}	3.3×10^{-4}	7.0×10^{-4}	7.6×10^{-4}	3.3×10^{-4}	2.7×10^{-4}	2.4×10^{-3}	6.7×10^{-10}	2.9×10^{-3}
Heels	3.6×10^{-6}	2.7×10^{-5}	3.6×10^{-6}	6.4×10^{-5}	3.0×10^{-5}	9.7×10^{-5}	2.7×10^{-4}	8.9×10^{-11}	1.6×10^{-5}
Radioactive Waste	1.3×10^{-5}	1.1×10^{-4}	1.3×10^{-5}	3.1×10^{-4}	9.3×10^{-5}	1.1×10^{-4}	8.9×10^{-4}	3.5×10^{-10}	1.2×10^{-5}
Converted Products (Depleted Uranium and Calcium Fluoride)	7.3×10^{-7}	7.3×10^{-8}	7.3×10^{-7}	2.2×10^{-7}	0.0×10^{0}	0.0×10^{0}	2.8×10^{-5}	3.2×10^{-11}	7.5×10^{-4}
Total	**2.9×10^{-7}**	**2.2×10^{-8}**	**3.3×10^{-7}**	**4.0×10^{-3}**	**2.4×10^{-3}**	**1.4×10^{-3}**	**1.4×10^{-2}**	**9.4×10^{-9}**	**7.8×10^{-3}**

Notes:
[a] Assuming the most likely scenario involving product enriched to 5 percent by weight of uranium-235.

Non-Radiological Impacts from Transportation Accidents

In addition to the radiological impacts during transportation described above, chemical impacts from a transportation accident involving uranium could also affect the surrounding public. Uranium compounds, in addition to being radioactive, can have toxic chemical effects (primarily on the kidneys) if inhaled or ingested. The operation of the ACP would result in the truck transport of UF_6 as feed and product material to and from the ACP, as well as the rail transport of U_3O_8 as a conversion product for offsite disposal. Calcium fluoride, another conversion product, contains small amounts of uranium as a contaminant.

When released from a shipping cylinder, UF_6 reacts with the moisture in the atmosphere to form HF and uranyl fluoride. HF is extremely corrosive and can damage the lungs and cause death if inhaled at high enough concentrations. Irreversible adverse effects resulting from sufficiently high concentrations of these chemicals include permanent organ damage, or the impairment of everyday functions, and death. Adverse effects from exposure to lower concentrations include skin rash and respiratory irritation. The number of deaths resulting from the chemical effects of HF and uranyl fluoride is estimated to be 1 percent of those experiencing irreversible effects (Policastro et al., 1997)

To estimate the chemical effects of an accident involving the transport of UF_6 and U_3O_8, DOE modeled the dispersion of chemical emissions released into the environment from a transportation accident involving a fire (ANL, 2001; DOE, 2004a). The results were used to determine the number of people whose exposure would exceed the threshold for adverse effects and irreversible adverse effects. DOE estimated the chemical effects for accidents in rural, suburban, and urban areas. Table 4-16 shows the potential chemical impacts to the public from a hypothetical severe transportation accident that involves a fire. The assumptions supporting the impacts summarized in this table are provided in Appendix D.

Table 4-16 Potential Chemical Consequences to the Population from Severe Transportation Accidents

Material	Mode	Number of Persons with Potential Adverse Health Effects			Number of Persons with Potential Irreversible Adverse Health Effects		
		Rural	Suburban	Urban	Rural	Suburban	Urban
UF_6	Truck	6	760	1,700	0	1	3
U_3O_8	Rail	0	47	103	0	17	38

Source: DOE, 2004a.

Based on the total number of trips, the length of the trips, and the mean accident rate, the estimated number of accidents involving shipments of UF_6 is 0.5 accidents per year or an average of one accident every two years. This would translate into a total of 15 potential accidents over the 30-year operating life of the proposed ACP. Of these accidents, approximately 55 percent would not result in the release of any UF_6, and another 43 percent would result in a release of no more than 10 percent of the UF_6. About two percent of all accidents are expected to be severe enough to result in the release of all the UF_6 present. The probability of one or more of the 15 expected accidents being this severe is about 26 percent. Such an accident is most likely to occur in a rural or suburban area. The shipment of U_3O_8 would likely involve no more than four trainloads per year, making an accident unlikely.

These results indicate that the probability of a severe transportation accident that releases sufficient quantities of uranium that could pose a health risk is low, but that the consequences of such an accident,

should it occur, are high. Based on this analysis, the public health impacts associated with such an accident as part of the proposed action are considered MODERATE.

4.2.12.2 Site Preparation and Construction

This section evaluates the potential for occupational injuries and illnesses associated with the proposed site preparation and construction activities. It also evaluates the potential public and occupational health impacts from non-radiological and radiological releases during site preparation and construction.

Occupational Injuries and Illnesses

Non-radiological occupational injuries and illnesses associated with site preparation and construction were estimated using annual injury and illness data for heavy construction compiled by the U.S. Bureau of Labor Statistics. This Bureau compiles statistics by the North American Industry Classification System, which replaced Standard Industrial Classification Codes in 2000. Site preparation and construction of the proposed ACP is classified under North American Industry Classification System Code 2379, *Other Heavy and Civil Engineering Construction*. Incident rates for Total Recordable Cases and Lost Workday Cases for calendar year 2003, in units of incidents per 100 full-time equivalents, were obtained from the Bureau of Labor Statistics Publication *Table 1, Incident Rates of Nonfatal Occupational Injuries and Illnesses by Industry and Case Types 2003* (BLS, 2004a). Fatality incident rates for *Construction* (North American Industry Classification System Code 23) for calendar year 2003, in units of incidents per 100,000 full-time equivalents, were obtained from Bureau of Labor Statistics Publication *National Census of Fatal Occupational Injuries in 2003* (BLS, 2004b).

The number of construction workers per year (full-time equivalents) and the duration of construction were obtained from USEC's Environmental Report (USEC, 2005a). The incident rates for Total Recordable Cases, Lost Workday Cases, and Fatalities were applied to the number of construction workers per year and the construction schedule to estimate the total number of incidents. The incident rates, total full-time equivalents, and total incidents are summarized in Table 4-17. Based on the total number of incidents estimated for site preparation and construction, impacts to occupational safety from site preparation and construction would be SMALL.

Table 4-17 Health and Safety Statistics for Estimating Industrial Safety Impacts Common to the Workplace and Total Incidents for Site Preparation and Construction

FTEs [a]		Total Recordable Cases		Lost Workday Cases		Fatalities	
FTEs per year	Total FTEs	Incidents per 100 FTEs	Total Recordable Cases	Incidents per 100 FTEs	Lost Workday Cases	Incidents per 100,000 FTEs	Total Fatalities
1,013	5,065	4.3	218	1.9	96	11.7	0.59

Notes:
[a] FTEs = full-time equivalents.
Source: USEC, 2005a; BLS, 2004a; BLS, 2004b.

Non-Radiological Impacts

During the site preparation and construction phase, there may be occupational exposures to fugitive dust kicked up from land disturbances and to pollutants exhausted from vehicles and earth-moving equipment, including particulate matter, nitrogen oxides, sulfur oxides, and carbon monoxide. For this Draft EIS, the

NRC staff predicted the following maximum (one-hour) airborne concentrations in workplace environments: 0.31 milligrams per cubic meter of particulate matter, 0.50 milligrams per cubic meter of nitrogen oxides, 0.06 milligrams per cubic meter of sulfur oxides, and 0.14 milligrams per cubic meter of carbon monoxide (see Section 4.2.4.1). All of these concentrations are substantially lower than workplace exposure limits, so the occupational health impacts would be SMALL.

Both the water and air exposure pathways are of interest for the public. As discussed in Section 4.2.6.1, the potential impacts to surface water and groundwater quality due to site preparation and construction activities are expected to be small, because releases to surrounding ditches, tributaries, and creeks would be controlled under the National Pollutant Discharge Elimination System and through the use of engineering controls and best management practices. The primary threat to water quality would be a temporary increase in sedimentation and turbidity, as a result of storm water runoff from soils exposed during the construction phase, but this potential impact is not a human health concern. Therefore, the public health impacts associated with any non-radiological water contamination would be SMALL.

As discussed in Section 4.2.4.1 (see Table 4-1), site preparation and construction activities are predicted to result in airborne concentrations of criteria pollutants at the reservation boundary that are below the National Ambient Air Quality Standards, except for a slight exceedance of the standard for particulate matter with a mean diameter of 2.5 micrometers or less out to a distance of 1,000 meters (3,280 feet) beyond the southern fenceline. While emissions from site activities contribute to this exceedance, the vast majority of it is the result of high background concentrations of 13.8 micrograms per cubic meter for particulate matter with a mean diameter of 2.5 micrometers or less in the area. Overall, this exceedance would be small in magnitude (the predicted concentration is 16.1 grams per cubic meter relative to the standard of 15 grams per cubic meter), temporary, confined to a limited area, and a public health threat only if somebody were to move to the affected area near the fenceline. Therefore, the anticipated public health impacts are expected to be SMALL.

<u>Radiological Impacts</u>

Radiological impacts during site preparation and construction would be primarily to the construction workers performing those activities. Exposures to offsite personnel are greatly below those of the construction workers themselves because of atmospheric dispersion of airborne material and increased distance from external exposure sources. The construction workers are assumed to be an unmonitored population, meaning that they are not monitored for radiation exposure by the onsite radiation exposure control program. Because the workers are not considered "radiation workers," the applicable dose limits for the construction workers are those for the general public listed in 10 CFR § 20.1301(a)(1).

Site preparation and construction activities would not generate any radiological contamination, but they would disturb areas contaminated by previous site activities, including operation of the Gas Centrifuge Enrichment Plant, operation of the Gaseous Diffusion Plant, and storage of previously accumulated cylinders of uranium-bearing material. Therefore, the primary modes of exposure for construction personnel would be: (1) inhalation of previously existing radiological contamination that are in the dust suspended by construction activities; (2) external exposure from radionuclides contained in contaminated soil suspended in the air; (3) external exposure from radionuclides previously deposited in the soil on the ground; and (4) external exposure from existing sources nearby on the site such as the cylinder storage yards. Internal exposure from ingestion of food and drinking water is not considered a potential exposure mode for the construction workers.

The method for estimating the radiation dose received by the construction personnel from each of these exposure modes is given in Appendix C. Dose from inhalation of radioactive material suspended in the air, external exposure from radioactive material suspended in the air, and external exposure from

radioactive material in the surrounding soil was calculated using data from site environmental reports and dose factors from Federal Guidance Report 13 (the latest dose conversion factors published by the U.S. EPA) (EPA, 1999). The dose from external exposure to existing sources of radiation at the site was estimated using information from the thermoluminescent dosimeters located at various locations within the site boundary. Many of these thermoluminescent dosimeters are located near the locations where construction work is expected to be performed, making them the best available data on ambient radiation fields in the vicinity of the work activities.

The maximum estimated dose for each of the exposure modes was calculated for an annual exposure period. These estimated doses are:

- Internal dose from inhalation – less than 1×10^{-3} millisieverts per year (0.1 millirem per year);
- External dose from submersion – less than 1×10^{-3} millisieverts per year (0.1 millirem per year);
- External dose from radionuclides in soil – less than 1×10^{-3} millisieverts per year (0.1 millirem per year);
- External dose from existing sources – 0.88 millisieverts per year (88 millirem per year); and
- Total maximum possible dose – 0.89 millisieverts per year (89 millirem per year).

The maximum dose is dominated by the external dose received from existing external sources. As described in Appendix C, the 0.88-millisieverts (88-millirem) dose from existing external sources is derived from a worst-case exposure analysis for a worker employed for a full year at the location of the highest reading thermoluminescent dosimeters near the proposed X-745H Cylinder Storage Yard. The most likely dose to construction workers from existing external sources is 0.20 millisieverts per year (20 millirem per year) based on the nearest thermoluminescent dosimeter readings, which would provide for a total maximum possible dose approximately 0.22 millisieverts per year (22 millirem per year) (DOE, 2003). A dose of 0.20 millisieverts (20 millirem) is on the same scale as the variations in individual annual dose caused by the fluctuation in natural background. Background radiation exposure in the U.S. averages approximately 3.6 millisieverts per year (360 millirem per year) (NRC, 2005a).

The total maximum possible dose to construction workers from all four pathways is less than the 1 millisievert per year (100 millirem per year) limit in 10 CFR § 20.1301(a)(1), even for estimates combining the most conservative analytical assumptions. This is a negligible dose, representing a lifetime excess cancer risk of less than 5×10^{-5} (less than a 5 in 100,000 chance of getting cancer) when using a risk coefficient of 5×10^{-2} risk per sievert (5×10^{-4} risk per rem) (EPA, 1994). Based on this assessment, the impact on workers from radiological exposure during site preparation and construction is SMALL.

The dose to offsite personnel will be significantly smaller than that for construction workers, particularly since offsite personnel will not have any potential for measurable exposure from the cylinder storage yards. As described in Appendix C, the maximum exposure to offsite personnel is estimated to be less than 1×10^{-3} millisieverts per year (0.1 millirem per year). The impact on offsite personnel from site preparation and construction is therefore SMALL.

4.2.12.3 Facility Operation

This section evaluates potential occupational injuries and illnesses, as well as public and occupational health impacts associated with non-radiological and radiological releases, from the proposed ACP operations. It also evaluates the potential impacts of plausible accident scenarios.

Occupational Injuries and Illnesses

As for site preparation and construction, non-radiological occupational injuries and illnesses associated with facility operation were estimated using annual injury and illness data from the U.S. Bureau of Labor Statistics. Operation of the proposed ACP is classified under North American Industry Classification System Code 325188, *All Other Basic Inorganic Chemical Manufacturing*. Incident rates for Total Recordable Cases and Lost Workday Cases for calendar year 2003, in units of incidents per 100 full-time equivalents, for North American Industry Classification System Code 325188 were obtained from the Bureau of Labor Statistics Publication *Table 1, Incident Rates of Nonfatal Occupational Injuries and Illnesses by Industry and Case Types 2003* (BLS, 2004a). Fatality incident rates for *Manufacturing* (North American Industry Classification System Code 325) for calendar year 2003, in units of incidents per 100,000 full-time equivalents, were obtained from Bureau of Labor Statistics Publication *National Census of Fatal Occupational Injuries in 2003* (BLS, 2004b).

The number of operations workers per year (full-time equivalents) and the duration of facility operation were obtained from USEC's Environmental Report (USEC, 2005a). The incident rates for Total Recordable Cases, Lost Workday Cases, and Fatalities were applied to the number of operations workers per year and the operation schedule to estimate the total number of incidents. The estimated incident rates, total full-time equivalents, and total incidents are presented in Table 4-18. Based on the small total number of incidents reported in this table, impacts to occupational safety from facility operation should be SMALL.

Table 4-18 Health and Safety Statistics for Estimating Industrial Safety Impacts Common to the Workplace and Total Incidents for Facility Operation

FTEs [a]		Total Recordable Cases		Lost Workday Cases		Fatalities	
FTEs per year	Total FTEs	Incidents per 100 FTEs	Total Recordable Cases	Incidents per 100 FTEs	Lost Workday Cases	Incidents per 100,000 FTEs	Fatalities
600	16,200	2.8	454	1.3	211	2.5	0.41

Notes:
[a] FTEs = full-time equivalents.
Source: USEC, 2005a; BLS, 2004a; BLS, 2004b.

Routine Non-Radiological Impacts

The greatest potential for occupational exposures is in the product and tails withdrawal buildings, where cylinder connections and disconnections have the potential to release small amounts of UF_6 into the workplace environment. Any released UF_6 would react with ambient moisture to form HF and uranyl fluoride. Gulper systems, utilizing a flexible hose or ventilation hood, would be used to evacuate any such releases from the workplace. Airborne concentrations of HF and uranyl fluoride are expected to be insignificant with respect to worker exposure except in the area in the immediate vicinity of the release area and the gulper. Based on historical monitoring results and the anticipated amount of UF_6 released, USEC estimates that workplace concentrations of HF would be less than one percent of the Occupational Safety and Health Administration's Permissible Exposure Limit of 2.5 milligrams per cubic meter over an eight-hour averaging time. Concentrations of HF in the immediate vicinity of the UF_6 release point could be briefly higher, but are still expected to be less than 10 percent of the Permissible Exposure Limit (USEC, 2005a). Based on this analysis, the impacts associated with occupational exposures to HF in the workplace should be SMALL.

The NRC staff estimates that uranium concentrations in the workplace air could be as high as 0.7 milligram per cubic meter. This concentration was estimated using USEC's reported maximum short-term concentration of HF and then using the stoichiometry of the UF_6 reaction with atmospheric moisture to form uranyl fluoride and HF fumes. The staff expects that concentrations this high would represent short-term peaks in the immediate vicinity of "puff releases" of UF_6. For such short-term exposures, a relevant standard is the National Institute of Occupational Safety and Health's Immediately Dangerous to Life and Health level of 10 milligrams per cubic meter of uranium over a one-hour period. Since the staff's predicted concentration is below this standard, the impacts associated with occupational exposures to uranium in the workplace air are also likely to be SMALL.

In addition to the HF and uranyl fluoride, workers could be exposed to airborne concentrations of criteria pollutants emitted from the operation of the proposed ACP's emergency diesel generators. The NRC staff predicted that these emissions would result in the following maximum (one-hour) airborne concentrations in workplace environments: 0.006 milligrams per cubic meter of particulate matter, 0.34 milligrams per cubic meter of nitrogen oxides, 0.005 milligrams per cubic meter of sulfur oxides, and 0.09 milligrams per cubic meter of carbon monoxide (see Section 4.2.4.2). All of these concentrations are substantially lower than workplace exposure limits, so the occupational health impacts associated with exposures to criteria pollutants would be SMALL.

With respect to public health impacts, Section 4.2.6.2 concludes that non-radiological releases from proposed ACP operations to surface water and groundwater should be small and should not degrade existing water quality. Therefore, the public health impacts associated with such liquid releases would also be SMALL.

Public health impacts associated with non-radiological releases to the air are also expected to be SMALL. As detailed in Section 4.2.12.3, routine airborne emissions from the proposed ACP are projected to result in a maximum HF concentration of 2.35×10^{-3} micrograms per cubic meter and a maximum uranium concentration of 6.09×10^{-3} micrograms per cubic meter, both at the point of the Ohio National Guard building located onsite 555 meters (1,820 feet) from the proposed ACP buildings. Both of these concentrations are orders of magnitude below safe levels established by the Occupational Safety and Health Administration (2,500 micrograms per cubic meter for HF and 50 micrograms per cubic meter for uranium, both averaged over eight hours). Similarly, as discussed in Section 4.2.4.2, the predicted concentrations of criteria pollutants in air at the property boundary are well below the National Ambient Air Quality Standards.

<u>Routine Radiological Impacts</u>

This section describes the potential radiological impacts to members of the public and workers from the proposed ACP operations. Appendix C documents the methodology used in evaluating and reviewing information and site-specific data provided by USEC. Technical reports and safety analyses related to the potential hazards, and other independent information sources, were also reviewed.

<u>Public Health Impacts</u>

Radiation exposure to the public is possible via intake of uranium released from proposed ACP operations or from direct external exposure to the radiation emitted by the uranium. The two potential pathways of concern leading to public intake of uranium are airborne releases and liquid releases. Airborne releases may occur from routine operations or from small controlled releases to the atmosphere from the uranium enrichment process lines, specifically at the feed, withdrawal, sampling, and analysis points. Liquid releases may result from decontamination and maintenance of failed equipment or equipment being serviced and any associated releases of radioactive liquids to surface water. Direct external exposure

could occur from emission of radiation from the process lines, storage and handling of UF_6, and the collection, management, temporary storage, and transportation of other low-level radioactive or low-level mixed waste. Direct radiation and skyshine (radiation reflected from the atmosphere) originating from operations inside the facility would be expected to be undetectable at offsite areas. The direct radiation emitted by the uranium in the facility would be significantly absorbed by the heavy process lines, walls, equipment, and tanks at the proposed ACP. Additionally, any direct radiation would have to travel over 900 meters (3,000 feet) to reach the current nearest member of the public.

Public Dose From Airborne Releases of Radioactive Materials

The proposed ACP would release small amounts of uranium to the atmosphere during operation. The modeling performed for this analysis evaluated the impact of these releases to offsite populations and to onsite populations that are not included in the site's radiological dose monitoring program. Both of these groups are considered to be limited by the 1 millisievert per year (100 millirem per year) public exposure limits in 10 CFR § 20.1301(a)(1) and by the 0.1 millisieverts per year (10 millirem per year) airborne dose limits in 40 CFR Part 61, Subpart H, the U.S. EPA's National Emissions Standards for Hazardous Air Pollutants.

This analysis modeled releases from five release sources: (1) stacks on the process buildings (X-3001, X-3002, X-3003, and X-3004); (2) the product and tails withdrawal buildings (X-3356 and X-3366); (3) the analytical laboratory (X-710); (4) the feed component of Building X-3346; and (5) the customer services component of Building X-3346. The feed, withdrawal, and product operations uranium-235 design assay may range from approximately 1.6 percent to 10 percent. The customer product range is typically from approximately 2.4 percent to 5 percent, although it may occasionally be as high as 10 percent. Table 4-19 shows the annual release rates modeled for each of the locations using a customer product assay of 5 percent by weight of uranium-235. The values in this table represent the maximum of the typical customer assay range and should provide a reasonably high estimate of the most likely potential dose received from airborne releases of uranium from the ACP. In order to bound the infrequent and less likely possibility of product being enriched to 10 weight percent of uranium-235, this analysis also calculated the potential annual dose from airborne emissions assuming the maximum customer assay allowable under the NRC license.

Table 4-19 Airborne Release Rates Assuming Enrichment of 5 Weight Percent of Uranium-235

Location	Uranium-234 Bq/yr	Uranium-235 Bq/yr	Uranium-238 Bq/yr
Feed (X-3346)	2.89×10^7	1.27×10^6	2.76×10^7
Analytical Lab (X-710)	2.33×10^8	1.07×10^7	8.14×10^7
Process Buildings (X-3001through X-3004)	2.21×10^9	1.02×10^8	7.70×10^8
Withdrawal (X-3356 and X-3366)	8.29×10^7	3.81×10^6	2.89×10^7
Customer Services (X-3346)	5.07×10^7	1.79×10^6	5.37×10^6
Total Plant	2.60×10^9	1.19×10^8	9.14×10^8

Notes:
Bq/yr = becquerels per year
1 curie (Ci) = 3.7×10^{10} becquerels

Version 3 of the U.S. EPA air modeling code CAP88-PC was used to assess the impacts from proposed ACP emissions of uranium. The CAP88-PC model analyzes radiation dose from a number of exposure pathways. These include inhalation, submersion (external dose from a cloud of airborne radioactive material), groundshine, and ingestion of foodstuffs containing radioactive material propagated into the foodchain following deposition on the ground. CAP88-PC is approved by U.S. EPA for demonstrating compliance with the National Emission Standards for Hazardous Air Pollutants; version 3 is the latest update that includes the most recent dose and risk conversion factors. A description of the modeling approach in CAP88-PC Version 3, together with the compiled outputs from CAP88-PC for this analysis, are provided in Appendix C.

As shown in Table 4-19, the feed operation's emissions would derive from natural uranium. The process, withdrawal, and analytical laboratory buildings are assumed to have an average 2 percent uranium-235 assay, and the customer services building emissions would derive from material having an average 5 percent uranium-235 assay based on typical customer orders. The process building vent characteristics were based on the existing process vents in X-3001 and X-3002 where the vent height is 23 meters (75 feet) above grade and the vent diameter is 0.05 meter (2 inches). The vent heights for the feed, withdrawal, and customer services buildings are 12 meters (39 feet) above grade. The analytical laboratory vent height is 9 meters (30 feet) above grade. The model assumed a zero height plume rise for all atmospheric stability categories.

Although CAP88-PC has allowance for up to six independent stacks, all stacks modeled in any given case are assumed to be co-located. In most assessments this does not present a problem since vents that are physically offset by distances that are small relative to the downwind area being assessed can be safely assumed to be co-located. In this analysis, four of the vents are located in close proximity relative to the assessment distances being modeled. The only exception is the X-710 Laboratory Facility; this facility is treated as if it were co-located with the other vents in the model. In reality this facility is approximately 850 meters (2,800 feet) upwind from the critical receptor location relative to the other vents. The modeling ignores this difference in distance, which should result in a small overestimation of the dose at the critical receptor location.

Wind velocities used in the model were from the onsite meteorological station and represent measurements collected at 30 meters (98 feet) above grade from 1998 to 2002. The prevailing winds at the proposed ACP site blow from the southwest toward the northeast with a secondary frequency in the opposite direction towards the southwest. Although the primary direction is from the southwest, the DOE reservation has its greatest extent towards the northeast, resulting in greater dispersion of emissions in that direction prior to the emissions reaching any receptor locations at or beyond the northeast corner. Also, the proposed ACP would be located in the southwest corner of the reservation thus maximizing the possible dispersion prior to any emissions from the proposed ACP reaching receptors located in the direction of the prevailing winds.

For modeling purposes the distances from the proposed ACP stacks to the receptor locations were measured from the center point between the four process buildings to the DOE reservation boundary in each of the 16 compass directions. The model also evaluated the two onsite tenant organizations, the Ohio National Guard at the X-751 Mobile Equipment Maintenance Shop and the Ohio Valley Electric Cooperative office building on the Main Access Road, as the nearest members of the public. Distances were scaled from a blueprint-size site map with the Universal Transverse Mercator grid (100-meter [328-foot] increments) overlaid.

The model used a rural food consumption pattern to estimate the dose to an assumed critical receptor location at the DOE reservation boundary and the collective population dose for an 80-kilometer (50-mile) radius around the proposed ACP. The rural food consumption pattern assumes a high percentage of

foodstuffs are produced at home or at the point of exposure (70 percent vegetables, 40 percent milk, and 44 percent meat), with the remainder produced within an 80-kilometer (50-mile) radius. Onsite tenants were also assumed to consume foodstuffs produced within the 80-kilometer (50-mile) radius surrounding the proposed ACP, but not food products raised on the DOE reservation. These food consumption assumptions provide for an assessment that calculates a dose from ingestion representing the upper end of those doses expected to be reasonably possible, since few people actually consume a diet produced exclusively within 80 kilometers (50 miles) of their residence.

Table 4-20 shows the estimated dose to receptors residing at the site boundary in each of the 16 directions modeled in CAP88, along with the estimated dose to the two onsite tenant organizations. The estimated doses shown in this table are for the highest typical customer product assay of 5 weight percent of uranium-235. The maximum exposure is to the critical receptor residing on the DOE reservation boundary 1.1 kilometers (0.68 mile) south-southwest of the proposed ACP. The maximum individual 50-year total effective dose equivalent rate at this location from air emissions is modeled to be 2.10×10^{-3} millisieverts per year (0.21 millirem per year). The Ohio National Guard X-751 Mobile Equipment Maintenance Shop received the maximum individual total effective dose equivalent rate for the onsite tenant organizations at 0.003 millisieverts per year (0.30 millirem per year). These estimated doses are well below the U.S. EPA National Emission Standards for Hazardous Air Pollutant limit of 0.1 millisieverts per year (10 millirem per year) and the NRC total effective dose equivalent limit of 1 millisievert per year (100 millirem per year).

For the 10 weight percent customer assay scenario, which is expected to be much less frequent than the 5 weight percent scenario presented above, the maximum fenceline dose is estimated to be 3.3×10^{-3} millisieverts per year (0.33 millirem per year) and the dose at the Ohio National Guard location is 1.1×10^{-2} millisieverts per year (1.1 millirem per year). Although the 10 weight percent scenario was analyzed for the purpose of bounding the possible dose, the results are not considered reasonable for an annual exposure because of the low probability and infrequent occurrence of that product assay. Table 4-20 reports the results for a full year of operation at a product assay of 5 percent by weight of uranium-235, which represents a reasonable maximum given the expected ACP customers. Nevertheless, even at the 10 percent assay, the predicted doses are well below the U.S. EPA National Emission Standards for Hazardous Air Pollutant limit and the NRC total effective dose equivalent limit noted above.

Table 4-20 Annual Total Effective Dose Equivalent from Air Releases During Operation Assuming Enrichment of 5 Weight Percent of Uranium-235

Location	Direction	Distance meters[a]	Dose millisievert/year[b]
Site Boundary	North	3,350	1.0×10^{-3}
Site Boundary	North-northwest	2,012	1.2×10^{-3}
Site Boundary	Northwest	1,344	1.6×10^{-3}
Site Boundary	West-northwest	1,062	1.7×10^{-3}
Site Boundary	West	950	1.6×10^{-3}
Site Boundary	West-southwest	1,062	1.4×10^{-3}
Site Boundary	Southwest	1,308	1.4×10^{-3}
Site Boundary	South-southwest	1,118	2.1×10^{-3}
Site Boundary	South	1,050	1.8×10^{-3}
Site Boundary	South-southeast	1,230	1.2×10^{-3}
Site Boundary	Southeast	1,344	1.2×10^{-3}
Site Boundary	East-southeast	1,342	1.3×10^{-3}
Site Boundary	East	1,875	1.1×10^{-3}
Site Boundary	East-northeast	2,404	1.2×10^{-3}
Site Boundary	Northeast	4,137	8.0×10^{-4}
Site Boundary	North-northeast	4,891	7.0×10^{-4}
National Guard	East	555	3.0×10^{-3}
Ohio Valley Electric Cooperative	North-northwest	1,526	1.6×10^{-3}

Notes:
[a] To convert meters to feet multiply by 3.28.
[B] To convert millisievert to millirem multiply by 100.

CAP88-PC output includes a table of calculated airborne concentrations, in units of microcuries per cubic meter, for each radionuclide at each location defined by the user in the model's input file. These concentrations can then be converted from microcuries per cubic meter to micrograms per cubic meter for the purpose of evaluating the potential chemical toxicity of uranium rather than its radiation hazard. The uranium concentrations are not expected to be noticeably different in the case of a customer assay of 10 weight percent of uranium-235 rather than 5 weight percent of uranium-235. Changes in assay do not significantly affect the total uranium release, only the isotopic makeup of the uranium in the release.

Table 4-21 provides the calculated airborne uranium and corresponding HF concentrations at the identical receptor locations listed in Table 4-20.[7] The maximum fenceline airborne uranium concentration is predicted to be 0.005 micrograms per cubic meter along the south property line. The maximum airborne uranium concentration modeled for an onsite location is 0.006 micrograms per cubic meter at the Ohio National Guard X-751 Mobile Equipment Maintenance Shop. These estimated concentrations are well below the National Institute for Occupational Safety and Health Time-Weighted Average Recommended Exposure Level and the American Conference of Industrial Hygienists Threshold Limiting Value for uranium of 200 micrograms per cubic meter (NIOSH, 1996; NIOSH, 2005).

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[7] Average HF concentrations can be estimated using the stoichiometry of the UF_6 reaction with atmospheric moisture to form uranyl fluoride (a solid particulate) and HF fumes. Four molecules of HF are generated for each molecule of UF_6 released.

Table 4-21 Predicted Airborne Concentrations of Uranium and Hydrogen Fluoride at Receptor Locations

Location	Direction	Distance meters[a]	Total Uranium ($\mu g/m^3$)[b]	Hydrogen Fluoride ($\mu g/m^3$)
Site Boundary	North	3,350	1.73×10^{-3}	6.69×10^{-4}
Site Boundary	North-northwest	2,012	2.29×10^{-3}	8.84×10^{-4}
Site Boundary	Northwest	1,344	3.03×10^{-3}	1.17×10^{-3}
Site Boundary	West-northwest	1,062	3.45×10^{-3}	1.33×10^{-3}
Site Boundary	West	950	3.09×10^{-3}	1.19×10^{-3}
Site Boundary	West-southwest	1,062	2.61×10^{-3}	1.01×10^{-3}
Site Boundary	Southwest	1,308	2.59×10^{-3}	1.00×10^{-3}
Site Boundary	South-southwest	1,118	4.09×10^{-3}	1.58×10^{-3}
Site Boundary	South	1,050	5.21×10^{-3}	2.01×10^{-3}
Site Boundary	South-southeast	1,230	2.30×10^{-3}	8.88×10^{-4}
Site Boundary	Southeast	1,344	2.21×10^{-3}	8.53×10^{-4}
Site Boundary	East-southeast	1,342	2.32×10^{-3}	8.96×10^{-4}
Site Boundary	East	1,875	2.05×10^{-3}	7.94×10^{-4}
Site Boundary	East-northeast	2,404	2.12×10^{-3}	8.20×10^{-4}
Site Boundary	Northeast	4,137	1.23×10^{-3}	4.75×10^{-4}
Site Boundary	North-northeast	4,891	1.01×10^{-3}	3.90×10^{-4}
National Guard	East	555	6.09×10^{-3}	2.35×10^{-3}
Ohio Valley Electric Cooperative	North-northwest	1,526	3.15×10^{-3}	1.22×10^{-3}

Notes:
[a] To convert meters to feet multiply by 3.28.
[B] $\mu g/m^3$ = micrograms per cubic meter.

In summary, airborne emissions of uranium from proposed ACP operations are predicted to cause radiation doses to the public that are well below EPA's National Emission Standards for Hazardous Air Pollutants, as well as airborne concentrations of uranium that are well below toxicity limits established by the National Institute for Occupational Safety and Health and the American Conference of Industrial Hygienists. Therefore, the impacts from such emissions are expected to be SMALL.

Public Dose From Direct Gamma Radiation

The presence of radioactive materials in quantities above natural background provides the possibility for members of the public to receive radiation dose from gamma photons emitted from these materials. At the proposed ACP, only isotopes of uranium would be present in quantities large enough to provide the potential for members of the public to receive measurable external radiation dose. Of the uranium onsite, only that being stored as depleted uranium would be continuously present in sufficient quantity to represent a potential source of direct radiation dose to the public. There would be small amounts of other gamma emitters present onsite as sealed sources and laboratory standards, but these are not detectable at any large distance.

Using a model to predict radiation dose to the public from a site like the proposed ACP always yields uncertain estimates, given the lack of knowledge of the locations of the receptors as a function of time relative to the location of the source, and the associated shielding and distances involved. The best

approach for developing estimates of radiation dose in these situations is to use measured radiation dose at various locations of interest. The site conducts external gamma radiation monitoring using a network of lithium fluoride thermoluminescent dosimeters positioned at various locations both on and off the DOE reservation. There are nine thermoluminescent dosimeters spaced around the perimeter of the limited-access area of the DOE reservation including cylinder storage yards; eight dosimeters spaced around the DOE reservation boundary; and two dosimeters located off-reservation. Each of these dosimeters are collected and analyzed quarterly. Thermoluminescent dosimeter processing and evaluation is performed by a facility having current accreditation from the National Voluntary Laboratory Accreditation Program of the National Institute of Standards and Technology.

The thermoluminescent dosimeters of interest in this assessment are those at the reservation boundary, near the National Guard and Ohio Valley Electric Cooperative locations, the thermoluminescent dosimeter in Piketon, and the thermoluminescent dosimeter on Camp Creek Road near the Pike County/Scioto County line. The gamma radiation levels recorded by these thermoluminescent dosimeters can be used to determine if the existing depleted uranium storage yards are generating any noticeable increase in gamma radiation levels above ambient background at the potential locations of receptor populations. Table 4-22 shows the measured gamma radiation reading at the thermoluminescent dosimeters of interest for the four quarters in the year 2003.

Table 4-22 Thermoluminescent Dosimeter Gamma Radiation Readings for the Year 2003 [a,b]

Dosimeter	Location	Quarter 1 2003 mR	Quarter 2 2003 mR	Quarter 3 2003 mR	Quarter 4 2003 mR	Total 2003 mR
1404A	C Road	22	24	25	18	89
862	A Road	26	31	31	21	109
A12	Boundary East	22	25	26	18	91
A15	Boundary Southeast	24	16	27	19	86
A23	Boundary Northeast	23	27	26	20	96
A24	Boundary North	24	27	27	lost TLD	N/A
A28	Camp Creek Road	22	25	26	18	91
A29	Boundary West	23	27	28	19	97
A3	Boundary South	22	25	25	18	90
A6	Piketon	22	25	26	18	91
A8	Boundary North	28	28	28	21	105
A9	Boundary Southwest	24	27	28	19	98

Notes:
[a] TLD = thermoluminescent dosimeter.
[b] mR = milliRoentgens; 1 milliRoentgen of exposure produces approximately 8.7×10^{-3} millisieverts (0.87 millirem) of dose.

Thermoluminescent dosimeters 1404A and 862 are included to provide an estimate of potential exposures at the National Guard facility and the Ohio Valley Electric Cooperative office, respectively. The thermoluminescent dosimeters on the boundary provide an indication of the maximum radiation exposure

that an offsite receptor located full time at the boundary could receive over the course of a year. The Camp Creek and Piketon thermoluminescent dosimeters indicate whether any exposure above ambient background is being detected in those locations.

The ambient background exposure rate in the region is approximately 90-95 milliRoentgens per year (approximately 0.8 millisieverts or 80 millirem). None of the thermoluminescent dosimeters show significantly elevated exposure rates above this ambient level. The only thermoluminescent dosimeters with readings above the ambient background are thermoluminescent dosimeters 862 and A8, the two thermoluminescent dosimeters in the group nearest the cylinder storage yards. Even in those instances the maximum amount of radiation exposure above the ambient background amounts over the course of a year to less than 15 milliRoentgens (0.13 millisieverts or 13 millirem) for an unshielded receptor spending 100 percent of the year standing at that location. An actual resident at that location would receive on the order of 1 milliRoentgen (0.0087 millisieverts or 0.87 millirem) per year additional exposure when the effects of shielding and residence time are included. This dose is not expected to increase should the ACP product change from the expected 5 weight percent of uranium-235 to the less likely 10 weight percent of uranium-235. The number of tails cylinders is expected to be less in a 10 percent scenario and the isotopic content of each tails cylinder will not change unless the tails assay changes. Accordingly, the estimated dose at 5 percent should be equal to or higher than that for the 10 percent product scenario.

The thermoluminescent dosimeter readings are inclusive of any exposure caused by the presence of existing radiation sources on the DOE reservation, including direct radiation and skyshine. Even for those thermoluminescent dosimeters of interest nearest the existing cylinder storage yards, which are the largest potential sources of direct radiation, there is only a minimal increase in the annual exposure rate. According to the 2003 thermoluminescent dosimeter data, the presence of the existing storage yards has a minimal effect, if any, on the exposure rate at the site boundary. The additional storage yards planned for the proposed ACP are also expected to have a minor effect on the radiation exposure rate at the site boundary. USEC is stationing four additional thermoluminescent dosimeters near the planned X-745H Storage Yard, and one additional thermoluminescent dosimeter near the proposed ACP to the southwest (USEC, 2004c). Should either the X-745H Yard or the proposed ACP produce unexpected increases in the environmental exposure rate, that increase will be detected by both the new and existing thermoluminescent dosimeters, giving USEC the information needed to correct a potentially harmful situation. Therefore, the impact from direct exposure is expected to be SMALL.

Public Dose From Liquid Releases of Radioactive Material

The dose to the public from water-borne releases of radioactive material from the proposed ACP are expected to be negligible. As discussed in Section 4.2.6.2, USEC does not anticipate any liquid discharges of licensed radioactive materials from the proposed ACP. Any effluents potentially containing radioactive material would have to meet the NRC standards in 10 CFR Part 20 (Standards for Protection Against Radiation) prior to being discharged or would have to be disposed at a licensed facility (USEC, 2004c). The most likely pathway for release of uranium from the process facilities would by through the cooling water system, which is an isolated closed loop system. The only routine intentional wastewater discharge from plant operation will be blowdown water from the tower water cooling system, which does not come into contact with the main cooling system. Fluids from maintenance and cleaning activities are captured in dedicated drains to eliminate uncontrolled releases of potentially contaminated liquids. Accordingly, the impact from water-borne releases of radioactive materials is expected to be SMALL.

Summary of Public Dose

Based on these estimates, normal operations at the proposed ACP would have SMALL impacts to public health. The most significant impact would be from direct radiation exposure to receptors close to the cylinder storage yards (containing filled and empty Type 48Y cylinders). Members of the public who are nearest to the cylinder storage yards would have annual direct radiation exposures combined with exposure through inhalation. This potential combined exposure would result in annual doses of less than 0.05 millisieverts (5 millirem). These results are based on conservative assumptions (see Appendix C), and it is anticipated that actual exposure levels would be less than presented here. The total annual dose from all exposure pathways would be less than the limit of 1 millisievert per year (100 millirem per year) established in the NRC's regulations in 10 CFR § 20.1301. All exposures are also expected to be significantly below the U.S. EPA limit of 0.25 millisieverts per year (25 millirem per year), as set in 40 CFR Part 190 for uranium fuel-cycle facilities.

These conclusions are valid even in the event that the ACP operates at product enrichments of 10 weight percent uranium-235. The maximum dose from airborne releases of uranium, liquid releases, and direct external exposure from the cylinder storage yards will not be significantly affected by enrichment up to 10 percent. Only the airborne exposures are expected to potentially increase, but the maximum dose from air releases is still only about 0.011 millisieverts per year (1.1 millirem per year). No increase in dose from direct external exposure or liquid releases is expected in the event of enrichment to 10 weight percent uranium-235.

Occupational Exposure Impacts

Under the proposed action, the most significant contributor to occupational radiation exposure would be direct radiation from the UF_6. The most substantial sources of direct radiation include: the empty Type 48Y cylinders with residual material; full Type 48Y cylinders containing either feed material or depleted UF_6; Type 30 product cylinders; and various traps that help minimize UF_6 losses from the cascade while simultaneously concentrating it. The occupational doses received by personnel involved even with these higher sources is traditionally low; the average dose to cylinder workers at the Portsmouth reservation in 2003 was 0.29 millisieverts (29 millirem) (DOE, 2004b).

The United States Enrichment Corporation has implemented a comprehensive exposure control program at the site to manage occupational radiation exposure and dose. The program maintains exposures "As Low As Reasonably Achievable" through the use of radiation monitoring systems, personnel dosimetry, and mitigation systems to reduce environmental concentrations of uranium. USEC would adapt and apply a similar program specifically for the ACP. The proposed ACP personnel monitoring program would monitor for internal exposure from intake of uranium as well as dose from external exposure to radiation. USEC would also apply an annual administrative limit of 10 millisieverts (1,000 millirem), which is well below the 10 CFR § 20.1201 limit of 50 millisieverts (5,000 millirem).

The occupational exposure analysis and the historical exposure data from the United States Enrichment Corporation facilities demonstrate that a properly administered radiation protection program at the proposed ACP would maintain the radiological occupational impacts below the regulatory limits of 10 CFR § 20.1201. Therefore, the impacts from occupational exposure at the proposed ACP are expected to be SMALL.

Impacts from Plausible Accidents

Operation of the proposed ACP would involve risks to workers, the public, and the environment from potential accidents. The NRC's regulations in 10 CFR Part 70, Subpart H, (Additional Requirements for Certain Licensees Authorized to Possess a Critical Mass of Special Nuclear Material), require that each applicant or licensee evaluate, in an Integrated Safety Analysis, its compliance with certain performance requirements. Appendix H of this Draft EIS summarizes the methods and results used by NRC staff to independently evaluate the consequences of potential accidents identified in USEC's Integrated Safety Analysis. The accidents evaluated by the staff are a representative selection of the types of accidents that are possible at the proposed ACP.

The analytical methods used in this consequence assessment are based on NRC guidance for analysis of nuclear fuel-cycle facility accidents (NRC, 1990; NRC, 1991; NRC, 1998; NRC, 2001). With the exception of the criticality accident, the hazards evaluated involve the release of UF_6 vapor from process systems that are designed to confine UF_6 during normal operations. As described below, UF_6 vapor poses a chemical and radiological risk to workers, the public, and the environment.

Selection of Representative Accident Scenarios

The Integrated Safety Analysis Summary and Emergency Plan (USEC, 2004a; USEC, 2004b) describe potential accidents that could occur at the proposed ACP. Accident descriptions are provided by USEC for two groups according to the severity of the accident consequences: high-consequence events and intermediate-consequence events.

In this Draft EIS, a range of possible accidents was selected for detailed evaluation to bound the potential human health impacts associated with accidents. The accident sequences selected vary in severity from high- to low-consequence events, and include accidents initiated by operator error and equipment failure. The accident sequences evaluated by NRC staff were as follows:

- Explosion from wrecked centrifuge(s) following backfill with air;
- Process building construction fire;
- Cold trap shell structure failure;
- Breach of over-pressurized liquid cylinder; and
- Generic inadvertent nuclear criticality.

Accident Consequences

Table H-11 in Appendix H presents the predicted consequences from the selected accident scenarios, assuming such accidents occur. The analytical results indicate the accidents at the proposed ACP pose acceptably low risks. The most significant accident consequences are those associated with the release of UF_6 caused by a breach of an over-pressurized cylinder. The proposed ACP design reduces the likelihood of this event by having automatic high temperature and high pressure trips.

More generally, NRC regulations and USEC's operating procedures for the proposed ACP are designed to ensure that the high and intermediate accident scenarios would be highly unlikely. The NRC staff's Safety Evaluation Report assesses the safety features and operating procedures required to reduce the risks from accidents. The combination of Items Relied on for Safety that mitigate emergency conditions, and the implementation of emergency procedures and protective actions in accordance with the proposed Emergency Plan for the ACP, would limit the impacts of accidents that could otherwise extend beyond the proposed ACP boundaries. The Items Relied on for Safety include such measures as active and passive engineered controls.

Based on this analysis, accidents at the proposed ACP would result in SMALL to MODERATE impacts to workers, the environment, and the public.

4.2.12.4 Ceasing Operations at Paducah

Cessation of enrichment plant operations at Paducah would reduce radiological occupational exposures. Upon shutdown, no additional uranium would be transported to the plant for enrichment, and no additional depleted uranium would be generated by enrichment operations. Depleted uranium contained in process equipment would eventually be purged from the equipment. Some radiological occupational exposure would result from the purging, but such exposure would be short term and controlled to within regulatory limits. After purging of equipment, however, potential radiological exposure associated with handling of uranium raw material, operation of enrichment plant equipment, and generation of depleted uranium would be eliminated. Also, the operations workforce would be reduced to a much smaller maintenance and security workforce, which would reduce the number of workers potentially exposed to radiation as well as the level of radiation exposure for each worker. Therefore, radiological occupational health impacts associated with cessation of Paducah enrichment plant operations would be lower than that associated with plant operations.

Non-radiological occupational health impacts would also be reduced by cessation of Paducah operations. There would be a temporary increase in the number of plant workers and an increase in the person-hours worked as the plant is shut down. Some potential non-radiological occupational health impacts could result from these increased activities, but any such increase would be temporary. After the plant ceases operations, the number of workers and the associated annual person-hours worked would be reduced, thereby reducing potential non-radiological occupational health impacts. The potential for such impacts would also be reduced because the more potentially hazardous occupational activities associated with enrichment plant operations would be eliminated. Therefore, non-radiological occupational health impacts associated with cessation of Paducah enrichment plant operations would be lower than that associated with plant operations.

Cessation of Paducah enrichment plant operations would also reduce public health impacts. Air emissions, wastewater effluents, and waste generated by enrichment plant operations would be reduced, thereby reducing associated radiological and non-radiological public health impacts. Ongoing public health impacts associated with historical radiological releases from Paducah enrichment plant operations (e.g., historical deposition of particulate radionuclides to soils and sediments) would not be affected by cessation of operations.

Based on this analysis, the cessation of operations at the Paducah Gaseous Diffusion Plant would be expected to cause SMALL impacts to public and occupational health.

4.2.13 Waste Management Impacts

This section describes potential impacts associated with the generation, management, and disposal of radioactive and non-radioactive wastes generated from the proposed action. It includes an analysis of the management and disposal of depleted uranium expected to be generated by proposed ACP operations. However, the management and disposal of decontamination and decommissioning wastes are assessed separately in Section 4.2.15.

4.2.13.1 Site Preparation and Construction

Site preparation and construction would include refurbishment of existing facilities, including dismantling of the former Gas Centrifuge Enrichment Plant, and construction of the proposed ACP. The types and quantities of wastes anticipated to be generated during site preparation and construction are summarized in Table 2-3 in Chapter 2 of this Draft EIS. These include centrifuge parts and other low-level radioactive waste; rags, wipes, aerosol cans, and other hazardous wastes; paper, construction debris, wood, and other sanitary/industrial waste; and circuit boards, bulbs, lead parts, and other recyclables. The major portion of the wastes generated from site preparation and construction activities would be from refurbishment of the X-3001, X-3002, and X-3346 Buildings. It is anticipated that only sanitary/industrial wastes would be generated during proposed ACP construction activities. Management procedures for wastes generated from refurbishment, site preparation, and construction activities are summarized in Section 2.1.4.1. The potential impacts associated with these management procedures are discussed below.

<u>Low-Level Radioactive Waste</u>

The only significant amounts of radioactive waste generated during site preparation and construction would result from the removal of the 720 centrifuges that were part of the prototype Gas Centrifuge Enrichment Plant built at the reservation in the early 1980s. Removing these centrifuges and their associated piping and equipment would produce between 7,787 and 8,495 cubic meters (275,000 and 300,000 cubic feet) of low-level radioactive waste. The centrifuges and the associated systems contain only very small amounts of residual uranium, resulting in a very low activity per cubic foot of material. The low activity should remain contained and produce no measurable dose hazard to the public. Occupational exposures would also be low because the low specific activities would produce only small external dose rates, and because airborne activities would be controlled by using air monitoring and ventilation systems during removal operations. Occupational doses would also be controlled and monitored through the site radiation exposure control program.

No long term storage or disposal of the Gas Centrifuge Enrichment Plant equipment would occur onsite. After removal from the X-3001 and X-3002 Process Buildings, the equipment will be shipped to a licensed low-level radioactive waste disposal facility, such as the EnviroCare facility in Utah, which is subject to regulatory controls to limit radiological releases and exposures. As a result, the impacts associated with the management of this wastestream should be SMALL.

<u>Low-Level Mixed Waste</u>

Hazardous wastes generated from site preparation and construction activities would in general be collected and packaged by the waste generator. All such wastes would be considered as potentially radioactive until characterized. Hazardous wastes that are ultimately categorized as low-level mixed waste based on the radionuclide content would be segregated and managed separately from strictly *Resource Conservation and Recovery Act* hazardous wastes. Waste generation and management procedures would be implemented to minimize the generation of any low-level mixed waste, and in fact none is currently anticipated. Therefore, the impacts associated with the management of this wastestream should be SMALL.

<u>Hazardous Waste</u>

Hazardous wastes generated from site preparation and construction activities would be accumulated and staged at the XT-847 Facility prior to shipment off reservation for treatment and disposal. The XT-847 Facility is equipped with concrete floors, four-hour rated fire walls, and fire doors, and is divided into three staging areas. The XT-847 Facility also includes a *Resource Conservation and Recovery Act* 90-

day storage facility. Hazardous wastes may be further characterized at this facility and would be packaged and labeled in accordance with *Resource Conservation and Recovery Act* regulations and U.S. Department of Transportation regulations. The waste containers would be subject to periodic inspection, and any leaking containers would be transferred to other containers or overpacked prior to shipment offsite to a hazardous waste treatment, storage, or disposal facility. Hazardous waste would not be stored at the XT-847 Facility for more than 90 days prior to transfer offsite, and hazardous wastes would be determined to meet the waste acceptance criteria of the receiving offsite treatment, storage, or disposal facility prior to shipment. All such shipments would be made only to USEC-approved treatment, storage and disposal facilities. All hazardous wastes (and other wastes) generated from site preparation and construction activities would be tracked through a Request for Disposal system and assigned a unique identification number. Waste shipments offsite for treatment and disposal would be tracked by this identification number with respect to location, characterization, and other factors.

As shown in Table 2-3, up to approximately 17 cubic meters (600 cubic feet) of *Resource Conservation and Recovery Act* hazardous waste per year would be generated during site preparation and construction activities. Onsite waste management capacity at the XT-847 Facility is adequate to manage this amount of waste, and this amount of waste would not exceed the capacity of hazardous waste treatment, storage, and disposal facilities. Waste management procedures are in place for *Resource Conservation and Recovery Act* hazardous wastes generated from existing operations, as described above and in Section 2.1.4.1 and Section 3.14 of this Draft EIS, and would be applied to hazardous wastes generated from site preparation and construction activities for the proposed ACP. Such procedures would serve to minimize onsite releases and ensure offsite treatment and disposal in accordance with *Resource Conservation and Recovery Act* regulations and other applicable regulations. Therefore, impacts associated with the management of hazardous wastes from site preparation and construction activities would be SMALL.

<u>**Recyclable Waste**</u>

As shown in Table 2-3, up to approximately 184 cubic meters (6,500 cubic feet) of recyclables would be generated from site preparation and construction activities. Potentially recyclable materials would be considered as such until characterized. Potentially recyclable materials that are categorized as low-level radioactive waste, low-level mixed, or hazardous waste would be segregated and managed separately from recyclables. Reasonable efforts would be taken using USEC waste minimization and pollution prevention policies and established recycling procedures to minimize the amount of waste generated.

Recyclable wastes generated from site preparation and construction activities would generally be transferred offsite to local recycling firms. Such firms have adequate capacity to manage the anticipated volumes of such materials. Therefore, the impacts of managing recyclables from site preparation and construction activities would be SMALL.

<u>**Classified/Sensitive Waste**</u>

It is not anticipated that any classified waste would be generated from the proposed site preparation and construction activities.

<u>**Sanitary/Industrial Waste**</u>

Sanitary/industrial waste generated from site preparation and construction would be disposed of primarily at the Pike County Landfill. The Rumpke Beach Hollow Landfill is also available for the disposal of such waste. Both of these landfills are used by local municipalities and are subject to State and local environmental protection regulations. The capacity of the Pike County Landfill is 1,814 metric tons per day (2,000 tons per day) and that of the Rumpke Beach Hollow Landfill is 240 metric tons per day (264

tons per day). At current disposal rates, the Pike County Landfill has sufficient disposal capacity for 34 years and the Rumpke Beach Hollow has sufficient disposal capacity for 82 years. As shown in Table 2-3, approximately 1,270 metric tons (1,400 tons) of sanitary/industrial waste would be generated during site preparation and construction, which would not significantly affect the disposal capacity of the local landfills. Therefore, the impact of sanitary/industrial waste generated from site preparation and construction activities would be SMALL.

4.2.13.2 Facility Operation

Section 2.1.4.3 of this Draft EIS summarizes the types and quantities of wastes anticipated to be generated from facility operations over the 30-year license period, along with the proposed practices for managing each wastestream. These wastes include depleted uranium; other low-level radioactive waste; low-level mixed waste; hazardous waste; recyclable waste; classified waste; and paper, office waste, and other sanitary/industrial wastes. The potential impacts associated with the generation, storage, treatment, and disposal of each wastestream are assessed in turn below.

<u>Depleted Uranium</u>

Up to approximately 42,800 Type 48G cylinders of depleted UF_6 would be generated by the 7 million SWU plant operating full time for 30 years (USEC, 2005a). This is the most likely estimate of the amount of tails to be produced assuming USEC enriches product to the expected average of approximately 5 percent by weight of uranium-235. It is also a reasonably conservative estimate, as production of more highly enriched product at the same tails assay results in lower rates of tails generation. If the ACP were to generate product at the maximum licensed assay of 10 weight percent of uranium-235, the tails generation would be about 87 percent of the amount reported above (USEC, 2005a).

These cylinders would contain a total of approximately 571,000 metric tons (629,420 tons) of depleted UF_6. Each individual cylinder would contain the following amounts of radioactivity: 1.92×10^{10} becquerels (0.52 curies) of uranium-234, 1.48×10^9 becquerels (0.04 curies) of uranium-235, and 9.25×10^{10} becquerels (2.5 curies) of uranium-238.

USEC currently manages depleted UF_6 at the DOE reservation in accordance with 40 CFR Part 266 and Ohio Administrative Code 3745-266, and these same management procedures would be used for the new depleted UF_6 cylinders produced by the proposed ACP. Ohio EPA establishes requirements for management, inspection, testing, and maintenance associated with the depleted UF_6 storage yards and cylinders owned by USEC at the DOE reservation, as stipulated in Section 9 of the ACP License Application.

The need for a long-term disposal path for depleted UF_6 has become clear; the current practice of storing the depleted UF_6 in cylinders on pads at the enrichment facility has been successful as an intermediate practice, but viable uses for large amounts of depleted uranium have not materialized. DOE has recognized that long-term disposal of the depleted uranium will require conversion to a non-reactive form such as U_3O_8 and has begun construction of a depleted UF_6 conversion facility at Piketon in order to convert the depleted uranium owned by DOE into a more non-reactive form suitable for long-term disposal.

Impact on DOE Conversion Facility Operation

Section 3113(a) of the *USEC Privatization Act* (Public Law 104-134) requires DOE to accept low-level waste, including depleted uranium that has been determined to be low-level waste, for disposal upon the request and reimbursement of costs by USEC. Section 3113 was recently amended (by HR4818, Omnibus Appropriations bill) to add the following new paragraph to subsection (a):

> *(4) In the event that a licensee requests the Secretary to accept for disposal depleted uranium pursuant to this subsection, the Secretary shall be required to take title to and possession of such depleted uranium at an existing depleted UF_6 storage facility.*

To date, this provision has not been invoked and the form in which the depleted uranium would be transferred to DOE has not been specified. However, it is likely that depleted uranium from the proposed ACP transferred under this provision of law in the future would be in the form of depleted UF_6, thus adding to the inventory of material needing conversion at the Piketon depleted UF_6 conversion facility. DOE is aware of the possibility that the conversion facility being constructed at Piketon may need to operate longer than initially planned in order to process waste transferred to DOE from the proposed ACP. DOE acknowledges in its EIS for the conversion facility that "...it is reasonable to assume that the conversion facilities could be operated longer than specified in the current plans in order to convert this material." (DOE, 2004a)

The Piketon conversion facility is planned to operate for 18 years beginning in 2006. The existing inventory planned for conversion is 243,000 metric tons (267,862 tons) of depleted UF_6 (DOE, 2004a). The projected maximum amount of 571,000 metric tons (629,420 tons) of depleted UF_6 generated by the proposed ACP represents a significant increase in this existing inventory. Converting the depleted UF_6 from the proposed ACP would require DOE to significantly extend the life of the conversion facility, or to construct a second conversion facility on the site. DOE has maintained that, with routine facility and equipment maintenance, periodic equipment replacements, or upgrades, the conversion facility could be operated safely beyond the 18-year planned life-time period to process the additional depleted UF_6 from the proposed ACP. In addition, DOE indicates the estimated impacts that would occur from prior conversion facility operations would remain the same when processing the proposed ACP wastes. The overall cumulative impacts from the operation of the conversion facility would extend proportionately with the increased life of the facility (DOE, 2004a).

Based on this analysis, the added inventory of depleted UF_6 coming from the proposed ACP should not change the nature or magnitude of the impacts from the DOE conversion facility operations, but it would extend those impacts for several additional years. As a result, the overall impacts to DOE conversion facility operations are considered MODERATE.

Transportation Impacts

Once the depleted UF_6 cylinders are filled at the proposed ACP and then cooled so that the gaseous depleted UF_6 is solidified, they would be transported onsite to one of two cylinder storage yards located north of Perimeter Road (the existing X-745G-2 Yard would support the first five years of operation and the new X-745H Yard would support the remaining 25 years of operation). They would then be transported back for processing in the onsite DOE conversion facility, located just north of the proposed ACP in the southwest quadrant of the reservation's central area. This onsite handling and movement of solidified depleted UF_6 cylinders would be in accordance with all applicable NRC requirements and standard operating procedures, and would be conducted in a manner designed to minimize risks to workers, the public, and the environment.

Consistent with assumptions made in the DOE EIS for the conversion facility at Piketon (DOE, 2004a), the NRC staff assumes that the depleted U_3O_8 from the conversion facility would be loaded into empty cylinders or bulk bags, which would be loaded onto railcars for shipment for disposal at either the Envirocare facility in Clive, Utah (the proposed DOE disposition site) or the DOE facility at the Nevada Test Site (the optional DOE disposition site). The calcium fluoride generated from the conversion process is also assumed to be packaged and shipped in this same manner. Given the quantities of material generated, the NRC staff estimates that approximately one train with 100 railcars would be needed every three months to ship the U_3O_8 and calcium fluoride to an offsite disposal facility.

The impacts associated with this rail shipment are assessed in Section 4.2.12.1. As shown in Table 4-15, this shipment is estimated to result in 2.8×10^{-5} latent cancer fatalities per year of operation from exposure to direct radiation during incident-free transport, and an additional 7.5×10^{-4} latent cancer fatalities per year from accidents that result in the release of radioactive material to the environment. The total latent cancer fatalities per year is estimated to be approximate 8×10^{-4} or less than one cancer fatality over 30 years of operation. Based on this analysis, the impacts associated with the offsite shipment of materials from the conversion facility are expected to be SMALL.

Disposal Impacts

DOE has analyzed the human health impacts from long-term disposal of uranium oxides in their Programmatic Environmental Impact Statement on disposal of depleted uranium (DOE, 1999b). Four forms of depleted uranium waste were examined in the study: disposal of U_3O_8 in either a grouted or ungrouted form, or disposal of uranium dioxide in either a grouted or ungrouted form. Ungrouted waste is typically in a powder or pellet form, while grouted waste is the material resulting from mixing the uranium oxide material with cement and repackaging in drums. Grouting the waste is intended to increase the waste's structural strength and reduce the leaching rate of the waste to water.

DOE's analysis determined that the long-term disposal of depleted uranium in the form of U_3O_8 at a "generic dry location" is expected to produce zero dose to the maximally exposed individual at a time of 1,000 years from disposal. The maximally exposed individual in this case is considered to be an individual living at the boundary of the disposal site who uses a well at the site boundary as a water source. In the DOE analysis, the critical pathway is groundwater transport to the well; however, in the dry site environment, uranium is not able to migrate to groundwater in the 1,000-year time period, and thus there is no calculated dose.

In a subsequent *National Environmental Policy Act* analysis, DOE proposed disposing the depleted uranium at Envirocare (i.e., "generic dry location") (DOE, 2004a). However, the Envirocare sites does not have potable groundwater sources under the disposal facility, so the groundwater pathway is not a concern even when the analysis is extended out to 10,000 years. Thus when applying the DOE analysis scenario to such a site, there would be no dose to the maximally exposed individual even in a 10,000-year analysis.

NRC staff also reviewed the Waste Acceptance Criteria for the Envirocare site which allows for the disposal of depleted uranium with no volume restrictions. During this review, NRC staff contacted the Division of Radiological Control of the State of Utah to discuss the Envirocare Waste Acceptance Criteria and performance assessment (NRC, 2005b). From this review and discussion it is apparent that the Division of Radiological Control has considered the disposal of depleted uranium at the Envirocare site. Several site-specific factors contribute to the acceptability of depleted uranium disposal at Envirocare, including a lack of potable groundwater, extremely low annual precipitation, and land use controls by Tooele County. As Utah is an NRC Agreement State, and Envirocare has met Utah's licensing requirements, the impacts from disposal of depleted uranium at the Envirocare facility would be SMALL.

Capacity Impacts

In a Memorandum and Order (CLI-05-05, Docket No. 70-3103-ML) dated January 18, 2005, the Commission concluded that depleted uranium is properly considered a form of low-level radioactive waste ("regardless of which form it may take," as stated in the Commission Order). Additionally, as described in 10 CFR § 61.55(a)(6), depleted uranium is Class A waste.

The quantity of depleted uranium potentially requiring disposition could affect the available disposal capacity for low-level waste. A June 2004 General Accounting Office report concluded there is sufficient disposal capacity for current volumes of Class A low-level radioactive waste to last for more than 20 years (GAO, 2004).

Further, access to the existing low-level waste disposal facilities is limited by certain agreements and is potentially subject to change. The Barnwell, South Carolina disposal facility currently accepts waste from all U.S. generators except those in Rocky Mountain and Northwest compacts. Beginning in 2008, however, the Barnwell facility will only accept waste from the Atlantic Compact States, which are limited to Connecticut, New Jersey, and South Carolina. The Richland, Washington disposal facility currently accepts waste only from the Northwest and Rocky Mountain Compacts, which together comprise Washington, Oregon, Idaho, Montana, Utah, Wyoming, Nevada, Colorado, New Mexico, Alaska, and Hawaii. Therefore, for the converted depleted uranium from the proposed ACP, the only viable existing disposal options are the Envirocare facility in Clive, Utah or the DOE-operated Nevada Test Site facility. The remaining estimated capacity for the Envirocare facility is approximately 2.1 million cubic meters (2.7 million cubic yards). Assuming a waste density 0.39 cubic meter per metric ton (0.46 cubic yard per ton), the total amount of depleted UF_6 estimated to be generated by the proposed ACP equates to approximately 222,485 cubic meters (291,000 cubic yards), which would take up approximately 11 percent of the remaining Envirocare capacity. Considering this small fraction, along with the fact that some of the proposed ACP's converted depleted uranium could go to the Nevada Test Site if needed, the impacts on available disposal capacity are expected to be SMALL.

Low-Level Radioactive Waste

Operation of the proposed ACP would result in generation of relatively small amounts of low-level radioactive waste in addition to the depleted uranium tails. These wastes include classified waste (failed centrifuges), heeled cylinders, and assorted other wastestreams. Much of this waste would be typically transferred to the XT-847 Facility, where the waste may be further sampled/measured to assist in determining the proper waste characterization and proper disposal/treatment. After containerization, characterization, labeling/marking, and other processing, the waste would be scheduled for off-reservation disposal/treatment at a Treatment, Storage, Disposal, Recycling Facility. Such offsite facilities to be used by the proposed ACP include the Envirocare facility in Utah for low-level radioactive waste and the Nevada Test Site in Nevada for classified waste. These are licensed facilities for the type of waste intended to be shipped to them from the proposed ACP. Handling of low-level radioactive wastes will be by workers monitored as part of the site radiological control program.

Failed Centrifuges

Centrifuges that fail during operation would be maintained onsite to be crushed and disposed during decommissioning. The rate of centrifuge failures is expected to be very low, so this waste stream is expected to be small in volume (12-15 cubic meters per year [420-520 cubic feet per year]) (USEC, 2005a). The radiological activity in the failed centrifuge waste is expected to be low, since the centrifuges hold only a small amount of uranium at any given time.

The overall activity and volume of this waste would be small in comparison to the expected volume of decommissioning wastes. Storage of the failed centrifuges should present no significant hazard as the material is low in activity and relatively small in volume. The impact of managing and disposing the failed centrifuges is therefore expected to be SMALL.

Heeled Cylinders

Approximately 50 76-centimeter (30-inch) heel cylinders would be shipped to vendors monthly for cleaning and recertification or washing only; these cylinders would contain heel weights of less than 11 kilograms (25 pounds) (USEC, 2005a). The cleaning and recertification vendors would be Westinghouse in Columbia, South Carolina and Framatome in Richland, Washington. The 76-centimeter (30-inch) heel cylinders would be shipped in an array of 25 cylinders per shipment. Approximately 50 clean/recertified cylinders would be received in return at the proposed ACP monthly (USEC, 2005a).

The low numbers and small activities in the heeled cylinders represent no measurable risk to public health and safety. The impact of managing and disposing of the heeled cylinders is therefore expected to be SMALL.

Other Low-Level Radioactive Waste

The largest other low-level radioactive waste stream by volume expected to be generated by proposed ACP operations would be dry active waste, at between 170 to 340 cubic meters per year (6,000 to 12,000 cubic feet per year). This would include radioactively contaminated metal. Uranium concentrations in this waste would range from the lower limit of detection for the analytical method used up to approximately 200 parts per million total uranium. The maximum technetium-99 activity expected to be seen in this waste is 37,000 becquerels per kilogram (1,000 picocuries per gram).[8] Some small volume low-level radioactive waste streams with higher radionuclide concentrations would also be generated from operation of the alumina, magnesium, and sodium fluoride chemical traps. Total uranium in these small volume streams may approach 0.1 gram per gram, with technetium-99 activities up to 1 microcurie per gram.

Based on the quantities generated, the radiological characteristics of the waste, and the fact that the low-level radioactive waste would be ultimately treated and disposed in facilities licensed for that purpose, the impact of these wastes is expected to be SMALL.

Low-Level Mixed Waste

Examples of low-level mixed waste may include laboratory waste, decontamination solutions, and solvents that also contain radiological contaminants. Radiological contaminants in such wastes are expected to have concentrations similar to that in the dry active waste described above. Operation of the proposed ACP would generate small amounts of low-level mixed waste, about 8 to 11 cubic meters per year (300 to 400 cubic feet per year). USEC would manage low-level mixed waste generated by the proposed ACP, using workers monitored as part of the site radiological control program, in accordance with the requirements of 40 CFR Part 266, Subpart N and Ohio Administrative Code 3745-266. These regulations constrain the storage, handling, and treatment of low-level mixed waste in order to keep them segregated from other wastes and to minimize the potential for releases until their ultimate disposal. Mixed wastes that cannot be treated onsite would be stored until they can be shipped to a commercial

[8] Technetium-99 is a fission product that has contaminated much of the fuel cycle as a result of past recycling of reprocessed uranium. It would not be newly generated as a contaminant from ACP operations.

treatment or disposal facility licensed under 10 CFR Part 61. The offsite mixed waste disposal facility proposed for the ACP is the Perma-Fix facility in Florida.

Based on the quantities generated, the characteristics of the waste, and the fact that low-level mixed waste would be ultimately treated and disposed in a facility licensed for that purpose, the impact of such waste management and disposal is expected to be SMALL.

<u>Hazardous Waste</u>

The proposed ACP would be categorized as a large-quantity generator of hazardous waste regulated under the *Resource Conservation and Recovery Act.* However, the proposed ACP would not be categorized as a greater than 90-day storage facility, and hazardous waste generated from facility operations would have to be transferred offsite to an approved greater than 90-day storage facility within 90 days of generation. Procedures and facilities for managing hazardous wastes generated from facility operations activities are described in Section 4.2.12.2, Section 2.1.4.3, and Section 3.14.

As shown in Table 2-6, up to approximately 3 cubic meters (110 cubic feet) of hazardous waste per year would be generated during facility operations. Onsite waste management capacity at the XT-847 Facility is adequate to manage this amount of waste, and this amount of waste would not exceed the capacity of permitted treatment, storage, and disposal facilities. Management procedures in place for hazardous wastes generated from existing operations, as described in the above-referenced sections, would also be used for newly generated wastes from proposed ACP operations. Such procedures would minimize the potential for onsite releases and ensure offsite treatment and disposal in accordance with applicable Federal and State requirements. Therefore, the impacts associated with the management and disposal of hazardous wastes from facility operation would be SMALL.

<u>Recyclable Waste</u>

Up to approximately 57 cubic meters per year (2,000 cubic feet per year) of recyclables would be generated from proposed ACP operations. This could include used oil, circuit boards, fluorescent bulbs, and lead-acid batteries. As described in Section 4.2.13.2, Section 2.1.4.3, and Section 3.14, recyclable wastes would generally be transferred offsite to local recycling firms. Management of the wastes would be unlikely to result in harmful releases to the environment and the offsite recycling firms are expected to have adequate capacity to manage the small additional volumes of material from the proposed ACP. Therefore, the impacts of managing recyclable waste from proposed ACP operations would be SMALL.

<u>Classified/Sensitive Waste</u>

Classified waste is waste that is classified because of its configuration, composition, contamination, or contained information. One classified wastestream – failed centrifuges – is discussed in the preceding section on low-level radioactive waste. In addition to those wastes, proposed ACP operations would generate another 8 to 11 cubic meters per year (300 to 400 cubic feet per year) of other "non-regulated" classified waste. Such non-regulated waste would be any discarded material that is excluded under the Ohio Administrative Code and does not exhibit a characteristic of a hazardous waste regulated under the *Resource Conservation and Recovery Act.* Such waste may remain on the reservation or transferred off-reservation to a classified disposal facility. The practices for managing the waste would be in accordance with all applicable Federal and State requirements, would follow standard operating procedures, and would minimize the potential for releases to the environment and for human exposures. Therefore, the impacts associated with these wastes from proposed ACP operations are expected to be SMALL.

Sanitary/Industrial Waste

Sanitary/industrial waste generated from proposed ACP operations would be disposed primarily at the Pike County Landfill, with the Rumpke Beach Hollow Landfill being available as an alternate. As shown in Table 2-6, approximately 227-272 metric tons per year (250-300 tons per year) of sanitary/industrial waste would be generated from facility operations, which would not significantly change the nature of wastes currently handled or affect the disposal capacity at the local landfills. Therefore the impact of sanitary/industrial waste generated from facility operations would be SMALL.

4.2.13.3 Ceasing Operations at Paducah

Cessation of enrichment plant operations at Paducah would reduce current waste generation and disposal activities. Upon shutdown, no additional uranium would be transported to the plant for enrichment, and no additional depleted uranium would be generated by enrichment operations. A variety of radioactive wastes would ultimately be generated as part of activities to prepare the plant for cold standy status (e.g., depleted uranium contained in process equipment would be purged from the equipment), but no such wastes would be generated by the simple act of ceasing operations. Therefore, radioactive waste management impacts associated with cessation of Paducah enrichment plant operations would be lower than that associated with existing plant operations.

Non-radiological waste management impacts would also be reduced by cessation of Paducah operations. Once the plant is shut down, non-radiological wastes would be reduced to essentially sanitary wastes from workers and routine maintenance activities. Preparing the plant for cold standby status would generate some non-radiological wastes, but those activities are not considered within the scope of this Draft EIS (preparing the plant for cold standby status would be subject of a separate environmental review). Therefore, non-radiological waste management impacts associated with cessation of Paducah enrichment plant operations would be reduced compared to those from current plant operations.

4.2.14 Impacts from Centrifuge Manufacturing

As discussed in Section 2.1.4.2, the proposed action would include the manufacturing of centrifuge components and the assembly and testing of centrifuges to be used in the ACP. Most of the proposed machining and fabrication activities, and most of the specific parts to be manufactured, are typical of the precision machine shop and fabrication industry throughout the U.S., are not unique to the proposed action, and are not analyzed in this Draft EIS. However, some parts are unique and would not be manufactured if not for the proposed ACP. The manufacturing and assembly process would be an ongoing activity through the production of approximately 24,000 machines for the 7 million SWU plant (USEC, 2005a). The production rate capability would be developed to ramp up to approximately 16 completed centrifuges per day (USEC, 2005a).

USEC has not yet selected the location(s) for this proposed manufacturing, but is considering either onsite at the DOE reservation in Piketon, three existing manufacturing facilities located off the DOE reservation, or some combination of these locations. If onsite, the centrifuge manufacturing and assembly operation would be conducted in either the X-7725 building or another comparable site building. USEC is considering three alternate locations in different States for the offsite manufacturing. All options under consideration are existing manufacturing facilities and work would be conducted inside existing facilities (USEC, 2005d).

The following sections evaluate the potential environmental impacts of the proposed centrifuge manufacturing process, focusing on each of the 13 resource areas in the same order as discussed above. Because some of the manufacturing details are propriety and export controlled information, and because

USEC has not yet selected the proposed manufacturing location(s), some aspects of the following analysis are more generalized than the analysis of proposed site preparation and construction activities and proposed ACP operations presented in prior sections.

4.2.14.1 Land Use Impacts

No new manufacturing facilities would have to be constructed to accommodate the proposed action, since all centrifuge manufacturing would occur inside existing buildings. The level and nature of activities within these buildings would change somewhat, but this would not affect existing land uses either onsite or in surrounding areas. Likewise, the increased truck and commuter traffic needed to move materials and workers in and out of the manufacturing site(s) would be accommodated on existing roadways, so no land would have to be taken for new road right-of-way. Because all the potential manufacturing locations are in industrial areas, the increased truck and commuter traffic would not preclude or affect the surrounding land uses. As discussed in more detail below, the proposed centrifuge manufacturing also would not result in substantially new or more hazardous airborne emissions or liquid or solid waste streams that could affect surrounding areas or local waste management capabilities. As a result, the land use impacts of the proposed centrifuge manufacturing activities are expected to be SMALL.

4.2.14.2 Historic and Cultural Impacts

If all the centrifuge manufacturing occurs onsite at the DOE reservation in Piketon, there should not be any greater impacts to historic and cultural resources than that described in Section 4.2.2 for the proposed site preparation and construction activities and proposed ACP operations. The manufacturing and assembly would take place in the existing X-7725 building or other comparable building, with no new excavation or soil disturbance. In consultation with the State Historic Preservation Officer, the NRC staff has determined that these manufacturing activities would have no effect on the Portsmouth Gaseous Diffusion Plant historic district (Epstein, 2004). The manufacturing activities also have little potential to indirectly affect the 14 potentially Register-eligible sites within the area of potential effect, since the increased workforce needed to support onsite manufacturing activities would be expected to remain within designated work areas and since the surface materials on these sites were recorded and portable artifacts were collected during prior study.

The NRC staff also believes that the potential for historic and cultural resource impacts would be low if manufacturing were to occur at one or more of the alternate offsite locations. There would not be any new ground-disturbing activities in areas that have not been previously disturbed, and there would not be any removal or external modification of buildings or structures, at any of these alternate sites. Moreover, all of the planned activities would occur within existing buildings and would be consistent with existing site activities. For all of these reasons, the NRC staff would not expect the proposed offsite manufacturing to result in direct or indirect effects to historic properties, to the extent any such properties exist at these sites.

Based on this analysis, the impacts to historic and cultural resources of the proposed centrifuge manufacturing activities are expected to be SMALL.

4.2.14.3 Visual and Scenic Impacts

The visual and scenic impacts of the proposed centrifuge manufacturing are also expected to be SMALL. Since the manufacturing would occur entirely within existing buildings at existing manufacturing facilities, there will be no new construction or activities that will change existing views. There would be an increase in vehicle traffic around the manufacturing site(s), but it would all occur along existing roads and should not substantially change the present look and feel of the area(s).

4.2.14.4 Air Quality Impacts

Centrifuge manufacturing would include a filament winding process that requires a combination of resins, curing agents, or hardeners and filaments. Final curing of the resulting parts would occur in curing ovens or hoods. Solvents would be used to clean the produced parts and manufacturing equipment. Airborne emissions from these activities would be confined and captured by the use of hoods or local ventilation capture systems that vent the emissions. All emission sources would be permitted in accordance with Federal and State requirements (USEC, 2005d). Where required (e.g., for volatile organic vapors), emission control equipment would be used as part of the permitted emission vent system (USEC, 2005a). Airflow from the hoods would also be monitored to ensure adequate flow and alarm if a problem is detected so that operations can be curtailed (USEC, 2005a).

To assess potential air quality impacts for this Draft EIS, the NRC staff modeled pollutant emissions from centrifuge manufacturing and their associated air quality impacts. This analysis assumed that all of the proposed manufacturing occurs at the reservation in Piketon, which may be conservative because some of the manufacturing could also occur at one or more of the alternate offsite locations. Assuming all of the manufacturing takes place at Piketon also allowed the NRC to use available site-specific details on meteorology and distances to fencelines and receptors in the modeling.

The modeling approach focused on solvents and the primary ingredients of proposed curing agents and resins, which would not be released to the air if it were not for the proposed centrifuge manufacturing activities. Because the specific identity of these chemicals is propriety and/or export controlled, those details are withheld from this summary but can be found in Appendix E (this appendix is being withheld pursuant to 10 CFR 2.390). Other emissions would consist of carbon dioxide and water, and these emissions were not assessed because the anticipated emission levels are well below existing levels in the ambient atmosphere. All production emissions were modeled as a point source from the center of the X-7725 building. Emissions were assumed to be vented to the atmosphere through a 3.3-meter (10-foot) stack above the roofline with a release velocity of 15 meters per second (3,000 feet per minute), in compliance with Occupational Safety and Health Administration Standards.

As presented in more detail in Appendix E, this analysis predicted property-boundary maximum air concentrations of air toxics that are several orders of magnitude below applicable Short-Term Exposure Limits and Permissible Exposure Limits established by the Occupational Safety and Health Administration. For one curing agent ingredient that does not have a Permissible Exposure Limit, the NRC's predicted maximum concentration at the property boundary was below a safe level recommended by the manufacturer.

The NRC believes that these modeled results for Piketon should reasonably represent the situation if manufacturing took place at one of the proposed offsite facilities. While these other sites are already conducting similar manufacturing activities that may release some of the same pollutants associated with centrifuge manufacturing, the incremental emissions and air quality impacts caused by the proposed centrifuge manufacturing for the ACP are estimated to be very small. The differences in site-specific meteorology and distances to property boundaries at these other sites versus those details at Piketon should not materially affect this conclusion.

In addition to the airborne emissions from the manufacturing process, there would be increased emissions from the new vehicle traffic associated with the manufacturing activities. For the purpose of this Draft EIS, the NRC considered the air quality impacts associated with this additional traffic by conservatively assuming that all of the manufacturing activity took place at one of the candidate offsite locations, resulting in all the centrifuge components being shipped into Piketon by truck for assembly. This assumption maximizes the amount of vehicle traffic coming into Piketon. The manufacturing-related

truck traffic was evaluated over a period that overlaps (at least in part) with the proposed site preparation and construction activities and ACP operations at Piketon, in order to consider the maximum cumulative traffic and associated air quality effects. The results of this analysis, presented in Section 4.2.12.1 in the section titled "Airborne Emissions from Routine Transportation," show that the added vehicle traffic is not likely to significantly degrade air quality or cause an exceedance of air quality standards. This manufacturing-related truck traffic was evaluated over a period that overlaps (at least in part) with the proposed site preparation and construction activities and ACP operations at Piketon, in order to consider the maximum cumulative traffic and associated air quality effects. The results of this analysis, presented in Section 4.2.12.1 in the section titled "Airborne Emissions from Routine Transportation," show that the added vehicle traffic is not likely to significantly degrade air quality or cause an exceedance of air quality standards.

Based on this analysis, the air quality impacts of the proposed centrifuge manufacturing activities are expected to be SMALL.

4.2.14.5 Geology and Soils Impacts

The geology and soils impacts associated with the proposed centrifuge manufacturing should be SMALL. There would not be any new excavation required or any other new disturbance of soils or the subsurface. All of the proposed activities would take place within existing buildings at existing manufacturing facilities.

4.2.14.6 Water Resources

The manufacturing process associated with the proposed action would require process water and suitable wastewater discharge capacity. All of the potential locations where manufacturing would occur are industrial manufacturing areas with suitable infrastructure (water supply and wastewater treatment capacity). The manufacturing process would not require the development of new water supply sources or the development of additional wastewater treatment capacity.

In addition, there would be no projected chemical liquid effluents discharged from the manufacturing process. Liquid effluents would be limited to once-through cooling water and a cleaning water that would contain small concentrations of an industrial detergent. According to USEC, neither of these wastewaters would qualify as hazardous waste and would be released to the local sanitary treatment system. Alternatively, the once-through cooling water may be released directly to natural waterways, if permitted under the National Pollutant Discharge Elimination System. (USEC, 2005d)

Based on this analysis, the impacts to water resources caused by the proposed centrifuge manufacturing activities are expected to be SMALL.

4.2.14.7 Ecological Impacts

The proposed centrifuge manufacturing is expected to cause SMALL ecological impacts. Because no new construction would be required and all manufacturing activities would be confined to existing industrial facilities, there would be no new direct impacts to flora and fauna; rare, threatened, and endangered species; or wetlands. The proposed manufacturing operations would result in minor and controlled increases in air emissions, liquid discharges, and solid waste disposal, all of which would add incrementally to existing levels at the candidate manufacturing sites without significant potential for ecological impacts.

4.2.14.8 Socioeconomic Impacts

In order to reasonably bound the potential socioeconomic impacts of the proposed action, the NRC assumed that all manufacturing and assembly activities would occur in the Piketon region of influence, even though some or all of the activities may actually occur at another site. This phase of the proposed action is estimated to cost $1.4 billion and would be completed between 2004 and 2013 (USEC, 2005a). Its potential impacts to regional employment, tax revenue, population characteristics, housing resources, community and social services, and public utilities are assessed in turn below.

<u>Impacts to Regional Employment</u>

In each year between 2004 and 2013, average annual employment as a result of centrifuge manufacturing and assembly activities is estimated at 2,130 full-time jobs. This estimate includes both direct and indirect employment. Thus, the total number of full-time worker-years of employment generated as a result of centrifuge manufacturing and assembly activities is estimated as the product of 2,130 full-time workers multiplied by a total of ten years, resulting in 21,300 full-time worker years of employment. USEC developed this estimate from the RIMS-II model using appropriate assumptions about the number of direct jobs created, construction-related expenditures, and regional input/output multipliers.

As a result of manufacturing and assembly activities, an average of 2,130 direct and indirect jobs per year are expected to be created between the years 2004 and 2013 (USEC, 2005a). USEC developed this estimate with the RIMS-II model using appropriate assumptions about the number of direct jobs created, manufacturing-related expenditures, and regional input-output multipliers.

The total number of persons employed in the four counties of the region of influence in the year 2000 was 96,347 (BEA, 2002b). The total number of persons employed in Pike County, where the proposed action would located, was 14,944 in the year 2000 (BEA, 2002b). The employment expected to be generated by the manufacture and assembly activities therefore represents 2.2 percent of the total employment in the region and 14.3 percent of Pike County employment at the year 2000 levels.

Based on these figures, the impacts to regional employment of the manufacturing phase may be considered MODERATE.

<u>Impacts to Tax Revenue</u>

Impacts to regional tax revenues were estimated by USEC using per capita income levels in the region of influence as an estimate of the average salary associated with jobs created by the manufacturing activities. USEC estimates that the region's per capita income in 2004 dollars is $25,317 (USEC, 2005a).

Ohio State income tax rates for incomes between $20,000 and $40,000 are structured as a flat payment of $445.80 plus 4.5 percent of income over $20,000 (Ohio Department of Taxation, 2003). The State income tax payable by a worker earning $25,317 (the per capita income in the region) at these rates would be $685. The proposed action would create 2,130 jobs each year during the manufacturing phase; this level of employment remunerated at the per capita income in the region of influence translates to State income tax revenues of $1.5 million per year for each year of the manufacturing phase. Ohio's cumulative individual State income tax revenues for fiscal year 2003 were $8.3 billion (Ohio Department of Taxation, 2003). Income tax revenues resulting from the incomes generated by the centrifuge manufacturing phase can therefore be expected to account for approximately 0.02 percent of Ohio's cumulative annual individual income tax receipts at fiscal year 2003 levels.

Ohio State sales tax revenues are estimated to rise by $2.4 million (2004 dollars) per year for the manufacturing phase of the proposed action, assuming a 6 percent rate of sales tax. The estimate is based on the assumption that 75 percent of earnings after State income taxes are spent in State. Federal income taxes are not considered in computing disposable income; if Federal income taxes were included, it is likely that sales tax revenues would be lower than estimated here. Ohio's cumulative State sales and use tax revenues for calendar year 2003 were $6.7 billion. Sales tax revenues resulting from incomes generated by the centrifuge manufacturing activities can therefore be expected to account for approximately 0.04 percent of Ohio's annual sales tax receipts at calendar year 2003 levels.

Pike County's annual sales tax revenues, derived from a 1 percent county sales tax rate, are expected to rise by approximately $262,000 as a result of the new employment generated by the manufacturing phase of the proposed action. This estimate is based on the assumption that half the after-tax income arising from jobs generated by the manufacturing phase is spent on transactions within Pike County. This amount represents less than 6 percent of Pike County's general fund budget in 2005 (Pike County Auditor, 2005).

As demonstrated above, it is unlikely that State income tax, State sales tax, and county-level tax revenues would significantly increase as a result of the centrifuge manufacturing phase of the proposed action. Overall, the impacts to regional tax revenues of the manufacturing activities may therefore be considered SMALL.

Impacts to Population Characteristics

Of the 2,130 estimated jobs that are expected to be created during the centrifuge manufacturing phase, a total of 30 direct jobs are expected to be filled by USEC employees transitioned from the Portsmouth Gaseous Diffusion Plant (these jobs are to conduct the centrifuge manufacturing activities). An estimated 45 indirect jobs are expected to support the 30 positions filled by transitioned USEC workers. Thus, a total of 75 jobs generated through manufacturing and assembly activities represent jobs that are a continuation of already existing jobs that would be filled from within the region.

Therefore, 2,055 new jobs (direct and indirect) are expected to be created through manufacturing-related activities between the years 2004 and 2013. Commonly, an average of 75 percent of construction-related employment derives from within the region of influence (DOE, 1999). If 25 percent of the 2,055 manufacturing-related jobs are filled from outside the region, a total of 514 workers may be expected to move into the region. If all workers are assumed to move in as family households, and the average national family household size is assumed to be 3.13 (U.S. Census Bureau, 2003), the population influx into the region would be 1,608 persons. This represents 0.76 percent of the region population in the year 2000 (U.S. Census Bureau, 2000).

The impacts to population characteristics of the manufacturing and assembly phase may therefore be considered SMALL.

Impacts to Area Housing Resources

The average rental vacancy rate in the region is 8.6 percent for rental property and there are approximately 22,824 rental units in all (USEC, 2005a). This equates to an availability of approximately 1,963 rental housing units, based upon 2000 census data. Of the additional 2,055 jobs created by the centrifuge manufacturing phase, only 25 percent are expected to be filled by migration from outside the community. Therefore, the manufacturing phase is likely to increase the demand for rental housing by only 514 units out of a total of 1,963 rental units. Even accounting for seasonal increases in the demand

for housing created by recreational activities, the influx of workers during centrifuge manufacturing activities is not likely to cause housing shortages or increases in rental rates.

The impacts to area housing resources of the centrifuge manufacturing and assembly activities may therefore be considered SMALL.

Impacts to Community and Social Services

A total of 514 family households may be expected to migrate to the region as a result of employment opportunities generated in the manufacturing phase of the proposed action, as discussed above. According to the U.S. Census Bureau (2003), the average national family household size is 3.13 with an average of 0.95 individuals under the age of 18. Thus, the maximum influx of school-aged children is not expected to exceed 488, which represents 1.3 percent of the regional school population in the year 2000. The region contains 24 public school districts with a total of 95 schools serving approximately 37,000 students (Ohio Office of Strategic Research, 2003). The region student-to-teacher ratio stood at 15.3 in 2000 (Ohio Office of Strategic Research, 2003). This ratio would be 15.5 after the expected influx of school-age children into the region resulting from manufacturing-phase employment. The average student-to-teacher ratio in the State of Ohio was only slightly lower at 14.8 in the year 2000. The impacts to education services in the region of influence may therefore be considered SMALL.

Levels of service of fire, law enforcement, healthcare and administrative services in the region are lower than the State average, but are consistent with those typical in rural counties. The influx of 1,608 persons represents an augmentation of the region population of 0.76 percent and would have a minimal effect on fire, law enforcement, healthcare, and administrative levels of service. The impacts to community and social services may therefore be considered SMALL.

Impacts to Public Utilities

As described in Section 3.9.3.5, there has historically been very little overlap between utilities providing services to communities in the region of influence and those supporting the Portsmouth Gaseous Diffusion Plant. Dedicated utilities were constructed in the 1950s solely to support the needs of the Portsmouth Gaseous Diffusion Plant. The communities in the region have never had access to these utilities. Under the proposed action, utilities would continue to be procured through existing resources. With the exception of natural gas and landfill services, these dedicated utilities are expected to have more than adequate capacity to continue serving the ACP under the proposed action, including the proposed centrifuge manufacturing. Historically, the Gaseous Diffusion Plant has had no impact on availability or cost of these utilities to communities in the region. It is therefore unlikely that the proposed action would affect the cost or availability of public utility supplies in the region of influence.

With regard to natural gas usage, the proposed action would not require any more natural gas than can be supplied through the existing two-inch diameter supply line. The proposed action is expected to have no impact on the offsite availability or cost of natural gas.

The Pike County landfill would be the primary endpoint for sanitary/industrial waste disposal and the Rumpke Beach Hollow landfill is an alternative. The projected capacities and use of each are described in Section 3.9.3.5. As apparent from Table 2-3 and Table 3-23, industrial/sanitary wastes from the centrifuge manufacturing and assembly activities would account for a minor fraction of the capacity of these facilities.

Although the manufacturing phase of the proposed action may result in migration of people into the region, the level of migration is expected to be well below the rental vacancy rate in the area, as discussed

in the preceding section on housing resources. Therefore, the population influx due to manufacturing phase jobs is not expected to affect either the pricing or availability of public utilities in the region.

Considering all these factors, the impacts to public utilities of the centrifuge manufacturing phase of the proposed action are expected to be SMALL.

4.2.14.9 Environmental Justice Impacts

As discussed in the other sections within Section 4.2.14, the proposed centrifuge manufacturing and assembly activities are expected to cause SMALL impacts to all of the resource areas considered, except for the potential impacts to regional employment, which may be as large as MODERATE. These impacts to regional employment are generally considered positive.

The overall transportation impacts at the Piketon site, due to centrifuge manufacturing combined with the proposed site preparation and construction activities and the proposed ACP operations, would also be MODERATE (see Section 4.2.11.1). These impacts, including an increase in traffic congestion and an increase in injuries due to traffic accidents on U.S. Route 23 and Ohio State Road 32, would equally affect all populations driving on those.

Based on this analysis, the environmental justice impacts of the proposed centrifuge manufacturing and assembly activities would be SMALL because the activities would not cause any disproportionately high and adverse impacts to minority or low-income populations.

4.2.14.10 Noise

Manufacturing of centrifuges would not involve any forging or impact noise. The main manufacturing activity would involve winding of magnetic coils, which will not produce substantial noise levels. Although actual noise estimates for the centrifuge manufacturing activities are not available, USEC asserts that they can be approximated by the noise levels around an automobile assembly plant. These noise levels are 55 to 60 dBA at about 60 meters (200 feet) from the plant property (USEC, 2005a). Given these low levels, the attenuation expected to be provided by the building facade and likely distance to receptors (over 900 meters or 3,000 feet to the nearest residence at Piketon), and the current background levels of noise at the proposed manufacturing sites, the noise impacts of the proposed centrifuge manufacturing are expected to be SMALL.

4.2.14.11 Transportation Impacts

The analysis of transportation impacts associated with the proposed site preparation and construction activities in Section 4.2.11.1 considers the impacts associated with the shipment of centrifuges and other equipment into the site at Piketon, together with other transportation impacts associated with the proposed action. That analysis concludes that the cumulative transportation impacts at the site would be MODERATE. This includes a decrease in the level of service of U.S. Route 23 and Ohio State Road 32, as well as increase in injuries resulting from the increase in vehicle traffic (see Section 4.2.11.1).

4.2.14.12 Public and Occupational Health Impacts

The principal public health threat associated with the proposed centrifuge manufacturing is associated with the release of airborne pollutants that may migrate offsite to where people might be exposed. However, as discussed in Section 4.2.14.4 on air quality, modeling conducted by the NRC staff predicted property-boundary maximum air concentrations of air toxics that are several orders of magnitude below

applicable Short-Term Exposure Limits and Permissible Exposure Limits established by the Occupational Safety and Health Administration. Therefore, the public health impacts are expected to be SMALL.

The occupational health impacts of the proposed centrifuge manufacturing are also expected to be SMALL. For the most part, the proposed manufacturing materials and process would be similar to those currently used at the candidate sites, so the centrifuge manufacturing would be adding only incrementally to existing worker risks. There is the potential for workspace air to be contaminated with volatile organic material from the curing operations, but these emissions are supposed to be confined and captured by the use of hoods to protect the workers. Similarly, certain component cleaning processes could emit solvent vapors, but these processes would be performed under hoods and/or in clean rooms to control worker exposures (USEC, 2005d). Finally, the filament winding process that is unique to centrifuge manufacturing would present some added risk for worker accidents and injuries, but it would not be much different or greater than that currently associated with the precision machine shop and fabrication industry.

4.2.14.13 Waste Management Impacts

Some *Resource Conservation and Recovery Act* hazardous waste would be generated from the solvents used to clean the produced centrifuge parts and manufacturing equipment. This waste would be in the form of excess spent solvents, rags, wipes, and other material that came into contact with the spent solvent. Excess fibers, reacted resins, and curing agents would be non-hazardous waste. (USEC, 2005d)

The impacts associated with the management and disposal of these waste streams are expected to be SMALL. Both the hazardous and non-hazardous wastes would be handled and disposed in accordance with all local, State, and Federal requirements. Releases of potentially harmful contaminants that could pose a significant public health or environmental threat are not expected, and the character and volume of wastes generated are not expected to pose a problem for existing waste management capabilities and capacities.

4.2.15 Decontamination and Decommissioning

At the end of useful plant life, the proposed ACP would be decontaminated and decommissioned such that the facilities would be returned to DOE in accordance with the requirements of the Lease Agreement with DOE and applicable NRC license termination requirements. The intent of these activities is to return the ACP site to a state that meets NRC requirements for release for unrestricted use. It is anticipated that at the end of the useful life of the plant, most of the buildings and outdoor areas of the plant would already meet NRC requirements for unrestricted use in accordance with 10 CFR § 20.1402. Buildings, outdoor areas, and equipment that do not meet these requirements would be decontaminated and decommissioned in accordance with the Decommissioning Plan for the site.

Overview of Decontamination and Decommissioning Activities and Process

Decontamination and decommissioning would involve the removal and disposal of all operating equipment and waste materials associated with the proposed ACP with the exception of the plant infrastructure and equipment that existed onsite at the time the initiation of the Lease Agreement with DOE. Enrichment equipment and associated plant equipment would be removed, leaving only the building shells of the leased facilities and the plant infrastructure, including equipment that existed when the Lease Agreement with DOE was initiated (e.g., rigid mast crane, plant utilities, etc.). Items removed from the ACP would be categorized as potentially reusable equipment or waste. Waste materials, including wastes remaining onsite when the ACP ceases operations and wastes generated during the decontamination and decommissioning process, would be removed from the site as part of the decommissioning process. Any remaining depleted UF_6 would be converted to a more stable form in the onsite DOE conversion facility and the disposed offsite, as described in Section 4.2.12.2. Facilities leased from DOE would be decontaminated to applicable NRC criteria for unrestricted use. Following decommissioning activities, the leased facilities would be returned to DOE in accordance with the requirements of the Lease Agreement. The Centrifuge Assembly Area within the X-7725 Facility would be used as the Decontamination Service Area throughout this process and would handle disassembly and decontamination of ACP equipment. The Decontamination Service Area would be configured into a disassembly area, buffer stock area, decontamination area, and scrap storage area.

Because these decontamination and decommissioning activities are anticipated to occur approximately 30 years in the future, only a general description of the activities that would be conducted for the proposed ACP can be developed at this time for the Draft EIS. In accordance with 10 CFR § 70.38(d) and 10 CFR § 70.38(g)(1), the licensee would be required to prepare and submit a Decommissioning Plan to the NRC at least twelve months prior to the expiration of the NRC license, and would begin the decontamination and decommissioning activities upon approval of the final Decommissioning Plan by the NRC. Under 10 CFR § 70.38(g)(4), the Decommissioning Plan would include a description of the planned decommissioning activities, including: site characterization information and site remediation plan; a description of the methods us to ensure protection of workers and the environment against radiation hazards during decommissioning; a description of the planned final site radiation survey; an updated detailed cost estimate for the activities; and a description of the physical security plan and the material control and accounting plan for the decommissioning. The Decommissioning Plan would be subject to National Environmental Policy Act review, as applicable, at the time the Plan is submitted to the NRC.

Decontamination and decommissioning activities anticipated to be conducted for the proposed ACP are described in Section 10 of the USEC License Application. These activities include purging of equipment, dismantling and removal of equipment, decontamination of equipment and structures, salvage and sale of equipment, waste disposal, and final radiological survey. Decontamination and decommissioning activities are anticipated to begin 30 years after the commencement of operations and, for the purpose of this analysis, are estimated to occur over a period of six years from 2040 through 2045.

This section summarizes potential environmental impacts associated with the decontamination and decommissioning of the proposed ACP, addressing each of the different resource areas in the same order as discussed above. It does not assess potential impacts of decontaminating and decommissioning other parts of the reservation at Piketon or any part of the Paducah facility. Potential impacts of ceasing operations at the Paducah facility are discussed for the different resource areas in prior sections in Section

4.2. Potential impacts associated with the management of depleted uranium generated from proposed ACP operations, including any depleted uranium remaining onsite or contained within plant equipment at the time the proposed ACP ceases operations, are discussed in Section 4.2.13.2 (Waste Management), and are not discussed again here. Potential effects of ACP decontamination and decommissioning activities on the broader decontamination and decommissioning activities for other parts of the Piketon reservation are discussed in Section 4.3, Cumulative Impacts.

4.2.15.1 Land Use Impacts

Because the proposed ACP site within the Piketon reservation would be leased from DOE, the intent would be to return it to DOE control upon termination of the lease. It is anticipated that after decommissioning activities are completed, existing buildings and structures would remain onsite and the site would remain categorized for industrial use. Therefore, anticipated land use impacts from the decontamination and decommissioning of the proposed ACP would be SMALL.

At the time the reservation at Piketon as a whole is decommissioned, the categorization and control of the land formerly occupied by the ACP could change and the land use could change accordingly. Potential cumulative land use impacts from decommissioning the Piketon reservation as a whole are discussed in Section 4.3, Cumulative Impacts.

4.2.15.2 Historical and Cultural Resource Impacts

Decommissioning activities will be conducted in areas known to be devoid of cultural and historical resources; therefore, no projected impacts as a result of the decontamination and decommissioning are expected (USEC, 2005a). Any changes to or demolition of buildings or structures proposed to be conducted during decommissioning would be evaluated for historic and cultural resources impacts prior to any implementation. Therefore, anticipated impacts to historical and cultural resources from decontamination and decommissioning of the proposed ACP are SMALL.

4.2.15.3 Visual and Scenic Resource Impacts

Decontamination and decommissioning of the ACP is not anticipated to result in demolition of the buildings and structures leased from DOE. Therefore potential visual and scenic impacts associated with the site would be similar to those described in Section 4.2.3. Any changes to or demolition of buildings or structures that are proposed to be conducting during decommissioning would be evaluated for visual and scenic resource impacts prior to any implementation. Therefore, the anticipated visual impacts from decontamination and decommissioning of the proposed ACP would be SMALL.

4.2.15.4 Air Quality Impacts

Decontamination and decommissioning of the proposed ACP would involve operation of vehicles transporting workers, materials, and wastes, and operation of heavy construction equipment (e.g., cranes). Operation of such equipment would produce combustion (gasoline and diesel engine) exhaust emissions, including nitrogen oxides, sulfur oxides, carbon monoxide, and particulate matter. Combustion exhaust emissions from vehicle and equipment operations are anticipated to be lower in both quantity and duration than emissions from vehicle and equipment operations during construction of the proposed ACP.

Decontamination and decommissioning activities are also anticipated to generate fugitive dust from re-entrainment of dust from paved roads, potential excavation of surface soils, and transportation of wastes and materials. The Portsmouth facility is located in an Ohio county that is exempt from fugitive dust emissions regulations specified in Ohio Administrative Code 3745-17-08. However, dust

suppression techniques would be used to control fugitive dust emissions from these activities during dry conditions. Overall, fugitive dust emissions during decontamination and decommissioning are anticipated to be lower in both quantity and duration than those associated with construction of the proposed ACP.

The current state-of-the-art technologies in decontamination and decommissioning of radiologically contaminated equipment require the use of a limited amount of solvents to fully clean some metallic and nonmetallic equipment. The quantity of solvents required has dramatically reduced in recent years and, assuming a similar trend, should be minimized when the proposed ACP undergoes decontamination and decommissioning. Nevertheless, there is the potential for emission of solvents during the decontamination phase if solvent cleaning methods are used. These emissions would be of short duration (i.e., a few weeks).

Based on this analysis, the air quality impacts associated with decontamination and decommissioning are expected to be less than those impacts associated with site preparation and construction and proposed ACP operations, as described in Section 4.2.4. Therefore, the impacts would be SMALL.

4.2.15.5 Geology and Soils Impacts

Impacts to geology and soils associated with the decommissioning of the proposed ACP are not anticipated to exceed the geology and soils impacts associated with construction of the ACP (as discussed in Section 4.2.5). Building shells and plant infrastructure leased from DOE are anticipated to remain onsite after decommissioning is completed, so there should be a minimal amount of new soil disturbance or site excavation. Disturbed areas would be controlled through application of engineering controls and best management practices to minimize erosion and sediment runoff. Any such areas would also be restored upon completion of decommissioning, to the extent practicable. The floors of the proposed ACP process buildings and support facilities consist of troweled-surface and sealed concrete, and any spills that may occur during decommissioning would be subject to implementation of spill cleanup response and area decontamination protocols. Therefore, any radioactive material or hazardous material spills indoors are not anticipated to reach the underlying soils. As any spills that occur during plant operation would be remediated during plant operation, most outdoor areas of the proposed ACP site are anticipated to meet NRC unrestricted release requirements at the time the plant ceases operations. There is potential for additional removal of contaminated surface soils from the site during decontamination and decommissioning; however, any such surface removal is anticipated to be limited in scope and not anticipated to affect the site terrain or the subsurface. For all of these reasons, anticipated impacts to geology and soils from the decommissioning of the proposed ACP would be SMALL.

4.2.15.6 Water Resource Impacts

Although potable water use is expected to increase during part of the decommissioning phase due to the increased use of water for equipment decontamination and rinsing, the overall water use during decontamination and decommissioning would be less than or equal to water consumption during operations. As discussed in Section 4.2.6.2, the groundwater withdrawals needed to support proposed ACP operations would be well within permitted levels and would result in a small impact on the availability of groundwater. Therefore, even smaller withdrawals needed to support decontamination and decommissioning activities would also cause a SMALL impact.

Decontamination operations are anticipated to involve operation of degreasers, wet blast cabinets, citric acid baths, demineralized water baths, scrubbing facilities, and other equipment potentially generating radionuclide-containing wastewater requiring monitoring and discharge. Decontamination and decommissioning operations would also involve releases of sanitary wastewater and storm water runoff. The sanitary water and sewage treatment systems that would be used for the proposed ACP operations are

existing plant infrastructure that would continue to operate throughout decontamination and decommissioning. The plant infrastructure would be used to treat decontamination process wastewater and sanitary wastewater prior to discharge. Sanitary wastewater generated during decontamination and decommissioning would be discharged to the plant sanitary sewer system. It is not anticipated that any licensed materials would enter the sanitary sewer system during this phase. Storm water runoff from the ACP site during decontamination and decommissioning would continue to be managed through application of engineering controls and best management practices, and would continue to drain to the West Central Holding Pond (Permitted Outfall 012) and Southwest Holding Pond (Permitted Outfall 013). Automated samplers would continue to collect weekly composite samples from the holding ponds for radiological and National Pollutant Discharge Elimination System-mandated analyses, as described in Section 4.2.6. With all of these continued controls, the impacts associated with liquid discharges should remain SMALL during the decontamination and decommissioning phase.

Finally, precautions would also continue to be taken to avoid impacts from accidental releases of fuel, waste, sewage, or chemicals used during decontamination activities. These precautions would include the use of spill response plans, safety procedures, spill control and countermeasure plans, and spill response equipment, as described in Section 4.2.6. With these controls, the likelihood and severity of potential spills during decontamination and decommissioning would be minimized and any resulting impacts should be SMALL.

4.2.15.7 Ecological Impacts

Ecological impacts associated with ACP decommissioning are anticipated to be bounded by the ecological impacts associated with ACP site preparation and construction, which are described in Section 4.2.7.1. During operation of the proposed ACP, some of the vegetation may reestablish itself in areas that were cleared during construction but not paved. Areas of reestablished vegetation may need to be cleared during site decommissioning (e.g., to conduct surface soil removal for site remediation). Any areas cleared of vegetation during decommissioning are anticipated to be small and vegetation could reestablish itself in cleared unpaved areas after decommissioning activities are completed. Therefore, anticipated ecological impacts from the decommissioning of the proposed ACP would be SMALL.

4.2.15.8 Socioeconomic Impacts

The following sections evaluate potential impacts of the proposed decontamination and decommissioning activities to regional employment, tax revenue, population characteristics, area housing resources, community and social services, and public utilities.

<u>Impacts to Regional Employment</u>

After the cessation of operations, decontamination and decommissioning activities, will generate an average of 841 direct and indirect jobs per year. This estimate is derived from the RIMS-II model using appropriate assumptions about the number of direct jobs created, decontamination and decommissioning-related expenditures, and regional input-output multipliers.

The total number of persons employed in the four counties of the region of influence in the year 2000 was 96,347 (BEA, 2002a). The total number of persons employed in Pike County, where the proposed ACP would be located, in the year 2000 was 14,944 (BEA, 2002a). The employment expected to be generated by the decontamination and decommissioning phase of the proposed action therefore represents 0.9 percent of the total employment in the region and 5.6 percent of Pike County employment at the year 2000 levels.

Based on these figures, the impacts to regional employment of the decontamination and decommissioning phase may be considered SMALL.

Impacts to Tax Revenue

Impacts to regional tax revenues are calculated by using per capita income levels in the region of influence as an estimate of the average salary associated with jobs created by the decontamination and decommissioning phase of the proposed action. USEC estimates that the region's per capita income in 2004 dollars is $25,317 (USEC, 2005a).

Ohio State income tax rates for incomes between $20,000 and $40,000 are structured as a flat payment of $445.80 plus 4.5 percent of income over $20,000 (Ohio Department of Taxation, 2003). The State income tax payable by a worker earning $25,317 (the per capita income in the region) at these rates would be $685.07. The proposed action would create 841 jobs each year during the decontamination and decommissioning phase; this level of employment remunerated at the per capita income in the region translates to State income tax revenues of $576,000 per year for each year of the decontamination and decommissioning phase. Ohio's cumulative individual State income tax revenues for fiscal year 2003 were $8.3 billion (Ohio Department of Taxation, 2003). Income tax revenues resulting from the incomes generated by decontamination and decommissioning activities can therefore be expected to account for less than one percent of Ohio's cumulative annual individual income tax receipts at fiscal year 2003 levels.

Ohio State sales tax revenues are estimated to rise by $932,000 (2004 dollars) per year for the decontamination and decommissioning phase, assuming a six percent rate of sales tax. This estimate is based on the assumption that 75 percent of earnings after State income taxes are spent in State. Federal income taxes are not considered in computing disposable income; if Federal income taxes were included, it is likely that sales tax revenues would be lower than estimated here. Ohio's cumulative State sales and use tax revenues for calendar year 2003 were $6.7 billion. Sales tax revenues resulting from incomes generated by decontamination and decommissioning activities can therefore be expected to account for less than one percent of Ohio's annual sales tax receipts at calendar year 2003 levels.

Pike County's annual tax revenues are expected to rise by approximately $103,000 as a result of the new employment generated by decontamination and decommissioning activities, based on a county sales tax of one percent. This estimate is based on the assumption that half the after-tax income arising from jobs generated by the decontamination and decommissioning phase is spent on transactions within Pike County. This amount represents less than 2.5 percent of Pike County's general fund budget in 2005 (Pike County Auditor, 2005).

As demonstrated above, it is unlikely that State income tax, State sales tax, and county-level tax revenues would significantly increase as a result of the decontamination and decommissioning phase of the proposed action. The impacts to regional tax revenues are therefore considered SMALL.

Impacts to Population Characteristics

Of the 841 estimated jobs that are expected to be created during the decontamination and decommissioning phase (after the cessation of operations), a total of 148 direct jobs are expected to be filled by USEC employees transitioned from their positions at the proposed ACP; these jobs are to support management, design, licensing, planning, demolition, reuse, evaluation, quality assurance, nuclear and radiological safety, and operational readiness. An estimated 286 indirect jobs are expected to support the 148 positions filled by transitioned USEC workers. Thus, a total of 434 jobs generated

through decontamination and decommissioning activities represent jobs that are a continuation of already existing jobs that will be filled from within the region.

Based on these figures, a total of 407 new jobs (direct and indirect) per year is expected to be created through decontamination and decommissioning-related activities. Commonly, an average of 75 percent of construction-related employment derives from within the region of influence (DOE, 1999a). If 25 percent of the 407 jobs are filled from outside the region, a total of 102 workers may be expected to move into the region. If all workers are assumed to move in as family households, and the average national family household size is assumed to be 3.13 (U.S. Census Bureau, 2003), the population influx into the region would be 318 persons. This represents 0.15 percent of the region population in the year 2000 (U.S. Census Bureau, 2000). The impacts to population characteristics of the decontamination and decommissioning phase may therefore be considered SMALL.

Impacts to Area Housing Resources

The average rental vacancy rate in the region of influence is 8.6 percent for rental property and there are approximately 22,824 rental units in all. This equates to an availability of approximately 1,963 rental housing units, based upon 2000 Census data. Of the additional 407 jobs created by the decontamination and decommissioning phase, only 25 percent is expected to be filled by migration from outside the community. Therefore, the decontamination and decommissioning phase is likely to increase the demand for rental housing by only 102 units out of a total of 1,963 rental units. Even accounting for seasonal increases in the demand for housing created by recreational activities, the influx of workers during the decontamination and decommissioning phase is not likely to cause housing shortages or increases in rental rates. The impacts to area housing resources are therefore considered SMALL.

Impacts to Community and Social Services

Impacts to housing availability and community and social services have been estimated using baseline data from the year 2000. It is possible that these data may not be applicable during the decontamination and decommissioning period (2040 through 2045). However, the number of jobs created in this phase is small compared to the region of influence population; it is therefore likely that any effects on housing and community and social services would be proportionally SMALL.

As discussed above, a total of 102 family households may be expected to migrate to the region as a result of employment opportunities generated in the decontamination and decommissioning phase. According to the U.S. Census Bureau (2003), the average national family household size is 3.13 with an average of 0.95 individuals under the age of 18. Thus, the maximum influx of school-aged children is not expected to exceed 97, which is 0.26 percent of the regional school population in the year 2000. The region of influence contains 24 public school districts with a total of 95 schools serving approximately 37,000 students (ODOD, 2003). The student-to-teacher ratio stood at 15.3 in 2000 (ODOD, 2003). This ratio would not change after the expected influx of school-age children into the region resulting from decontamination and decommissioning employment. The average student-to-teacher ratio in the State of Ohio was only slightly lower at 14.8 in the year 2000. Based on this analysis, the impacts to education services in the region of influence would be SMALL.

Levels of service of fire, law enforcement, healthcare, and administrative services in the region of influence are lower than the state average, but are consistent with those typical in rural counties. The influx of 318 persons represents an augmentation of the region population of 0.15 percent and will have a SMALL effect on fire, law enforcement, healthcare, and administrative levels of service.

Impacts to Public Utilities

As described in Section 3.9.3.5, there has historically been very little overlap between utilities providing services to communities in the region of influence and those supporting the Portsmouth Gaseous Diffusion Plant. Dedicated utilities were constructed in the 1950s solely to support the needs of the Portsmouth Gaseous Diffusion Plant. The communities in the region have never had access to these utilities. Under the proposed action, utilities would continue to be procured through existing resources, with the exception of natural gas and landfill services. These dedicated utilities are expected to have more than adequate capacity to continue serving the ACP under the proposed action, including during the decontamination and decommissioning phase. Historically, the Gaseous Diffusion Plant has had no impact on availability or cost of these utilities to communities in the region. It is therefore unlikely that the proposed action would affect the cost or availability of public utility supplies in the region.

With regard to natural gas usage, the proposed action would not require any more natural gas than can be supplied through the existing two-inch diameter supply line. Decontamination and decommissioning are expected to have no impact on offsite availability or cost of natural gas.

The Pike County landfill would be the primary endpoint for sanitary/industrial waste disposal, with the Rumpke Beach Hollow landfill as an alternative. The projected capacities and use of each are described in Section 3.9.3.5. Given the substantial remaining capacities shown in Table 3-23 in that section, combined with the relatively small amount of sanitary/industrial waste expected to be generated from decontamination and decommissioning activities, a capacity shortfall is not expected.

Although the decontamination and decommissioning phase may result in migration into the region of influence, the level of migration is expected to be well below the rental vacancy rate in the area, as described above. Therefore, the population influx due to decontamination and decommissioning jobs is not expected to affect either the pricing or availability of public utilities in the region.

Based on this analysis, the impacts to public utilities of the decontamination and decommissioning phase would be SMALL.

4.2.15.9 Environmental Justice Impacts

Based on the potential impacts described above, there are no disproportionate high and adverse impacts to either low-income or minority populations associated with the decontamination and decommissioning of the proposed ACP. Therefore, the environmental justice impacts would be SMALL.

4.2.15.10 Noise Impacts

Noise during decommissioning would be generated from operation of heavy construction equipment and vehicles needed to move equipment, scrap metal, and waste. Noise levels generated during decommissioning are anticipated to be similar to those generated during construction of the proposed ACP. As described in Section 4.2.10, these levels are estimated to be around 73 to 94 decibels at 15 meters (50 feet), which would drop off to 58 decibels at the nearest residence or 53 day-night average noise level if decommissioning activities were limited to an eight-hour daytime shift. This noise level is within acceptable guidelines and would cause a SMALL impact.

4.2.15.11 Transportation Impacts

Transportation impacts associated with decontamination and decommissioning include impacts associated with transportation of the workforce to and from the site, transportation of materials to the site, and transportation of materials and wastes from the site.

The workforce for decontamination and decommissioning would average 287 employees at the site each year for a period of six years (USEC, 2005a). This can be compared to the average construction workforce of approximately 1,013 workers each year over a period of five years. Therefore, traffic associated with workforce transportation during decommissioning would be lower than workforce transportation impacts during construction. The amount of equipment and materials transported to the site during decommissioning also would be negligible compared to the quantities of equipment and materials transported to the site during construction. Therefore, traffic associated with materials and equipment transportation to the site would be much lower than that during site preparation and construction (as discussed in Section 4.2.11.1).

Decontamination and decommissioning would generate substantial quantities of wastes and other materials that would need to be transported offsite, not even counting the converted depleted uranium discussed in Section 4.2.13.2. This would include all 24,000 centrifuges; substantial quantities of piping, pumps, and other equipment; general trash; and citric cake, which consists of uranium and metallic compounds precipitated from citric acid decontamination solutions. Some of this waste may be crushed and subject to further volume reduction prior to disposal. The Environmental Report estimates that approximately 1.8 million cubic feet of radioactive waste would be generated during decontamination and decommissioning operations (USEC, 2005a). This would require almost 5,000 truck shipments for offsite disposal over the five-year decommissioning period, most of which are currently planned to go to the DOE facility at the Nevada Test Site or the Envirocare facility in Clive, Utah (USEC, 2005a). Because this volume of truck traffic is far less than the estimated 17,870 truck trips needed during the five-year proposed ACP construction period, the transportation impacts associated with the decommissioning truck traffic should be far less than that described for site preparation and construction in Section 4.2.11.1.

Based on this analysis, the amount vehicle traffic (including worker vehicles and trucks carrying materials and wastes) during decontamination and decommissioning would be lower than the amount of traffic during site preparation and construction. Since the transportation impacts associated with site preparation and construction are projected to be small, such impacts associated with decontamination and decommissioning should also be SMALL.

4.2.15.12 Public and Occupational Health Impacts

The current decontamination and decommissioning plans call for cleaning the structures and selected facilities to free-release levels and allowing them to remain in place for future use. Allowing the buildings to remain in place would reduce the potential number of workers required for decontamination and decommissioning, which would reduce the number of injured workers. If residual contamination is discovered, it would be decontaminated to free-release levels or removed from the site and disposed in a licensed low-level radioactive waste facility. Occupational exposures during onsite decontamination and decommissioning would be bounded by the potential exposures during operation (10 millisieverts [1,000 millirem] or less, as discussed in Section 4.2.12.3) because standard quantities of uranium (i.e., UF_6 in Type 48Y cylinders) could be handled, at least during the portion of the decontamination and decommissioning operations that purges the gas centrifuge cascades of UF_6. Once this decontamination operation is completed, the quantity of UF_6 would be residual amounts and significantly less than handled during operations. Because systems containing residual UF_6 would be opened, decontaminated (with the removed radioactive material processed and packaged for disposal), and dismantled, an active

environmental monitoring and dosimetry (external and internal) program would be conducted to maintain "As Low As Reasonably Achievable" doses and doses to individual members of the public as required by 10 CFR Part 20.

One aspect of the potential decontamination and decommissioning impacts that is not bounded by the above analysis of proposed ACP operations impacts is the potential public and occupational health impacts associated with the transport of radioactive materials generated during decontamination and decommissioning. For purposes of this analysis, it is assumed that there will be 5,100 shipments to the Nevada Test Site, 105 shipments to Clive, Utah, and 60 shipments to Kingston, Tennessee. The number of latent cancer fatalities, summarized in Table 4-23, from the transportation of all decontamination and decommissioning waste is estimated to be 0.3, including 0.005 deaths resulting from the release of radioactive material as a result of accidents.

Based on these analyses, the public and occupational health impacts associated with decontamination and decommissioning would be SMALL.

Table 4-23 Estimated Latent Cancer Fatalities from the Transportation of Decontamination and Decommissioning Waste

Material	Incident Free								Accidents
	General Population			Occupational Workers			Total	Maximally Exposed Individual	
	Off-Link	On-Link	Rest Stops	Crew	Inspection Stops	Loading Crew			
Classified[a]	5.1×10^{-3}	4.8×10^{-2}	1.2×10^{-1}	8.9×10^{-2}	3.1×10^{-2}	2.1×10^{-2}	3.1×10^{-1}	2.0×10^{-7}	4.7×10^{-3}
Unclassified	8.6×10^{-5}	7.4×10^{-4}	2.2×10^{-3}	1.4×10^{-3}	1.9×10^{-3}	4.7×10^{-4}	6.8×10^{-3}	4.1×10^{-9}	7.3×10^{-5}
Liquid	1.5×10^{-6}	1.0×10^{-5}	1.2×10^{-5}	2.7×10^{-5}	1.0×10^{-5}	1.1×10^{-4}	1.7×10^{-4}	1.8×10^{-10}	1.7×10^{-6}
Total	5.2×10^{-3}	4.9×10^{-2}	1.2×10^{-1}	9.1×10^{-2}	3.2×10^{-2}	2.1×10^{-2}	3.2×10^{-1}	2.0×10^{-7}	4.8×10^{-3}

Notes:
[a] A waste that is classified because of its configuration, composition, contamination, or contained information.

4.2.15.13 Waste Management Impacts

The waste management and recycling programs used during operations would apply to decontamination and decommissioning. Materials eligible for recycling would be sampled or surveyed to ensure that contamination levels would be below release limits. Staging and laydown areas would be segregated and managed to prevent contamination of the environment and creation of additional wastes. Therefore, the impacts would be SMALL.

4.3 Cumulative Impacts

Cumulative impacts are the impacts (effects) on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR § 1508.7). This section defines the resources that may be subject to cumulative impacts, defines the other past, present, and reasonably foreseeable future Federal and non-Federal actions that are considered pertinent, and presents an analysis of the cumulative impacts. Cumulative impacts encompass the following relative to this section:

- The action refers to the construction and operation of the proposed ACP on the DOE reservation.

- The direct and indirect impacts of the proposed action are a key criterion in determining if cumulative effects on localized and regional environmental and natural resources need to be addressed (e.g., if the proposed action has no effects on a given resource, it is not necessary to address the existing cumulative effects that have occurred with respect to that resource).

- For those cumulative effects that need to be addressed, it is necessary to consider the direct and indirect effects of past, present, and reasonably foreseeable future actions on the affected resources.

- Direct effects are those effects caused by the proposed action, past actions, present actions, or reasonably foreseeable future actions, that occur at the same time and place as the respective actions (40 CFR § 1508.8(a)); indirect effects are caused by the respective actions and are later in time or farther removed in distance, but are still reasonably foreseeable (indirect effects may include: growth-inducing effects; other effects related to induced changes in the pattern of land use, population density, or growth rate; and related effects on air, water, and other natural systems, including ecosystems) (40 CFR §1508.8(b)).

- The respective actions may have been, or would be, the result of decisions made by various governmental levels (Federal, State, or local) or the private sector; further, such actions may be on DOE reservation lands or offsite (the key is that a common resource is affected).

- Cumulative impacts need to be analyzed relative to a place-based perspective (the situation for activities occurring at the DOE reservation) as well as a national perspective (the situation for proposed centrifuge manufacturing activities) on the specific resources affected.

- Each affected resource, ecosystem, and human community must be analyzed for its sustainability and capacity to accommodate additional effects, based on its own time and space parameters (CEQ, 1997).

The affected environment, as described in Chapter 3, presents the baseline conditions against which the cumulative impacts will be reviewed. Chapter 3 incorporates the effects of past actions on the various

resources, as well as identifies trends (e.g., development, farming) that influences the various resources. Such effects and trends were considered in evaluating cumulative impacts. Sections 4.2 and 4.4 present the impacts associated with the proposed action and the no-action alternative, respectively, on each resource area.

As presented in Sections 4.2 and 4.4 of this Draft EIS, implementation of the proposed action and no-action alternative would not result in additional cumulative impacts on cultural resources, visual and scenic resources, and noise. Under the proposed action and the no-action alternative, cultural resources would not be affected; therefore, there would be no additional cumulative impacts. Cumulative effects on visual and scenic resources and noise are not addressed because of the lack of visual intrusions from the facility in relation to its adjoining location on the DOE reservation, and the temporary and localized nature of the noise impacts. The proposed action and/or no-action alternative may affect the remaining resource areas described in Chapter 3 and Sections 4.2 and 4.4. The potential impacts are described in Sections 4.3.1 to 4.3.10.

To define the activities that would result in a cumulative impact on the various resources, other Federal and non-Federal activities were reviewed on a placed-based perspective. Several activities occurring on the DOE reservation as well as national activities were identified that may result in cumulative impacts on local and national resources. The local activities include: (1) environmental restoration activities (DOE, 2004b); (2) industrial reuse of portions of the DOE reservation (DOE, 2001a); and (3) the development of depleted UF_6 conversion facilities at the DOE reservations located in Piketon and Paducah (DOE, 2004a; DOE, 2004c). The national activities that may result in cumulative impacts on nationally-based resources include the operation of the proposed National Enrichment Facility in New Mexico (NRC, 2004), and the conversion of existing and future depleted UF_6 (DOE, 2004a; DOE, 2004c). Such activities would result in cumulatively more radioactive material being transported across the nation, and the generation of more U_3O_8 that would require disposal. Table 4-24 presents a description of the other activities considered in this cumulative impact analysis.

Table 4-24 Other Activities Considered for Cumulative Impacts

Activities	Description
	Local (Place-based) Activities
Environmental Restoration Activities	DOE and USEC are responsible for implementing environmental compliance activities at the DOE reservation. DOE is responsible for environmental restoration, waste management, uranium programs, and long-term stewardship of nonleased facilities at the Portsmouth Gaseous Diffusion Plant. USEC is responsible for cold standby operations, removal of uranium deposits from process equipment, and winterization of the process buildings. Under the Environmental Restoration Program inactive sites are remediated through the removal, containment, and treatment of contaminants. The DOE reservation has been divided into quadrants (Quadrants I, II, III, and IV) to facilitate the cleanup process. The Environmental Restoration Program was established to fulfill the requirements of the Ohio Consent Decree and U.S. EPA Administrative Consent Order, both issued in 1989. In addition to monitoring, other remedial actions include: • Actions required in Quadrant I for the X-749/X-120/PK Landfill and the Quadrant I Groundwater Investigation Area. • Remedial actions in Quadrant II in the X-701B area to address contaminated soil, installation of landfill caps, and groundwater (DOE, 2004b). Quadrant II also contains "deferred units" that cannot be remediated while the reservation is operational. Such areas must meet criteria that are protective of human health and the environment. DOE performs annual reviews of all deferred units to confirm that the status has not changed. • Remedial activities in Quadrant III including phytoremediation of the groundwater plume near the X-740 Waste Oil Handling Facility. No ongoing remedial actions (other than monitoring) occur in Quadrant IV (DOE, 2004b).
Reindustrialization Program	Under its Reindustrialization Program, DOE would transfer real property (i.e., underutilized, surplus, or excess DOE reservation land and facilities) by lease and/or disposal (e.g., sale, donation, transfer to another Federal agency, or exchange) to a community reuse organization, to other Federal agencies, or to other interested persons and entities. Such transfers would be subject to DOE and regulator approval. Approximately 526 hectares (1,300 acres) are currently available for transfer (DOE, 2001a). No current reindustrialization activities are under development or consideration for the DOE reservation.

Table 4-24 Other Activities Considered for Cumulative Impacts (continued)

Activities	Description
Development and Operation of a Depleted UF_6 Conversion Facility	Beginning in 2004, DOE began the construction of a conversion facility at the DOE reservation for conversion of the depleted UF_6 cylinders at Portsmouth and the East Tennessee Technology Park. DOE estimates that construction will last two years, the operational period will last 18 years, and that decommissioning and decontamination will last three years. The conversion facility will be located in the west-central portion of the reservation, and will encompass approximately 10 hectares (25 acres). Conversion is a continuous process in which depleted UF_6 is vaporized and converted to a mixture of uranium oxides (primarily U_3O_8) by reaction with steam and hydrogen in a fluidized-bed conversion unit. The resulting depleted U_3O_8 powder will be collected and packaged for disposition. Equipment will also be installed to collect the hydrogen fluoride co-product and process it into any combination of several marketable products (hydrofluoric acid or calcium fluoride) for storage, sale, or disposal in the future, if necessary. The conversion facility will be designed to convert 13,500 metric tons (15,000 tons) of depleted UF_6 per year.
	National Activities
Proposed National Enrichment Facility	The proposed National Enrichment Facility in New Mexico and the handling of its associated wastestream of depleted UF_6 cylinders, to include transportation to a conversion facility and the ultimate disposal of the U_3O_8.
Conversion of Existing and Future depleted UF_6 Cylinders	The existing depleted UF_6 cylinders are located at DOE facilities in Paducah, Kentucky, Portsmouth, Ohio, and the East Tennessee Technology Park. The potential future generation of depleted UF_6 cylinders would be from the continued operation of the Paducah Gaseous Diffusion Plant, the potential operation of the proposed National Enrichment Facility, or the potential operation of the proposed USEC ACP. The converted UF_6 will be disposed of at the Envirocare licensed disposal facility in Utah or the Nevada Test Site in Nevada. DOE has identified the Envirocare facility as the "primary" disposal facility, and the Nevada Test Site as the "secondary" disposal facility (DOE, 2004c).

Sources: DOE, 2001a; DOE, 2001b; DOE, 2004a; DOE, 2004b; DOE, 2004c; NRC, 2004.

The following sections present a discussion of the cumulative impacts, by resource. The discussion focuses on the cumulative impacts associated with the proposed action. The cumulative impacts associated with the no-action alternative would be less than the cumulative impacts on each resource under the proposed action, except for the socioeconomic impacts, as there would be fewer jobs created under the no action alternative. Therefore, except for socioeconomic impacts, the cumulative impacts associated with the no-action alternative are not discussed in detail.

4.3.1 Land Use

Existing industrial development occupies approximately 40 percent (600 hectares [1,483 acres]) of a total of 1,503 hectares (3,714 acres) of the DOE reservation. Implementation of all current and future actions, as described in Table 4-24, as well as the proposed ACP, would lead to the conversion of an additional 10 hectares (25 acres) to industrial use, resulting in a small cumulative impact on land use.

4.3.2 Climatology, Meteorology, and Air Quality

<u>Site Preparation and Construction</u>

Site preparation and construction activities associated with the depleted UF_6 conversion facility at the DOE reservation, the proposed ACP, and the ongoing environmental restoration program would result in a cumulative impact on ambient air quality. Fugitive dust emissions, as well as particulate emissions associated with construction vehicles and heavy equipment, would increase the concentrations of particulate matter with a mean diameter of 2.5 micrometers or less. As presented in Section 4.2.6, the DOE reservation is located in an attainment region, although measured concentrations for certain criteria pollutants (ozone and particulate matter with a mean diameter of 2.5 micrometers or less) have been above State and national air quality standards. The reservation is located in a county that is exempt from the restrictions on emissions for fugitive dust specified in Ohio Administrative Code 3745-17-08. Elevated ozone concentrations of regional concern are associated with high precursor emissions from the Ohio Valley region and long-range transport from southern States. Because ozone formation is a regional issue affected by emissions for an entire area, the small additional cumulative contribution to the county total would be unlikely to substantially alter the ozone levels of the county (DOE, 2004a).

For fugitive dust emissions, the site preparation and construction phase of the depleted UF_6 conversion facility and the proposed ACP would result in the most particulate emissions, with the majority arising from vehicle particulate emissions associated with the construction vehicles. Because the construction for each facility would not overlap (the construction vehicle emissions would not overlap), the cumulative impacts on air quality are anticipated to be MODERATE. To avoid nuisance conditions and particulate matter concerns, USEC has proposed to use dust suppression techniques to mitigate dust release during excavation under dry conditions.

Per the analysis in Section 4.2.4.1, the NRC-recommended mitigation measures to reduce the predicted impacts associated with particulate matter emissions also would reduce the cumulative impacts to SMALL. The combined use of use Tier 2 construction-related vehicles and ultra-low sulfur diesel fuel would reduce particulate matter emissions by about 60 percent.

<u>Transportation</u>

The cumulative impacts of long- and medium-haul trucks, and worker vehicle emissions would include increases in carbon monoxide and sulfur dioxide emissions in excess 19 percent of current 2004 county baseline, and emissions of nitrogen oxides and particulate matter with a mean diameter of 10 micrometers or less in excess of 10 percent of the current 2004 county baseline. These cumulative changes would likely be sufficiently large to be detected through ambient air quality monitoring. However, they would occur only temporarily during the construction phase (estimated to be five years), and would be unlikely to be large enough to exceed National Ambient Air Quality Standards. The potential ambient air quality impacts associated with increased emissions from construction-related traffic would be SMALL.

Cumulative impacts on ambient air quality during operation of the depleted UF_6 conversion facility and the proposed ACP, as well as the continued environmental restoration program, would not result in substantial emissions of criteria air pollutants.

The potential cumulative impacts of radiological air emissions from the depleted UF_6 conversion facility and the proposed ACP, which would be regulated by the U.S. EPA under 40 CFR Part 61, Subpart H (National Emissions Standards for Hazardous Air Pollutants) were also analyzed. Radiological releases to air from both facilities would be routinely monitored to ensure that releases are at, or below, the expected and regulated quantities. In addition, under the environmental restoration program, DOE

collects data from a monitoring network of 15 ambient air samplers—as described in the DOE site environmental report for 2003 (DOE, 2004b). The monitoring network is intended to assess whether the radiological air emissions from the DOE reservation, as a whole, affect air quality in the surrounding area. Data are collected both onsite and in the area surrounding the DOE reservation. A background ambient air monitoring station is located approximately 21 kilometers (13 miles) southwest of the site. Analytical results from air sampling stations closer to the plant were compared to background measurements (DOE, 2004b), and based on the predicted emission rates associated with the depleted UF_6 conversion facility and the proposed ACP, and the comprehensive site monitoring program, the cumulative radiological air emissions would result in a SMALL impact on air quality.

4.3.3 Geology and Soils

The proposed action and no action alternative would not impact geology; therefore, there would be a SMALL cumulative impact.

For soils, the primary cumulative impacts resulting from past and present actions has been disturbance in areas where the land use has been converted to industrial activities. Soil losses have occurred via erosion, and some soils on the DOE reservation have become radiologically contaminated. Environmental restoration activities would require some additional land disturbance, primarily in previously disturbed areas. Specifically, the environmental restoration program would require soil removal and capping activities associate with the X-749/X-120/PK Landfill in Quadrant I. Site preparation and construction of the depleted UF_6 conversion facility and the proposed ACP primarily would affect previously disturbed soils on the industrialized portions of the reservation. The proposed ACP would impact approximate 6 hectares (15 acres) of relatively undisturbed soil, while the depleted UF_6 conversion facility will be constructed entirely within the industrial area; therefore, the cumulative impact on soils would result in a SMALL cumulative impact.

4.3.4 Water Resources

<u>Floodplains</u>

Neither the proposed action or the no action alternative would affect any flood plains; therefore, there would be a SMALL cumulative impact.

<u>Surface Water and Groundwater</u>

Site preparation and construction of the depleted UF_6 conversion facility and the proposed ACP, as well as the continued environmental restoration program, would result in a MODERATE short-term cumulative impact on surface water quality. The cumulative construction time of the depleted UF_6 conversion facility and the proposed ACP would be approximately 5.5 years, which would result in increased erosion and storm water flows entering adjacent surface water features. The environmental restoration program will require soil removal and capping activities associated with the X-749/X-120/PK Landfill in Quadrant I, that may result in increased erosion and storm water flows entering adjacent surface water features. However, because the construction areas are greater than 2 hectares (5 acres), DOE and USEC would be required to obtain NPDES permits for storm water discharge from the construction sites, which would require the use of various best management practices to reduce or exclude sediment transport into the surface water features, as presented in Section 4.2.5, Geology and Soil Impacts. The cumulative impacts of the operational phases would be SMALL, as all discharges would meet EPA and State NPDES standards, as well as DOE and NRC standards, which are designed to protect human and environmental health.

Site preparation and construction, and operation of the depleted UF_6 conversion facility and the proposed ACP, as well as the continued environmental restoration program, would also result in a small long-term cumulative impact on groundwater. Table 4-25 presents the individual and cumulative withdrawal and discharge rates for the DOE reservation.

Table 4-25 Water Withdrawal and Discharge Rates [a]

Type of Water Withdrawal/ Discharge	Current [b]		Proposed ACP		Depleted UF_6 Conversion		Total		Percent Change Over Current and Total Rates
	m^3/day	gpd	m^3/day	gpd	m^3/day	gpd	m^3/day	gpd	
Construction									
Groundwater Withdrawal	20,819 [c] 75,708 [d]	5,500,000 [c] 20,000,000 [d]	814	215000	21	5472	835	220472	4 27
Wastewater	909 [c] 2,275 [d]	240,000 [c] 601,000 [d]	814	215000	21	5472	835	220472	92 77
Operation									
Groundwater Withdrawal	20,819 [c] 75,708 [d]	5,500,000 [c] 20,000,000 [d]	2461	650000	342	90411	2803	740411	13 31
Wastewater	909 [c] 2,275 [d]	240,000 [c] 601,000 [d]	361	95400	30	8000	391	103400	43 57
Cooling Water Blowdown	4,603 [c]	1,216,000 [c]	273	72000	87	23000	360	95000	8

Notes:
[a] m^3/day = cubic meters per day; gpd = gallons per day.
[b] Current withdrawals and discharges include those from the ongoing environmental restoration program.
[c] Values represent current withdrawal or discharge rates.
[d] Values represent capacity and permitted withdrawal or discharge rate.
Sources: DOE, 2004c; USEC, 2005a.

During construction, additional groundwater withdrawal and wastewater discharges of up to 835 cubic meters per day (220,472 gallons per day) would result in SMALL cumulative impacts. The wastewater would feed into the onsite sanitary treatment plant and even though the additional wastewater represents a 92 percent change over the current volume, it would only represent a 77 percent change to the total capacity of the facility. This additional wastewater would not affect the status or water quality criteria contained in the existing permit and would represent a SMALL cumulative impact on surface water quality. For groundwater, the additional withdrawal of 835 cubic meters (220,472 gallons) represents a four percent increase over the current withdrawal rate, and would bring the total withdrawal rate to 27 percent of system capacity.

During operation, the additional wastewater discharge (391 cubic meters per day [103,400 gallons per day]), groundwater withdrawal (2,803 cubic meters per day [740,411 gallons per day]), and cooling water blowdown (360 cubic meters per day [95,000 gallons per day]) would result in SMALL cumulative impacts. Wastewater would feed into the onsite sanitary treatment plant and even though the additional wastewater represents a 43 percent change over the current volume, it would only represent 57 percent of the total capacity of the facility. This additional wastewater would not affect the status or water quality criteria contained in the existing permit and would represent a SMALL cumulative impact on surface water quality. The additional groundwater withdrawal would represent a 13 percent increase over the current withdrawal rate, and would bring the total withdrawal rate to 31 percent of the system capacity. The associated tower water cooling system would discharge an additional 360 cubic meters per day (95,000 gallons per day) to the DOE reservation recirculating cooling water system, which discharges to the Scioto River. This represents an 8 percent increase over the current 4,603 cubic meters per day (1,216,000 gallons per day). This discharge would be non-contact cooling water and would not alter the properties or quality of the current discharge. The volume would be the only attribute of the wastewater that would be altered relative to the current recirculating cooling water system discharge. As such, the tower water cooling discharges would have a SMALL cumulative impact on surface water quantity and quality.

4.3.5 Ecology (Flora, Fauna, Wetlands, and Threatened and Endangered Species)

For wetlands and threatened and endangered species, the proposed action and the no-action alternative would not require the filling or dredging of any wetlands and would not affect any listed species; therefore, there would be SMALL cumulative impacts on such resources.

The construction of the depleted UF_6 conversion facility and the proposed ACP would result in a SMALL short-term cumulative impact on the flora and fauna within the DOE reservation. Such impacts would result from the increased human activity, dust associated with earth moving, noise from the operation of the construction vehicles, and the removal of vegetation that acts as a buffer between the developed areas and undisturbed forested and riparian areas of the reservation. Habitat disturbance would involve settings commonly found in this part of Ohio, in many cases previously disturbed. The cumulative impact would result in limited removal of undisturbed vegetation, less than 0.5 hectare (1 acre).

The operation of the depleted UF_6 conversion facility and the proposed ACP, as well as the continued environmental restoration program would result in a SMALL long-term cumulative impact on flora and fauna. The increased personnel and activities on the reservation associated with such operations and programs would preclude wildlife sensitive to human activities from utilizing the managed areas of the reservation.

4.3.6 Socioeconomic and Local Community Services

Site preparation and construction of the depleted UF_6 conversion facility and the proposed ACP would not overlap, and other than the prolonged construction activities that would occur on the DOE reservation, the construction jobs created would not result in an additional cumulative impact. The construction period and the associated increase in workforce would last from approximately 2005 to 2010. This would result in approximately 4,000 direct and indirect jobs. No employment increase or decrease is anticipated to be associated with the ongoing environmental restoration program. Based on the information presented in Section 4.2.10.2, such an increase, over 3.5 percent of the total employment in the region of influence and over 22.5 percent of Pike County employment at year 2000 levels, would result in a MODERATE positive cumulative impact. The 4,000 direct and indirect jobs would result in a SMALL cumulative impact on tax revenue, population characteristics, community and social services, and public utilities, as the cumulative effects would not substantially alter the existing tax or population characteristics and would not require any additional services.

The operation of the depleted UF_6 conversion facility and the proposed ACP would result in approximately 2,000 additional direct and indirect jobs. Based on the information presented in Section 4.2.10.3, such an increase, over 1.6 percent of the total employment in the region, and over 10 percent of Pike County employment at year 2000 levels, would result in a MODERATE cumulative impact. The 4,000 direct and indirect jobs would result in a SMALL cumulative impact on tax revenue, population characteristics, community and social services, and public utilities, as the cumulative effects would not substantially alter the existing tax or population characteristics and would not require any additional services.

Under the no-action alternative, the conversion facility would still be built, resulting in short-term (construction) and long-term (operations) SMALL cumulative socioeconomic impacts as presented above. However, because the proposed ACP would not be constructed or operated, the short-term and long-term employment opportunities would be less than those associated with the proposed action.

4.3.7 Environmental Justice

Although minority and low-income populations occur in the vicinity of the DOE reservation (see Section 4.2.9), construction and operation of the depleted UF_6 conversion facility and the proposed ACP, as well as the continued environmental restoration program, would not affect such populations. Accordingly, there would be no cumulative impacts on environmental justice populations.

4.3.8 Transportation

Site preparation and construction and operation of the depleted UF_6 conversion facility and the proposed ACP, as well as the continued environmental restoration program, would result in a MODERATE cumulative impact on transportation. Traffic associated with the ongoing environmental restoration program is part of the existing traffic flow and is not expected to increase or decrease. The construction periods of the depleted UF_6 conversion facility and the proposed ACP would not overlap; however, the level of increased construction worker commuter traffic would be extended. During site preparation and construction of the proposed ACP, the level of service for U.S. Route 23 would temporarily change from B (i.e., free flow of traffic) to C (i.e., the influence of traffic density on operations becomes marked, maneuverability is affected, and travel speeds are reduced). For State Road 32, site preparation and construction would temporarily change the level of service of the roadway from A to B, which is still uncongested roadway conditions. The Highway Capacity Manual notes that speed remains relatively constant across Levels of Service A through D.

Transportation associated with the operation of the depleted UF_6 conversion facility is estimated to be 12,300 truck shipments and 6,800 rail shipments over 18 years, which equates to approximately three truck shipments and two rail shipments per day (assuming a five-day work week). An estimated workforce of 160 at the conversion facility would result in up to 320 daily vehicle trips. The additional traffic associated with the operation of the depleted UF_6 conversion facility would not further degrade the level of service associated with the site preparation and construction activities of the proposed ACP; therefore, the traffic impacts would be SMALL.

Operation of the depleted UF_6 conversion facilities at Portsmouth, Ohio and Paducah, Kentucky, the proposed ACP, as well at the operation of the National Enrichment Facility in New Mexico, would result in some additional transportation of radioactive material. The cumulative impact from routine traffic accidents associated with the additional transportation would be SMALL, as the increase would be a fraction of one percent of the total truck volume in the U.S. Such a small increase in the overall truck volume would result in a negligible change in the number of routine traffic accidents. The cumulative impacts of non-routine traffic accidents associated with the transport of the radioactive material are presented under Section 4.3.9.

4.3.9 Public and Occupational Health

This section describes the cumulative impacts to public and occupational health associated with transportation to and from the DOE reservation, site preparation and construction activities on the DOE reservation, and operation of the existing, planned, and proposed facilities on the DOE reservation. The focus of the discussion is on radiological cumulative effects, and when appropriate, cumulative nonradiological effects are described.

4.3.9.1 Transportation

As presented in Section 4.3.2, transportation activities associated with the depleted UF_6 conversion facility and the proposed ACP, as well as the ongoing environmental restoration program, would result in additional air emissions.

The highest level of activity and emissions on the DOE reservation would occur during the cumulative construction phase. Emissions of National Ambient Air Quality Standard-regulated pollutants during this period would likely be small, and thus not cause an exceedance of the standard. Because the standards are designed to protect human health, the change in emissions would be unlikely to cause any adverse health impacts within the surrounding population. Therefore, the potential impacts on public and occupational health related to the emission of National Ambient Air Quality Standard-regulated pollutants would be SMALL.

The cumulative impacts of transporting radioactive material to and from the DOE reservation have been analyzed in other *National Environmental Policy Act* documents, specifically the:

- *Programmatic Environmental Impact Statement for the U.S. Department of Energy, Oak Ridge Operations Implementation of a Comprehensive Management Program for the Storage, Transportation, and Disposition of Potentially Reusable Uranium Materials* (DOE, 1999a);

- *Transportation Impact Assessment for Shipment of Uranium Hexafluoride (UF_6) Cylinders from the East Tennessee Technology Park to the Portsmouth and Paducah Gaseous Diffusion Plants* (ANL, 2001); and

- *Final Environmental Impact Statement for Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at the Portsmouth, Ohio Site* (DOE, 2004a).

These previous studies did not identify any significant impacts to public and occupational health associated with transportation to and from the DOE reservation. The analysis of potential environmental impacts in Chapter 4, along with the results of these studies, indicates that the cumulative impacts on public and occupational health would not substantially vary from the estimated latent cancer fatalities presented in Section 4.2.11.1.

Ongoing and anticipated operations at the Padacah Gaseous Diffusion Plant involve truck and rail transportation of radioactive materials, including raw materials, products, and wastes. Such shipments would result in radiation dose to members of the public. Existing conditions at the Portsmouth Gaseous Diffusion Plant involve approximately 35 truck shipments per year of low-level waste, resulting in an estimated 7.4×10^{-6} millisieverts per year (7.4×10^{-4} millirem per year) dose to the maximum exposed individual (DOE, 2004a). Operation of the depleted UF_6 conversion facility would involve approximately 435 truck shipments per year, including shipments of depleted UF_6 from the East Tennessee Technology Park to the DOE reservation, resulting in an estimated 2.8×10^{-5} millisieverts per year (2.8×10^{-3} millirem per year) dose to the maximum exposed individual, and an estimated 18 rail shipments per year, resulting in an estimated 1.9×10^{-5} millisieverts per year (1.9×10^{-3} millirem per year) dose to the maximally-exposed individual (DOE, 2004a). Other ongoing and anticipated actions, including existing depleted UF_6 management operations, site remediation activities, and standby and reindustrialization of the Portsmouth Gaseous Diffusion Plant, would involve approximately 220 truck shipments per year and approximately 200 rail shipments per year, resulting in an estimated 8.5×10^{-5} millisieverts per year (8.5×10^{-3} millirem per year) dose to the maximum exposed individual. The total dose to the maximum exposed individual from transportation under existing conditions, ongoing operations, and anticipated actions other than the proposed ACP is 7.7×10^{-5} millisieverts per year (7.7×10^{-3} millirem per year) for truck transportation and 6.2×10^{-5} millisieverts per year (6.2×10^{-3} millirem per year) for rail transportation. (DOE, 2004a)

The dose to the maximum exposed individual from truck and rail transportation for proposed ACP facility operations would be 9.4×10^{-11} person-sievert per year (9.4×10^{-9} person-rem per year). Considering the overall dose from transportation conducted under existing conditions, and ongoing and anticipated operations, the cumulative radiological impacts to the public from transportation would be SMALL.

4.3.9.2 Site Preparation and Construction Activities

The cumulative impacts associated with site preparation and construction activities on public and occupational health would result from a longer construction period, up to six years, and the construction schedules for the facilities would not overlap. Some of the same workers may be involved in the site preparation and construction activities for the proposed ACP as for the depleted UF_6 conversion facility. However, the potential annual radiological exposure to an onsite worker (0.88 millisieverts per year [88 millirem per year]) would not exceed the applicable dose limits for the general public of 1 millisievert per year (100 millirem per year) limit listed at 10 CFR § 20.1301(a)(1). During the site preparation and construction activities, the potential dose to offsite personnel would not increase. The maximum exposure to offsite personnel would be less than 0.001 millisieverts per year (0.1 millirem per year) (see Appendix C).

4.3.9.3 Operations

The ongoing environmental restoration program at the DOE reservation would not result in development of new sources of radiation emission, therefore, the cumulative analysis focus on the depleted UF_6 conversion facility and the proposed ACP.

The estimated dose to involved workers at the depleted UF_6 conversion facility is 0.75 millisieverts per year (75 millirem per year), which is less than the applicable dose limits for the general public of 1 millisieverts per year (100 millirem per year) limit listed at 10 CFR § 20.1301(a)(1) and well below the 10 CFR § 20.1201 limit of 50 millisieverts (5,000 millirem) for involved workers (i.e., workers in radiologically controlled areas) (DOE, 2004b). The estimated dose to involved workers at the proposed ACP facility is up to 0.29 millisieverts per year (29 millirem per year), which is well below the regulatory thresholds. Because the workers at depleted UF_6 conversion facility and the proposed ACP would not be working at both facilities, there would not be a cumulative exposure and even considering the overall collective dose to workers from existing conditions, and ongoing and anticipated operations at the DOE reservation, the cumulative radiological impacts to workers from existing conditions and ongoing and anticipated site operations will be SMALL.

To assess the cumulative impacts on public health, the potential cumulative impacts of radiological air emissions from the depleted UF_6 conversion facility and the proposed ACP were analyzed. Radiological releases to air from both facilities would be routinely monitored to ensure that releases are at or below the expected and regulated quantities. In addition, under the environmental restoration program, DOE collects data from a monitoring network of 15 ambient air samplers (DOE, 2004b). The monitoring network is intended to assess whether the radiological air emissions from the DOE reservation, as a whole, affect air quality in the surrounding area. Data are collected both onsite and in the area surrounding the DOE reservation. A background ambient air monitoring station is located approximately 21 kilometers (13 miles) southwest of the site. The analytical results from air sampling stations closer to the plant are compared to background measurements (DOE, 2004b).

Based on the predicted emission rates associated with the depleted UF_6 conversion facility and the proposed ACP, and the comprehensive site monitoring program, the cumulative radiological emissions would result in a SMALL impact on air quality.

The cumulative effect of operating the depleted UF_6 conversion facility and the proposed ACP may result in the doubling of the radiation measured at the fence line of the DOE reservation. Current measurements indicate that the maximum value is approximately 0.001 millisieverts per year (0.1 millirem per year), and the operation of the depleted UF_6 conversion facility and the proposed ACP would introduce new sources of radiological emissions. The new emissions may increase to an average of 0.002 millisieverts per year (0.2 millirem per year). The value of 0.002 millisieverts per year (0.2 millirem per year) would be far less than the applicable dose limits for the general public of 1 millisievert per year (100 millirem per year) limit listed at 10 CFR § 20.1301(a)(1) and would result in a SMALL cumulative impact.

The probability for cumulative impacts on public and occupational health resulting from accidents was also analyzed. Such accidents could range from likely accidents (occurring an average of one or more times in 100 years) to extremely rare (occurring an average of less than one time in a million years). Such accidents are associated with the depleted UF_6 conversion facility and the proposed ACP. Because of the low probability of two accidents happening at the same time, the cumulative consequences of such an event were not analyzed. The probability of two likely accidents occurring at the same time is very low, the product of their individual probabilities being 0.0001. Moreover, in the event that two facility accidents from the likely category occurred at the same time, the consequences for the public would still be SMALL (DOE, 2004a).

4.3.10 Waste Management

Sanitary and industrial waste generated from all operations and activities at the DOE reservation would be disposed primarily at the Pike County Landfill, with the Rumpke Beach Hollow Landfill being available as an alternate. The wastes generated and transferred to the landfills would not substantially change the nature of wastes currently handled or affect the disposal capacity at the local landfills. Therefore the impact of sanitary and industrial waste generated from facility operations would be SMALL.

Hazardous wastes would be generated by the depleted UF_6 conversion facility, the Paducah Gaseous Diffusion Plant, the ongoing environmental restoration activities, and the proposed ACP facility. USEC would manage its wastes with the intent to store onsite only as a last resort. DOE is decreasing its permitted waste storage management areas in order to provide increased space available for USEC's advanced technology centrifuge program. United States Enrichment Corporation would continue to utilize DOE storage facilities for hazardous and mixed wastes that it must keep onsite for more than 90 days, but would continue to store its low-level waste independent of DOE, and ship as much of its waste as possible offsite for recycling, treatment, and disposal.

Potential cumulative effects from management of hazardous materials would be SMALL. The operation of the depleted UF_6 conversion facility and the proposed ACP, follow the same regulatory requirements, perform required inspections, and manage hazardous materials in a manner that is protective of the environment.

Section 3113(a) of the *USEC Privatization Act* (Public Law 104-134) requires DOE to accept low-level waste, including depleted uranium that has been determined to be low-level waste, for disposal upon the request and reimbursement of costs. DOE has stated that depleted uranium transferred under this provision of law in the future, would most likely be in the form of depleted UF_6, thus adding to the inventory of material needing conversion at a depleted UF_6 conversion facility. DOE stated that, "...it is reasonable to assume that the conversion facilities could be operated longer than specified in the current plans in order to convert this material" (DOE, 2004a).

To review the cumulative impacts on national waste disposal to include the conversion of depleted UF_6 and the ultimate disposal of U_3O_8 produced from the depleted UF_6 conversion facilities at Portsmouth, Ohio, and Paducah, Kentucky, this Draft EIS analyzed the existing inventories of depleted UF_6 as presented in the *Portsmouth Annual Environmental Report for 2003* (DOE, 2004b) and *Final Environmental Impact Statement for Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at the Paducah, Kentucky Site* (DOE, 2004c), and the production of depleted UF_6 from the proposed ACP and the proposed National Enrichment Facility in Lea County, New Mexico. For the purposes of this analysis, NRC assumed that ceasing operations at Paducah, resulting in no more depleted UF_6 generation at that site, and the start up of the proposed ACP and the resulting generation of depleted UF_6 would result in a "no-net increase" of depleted UF_6.

The existing DOE inventory of depleted UF_6 includes cylinders stored at the Paducah Site, the Portsmouth Site, and the East Tennessee Technology Park. Approximately 440,000 metric tons (485,017 tons) of depleted UF_6 are stored at the Paducah Site, 250,000 metric tons (275,578 tons) of depleted UF_6 are stored at the Portsmouth Site, and approximately 75,000 metric tons (82,673 tons) at the East Tennessee Technology Park (DOE, 2004b; DOE, 2004c). The proposed National Enrichment Facility would generate approximately 197,000 metric tons (217,155 tons) of depleted UF_6 (NRC, 2005). The proposed ACP would generate approximately 571,000 metric tons (629,420 tons) of depleted UF_6 (USEC, 2004c).

The design capacity of the Portsmouth conversion facility is 13,500 metric tons per year (14,881 tons per year) of depleted UF_6, and would require 18 years of operation to convert the amount of depleted UF_6 in the Portsmouth and East Tennessee Technology Park inventories (DOE, 2004a). The design capacity of the Paducah conversion facility is 18,000 metric tons per year (19,841 tons per year) of depleted UF_6, and would require 25 years of operation to convert the amount of depleted UF_6 in the Paducah inventory (DOE, 2004c).

The Paducah conversion facility would generate approximately 6,000 cubic meters or approximately 14,300 metric tons, (7,850 cubic yards or 15,763 tons) per year of depleted triuranium octaoxide over the 25-year license period from converting the depleted UF_6 that is stored at the Paducah Site (DOE, 2004c). The Portsmouth conversion facility would generate approximately 3,570 cubic meters or approximately 10,800 metric tons (4,700 cubic yards or 11,905 tons) per year of depleted triuranium octaoxide over the 18-year license period from converting the depleted UF_6 that is stored at the Portsmouth and East Tennessee Technology Park sites (DOE, 2004a). This amounts to a total of 214,725 cubic meters (280,850 cubic yards) of depleted triuranium octaoxide for disposal, representing approximately 10.3 percent of the available disposal capacity of the Envirocare facility.

The additional depleted UF_6 generated by the proposed ACP and National Enrichment Facility would generate an additional 768,000 metric tons (846,575 tons), which at the current processing rates would require both conversion facilities to operate for an additional 24 years.

All of the depleted triuranium octaoxide produced from the depleted UF_6 conversion facilities and all the depleted U_3O_8 produced from the depleted UF_6 that is stored at the Portsmouth and Paducah Sites could be disposed of at the Envirocare facility in Utah. The available disposal capacity of the Envirocare facility as of December 2002 was 2.07 million cubic meters (2.71 million cubic yards).

Overall the depleted triuranium octaoxide, that would be generated from converting the depleted UF_6 produced by the proposed ACP, the depleted UF_6 produced by the National Enrichment Facility, and the depleted UF_6 stored at the Portsmouth and Paducah sites would represent approximately 20 percent of the available disposal capacity of the Envirocare facility.

The depleted U_3O_8 from the conversion facilities would be generated over a period of several decades of operation, and over this period of time other licensees would also be generating low-level waste that would also be required to be disposed of at licensed facilities. Ultimately the entire existing 2.1 million cubic meters (2.7 million cubic yards) disposal capacity of the Envirocare facility would be utilized. The depleted U_3O_8 generated by the conversion facilities would contribute approximately 20 percent of the total capacity utilization. In order to address this circumstance, private entities could develop additional low-level waste disposal capacity during that time frame, or DOE could decide to dispose of the depleted triuranium octaoxide at the Nevada Test Site facility rather than at Envirocare. In either case, it is anticipated that the cumulative effect of the generation and disposal of depleted U_3O_8 on licensed low-level waste disposal capacity would be SMALL.

4.4 Impacts of the No-Action Alternative

As discussed in Section 2.2 of this Draft EIS, the no-action alternative would consist of USEC not constructing, operating, or decommissioning the proposed ACP at Piketon. The buildings and land proposed to be used for the ACP at the DOE reservation in Piketon would therefore be available for some other use. At the same time, the uranium fuel fabrication facilities in the United States would continue to obtain low-enriched uranium from currently available sources, including the Paducah Gaseous Diffusion Plant, and the downblending of highly enriched uranium under the "Megatons to Megawatts" program. In order to meet growing demands for enriched uranium, additional domestic enrichment facilities

utilizing a more efficient technology in the future could be constructed. This could include the gas centrifuge facility proposed by Louisiana Energy Services near Eunice, New Mexico, as well as other possible facilities. The associated impacts associated with the existing uranium fuel cycle activities in the U.S. would continue as expected today if the proposed ACP is not constructed, operated, or decommissioned.

If any additional domestic enrichment facilities are proposed in the future, the environmental impacts at any alternate site(s) would have to be assessed in a separate *National Environmental Policy Act* review. Impacts at any such alternate site(s) may be larger than those associated with the proposed action involving the ACP if all the facilities need to be built from scratch (about half of the proposed ACP facilities already exist). The construction and operation of another enrichment facility in the United States, needed to fulfill growing demands, could result in more or less impacts than the proposed action, depending on the particulars of the proposed action and ecological conditions at any alternate site(s). However, those impacts would have to be evaluated in a separate National Environmental Policy Act review and would likely be avoided or mitigated to the point where they are considered SMALL. Assuming that review and associated consultations with preservation officials follow standard procedures, impacts to any resources of concern should be avoided or mitigated to the point of being SMALL. However, any alternative sites and facilities would be subject to a separate National Environmental Policy Act review that would endeavor to avoid or mitigate potential visual and scenic impacts to the point that they can be considered SMALL.

The following sections evaluate the potential impacts associated with this no-action alternative. Each of the same resource areas evaluated for the proposed action in Section 4.2 are briefly assessed here in the same order as above.

4.4.1 Land Use Impacts

Under the no-action alternative, the facilities currently leased to USEC for the ACP would remain leased to USEC. Some of these facilities would likely continue to be used for the Lead Cascade Demonstration Facility, which is currently scheduled to operate until the middle of 2008 in order to continue to provide a demonstration of the gas centrifuge enrichment process. Any future uses of the facilities currently proposed for the ACP would be up to USEC and DOE, but would be expected to include similar activities within the nuclear fuel cycle, consistent with USEC's and the reservation's history and mission.

If the buildings and grounds currently proposed for the ACP were in fact not used for that purpose, it is very unlikely that those buildings and grounds would be available for completely different uses. In a recent Environmental Assessment examining reindustrialization alternatives at Piketon (DOE, 2001a), DOE concluded that property currently under lease by USEC would not be available for reindustrialization, such as different kinds of light or heavy manufacturing.

Nevertheless, the current program for examining and implementing reindustrialization alternatives at the reservation would remain in place under the no-action alternative, and this program would likely lead to alternate uses of other property on the reservation just like it has in the past. Current and future reindustrialization activities would be coordinated through the Southern Ohio Diversification Initiative, the recognized community reuse organization for the DOE reservation at Piketon. DOE's Office of Worker and Community Transition established community reuse organizations to minimize the adverse effects of workforce restructuring at DOE facilities that have played an historic role in the nation's defense. These organizations provide assistance to the neighboring communities negatively affected by changes at these sites.

The Southern Ohio Diversification Initiative actively promotes the reuse of DOE property by private industry. The first lease between DOE and the Southern Ohio Diversification Initiative was signed on April 1, 1998, for 2.4 to 3.2 hectares (6 to 8 acres) of land on the north side of the DOE reservation property. The tract was used as a right-of-way for a railroad spur to connect with the existing DOE north rail spur. A portion of this property was then subleased by the Southern Ohio Diversification Initiative to the Mead Corporation for access to the rail line for a new wood grading operation. This action was covered under *National Environmental Policy Act* Categorical Exclusion Number CX-POR-522, completed in 1997. A second lease between DOE and the Southern Ohio Diversification Initiative was signed on October 13, 2000, for 4.9 hectares (12 acres) of land adjacent to the area of the first lease. This tract will be used for additional railroad spurs and use of existing rail facilities. This action was covered under *National Environmental Policy Act* Categorical Exclusion Number CX-PORTS-538. (DOE, 2001a)

Other alternate uses of reservation property that have been approved and implemented in the recent past include the following:

- Right-of-way easement for a waterline and sewer line;
- License for non-Federal use of property for concurrent road usage;
- Recreational license to Scioto Township for development of a community park;
- Greenway licenses to Scioto Township and Seal Township; and
- Lease/license (short-term) for use of parking lots by the Southern Ohio Diversification Initiative.

All of these efforts to find alternative uses of property on the Piketon reservation would continue under the no-action alternative, but they would not be broadened to include the facilities and grounds currently proposed for the ACP. The facilities and grounds proposed for the ACP are unavailable for reindustrialization and would be expected to be used in some other way related to uranium enrichment, if not used for the ACP. Therefore, the land use impacts of the no-action alternative would be SMALL.

4.4.2 Historic and Cultural Resources Impacts

The no-action alternative would involve no new construction or land disturbance activities that could threaten historic and cultural resources of interest in the area of potential effect. Any alternate proposal for additional domestic enrichment facilities would have to be examined to determine potential impacts to historic and cultural resources.

4.4.3 Visual and Scenic Impacts

Under the no-action alternative, the proposed ACP facilities would not be constructed, and the DOE reservation at Piketon would look just like it is presently planned to look. Any visual and scenic impacts would be transferred to the site(s) of additional enrichment facilities built elsewhere, and would likely be greater than those of the proposed action if that site is presently not as industrialized as the DOE reservation at Piketon.

4.4.4 Air Quality Impacts

Under the no-action alternative, air quality in the general area would remain at its current levels described in Section 3.5. The fugitive dust associated with the proposed ACP site preparation and construction activities and the resulting temporary increase in particulate matter concentrations would be avoided. The Paducah Gaseous Diffusion Plant would continue to operate at its current level with the existing emissions associated with the coal combustion needed to support that technology. Additional domestic enrichment facilities could be built at alternate sites in the future, with site-specific impacts that would

have to be assessed in a separate environmental review. Because it is likely that more construction would be needed at sites other than Piketon (since half the facilities needed at Piketon already exist), the air quality impacts associated with construction at alternate sites would likely be greater than those assessed for the proposed action. However, any such construction-related impacts would be temporary and subject to best management practices and air quality regulatory controls. Any air quality impacts associated with operations at alternate sites would likely be small, assuming the use of gas centrifuge technology, which does not emit substantial quantities of air pollutants. For these reasons, the air quality impacts of the no-action alternative are expected to be SMALL.

4.4.5 Geology and Soils Impacts

Under the no-action alternative, no major new construction would be undertaken by the United States Enrichment Corporation or USEC at the reservation in Piketon. Current industrial activities at the site would continue, with the same level of disturbance to the land and the same threat of soil contamination. The no-action alternative would not be expected to give rise to alternate activities at the reservation that would substantially increase the potential for geology or soils impacts at Piketon. If additional domestic enrichment facilities are built in the future, the geology and soils impacts at any alternate site(s) may be larger than those associated with the proposed action if all the facilities needed to be built from scratch (about half of the proposed ACP facilities already exist). However, even in this case, limited impacts to geology would be expected and any impacts to soils would likely be temporary and controlled. Therefore, the impacts of the no-action alternative on these resources would be SMALL.

4.4.6 Water Resource Impacts

Under the no-action alternative, the small impacts to surface water and groundwater caused by the proposed action would be avoided, and current activities at the reservation at Piketon and at the Paducah Gaseous Diffusion Plant would continue with their same level of impacts. Water usage rates and wastewater discharge rates at Piketon would continue to be well below system design capacities and historical operating levels. Additional domestic enrichment facilities could be built at alternate sites in the future, and the impacts to water resources would likely be similar to those described in this Draft EIS for the proposed action. Therefore, the water resource impacts associated with the no-action alternative are expected to be SMALL.

4.4.7 Ecological Impacts

The no-action alternative would avoid the need to clear and grade the 10-hectare (24-acre) area needed for the X-745H Cylinder Storage Yard north of Perimeter Road, which has the potential for small impacts to the local habitat and water quality in nearby tributaries leading to Little Beaver Creek. All activities at Piketon would continue on their present course without any new or greater ecological impacts. If additional domestic enrichment facilities are built in the future, the ecological impacts at any alternate site(s) may be larger than those associated with the proposed action if all the facilities needed to be built from scratch (about half of the proposed ACP facilities already exist), and if the selected site(s) have more pristine or sensitive ecological features. However, even in this case, ecological impacts would be expected to be limited and mitigated. Therefore, the ecological impacts of the no-action alternative are expected to be SMALL.

4.4.8 Socioeconomic Impacts

Under the no-action alternative, UF_6 production would continue at the Paducah Gaseous Diffusion Plant, avoiding the impacts to the Paducah region of influence that would arise from cessation of enrichment operations at that site. The most significant avoided impact of the no-action alternative would be the

adverse effect to employment in the region surrounding Paducah, as described in Section 4.2.8.4. The level of activity at Paducah would remain temporarily constant under the no-action alternative and those jobs would not be lost.

On the other hand, the no-action alternative would also imply that none of the socioeconomic benefits associated with the proposed action, including increased employment, income, and tax revenues described in Sections 4.2.8.2 and 4.2.8.3, would accrue to the community in the Piketon region of influence. Adverse effects to the Piketon region of influence would include the loss of approximately 1,500 direct and indirect jobs during the 30-year operations phase, 3,362 direct and indirect jobs during the five-year construction phase, and 2,130 direct and indirect jobs during the 10-year manufacturing phase that would have been created by the proposed action.

Eventually, additional domestic enrichment facilities would likely be built in one or more other places in order to meet the nation's growing demand for enriched uranium. This would be expected to result in the same cessation of activities at Paducah as under the proposed action, and the same socioeconomic impacts of the proposed action but an alternate location. Therefore, the socioeconomic impacts of the no-action alternative are expected to be SMALL.

4.4.9 Environmental Justice Impacts

Since the no-action alternative would not be expected to cause any high and adverse impacts, it should not raise any environmental justice issues. Therefore, any impacts would be SMALL.

4.4.10 Noise Impacts

Under the no-action alternative, the nature and scale of existing activities at Piketon and Paducah, and their associated noise levels, would remain constant. Additional domestic enrichment facilities could be constructed in the future. Depending on the construction methods and design of these facilities, the likely noise impact would be similar to that described for the proposed action. Therefore, noise impacts would be expected to be SMALL.

4.4.11 Transportation Impacts

Under the no-action alternative, traffic volumes and patterns would remain the same as described in Sections 3.12 and 4.2.11. Transportation of materials to, from, and between the Paducah and Portsmouth Gaseous Diffusion Plants would continue at present levels. Wastes resulting from United States Enrichment Corporation activities at Piketon would continue to be shipped off the reservation to treatment and disposal facilities, at rates and along routes similar to the current pattern. Additional domestic enrichment facilities could be constructed in the future, with transportation impacts likely to be similar to those described here for the proposed action. Overall, the transportation impacts of the no-action alternative would be expected to be SMALL.

4.4.12 Public and Occupational Health Impacts

Under the no-action alternative, there would not be any new activities that would pose a risk of worker injuries and illnesses and no new releases of non-radiological or radiological contaminants that could result in greater public exposures and health risks. All levels of activities, releases, and health impacts would remain constant and the subject of ongoing monitoring and assessment programs. The public and occupational health impacts of any other domestic enrichment facilities that would need to be built instead of the proposed ACP would also be expected to be appropriately controlled through engineering

design, best management practices, and regulatory controls. Therefore, the public and occupational health impacts of the no-action alternative would be expected to be SMALL.

4.4.13 Waste Management Impacts

Under the no-action alternative, new wastes, including sanitary, hazardous, low-level radioactive, and low-level mixed wastes, would not be generated, managed, and disposed. Additional domestic enrichment facilities could be constructed in the future. Depending on the construction methods, the design, and the location of these facilities relative to suitable waste management facilities, the likely waste management impacts would be similar to the proposed action. A significant difference could exist if another enrichment facility is not co-located with a depleted uranium conversion facility, like the ACP is adjacent to the new DOE conversion facility at Piketon. This would create additional requirements to transport the tails from the enrichment facility to a suitable conversion facility. That added transportation, however, would be subject to all NRC and Department of Transportation requirements and should pose only a small risk to workers and the public. Therefore, the impacts from waste management would likely be SMALL.

4.5 References

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5. MITIGATION

This chapter addresses potential means to mitigate adverse environmental impacts from the proposed action as required by Appendix A of Title 10, Part 51, of the *Code of Federal Regulations* (10 CFR Part 51). Under Council on Environmental Quality regulation 40 CFR 1500.2(f), Federal agencies shall to the fullest extent possible "use all practicable means consistent with the requirements of the *National Environmental Policy Act* and other essential considerations of national policy to restore and enhance the quality of the human environment and avoid or minimize any possible adverse effects of their actions on the quality of the human environment." The Council on Environmental Quality regulations define mitigation to include activities that (1) avoid the impact altogether by not taking a certain action or parts of an action; (2) minimize impacts by limiting the degree or magnitude of the action and its implementation; (3) repair, rehabilitate, or restore the affected environment; (4) reduce or eliminate impacts over time by preservation or maintenance operations during the life of the action; or (5) compensate for the impact by replacing or substituting resources or environments. This definition has been used in identifying potential mitigation measures. As such, mitigation measures are those actions or processes (e.g., process controls and management plans) that would be implemented to control and minimize potential impacts from construction and operation activities for the proposed American Centrifuge Plant (ACP).

USEC Inc. (USEC) must comply with applicable laws and regulations, including obtaining all appropriate construction and operating permits. A complete discussion of applicable laws and regulations is included in Chapter 1 of this Draft Environmental Impact Statement (EIS). The mitigation measures proposed by USEC, many of which are compliance related are discussed in Section 5.1.

Based on the potential impacts identified in Chapter 4 (Environmental Impacts), the U.S. Nuclear Regulatory Commission (NRC) staff has identified additional potential mitigation for the proposed ACP. These mitigation measures are described in Section 5.2.

The proposed mitigation measures provided in this chapter do not include environmental monitoring activities. Environmental monitoring activities are described in Chapter 6 of this Environmental Impact Statement.

5.1 Mitigation Measures Proposed by USEC

USEC identified mitigation measures in the Environmental Report (USEC, 2005a) that would reduce the environmental impacts associated with the proposed action. Table 5-1 lists the mitigation measures impact areas for the construction phase of the proposed action. Table 5-2 lists the mitigation measures impact areas for operations.

Table 5-1 Summary of Preliminary Mitigation Measures Proposed by USEC for Construction

Impact Area	Activity	Proposed Mitigation Measures
Geology and Soils	Soil disturbance	Use best management and construction practices to minimize the extent of excavation.
		Install physical barriers such as silt fences and straw bales, and re-seed disturbed areas to minimize erosion and sediment runoff.
	Soil contamination	Implement a Spill Prevention, Control, and Countermeasures Plan (SPCC).
		Sample, analyze and manage contaminated soils in accordance with NRC, State and other Federal requirements.
Water Resources	Runoff	Install physical barriers such as silt fences and straw bales, and re-seed disturbed areas to minimize erosion and sediment runoff.
		Use engineering controls, and best management and construction practices to minimize the extent of excavation.
		Implement an SPCC.
		Outside areas and the building roofs drain to the storm sewer.
	Water use	Implement a Pollution Prevention Plan to reduce or eliminate discharge of waste.
	Groundwater	Implement an SPCC.
		Sample, analyze and manage contaminated soils in accordance with NRC, State and other Federal requirements.
Ecological Resources	Wetlands disturbance	Maintain a buffer near adjacent wetlands during construction and place temporary lay-down areas on previously disturbed areas.
		Institute compensatory mitigation if impacts to wetlands are unavoidable.
Air Quality	Fugitive dust	Use dust suppression techniques to reduce release of dust during excavation under dry conditions.

Source: USEC, 2005a.

Table 5-2 Summary of Preliminary Mitigation Measures Proposed by USEC for Operations

Impact Area	Activity	Proposed Mitigation Measures
Geology and Soils	Cylinder storage	Implement an SPCC.
		Conduct routine visual inspections and preventive maintenance.
		In the case of release of liquid effluent, use absorbent spill equipment adjacent to the perimeter of the cylinder storage yards. Excavation of affected soils and implement confirmatory sampling to verify that there is no residual contamination. Use clean fill soils in the excavated areas.
	Aboveground storage	Implement an SPCC.
		Conduct routine visual inspections and preventive maintenance.
		Construct above ground storage tanks of appropriate materials.
		Sample accumulated water in tanks and manage according to analytical results.
		Use secondary containment for tanks storing petroleum products.
		Maintain spill cleanup materials in the areas of fuel line and tank hose connections.
		Sample, analyze and manage contaminated soils in accordance with NRC, State and other Federal requirements.
Water Resources	Runoff	Implement an SPCC.
		Conduct routine visual inspections and preventive maintenance of tanks, impoundment dikes.
		Use trained professionals to respond to any spills within process buildings.
	Water use	No wastewater would be discharged from the liquid effluent tanks.
	Groundwater	Implement a Pollution Prevention Plan to reduce or eliminate discharge of waste.
		Implement an SPCC.
		Conduct routine visual inspections and preventive maintenance.
		Sample, analyze and manage contaminated soils in accordance with NRC, State and other Federal requirements.
		Sample accumulated water in tanks and manage according to analytical results.
Public and Occupational Health	Generation of hazardous wastes	Implement a Hazardous Materials Policy to ensure proper identification of hazardous materials provide training on job-specific hazards, emergency procedures, incident management, medical surveillance, and decontamination.
Air Quality	Accidental gaseous releases	Use alumina traps to collect solidified uranyl fluoride.
Waste Management	Generation of industrial, hazardous, radiological, and mixed wastes	Implement an SPCC.
		Implement a Hazardous Materials Policy to eliminate or reduce to levels as low as reasonably achievable, generation of hazardous wastes.
		Implement a Pollution Prevention Program to reduce or eliminate pollution.

Source: USEC, 2005a.

No mitigation measures were identified for the resource areas of:

- Land Use;
- Transportation;
- Noise;
- Historical and Cultural Resources;
- Visual/Scenic Resources;
- Socioeconomics;
- Public and Occupational Health; and
- Environmental Justice.

5.2 Potential Mitigation Measures Identified by NRC

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the mitigation measures proposed by USEC for the proposed ACP and has identified additional potential mitigation measures in addition to those proposed by USEC. Additional potential mitigation measures were only identified for environmental resource areas for which analyses identified a potential for impacts and where the measure would be sufficiently beneficial as to warrant implementation. Potential mitigation measures in addition to those proposed by USEC were identified for air quality (Table 5-3).

Table 5-3 Summary of Potential Mitigation Measures Identified by NRC for Construction

Impact Area	Activity	Proposed Mitigation Measures
Air Quality	Particulate Matter	Use Tier 2 construction-related vehicles (2000 to 2005-model year equipment depending on engine horsepower rating) to reduce diesel emissions. Use ultra-low sulfur diesel.

No additional mitigation measures were identified by NRC staff for facility operations or decommissioning the proposed ACP.

5.3 References

(USEC, 2005a) United States Enrichment Corporation. "Environmental Report for the American Centrifuge Plant in Piketon, Ohio." Revision 3. NRC Docket No. 70-7004. July 2005.

(USEC, 2005b) United States Enrichment Corporation. "POEF-EW-16, Revision 3, Best Management Practices for the United States Enrichment Corporation, March 4." Responses to Request for Additional Information on the Environmental Report, AET 05-0013. April 15, 2005.

6. ENVIRONMENTAL MEASUREMENT AND MONITORING PROGRAMS

This chapter describes the proposed environmental measurements and monitoring program proposed to characterize the effects of potential radiological and nonradiological releases from the proposed American Centrifuge Plant (ACP) in Piketon, Ohio on human health and the environment. Measurement and monitoring programs include direct monitoring of radiological and physiochemical gaseous and liquid effluents from facility operations, and monitoring and measurement of ambient air, surface water, sediment, groundwater, soils, biota, and direct [gamma] radiation in the vicinity of the proposed ACP.

The proposed ACP would be located contiguous to an existing uranium enrichment plant, the Portsmouth Gaseous Diffusion Plant, at which uranium and UF_6 have been managed for approximately 50 years. The Portsmouth Gaseous Diffusion Plant was operated by the United States Enrichment Corporation, a subsidiary of USEC, from 1993 until it was placed in cold standby in 2002, and by predecessor organizations of the United States Enrichment Corporation prior to 1993. The environmental monitoring system for the proposed ACP is based on the experience and data accumulated at the Portsmouth Gaseous Diffusion Plant.

6.1 Radiological Measurements and Monitoring Program

The radiological monitoring and measurement program for the proposed ACP was developed in accordance with NRC Regulatory Guidelines (see Table 6-1). The NRC requires that a radiological monitoring program be established for the proposed ACP to monitor and report the release of radiological air and liquid effluents to the environment.

Table 6-1 Guidance Documents that Apply to the Radiological Monitoring Program

Document	Applicable Guidance
Regulatory Guide 4.15[1]	"Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment." This guide describes a method acceptable to the NRC for designing a program to ensure the quality of the results of measurements for radioactive materials in the effluents and the environment outside of nuclear facilities during normal operations.
Regulatory Guide 4.16[2]	"AMonitoring and Reporting Radioactivity in Releases of Radioactive Materials in Liquid and Gaseous Effluents from Nuclear Fuel Processing and Fabrication Plants and Uranium Hexafluoride Production Plants." This guide describes a method acceptable to the NRC for submitting semiannual reports that specify the quantity of each principal radionuclide released to unrestricted areas to estimate the maximum potential annual dose to the public resulting from effluent releases.

Notes:
[1] NRC, 1985.
[2] NRC, 1979.

Compliance with Title 10, "Energy,"of the *U.S. Code of Federal Regulations* (10 CFR) §20.1301 would be demonstrated using a calculation of the total effective dose equivalent to the individual who would likely receive the highest dose in accordance with 10 CFR § 20.1302(b)(1). Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I" describes the methodology for determining the total effective dose equivalent to the maximum exposed individual (NRC, 1977). Administrative action levels would be established for air emissions and wastewater effluent samples and monitoring instrumentation based on normal background radionuclide concentrations, existing administrative limits, and regulatory limits.

Table 6-2 provides a summary of the environmental measurement and monitoring program sampling locations, parameters, and frequency proposed for the ACP.

Table 6-2 Radiological Environmental Measurement and Monitoring Program Sampling Locations, Parameters, and Frequency

Media	Sampling Locations	Parameters	Frequency
Surface Water	RW-2, RW-3, RW-5, RW-7, RW-12, RW-13, RW-33, RW-10N, RW-10S, RW-10E, RW-10W	Total uranium, technicium-99, gross alpha/beta	Monthly
	RW-1, RW-6, RW-8	Total uranium, technicium-99, gross alpha/beta, fluoride, phosphorous-total	Weekly
Sediments	RM-6, RM-1, RM-12, RM-11, RM-7, RM-8, RM-5, RM-13, RM-33, RM-3, RM-2, RM-9, RM-10, RM-10N, RM-10E, RM-10S, RM-10W	Metals (Al, Sb, As, Ba, Be, Cd, Ca, Cr, Cu, Fe, Pb, Mg, Mn, Ni, K, Se, Si, Tl, Zn), Hg, Ag, PCBs, total uranium, technicium-99, gross alpha/beta	Semi-annually
Soils	(RIS-1, 3, 5, 12, 15, 17, 19, 22, 25, 26, 32, 33, 34, 35, 36) (SAS-1, 2, 3, 4, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29) (RS-10N, 10S, 10E, 10W)	Total uranium, technicium-99, gross alpha/beta	Semi-annually
Vegetation	(RIV-1, 3, 5, 12, 15, 17, 19, 22, 25, 26, 32, 33, 34, 35, 36) (SAV-1, 2, 3, 4, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29) (RV-10N, 10S, 10E, 10W)	Total uranium, technicium-99, gross alpha (if total uranium >0.1 ug/g), fluoride, gross alpha/beta	Semi-annually
Biota (fish)	RW-1, RW-2, RW-6, RW-8	Total uranium, technicium-99, gross alpha/beta, PCBs and Cr	Annually
Wildlife (deer)	Onsite	Total uranium, technicium-99, gross alpha/beta, fluoride, PCBs (fat, fetus)	Annually
Crops	5 to 6 locations	Total uranium, technicium-99, gross alpha (if total uranium >0.1 ug/g)	Annually

Notes:
ug/g = micrograms per gram.
Source: USEC, 2005.

Sampling and monitoring for radiological air emissions and ambient air quality are described in sections 6.1.1 and 6.1.2. Sampling and monitoring for radiological wastewater emissions and surface water and sediment are described in sections 6.1.3 and 6.1.4. Groundwater monitoring (conducted by the U.S. Department of Energy (DOE)), soils and vegetation sampling, and direct radiation monitoring are described in sections 6.1.5, 6.1.6, and 6.1.7, and laboratory standards for the monitoring and measurement program are described in Section 6.1.8.

6.1.1 Air Emissions Monitoring

Potentially radioactive airborne releases from the proposed ACP would be discharged through monitored discharge points, including:

- X-3346 Feed and Customer Services Building;
- X-3001 and X-3002 Process Buildings;
- X-3356 Product and Tails Withdrawal Building;
- X-3012 Process Support Building;
- X-7725 Recycle/Assembly Facility;
- X-7726 Centrifuge Training and Test Facility; and
- X-7727H Interplant Transfer Corridor.

Airborne release monitoring procedures for these sources would be designed in a manner to determine the quantities and concentrations of radionuclides discharged to the environment, in accordance with 10 CFR Part 70. Uranium isotopes anticipated to be released as airborne emissions would include uranium-234, uranium-235, uranium-236,and uranium-238. Specific compounds would include depleted hexavalent chromium, triuranium octaoxide (U_3O_8) and uranyl fluoride (UF_2). Ventilation air emissions from the process buildings would be monitored under the Radiation Protection Program. Environmental Compliance personnel would review summaries of the monitoring data at least quarterly to verify that ventilation exhausts are insignificant as defined in NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility,* i.e., less than 1.1×10^{-8} becquerels per milliliter (3×10^{-13} microcuries per milliliter) uranium (NRC, 2002).

Vent samples (i.e., activated alumina) would be analyzed for uranium isotopes (uranium-234, uranium-235, and uranium-238) and technicium-99. Uranium isotope concentrations are determined using either alpha spectrometry or inductively coupled plasma/mass spectrometry. Technetium concentrations would be determined using liquid scintillation counting. Analytical results would be reported in micrograms of analyte per gram of alumina. These results would then be converted to grams released using recorded flow data and the measured weight of alumina in the sampler and to activity using published specific activities for individual isotopes. Gaseous effluents equivalent to an annual public dose of less than 1.0×10^{-06} sievert (0.1 millirem) are anticipated. Since the airborne concentrations in 10 CFR Part 20, Appendix B, Table 2 are equivalent to an annual dose of 0.0005 sievert (50 millirem), the minimum detectible activity of these methods would be equivalent to less than 0.2 percent of the 10 CFR Part 20, Appendix B, Table 2 values.

Airborne release monitoring for proposed ACP air emissions sources would include the following buildings:

<u>X-3346 Feed and Customer Services Building</u>

The Feed Area of this building sublimes uranium hexafluoride (UF_6) for feed to the enrichment process, and contains a variety of potential sources for radioactive air emissions, both as gaseous UF_6 and particulate uranyl fluoride. These sources would be vented to the atmosphere through an evacuation system, which has separate sub-systems to control gaseous and airborne particulate emissions. Both sub-systems exhaust to a continuously monitored combined vent. The Customer Services Area of this building would liquefy UF_6 for quality control sampling and transfer of UF_6 material to customer cylinders for shipment. This area also would contain multiple potential sources for radioactive air emissions, both as gaseous UF_6 and particulate UF_2. These emissions sources would vent through a similar evacuation system with another continuously monitored combined vent. Each vent would be equipped with continuous gas flow monitoring instrumentation with local readout as well as the analytical

instrumentation required to continuously sample, monitor, and to alarm UF_6 breakthrough in the vent gas stream.

X-3001 and X-3002 Process Buildings

The X-3001 and X-3002 process buildings would house the operating centrifuge machines that separate the UF_6 into enriched product and depleted tails, and contain a limited variety of potential sources for radioactive air emissions, primarily as gaseous UF_6. These sources would be vented to the atmosphere through either the purge vacuum or evacuation vacuum systems, discharged through the X-3001 process vent. Both systems would exhaust to a common continuously monitored vent. Each process building vent would be equipped with continuous gas flow monitoring instrumentation with local readout, as well as analytical instrumentation to continuously sample, monitor, and alarm UF_6 breakthrough in the vent gas stream.

A continuous vent sampler using alumina media would be used to monitor the purge vacuum and evacuation vacuum system vents for UF_6. Weekly primary sample traps would be analyzed for uranium-234, uranium-235, uranium-238, and technetium-99. A secondary trap would be replaced quarterly. USEC does not expect to detect technetium-99 in the proposed ACP, but all vent samplers at the Portsmouth Gaseous Diffusion Plant, including those to be used at the proposed ACP, would be analyzed for technetium-99. Uranium isotope concentrations would be determined using either alpha spectroscopy or inductively coupled plasma/mass spectrometry, with minimum detectable activity of less than 0.2 percent of the 10 CFR 20, Appendix B, Table 2, values. A representative sample of air effluent would be collected using an isokinetic probe and monitoring of both vent and sampler air flows.

X-3356 Product and Tails Withdrawal Building

The X-3356 building would withdraw and desublime both the product and tail streams from the enrichment process, and would contain a variety of potential sources for radioactive air emissions, both as gaseous UF_6 and particulate uranyl fluoride. These sources would be vented to the atmosphere through evacuation systems similar to the X-3346 building. There would be separate evacuation systems, with separate monitored vents, for the tails withdrawal and the product withdrawal areas. The effluents from both sub-systems would be combined and vented to the atmosphere through a common vent after each sub-system has removed the uranium. Each vent would be equipped with continuous gas flow monitoring instrumentation with local readout as well as the analytical instrumentation required to continuously sample, monitor and to alarm UF_6 breakthrough in the vent gas stream.

X-3012 Process Support Building

The X-3012 building provides process control functions and maintenance support. Contaminated components may be serviced in the maintenance shops in the X-3012 building. Components requiring repair or examination that have been in service will be opened using appropriate personnel protective equipment, and may also include engineered local ventilation systems to capture any residual uranium ventilation air in the X-3012 building would be monitored under the Radiation Protection Program.

X-7725 Recycle/Assembly Facility; X-7726 Centrifuge Training and Test Facility; and X-7727H Interplant Transfer Corridor

Centrifuges would be assembled and may be disassembled for repair or inspection in either the X-7725 or X-7726 facilities. Assembled equipment may be tested in Gas Test Stands. Exhaust from the test stands would pass through alumina traps to a continuously monitored vent. The vent would be equipped with continuous gas flow monitoring instrumentation with local readout, as well as the analytical

instrumentation required to continuously sample, monitor, and to alarm UF_6 breakthrough in the vent gas stream. Ventilation air in both the X-7725 and X-7726 facilities would be monitored under a Radiation Protection Program.

Fugitive emissions from the X-7726 static stand would be captured by local ventilation systems. USEC does not expect measurable emissions from the X-7726 static stand as a result of opening centrifuges that have operated on UF_6 gas.

6.1.2 Ambient Air Quality Monitoring

Between 1980 and 2002, annual gaseous uranium air emissions from the Portsmouth Gaseous Diffusion Plant ranged between 3.59×10^{10} and 1.9×10^{8} becquerel per year (0.97 and 0.005 curies per year). Ambient air samples collected over this period by the Portsmouth Gaseous Diffusion Plant operators showed that these levels of air emissions do not produce a quantifiable difference in ambient air concentrations in unrestricted areas. Facility operations at the proposed ACP are not expected to exceed the levels of gaseous uranium air emissions monitored for the Portsmouth Gaseous Diffusion Plant between 1980 and 2002 (USEC, 2005).

In addition, experience at the Portsmouth Gaseous Diffusion Plant has shown that any unplanned air emissions release of uranium large enough to produce high or intermediate consequences to human health or the environment would first produce a large and very visible cloud of white smoke at the point of release. USEC has written a procedure for the proposed ACP for dealing with unplanned releases that includes immediate reporting of observed releases to the shift manager and evaluation by the environmental professionals of available information concerning potential consequences of the release (USEC, 2005). This approach is consistent with the guidance in NUREG-1520 (NRC, 2002). Ambient air quality impacts of proposed ACP facility operations, including action levels, will be based on gaseous air emissions monitoring of process vent emissions and other information and atmospheric dispersion modeling.

The United States Enrichment Corporation ceased sampling ambient air and returned the Portsmouth Gaseous Diffusion Plant's network of permanent air samplers to DOE in 1999, which upgraded the samplers for DOE use for ambient air quality monitoring. Based on the DOE annual environmental reports published since 1999, average airborne uranium concentrations have been 1.1×10^{-15} micrograms per milliliter (1.5×10^{-19} ounces per gallon) onsite (i.e., within the DOE reservation), 7.4×10^{-16} micrograms per milliliter (9.9×10^{-20} ounces per gallon) in unrestricted areas offsite, and 5.5×10^{-16} micrograms per milliliter (7.4×10^{-20} ounces per gallon) at the DOE background station (USEC, 2005). These results are a minimum of three orders of magnitude less than the applicable discharge limits for uranium isotopes in 10 CFR Part 20, Appendix B. Therefore, USEC does not anticipate conducting any ambient air quality monitoring in addition to that conducted by DOE and reported in DOE annual environmental reports.

The United States Enrichment Corporation maintains a meteorological tower that is located on the southern section of the DOE reservation. The tower is equipped with instruments at the ground, 10-, 30-, and 60-meter (32.8-, 98.4-, and 196.9-foot) levels. Among the parameters measured are air temperature, wind speed, wind direction, relative humidity, solar radiation, barometric pressure, precipitation, and soil temperature. Data from the National Weather Service or other local sources may be used in lieu of, or to supplement, onsite data. The air emissions source monitoring data and meteorological data would be used to calculate the environmental impacts of airborne emissions from the proposed ACP using U.S. EPA-approved dispersion models.

6.1.3 Wastewater and Stormwater Discharge Monitoring

There are four principal potential sources of radioactivity discharges to surface water from the proposed ACP facility operations, including: (1) the X-6619 Sewage Treatment Plant identified as permitted outfall 003; (2) the Portsmouth Gaseous Diffusion Plant Recirculating Cooling Water System identified as permitted outfall 004; (3) the X-2230N West Holding Pond identified as permitted outfall 012; and (4) the X-2230M Southwest Holding Pond identified as permitted outfall 013 (see Figure 6-1). The X-2230M and X-2230N holding pond discharges would be equipped with automated samplers and continuous flow measurement. The combined discharge of the recirculating cooling water system, the DOE reservation sewage treatment plant discharge, and other reservation holding ponds would be also equipped with automated samplers and continuous flow measurement. Outfalls with intermittent flows would be monitored with grab samplers during periods of outfall flow. Water samples from the permitted outfalls would be analyzed for gross alpha and gross beta activity, technetium beta activity, and total uranium concentration. The gross activities would be determined by proportional counter and the technetium activity by liquid scintillation.

The minimum detectable activities for water samples are 1.85 x 10^{-4} becquerels per milliliter (5 x 10^{-9} microcuries per milliliter) for gross alpha, 5.55 x 10^{-4} becquerels per milliliter (1.5 x 10^{-8} microcuries per milliliter) for gross beta, 7.4 x 10^{-4} becquerels per milliliter (2 x 10^{-8} microcuries per milliliter) for technetium beta. The total uranium concentration would be determined by inductively coupled plasma/mass spectrometry, with a minimum detectable concentration of 0.001 micrograms per milliliter (1.35 x 10^{-7} ounces per gallon). The isotopic distribution of the total uranium would be estimated to match the calculated uranium alpha activity to the measured gross alpha activity. The values for liquid releases are .0111 becquerels per milliliter (3 x 10^{-7} microcuries per milliliter) for each of the uranium isotopes and 2.22 becquerels per milliliter (6 x 10^{-5} microcuries per milliliter) for technetium. Consequently, the Minimum Detectable Activities for liquid effluents would be less than two percent of the applicable 10 CFR Part 20, Appendix B, Table 2 values.

The only underground tanks at the proposed ACP used to collect material that might contain radionuclides are the liquid effluent control underground tanks located south of the X-3001 Process Building. The liquid effluent control system consists of a set of drains and collection tanks primarily for collecting leaks and spills of chemically treated water. The drains are located throughout the process buildings. The tanks have a capacity of 2,082 liters (550 gallons) each. Liquid level gauges mounted above grade on pipe stands monitor the tanks. Routine monitoring of the tanks' contents would be based on observing and tracking the levels indicated on the gauges. USEC would use level gauges to detect any unplanned releases to groundwater or soil from the liquid effluent control system inventory tracking would be relied on to indicate any leaks from the tanks. The contents of the liquid effluent control system will be sampled and analyzed for the same parameters as the continuous permitted outfalls prior to disposal.

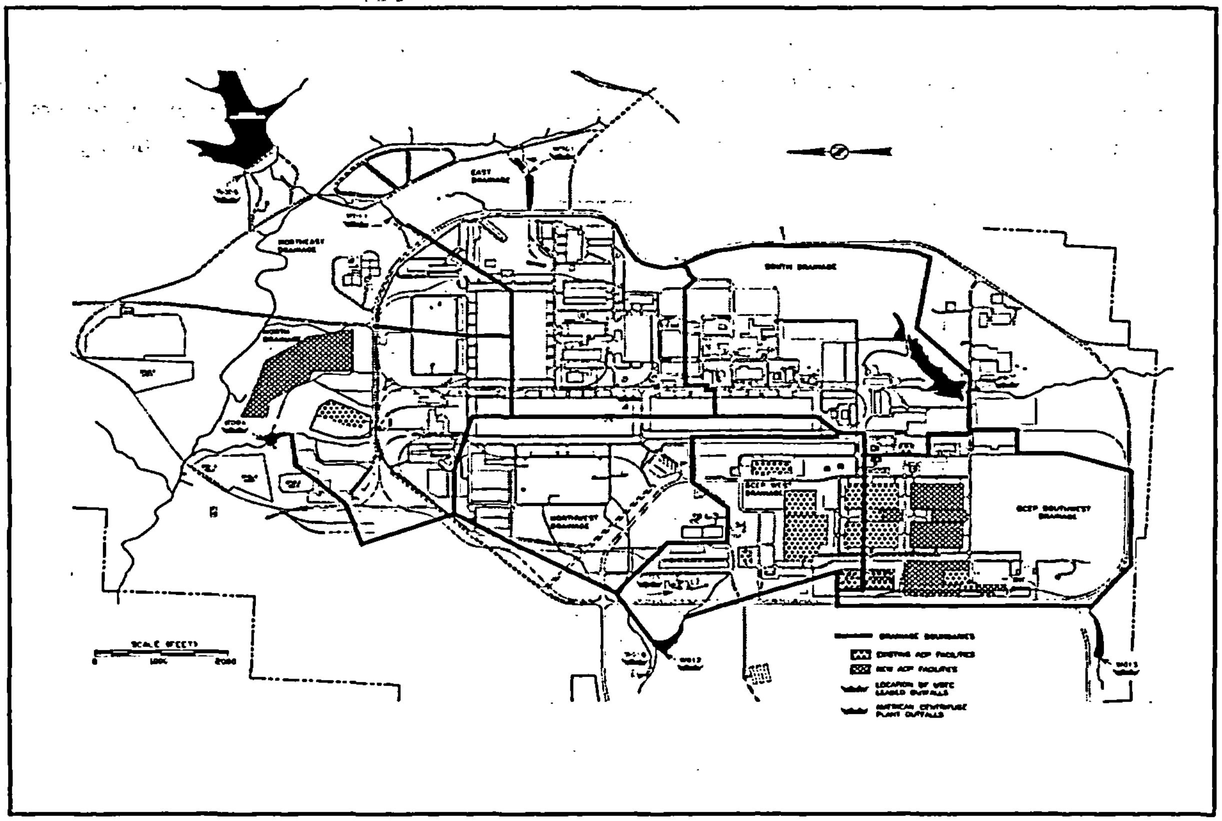


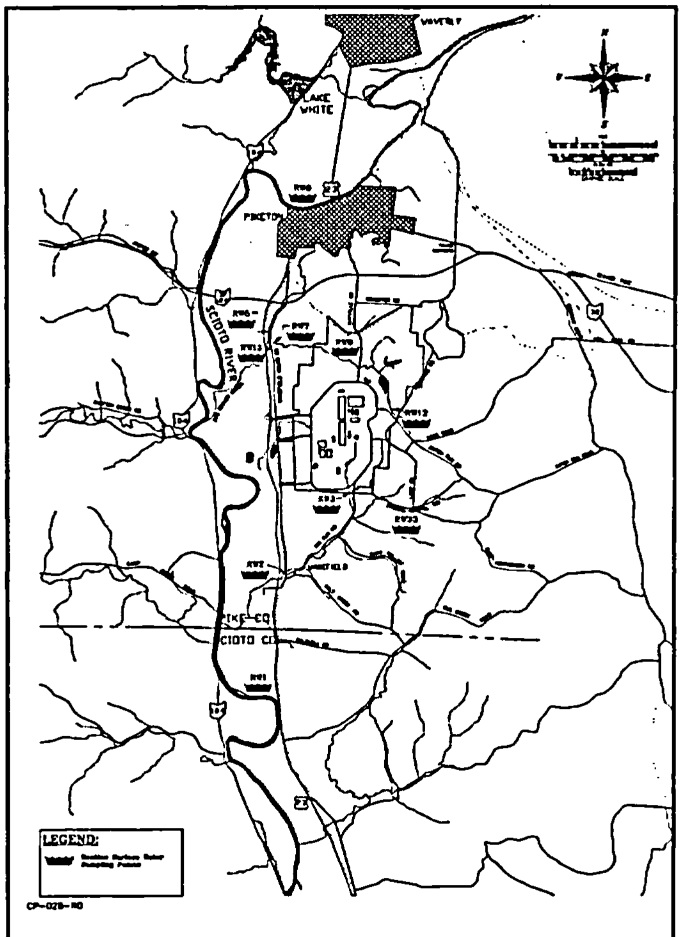
Figure 6-1 United States Enrichment Corporation National Pollutant Discharge Elimination System Outfalls at the DOE Reservation at Piketon (USEC, 2005)

6.1.4 Surface Water and Sediment Monitoring

Between 1980 and 2002, annual radiological wastewater discharges to surface water from the Portsmouth Gaseous Diffusion Plant have ranged between 2.63×10^{10} and 9.92×10^{8} becquerel per year (0.71 and 0.026 curies per year) (USEC, 2005). Surface water samples collected over this period by Portsmouth Gaseous Diffusion Plant operators show that these levels of wastewater discharges do not produce a statistically significant difference in radionuclide concentrations in the Scioto River (USEC, 2005). Facility operations at the proposed ACP are not expected to exceed the levels of wastewater discharge monitored for the Portsmouth Gaseous Diffusion Plant between 1980 and 2002. Impacts to local receiving waters from proposed ACP facility operation wastewater discharges, including action levels, will be based on discharge monitoring (described above) and pathways modeling.

United States Enrichment Corporation maintains a surface water monitoring program designed to assess the impacts to local receiving waters of wastewater discharges from DOE environmental remediation projects or historical contamination. Radiological analyses would be performed on grab samples from upstream and downstream locations in Little Beaver Creek, Big Beaver Creek, Big Run Creek, and the Scioto River (see Figure 6-2). Surface water samples would be collected weekly from the Scioto River and one location (RW8) in Little Beaver Creek. Other locations would be sampled monthly.

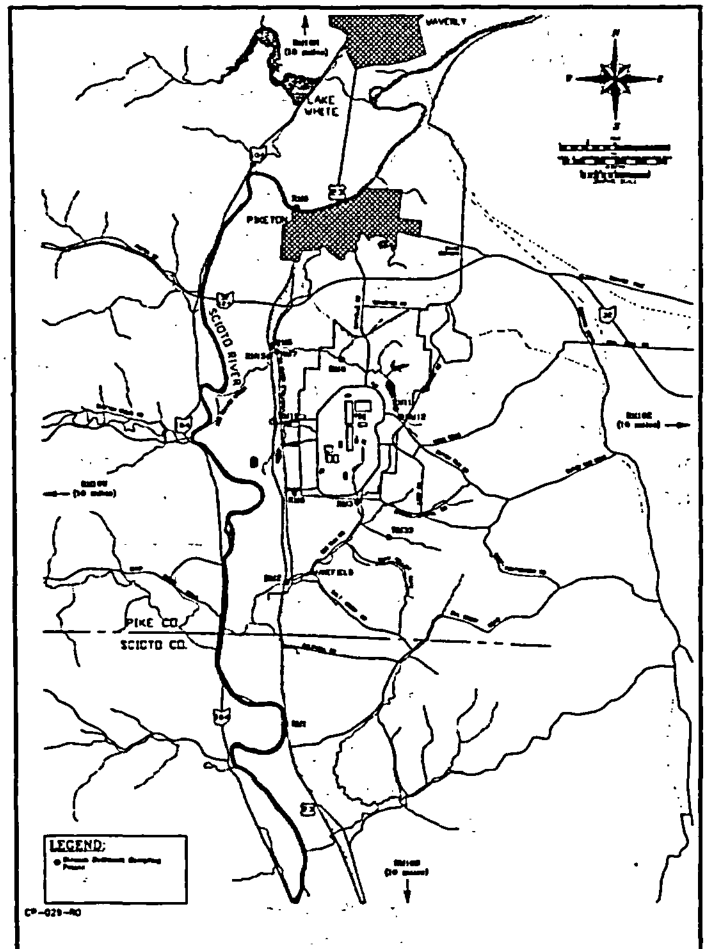
Analysis of sediment samples collected between 1980 and 2002 by Portsmouth Gaseous Diffusion Plant operators show that wastewater and stormwater discharges do not produce a statistically significant difference in sediment radionuclide concentrations in the Scioto River (USEC, 2005). Impacts of facility operations at the proposed ACP on sediment radionuclide concentrations in local receiving waters, including action levels, will be based on wastewater discharge monitoring pathways modeling.



Locations of Routine Surface Water Sampling Points

Figure 6-2 Locations of Routine Surface Water Sampling Locations (USEC, 2005)

Sediment sampling around the site would be conducted semiannually to assess potential radionuclide accumulation in the surrounding receiving streams. The sediment sampling locations include both upstream and downstream locations. Sample locations are described in Figure 6-3. Sediment sample analyses include gross alpha activity, gross beta activity, technetium beta activity, and total uranium concentration.



Locations of Stream Sediment Sampling Points.

Figure 6-3 Locations of Stream Sediment Sampling Points (USEC, 2005)

6.1.5 Groundwater Monitoring

Due to historical operations, the DOE reservation has multiple plumes of groundwater contamination. The primary contaminant in the plumes is the halogenated solvent trichloroethylene, but limited areas of technetium contamination also exist. DOE is conducting groundwater monitoring as part of a site-wide environmental remediation program under an Agreed Order with the State of Ohio (USEC, 2005).

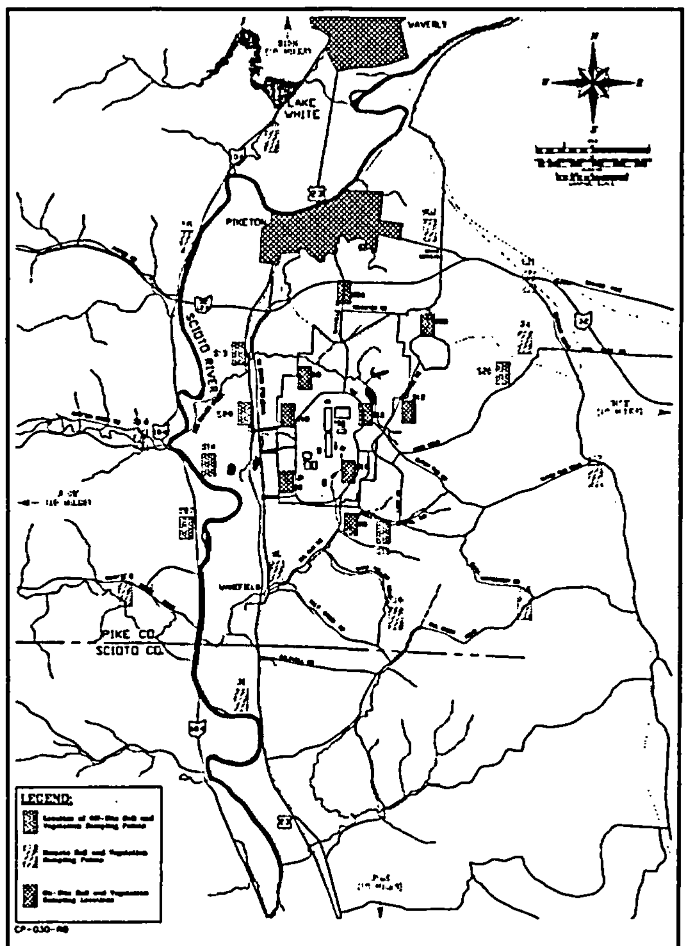
Groundwater monitoring data are reported as part of DOE's Annual Environmental Report for the DOE reservation. All groundwater monitoring conducted on the site is under the control of the DOE. United States Enrichment Corporation does not conduct a separate groundwater monitoring program.

6.1.6 Soil and Vegetation (Biota) Sampling

Between 1980 and 2002, annual uranium air emissions from the Portsmouth Gaseous Diffusion Plant have ranged between 3.59 x 10^{10} and 1.85 x 10^{8} becquerel per year (0.97 and 0.005 curies per year) (USEC, 2005). Soil and vegetation samples collected over this period by Portsmouth Gaseous Diffusion Plant operators show that these levels of air emissions do not produce a statistically significant difference in soil and vegetation concentrations in unrestricted areas. Wastewater and stormwater discharges from

the DOE reservation do not have a direct impact on soil and terrestrial vegetation around the DOE reservation. Facility Operations at the proposed ACP are not expected to exceed the levels of air emissions measured between 1980 and 2002. Therefore, impacts to soil and vegetation from ACP facility operation, including action levels, will be based on air emissions monitoring and atmospheric dispersion modeling.

United States Enrichment Corporation maintains a soil and vegetation monitoring program to assess the long-term impacts of air emissions from proposed ACP facility operations and from DOE environmental remediation projects, and to assess the impact of a high or intermediate consequence release that has already been detected and controlled (USEC, 2005). Soil and vegetation (wide-blade grass, typical of local cattle forage) samples would be collected semiannually. The sampling networks completely surround the DOE reservation, including the predominant downwind directions, and would be administratively divided into onsite, off-reservation (up to 5 kilometers [3.1 miles]) and remote (5 to 16 kilometers [3.1 to 10 miles] off-reservation). Figure 6-4 describes the sampling locations. Soil samples would be analyzed for gross alpha activity, gross beta activity, technetium beta activity, and total uranium concentration. Vegetation samples would be analyzed for technetium beta activity and total uranium concentration.



Location of Soil and Vegetation Sampling Points.

Figure 6-4 Locations of Soil and Vegetation Sampling Points (USEC, 2005)

In addition to the semiannual vegetation samples, United States Enrichment Corporation also collects annual crop samples from local gardeners and farmers on a voluntary basis. Because of the voluntary nature of these samples, the sampling locations change from year to year. Crop samples would normally be analyzed for technetium beta activity and total uranium concentration only. The analytical methods would be the same as for the vegetation samples.

6.1.7 Direct Gamma Radiation Monitoring

The only significant sources of environmental gamma radiation on site are the uranium isotope uranium-235 and the short-lived uranium-238 daughters. There would be small amounts of other gamma emitters present on site as sealed sources and laboratory standards, but direct radiation from these sources would benot detectable at any significant distance from the sources. Gamma radiation levels in unrestricted areas around the proposed ACP are dominated by naturally occurring radioactive materials.

United States Enrichment Corporation conducts external gamma radiation monitoring consisting of lithium fluoride thermoluminescence dosimeters positioned at various site locations and at locations off-reservation. There are nine dosimeters spaced around the perimeter of the limited area of the DOE reservation including cylinder storage areas; eight dosimeters spaced around the DOE reservation boundary; and two dosimeters located off-reservation. These dosimeters are collected and analyzed quarterly. Processing and evaluation are performed by a processor holding current accreditation from the National Voluntary Laboratory Accreditation Program of the National Institute of Standards and Technology.

6.1.8 Laboratory Standards

A National Voluntary Laboratory Accreditation Program-certified vendor processes the environmental thermoluminescence dosimeters. A laboratory licensed by the NRC or an Agreement State provides other radiological and chemical analyses for the monitoring and measurement program. The following description is based on current services provided by the onsite X-710 building laboratory, which is licensed by the State of Ohio and certified by the NRC, but is not part of the proposed ACP or operated by USEC. Off-reservation vendors providing analytical services for the proposed ACP will be required to meet the equivalent standards as part of the contract.

Environmental samples would be analyzed for gross activities by proportional counter and technetium activity by liquid scintillation. To accommodate a data sharing agreement with DOE, uranium concentrations in environmental samples would be determined by alpha spectrometry. The minimum detectable activities/concentrations would be comparable to those for effluent samples.

Laboratory quality control includes the use of a dedicated Chain of Custody system, formal written procedures, National Institute of Standards and Technology-traceable standards, matrix spikes, duplicate, and replicate samples, check samples, and blind and double-blind quality control samples.

Any laboratory providing analytical services to the proposed ACP will be required to participate in at least one laboratory intercomparison program covering each type of analysis contracted for. Intercomparison programs that the X-710 building laboratory currently participates in include:

- U.S. EPA Discharge Monitoring Report Study;
- National Institute of Occupational Safety and Health Proficiency Analytical Testing Program;
- U.S. EPA Water Pollution Performance Evaluation Study;
- U.S. EPA Water Supply Study;

- National Institute of Occupational Safety and Health Environmental Lead Proficiency Analytical Testing Program;
- Proficiency Environmental Testing program, a commercial program sponsored by the Analytical Products Department of Belpre, Ohio;
- DOE Environmental Measurements Laboratory Radionuclide Quality Assessment Program; and
- DOE's Mixed Analyte Performance Evaluation Program.

6.2 Nonradiological Measurements and Monitoring Program

As discussed in this chapter and summarized in Chapter 4, nonradiological impacts to the environment from the construction and operation of the proposed ACP are expected to be minimal. Consequently, non-radiological environmental monitoring prescribed through the various environmental permits for the construction and operation of the proposed ACP are expected to be sufficient to evaluate any nonradiological environmental impacts.

6.3 References

(NRC, 1985) U.S. Nuclear Regulatory Commission. "Monitoring and Reporting Radioactivity in Releases of Radioactive Materials in Liquid and Gaseous Effluents from Nuclear Fuel Processing and Fabrication Plants and Uranium Hexafluoride Production Plants." Regulatory Guide 4.16, Revision 1, 1985.

(NRC, 1979) U.S. Nuclear Regulatory Commission. "Quality Assurance for Radiological Monitoring Programs (Normal Operations) – Effluent Streams and the Environment." Regulatory Guide 4.15, Revision 1, 1979.

(NRC, 1977) U.S. Nuclear Regulatory Commission. "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purposes of Evaluating Compliance with 10 CFR Part 50, Appendix I." Regulatory Guide 1.109, Revision 1, ML 003740384, October 1977.

(NRC, 2002) U.S. Nuclear Regulatory Commission. NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility." May 2002.

(USEC, 2005) United States Enrichment Corporation. "Environmental Report for the American Centrifuge Plant in Piketon, Ohio." Revision 3. Docket No. 70-7004. July 2005.

7. COST BENEFIT ANALYSIS

The potential environmental impacts of constructing and operating the proposed ACP at Piketon, Ohio are discussed in Chapter 4 of this Draft EIS. This chapter summarizes those impacts along with other costs and benefits associated with the proposed action and the no-action alternative. The economic costs and benefits provided by USEC in its License Application and Environmental Report are presented and supplemented as necessary with additional assessments by the NRC staff.

Cost benefit analysis, also known as value impact analysis, provides a rationale for deciding whether an industrial project is likely to have a net positive economic impact by aggregating each of the costs and benefits resulting from the project. Cost benefit analysis may be used to compare alternative processes for achieving the same goals and for developing an objective rationale for choosing between competing processes. Cost benefit analysis involves valuing the benefits and negative impacts associated with a project in monetary terms, to the extent possible. The project with the highest net present value in discounted dollar terms is usually considered the best option. Alternatively, cost benefit analyses may rely entirely or partially on qualitative or ordinal scales to rate impacts and values for each attribute or impact area of concern (i.e., data can be ranked). Different weights may then be assigned to various attributes or impact areas consistent with stakeholder preferences to determine the optimal project alternative. The methodology employed for a cost benefit analysis usually depends on the specific issues involved in a project.

To support the NRC's decisionmaking this chapter compares costs and benefits both quantitatively, in monetary terms, and qualitatively. Section 7.1 weighs the costs and benefits associated with the proposed action. Section 7.2 then compares the costs and benefits for the proposed action relative to those of the no-action alternative. Section 7.3 combines these other two sections into overall conclusions. All of these sections draw heavily on the impacts discussion in Chapter 4 of this Draft EIS and in particular the socioeconomic impact analyses in Sections 4.2.10 and 4.4.10. Alternatives that have previously been ruled out for failing to meet the project's technical and policy objectives are described in Section 2.2.4 and are not revisited in this chapter.

7.1 Costs and Benefits of the Proposed Action

This section describes the costs and benefits of each life-cycle stage of the proposed action. Quantitative estimates (in terms of dollars) are provided where possible. Other costs and benefits are described in qualitative terms.

7.1.1 Costs of the Proposed Action

The direct costs associated with the proposed action may be categorized by the following life-cycle stages.

- Site preparation and construction (including refurbishment of existing facilities);
- Centrifuge manufacturing and equipment assembly;
- Facility operation; and
- Decontamination and decommissioning.

Table 7-1 presents the direct costs associated with each of these life-cycle stages. Pursuant to 10 CFR 2.390, the cost associated with facility operation is withheld.

Table 7-1 Direct Costs Associated with Proposed Action Life-cycle Stages

Life-cycle Stage of the Proposed Action	Cost
Site preparation and construction	$1.449 billion (nominal dollars[a]) between calendar years 2006 and 2010
Centrifuge manufacture and equipment assembly	$1.423 billion (nominal dollars) between calendar years 2004 and 2013
Facility operation	Costs accrue between calendar years 2010 and 2040; see Appendix G for costs
Decontamination and decommissioning	$435 million (2004$[b]) between calendar years 2040 and 2045

Notes:
[a] Nominal dollars are not adjusted for inflation.
[B] Dollars stated in year 2004 price levels.
Source: USEC, 2005a.

The proposed action would also result in indirect costs to the economy. The socioeconomic impacts in the region of influence would include impacts to area housing resources, community and social services, and public utilities. As a result of the proposed action, the population in the region of influence is expected to grow. With this population growth, there would be an expected increased demand for housing, school populations may grow, and demand may increase for community services like fire protection, law enforcement, and healthcare. As discussed in Section 4.2.10, these impacts are estimated to be small.

Finally, the proposed action would result in impacts to various resource areas, which can also be considered "costs" for the purpose of this analysis. The resource areas and corresponding impacts are summarized below and described in more detail in Chapter 4 of this Draft EIS. The impact of the proposed action is estimated to be small for all resource areas except air quality and transportation, which may have small to moderate impacts.

- **Land use** - The impact of the proposed action on land use and values is expected to be small. Site preparation and construction activities would occur on approximately 22 hectares (55 acres) of land, which comprises about 1 percent of the total 1,500 hectare (3,700 acre)- DOE reservation. The changes would occur on previously disturbed land that is not considered prime farmland, and would be consistent with current land use.

- **Historical and cultural resources** - The impact of the proposed action on historical and cultural resources is expected to be small. There would be no adverse indirect or direct effect on the 14 sites potentially eligible for the National Register of Historic Places within the area of potential effect of the project. Also, construction of new buildings and refurbishment of existing buildings would result in buildings of design, size, and function similar to the existing buildings, and therefore would not alter the historic setting of the existing Gaseous Diffusion Plant.

- **Visual and scenic resources** - The impact of the proposed action on visual and scenic resources is expected to be small. The Bureau of Land Management Visual Resources Management rating system classifies the proposed ACP site as Class III or IV, meaning it has moderate to little scenic value. Construction of the ACP would not alter the site's classification. No scenic rivers, nature preserves, or unique visual resources exist in the project area.

- **Air quality** - The impact of the proposed action on air quality is expected to be small to moderate. Airborne emissions from site preparation and construction should not result in exceedances of air quality standards, with the possible exception of short-term increases in particulate matter. Radiological releases from soil disturbances and decommissioning of the Gas Centrifuge Enrichment Plant would be small and controlled. Emissions from diesel generators would not cause air quality problems and maximum predicted concentrations of hydrogen fluoride resulting from ACP operations are below safe levels. Based on the maximum radiological emission rates for the ACP and the comprehensive site monitoring program, the expected impact to air quality from the plant's radiological emissions is also expected to be small.

- **Geology and soils** - The impact of the proposed action on site geology and soils is expected to be small. Most of the site is an existing industrial facility with altered natural soils. The soils are cohesive and over-consolidated and have low potential for liquefaction. There is little likelihood of impact from soil compaction or subsidence. The flat terrain where the ACP buildings would be located, and the dense soil, low moisture content, and vegetative cover in the area of a new large cylinder storage yard (X-745H) make landslides unlikely. Construction activities would not alter current drainage and would not disturb any soils that qualify for protection as prime farmland. There would be a potential for increased erosion and siltation of streams near the construction site of the new large cylinder storage yard, but both of these potential impacts should be minimized by the use of standard best management practices.

- **Water resources** - The impact of the proposed action on local water resources is expected to be small. Potential stream sedimentation from construction activities would be minimized by the use of silt fences and other best management practices. Any impacts to stream water quality would be of short duration. None of the proposed site preparation and construction activities would occur within a 100-year floodplain. Groundwater withdrawals would increase by 10 percent over current usage rates, but would still be only 31 percent of the total design capacity of the site's well fields, would not affect groundwater availability, and would not pose an increased risk of subsidence. Wastewater would continue to discharge from permitted NPDES outfalls and discharge rates, though increased above current levels, would represent only 75 percent of the existing system's design capacity. USEC does not anticipate any liquid discharges of radioactive materials from the proposed ACP (i.e., from cooling water, storm water runoff, or sanitary water). The potential for leaks or spills that could contaminate water resources would be limited by an approved Spill Prevention Control and Countermeasures Plan.

- **Ecological resources** - The impact of the proposed action on ecological resources is expected to be small. Construction of the X-745H Cylinder Storage Yard would result in increased erosion, stormwater runoff, and loss of 24 acres of vegetation, but would result in small impacts to the flora and fauna in and around the tributaries of Little Beaver Creek. That same cylinder storage yard would also be located within 500 meters of suitable summer habitat for the endangered Indiana bat, although studies have not documented the presence of this bat species on the DOE reservation. None of the site construction activities would occur in wetlands. However, some construction would occur adjacent to small wetlands, and standard erosion control measures would be used to limit sedimentation in these areas.

- **Environmental justice** - Within an 80-km (50-mile) radius around the proposed ACP site, there are 18 Census tracts that have populations qualifying as low-income and two Census tracts that have populations qualifying as minority. The closest of these tracts is 28 km (17 miles) from the proposed site. The proposed action would not result in disproportionately high or adverse impacts to any of these populations.

- **Noise** - Estimated construction noise levels at the site are below acceptable guidelines. No adverse noise impacts from ACP operations are expected at the closest residence due to low operational noise, the attenuation provided by the building façade, and distance attenuation of over 900 meters (3,000 feet). For these reasons, noise impacts are expected to be small.

- **Transportation** - Increased truck and vehicle traffic should result in small changes in current levels of congestion and delays on U.S. Route 23 and Ohio State Road 32, small increases in the number of traffic accidents resulting in injuries or fatalities, and small increases in vehicle emissions that should not degrade local air quality. Radiation exposures resulting from the planned shipments of radioactive materials are estimated to cause 0.02 latent cancer fatalities per year of operation or about one cancer fatality over thirty years of operation. The probability of a severe transportation accident that releases sufficient quantities of UF_6 that could pose a health risk is low, but the consequences of such an accident, should it occur, are high. Weighing all of these considerations together, the transportation impacts of the proposed action are expected to be small to moderate.

- **Public and occupational health** - The proposed action would result in small increases in the current number of occupational injuries and illnesses at the site, though still less than historical levels. Construction and process areas would be segregated, and personnel monitoring programs would be implemented, to minimize worker exposures to annual radiation doses of less than the 10 CFR § 20.1201 limit of 50 millisieverts (5,000 millirem). All routine radiation exposures to members of the public are expected to be significantly below the 10 CFR Part 20 regulatory limit of 1 millisievert (100 millirem) and 40 CFR Part 190 regulatory limit of 0.25 millisieverts (25 millirem) for uranium fuel-cycle facilities. Analytical results also indicate that plausible radiological accidents at the proposed ACP pose acceptably low risks. In addition, public and occupational exposures to non-radiological contaminants are projected to be less than applicable limits. Therefore, these impacts associated with the proposed action are expected to be small.

- **Waste management** - Site preparation, construction, and operations would generate varying amounts of low-level radioactive, low-level mixed, hazardous, sanitary/industrial, and recyclable wastes. All of these wastes would be managed in accordance with existing procedures for controlling contaminant releases and exposures. With the exception of the depleted uranium, all of the wastes would also be generated at volumes that are well within existing management capacities. The ACP would generate approximately 42,800 cylinders of depleted UF_6, containing approximately 571,000 metric tons (630,000 tons) of material. All of this depleted UF_6 could be converted to a more stable form at the new DOE conversion facility at Piketon, which would require DOE to significantly extend the life of this facility. The converted material would then be shipped by rail to an acceptable western disposal site, where sufficient capacity exists and where the disposal impacts should be small.

7.1.2 Benefits of the Proposed Action

The proposed action would result in the production of 3.5-7 million SWUs of enriched uranium between 2010 and 2040. As discussed in Section 1.3 of this Draft EIS, this level of production would represent an augmentation of the domestic supply of enriched uranium and would meet the following needs:

- The need for enriched uranium to fulfill domestic electricity requirements and replace the shortfall in supply created by the end of the Megatons-to-Megawatts program planned in 2013;

- The need for increased domestic supplies of enriched uranium for national energy security; and

- The need for upgraded uranium enrichment technology in the United States to replace the existing aging and less efficient gaseous diffusion plants.

The proposed action would also result in small positive socioeconomic impacts in the region around Piketon, as described in Section 4.2.10. Table 7-2 presents the employment and tax revenue benefits associated with the proposed action. In each year between 2006 and 2010, average annual employment as a result of site preparation, refurbishment, and construction activities is estimated at 3,362 full-time jobs. In addition, state income tax revenues would increase by an estimated $2.3 million per year. State sales tax receipts are estimated to increase by $3.7 million during site preparation and construction. Pike County would also benefit from increased sales tax revenues. These revenues are estimated to increase by $414,000.

During the ACP operations phase between 2010 and 2040, 1,500 jobs would be created in the region of influence. The State would benefit from $1.8 million and $2.4 million in additional income and sales tax receipts, respectively. Pike County would receive an estimated $263,000 in additional sales tax revenues.

The decontamination and decommissioning phase of the proposed action is expected to create a total of 841 annual, full-time jobs between 2040 and 2045, of which 407 would be new (the others would be filled by transitioned USEC workers). The State would raise income and sales tax revenues by $576,000 and $932,000, respectively. Pike County's sales tax revenues would increase by an estimated $103,000.

Table 7-2 Socioeconomic Benefits Associated with the Proposed Action

Life-cycle Stage of the Proposed Action	Direct and Indirect Jobs Created (Annual, Full-Time Jobs)	State Income Tax Revenues per Year	State Sales Tax Revenues per Year	Pike County Sales Tax Revenues per Year
Site preparation and construction	3,362	$2.3 million (2004$)	$3.7 million (2004$)	$414,000 (2004$)
Facility operation	1,500	$1.8 million (2013$)	$2.4 million (2013$)	$263,000 (2013$)
Decontamination and decommissioning	841	$576,000 (2004$)	$932,000 (2004$)	$103,000 (2004$)

Source: USEC, 2005a.

7.1.3 Conclusions Regarding the Proposed Action

This analysis demonstrates that there are significant economic and national energy benefits associated with the proposed action. There are also employment benefits that would result in increases to State and local tax revenues. In terms of costs, there are direct costs associated with the construction and operation phases of the proposed action, as well as indirect costs resulting from impacts associated with the proposed action on various resource areas. However, these impacts are estimated to be small in magnitude and small in comparison to the benefits of the proposed action. Therefore, the benefits of the proposed action are believed to outweigh the costs of the proposed action.

7.2 Comparative Cost Benefit Analysis of Proposed Action Relative to No-Action Alternative

This section compares the costs and benefits of the proposed action to those of the no-action alternative. This comparison focuses on the tradeoffs between the proposed ACP at Piketon versus continued operation of the Paducah Gaseous Diffusion Plant, since these are the main features that distinguish the proposed action from the no-action alternative. Other possible actions involving other domestic and

foreign uranium enrichment suppliers are likely to be similar under the two alternatives and are therefore not considered in the comparison.

7.2.1 Methodology

The proposed action and the no-action alternative are first assessed in Section 7.2.2 for compliance with various policy and technical objectives articulated by DOE. The proposed action and the no-action alternative are then analyzed in Section 7.2.3 for impacts and values across the following impact areas or attributes:

- Construction and manufacturing costs;
- Operating costs;
- Decommissioning costs; and
- Environmental and public and occupational health impacts.

The other indirect cost areas described in Section 7.1.1 are not included as part of this comparison because the effect of these impacts is assumed to be either: (1) approximately equal for the proposed action and the no-action alternative as defined above; or (2) too small a differential impact to materially affect the comparative cost benefit analysis.

The NRC staff assessed impacts and values for these criteria using either: (1) estimated dollars; or (2) ordinal ratings based on expert judgment where quantification is regarded as inappropriate or unnecessary. This approach is consistent with NRC guidance and is well suited to the current analysis.

This analysis does not attempt dynamic general equilibrium modeling of the economic effects of a cheaper source of enriched uranium for nuclear power plants. No attempt is made to model the effects of reduced enriched uranium prices on the ratio of nuclear and non-nuclear power in the domestic economy, on overall power demand and price, and on the potential economic benefits to consumers and suppliers. Instead, the analysis focuses on estimating the economic savings to society from replacing Paducah Gaseous Diffusion Plant production by a cheaper and less resource-intensive source based on centrifuge technology.

In addition, this analysis does not consider the costs and benefits associated with actions pertaining to the Portsmouth Gaseous Diffusion Plant. The Portsmouth Gaseous Diffusion Plant was closed in May 2001 to reduce operating costs. The NRC staff does not believe that there has been any significant change in the factors that were considered by USEC in its decision to cease uranium enrichment at Portsmouth. For the purposes of this cost benefit analysis, actions pertaining to the Portsmouth Gaseous Diffusion Plant, such as decontamination and decommissioning, are considered unrelated to the no-action alternative and the proposed action.

7.2.2 Compliance with Policy and Technical Objectives

As stated in correspondence with the NRC and in an agreement with USEC (DOE, 2002 and USEC, 2005a), and as described in Section 1.3 of this Draft EIS, DOE has the following policy and technical objectives that are relevant to the choice of an enrichment technology:

- The need for enriched uranium to fulfill domestic electricity requirements;

- The need for domestic supplies of enriched uranium for national energy security; and

- The need for upgraded uranium enrichment technology in the United States.

The following sections compare the proposed action and the no-action alternative in terms of how well they meet each of these objectives.

7.2.2.1 Meeting Future Demand

Currently, the demand for enriched uranium in the United States is met from three categories of sources:

- Domestic production of enriched uranium;
- The Megatons-to-Megawatts program; and
- Other foreign sources.

The Megatons-to-Megawatts program, which currently provides approximately 42 percent of the enriched uranium purchased by commercial nuclear reactors in the U.S., is likely to be available only until 2013 (USEC, 2005a). A significant shortfall in supply is therefore likely to arise after this date unless new sources are developed. Increasing imports from foreign sources are inconsistent with domestic energy security objectives. The only option is therefore to increase domestic production of enriched uranium.

Increasing production levels at the Paducah Gaseous Diffusion Plant may not be technically feasible given the maturity of the plant and its dated technology. Under the proposed action, the initial capacity of the ACP would be 3.5 million SWUs per year, which would provide roughly 25 percent of the projected U.S. enrichment needs and allow the Paducah plant to be retired. This capacity would be further enhanced to 7 million SWUs per year by 2013.

The proposed action is therefore better able to meet the objective of fulfilling the increased demand for enriched uranium than the no-action alternative.

7.2.2.2 National Energy Security

Currently, foreign sources supply as much as 86 percent of the U.S. demand for enriched uranium. All of the domestic production of enriched uranium currently takes place at a single plant – the aging Paducah Gaseous Diffusion Plant. The heavy dependence on foreign sources and the lack of diversification of domestic sources of enriched uranium represents a potential reliability risk for the domestic nuclear energy industry, which supplies 20 percent of national energy requirements. Interagency discussions led by the National Security Council have concluded that the United States should maintain a viable and competitive domestic uranium enrichment industry for the foreseeable future. DOE has noted the importance of promoting the development of additional domestic enrichment capacity to achieve this objective (DOE, 2002).

In this context, the proposed action offers a means of increasing domestic uranium enrichment capacity beyond existing levels. Furthermore, in combination with other new facilities, such as the 3 million SWU per year enrichment plant proposed by Louisiana Energy Services, the proposed action represents a significant diversification of domestic sources. As noted in the previous section, the no-action alternative does not offer much scope for increasing production levels and presents some degree of reliability risk.

The proposed action is therefore better able to meet the objective of national energy security than the no-action alternative.

7.2.2.3 Technology Upgrade

A DOE-USEC agreement in 2002 intended to "facilitate the deployment of new, cost effective advanced treatment technology in the U.S. on a rapid scale" (USEC, 2005a). In this context, the proposed action

represents the implementation of a technology that is contemporary, cost-effective, and reliable. The no-action alternative would involve continuation of a technology that is over 50 years old and that is, in comparison, highly resource-intensive. Continued operation of the Paducah Gaseous Diffusion Plant would involve high energy costs and high levels of water and Freon gas consumption (these differences in operating costs and resource consumption are described in the following sections).

The proposed action is therefore better able to meet the objective of domestic uranium enrichment technology upgrade than the no-action alternative.

7.2.3 Impacts and Value Analysis

This section compares the impacts and values of the proposed action and the no-action alternative over the following cost and impact categories:

- Construction and manufacturing costs;
- Operating costs;
- Decommissioning costs; and
- Environmental and public and occupational health impacts.

Appendix G presents a quantitative net present value analysis of the two alternatives integrating construction, manufacturing, operation, and decommissioning costs. Environmental and public and occupational health impacts have been considered qualitatively.

7.2.3.1 Construction and Manufacturing Costs

The site preparation and construction phase of the proposed action is estimated to incur costs of $1,449 million (nominal dollars) between calendar years 2006 and 2010 (USEC, 2005a). The manufacturing phase of the proposed action is estimated to cost $1,423 million (nominal dollars) between calendar years 2004 and 2013 (USEC, 2005a). These costs are for a plant capacity of 7 million SWUs per year and are consistent with those used by USEC to estimate employment and other socioeconomic impacts.

By comparison, no construction costs are assumed to be associated with the no-action alternative.

7.2.3.2 Operating Costs

The operating costs per SWU associated with the proposed action and the no-action alternative are discussed in Appendix G. These estimates, which are not presented here in order to preserve proprietary information (pursuant to 10 CFR 2.390), are based on the Paducah Gaseous Diffusion Plant 2005 budget and the proposed ACP estimated operation costs were provided by USEC (USEC, 2005b).

For the proposed action, the overall operating costs per SWU are approximately 20 percent of the operating costs per SWU of the no-action alternative. The large difference in operating costs derives from the lower resource consumption of the proposed action. The proposed action consumes only 5 percent as much electricity per SWU, 3 percent as much water per SWU, and 3.3 percent as much natural gas per SWU as the no-action alternative. The proposed action has a slightly higher oil consumption per SWU compared to the no-action alternative, but, unlike the no-action alternative, does not consume any coal.

While many of the benefits of lower resource consumption are captured in the differential operating cost estimates of the two alternatives, it is likely that significant potential benefits to the environment and to public health – which can also be characterized as positive externalities – are not fully accounted for in

the cost estimates. This issue is discussed in Section 7.2.3.4. Therefore, the overall operating cost savings of the proposed action may be even higher from a social perspective than estimated here.

7.2.3.3 Decommissioning Costs

The decontamination and decommissioning phase of the proposed action (with a plant capacity of 7 million SWUs per year) is estimated to incur costs of $435 million (2004$) over a period of six years (USEC, 2005a). Decontamination and decommissioning activities are expected to begin 30 years after the commencement of operations at the plant and are estimated in this analysis to occur from 2040 through 2045. The NRC evaluated the adequacy of USEC's proposed funding for these activities in the Safety Evaluation Report on the proposed ACP.

The decommissioning schedule and costs of the no-action alternative are considered independent of the proposed action and are not part of this analysis. Similarly, the decommissioning schedule and costs of the Portsmouth Gaseous Diffusion Plant are considered independent of the proposed action and are not part of this analysis.

The comparative cost benefit analysis also does not factor in costs associated with tails disposition. It is assumed that for a given production level, the amount of tails generated by the ACP would be roughly equivalent to the amount of tails that would have been generated using the Paducah Gaseous Diffusion Plant (USEC, 2005a). Therefore, no incremental costs result from the proposed action relative to the no-action alternative.

7.2.3.4 Environmental and Public and Occupational Health Impacts

Both the proposed action and the no-action alternative present limited environmental and public and occupational health impacts resulting from radiological and nonradiological releases.

The proposed action is likely to have much lower radiological releases than the no-action alternative because the amount of piping and pumping is significantly smaller and there are consequently fewer components that may leak. The smaller plant associated with the proposed action is likely to require less maintenance, which implies lower dose to workers, and a cleaner plant means less ambient worker exposure fewer radiation control areas.

The largest relative environmental and health impact is likely to derive from the much lower power requirement for the proposed ACP compared to the Paducah Gaseous Diffusion Plant. As previously mentioned, the proposed ACP is expected to consume only 4 percent as much electricity per SWU and 3.3 percent as much natural gas per SWU as the Paducah Gaseous Diffusion Plant. The proposed ACP would not consume any coal. This implies significantly lower emissions of gases associated with fossil fuel combustion, some of which are known to have substantial environmental and public health impacts.

Therefore, the proposed action is likely to have a much lower environmental and public health impact than the no-action alternative.

7.2.4 Conclusions Regarding the Proposed Action Versus the No-Action Alternative

Based on these considerations, the proposed action is preferable relative to the no-action alternative in the following respects:

- The proposed action better satisfies DOE's policy and technical objectives for meeting future demand, national energy security, and technological upgrades, relative to the no-action alternative.

- The proposed action would result in significant savings to the national economy, relative to the no-action alternative, even after accounting for the costs incurred during the construction, manufacturing, and decommissioning phases. These savings have been quantitatively estimated for different scenarios in Appendix G.

- The proposed action would have a significantly lower public and occupational health impact relative to the no-action alternative.

- The proposed action would have positive impacts on local employment, income and tax revenues during the construction, manufacturing, and decommissioning phases, as discussed in Sections 4.2.8 and 4.2.14.8.

This analysis therefore concludes that the proposed action definitively outranks the no-action alternative on all substantive impact areas.

7.3 Overall Cost Benefit Conclusions

The analysis in Section 7.1 demonstrated that there are significant economic and national energy benefits associated with the proposed action. There are also direct costs associated with the construction and operation phases of the proposed action, as well as indirect costs resulting from impacts associated with the proposed action on various resource areas. However, these impacts are estimated to be small in magnitude and small in comparison to the benefits of the proposed action.

The analysis in Section 7.2 illustrated the significant net benefits of the proposed action in comparison to the no-action alternative, in which there is continued uranium enrichment at the Paducah Gaesous Diffusion Plant. The proposed action better satisfies DOE's policy and technical objectives for meeting future demand for enriched uranium, improved national energy security, and desired technological upgrades, relative to the no-action alternative.

It is therefore apparent that, either considered on its own or in comparison to the no-action alternative, the proposed action is associated with significant net positive benefits.

7.4 References

(USEC, 2005a) United States Enrichment Corporation. "Environmental Report for the American Centrifuge Plant in Piketon, Ohio." Revision 3. Docket No. 70-7004. July 2005.

(USEC, 2005b) United States Enrichment Corporation. "Additional Responses to Request for Additional Information Regarding the Environmental Report (TAC No. L32307) - Proprietary Information." Dated April 21, 2005.

(DOE, 2002) U.S. Department of Energy. Letter from W.D. Magwood to M. Virgilio, U.S. Nuclear Regulatory Commission. Uranium Enrichment. July 25, 2002.

8. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

8.1 Unavoidable Adverse Environmental Impacts

Information on the adverse impacts to the affected environment at the proposed ACP that cannot be avoided for this proposed action is provided in Chapter 4 of this Draft EIS. The environmental impacts from the proposed action are generally small and would, in most cases, be mitigated by methods described in Chapter 5. Monitoring methods are described in Chapter 6. Table 2-8 compares the potential impacts from the proposed action to those of the no-action alternative. Detailed analysis of the potential impacts on public health and safety is provided in the safety evaluation report prepared by the NRC. Following is a summary of the impacts presented in Chapter 4.

- **Land Use** - Site preparation and construction would physically change approximately 22 hectares (55 acres) of land on the DOE reservation. These physical changes would be minor because: (1) the area to be occupied by the proposed ACP would be only a small portion of the 1,500-hectare (3,700-acre) reservation; (2) the majority of the proposed land has been previously disturbed; (3) no prime farmland would be affected; and (4) site preparation and construction would not affect or preclude any existing land uses on the property that surrounds the DOE reservation. The changes would simply convert the land use on the DOE reservation from managed lawns, fields, and limited forest buffer to developed areas, resulting in an overall SMALL impact.

- **Historic and Cultural Resources** - There would be no adverse indirect or direct effect on the 14 sites potentially eligible for the National Register of Historic Places within the area of potential effect of the project. Also, construction of new buildings and refurbishment of existing buildings would result in buildings of design, size, and function similar to the existing buildings, and would not alter the historic setting of the existing Gaseous Diffusion Plant. Therefore, impacts on historic and cultural resources should be SMALL.

- **Visual and Scenic Resources** - The Bureau of Land Management Visual Resources Management rating system classifies the proposed ACP site as Class III or IV, meaning it has moderate to little scenic value. Construction of the ACP would not alter the site's classification. No scenic rivers, nature preserves, or unique visual resources exist in the project area. Therefore, impacts of the proposed action on visual and scenic resources are expected to be SMALL.

- **Air Quality** - Airborne emissions from site preparation and construction should not result in exceedances of air quality standards, with the possible exception of short-term increases in particulate matter. Radiological releases from soil disturbances and decommissioning of the Gas Centrifuge Enrichment Plant would be small and controlled. Emissions from diesel generators would not cause air quality problems and maximum predicted concentrations of hydrogen fluoride resulting from ACP operations are below safe levels. Based on the maximum radiological emission rates for the ACP and the comprehensive site monitoring program, the expected impact to air quality from the plant's radiological emissions is also expected to be small. Considering all of these factors together, the air quality impacts would be SMALL in every respect, except for potential short-term increases in particulate matter during the site preparation and construction phase, which would result in MODERATE impacts.

- **Geology and Soils** - Most of the site is an existing industrial facility with altered natural soils. The soils are cohesive and over-consolidated and have low potential for liquefaction. There is little likelihood of impact from soil compaction or subsidence. The flat terrain where the ACP buildings would be located, and the dense soil, low moisture content, and vegetative cover in the area of a new large cylinder storage yard (X-745H) make landslides unlikely. Construction activities would not alter current drainage and would not disturb any soils that qualify for protection as prime farmland. There would be a potential for increased erosion and siltation of streams near the construction site of the new large cylinder storage yard, but both of these potential impacts should be minimized by the use of standard best management practices. For these reasons, the impacts to geology and soil are expected to be SMALL.

- **Water Resources** - Potential stream sedimentation from construction activities would be minimized by the use of silt fences and other best management practices. Any impacts to stream water quality would be of short duration. None of the proposed site preparation and construction activities would occur within a 100-year floodplain. Groundwater withdrawals would increase by 10 percent over current usage rates, but would still be only 31 percent of the total design capacity of the site's well fields, would not affect groundwater availability, and would not pose an increased risk of subsidence. Wastewater would continue to discharge from permitted NPDES outfalls and discharge rates, though increased above current levels, would represent only 75 percent of the existing system's design capacity. USEC does not anticipate any liquid discharges of radioactive materials from the proposed ACP (i.e., from cooling water, storm water runoff, or sanitary water). The potential for leaks or spills that could contaminate water resources would be limited by an approved Spill Prevention Control and Countermeasures Plan. Therefore, impacts to water resources should be SMALL.

- **Ecological Resources** - Construction of the X-745H Cylinder Storage Yard would result in increased erosion, stormwater runoff, and loss of 24 acres of vegetation, but with planned mitigation measures, would result in small impacts to the flora and fauna in and around the tributaries of Little Beaver Creek. That same cylinder storage yard would also be located within 500 meters of suitable summer habitat for the endangered Indiana bat, although studies have not documented the presence of this bat species on the DOE reservation. None of the site construction activities would occur in wetlands. However, some construction would occur adjacent to small wetlands, and standard erosion control measures would be used to limit sedimentation in these areas. For these reasons, impacts to ecological resources are expected to be SMALL.

- **Socioeconomics** - ACP construction and operation would result in a moderate increase in regional employment and a small increase in regional tax revenues (these impacts, however, are generally considered positive, not adverse). Impacts to population characteristics, housing resources, community and social services, and public utilities are projected to be small. Therefore, the socioeconomic impacts of the proposed action are expected to range from SMALL to MODERATE.

- **Environmental Justice** - Within an 80-kilometer (50-mile) radius around the proposed ACP site, there are 18 Census tracts that have populations qualifying as low-income and two Census tracts that have populations qualifying as minority. The closest of these tracts is 28 km (17 miles) from the proposed site. The proposed action would not result in disproportionately high or adverse impacts to any of these populations. Therefore, the environmental justice impacts of the proposed action would be SMALL.

- **Noise** - Estimated construction noise levels at the site are below acceptable guidelines. No adverse noise impacts from ACP operations are expected at the closest residence due to low operational noise, the attenuation provided by the building façade, and distance attenuation of over 900 meters (3,000 feet). Therefore, noise impacts of the proposed action would be SMALL.

- **Transportation** - Increased truck and vehicle traffic should result in small changes in current levels of congestion and delays on U.S. Route 23 and Ohio State Road 32, small increases in the number of traffic accidents resulting in injuries or fatalities, and small increases in vehicle emissions that should not degrade local air quality. Radiation exposures resulting from the planned shipments of radioactive materials are estimated to cause 0.02 latent cancer fatalities per year of operation or about one cancer fatality over thirty years of operation. The probability of a severe transportation accident that releases sufficient quantities of UF_6 that could pose a health risk is low, but the consequences of such an accident, should it occur, are high (resulting in an overall moderate rating). Considering all of these factors together, the transportation impacts of the proposed action are expected to be SMALL to MODERATE.

- **Public and Occupational Health** - The proposed action would result in small increases in the current number of occupational injuries and illnesses at the site, though still less than historical levels. Construction and process areas would be segregated, and personnel monitoring programs would be implemented, to minimize worker exposures to annual radiation doses of less than the 10 CFR § 20.1201 limit of 50 millisieverts (5,000 millirem). All routine radiation exposures to members of the public are expected to be significantly below the 10 CFR Part 20 regulatory limit of 1 millisievert (100 millirem) and 40 CFR Part 190 regulatory limit of 0.25 millisieverts (25 millirem) for uranium fuel-cycle facilities. Analytical results also indicate that plausible radiological accidents at the proposed ACP pose acceptably low risks. In addition, public and occupational exposures to non-radiological contaminants are projected to be less than applicable limits. Therefore, these impacts associated with the proposed action are expected to be SMALL.

- **Waste Management** - Site preparation, construction, and operations would generate varying amounts of low-level radioactive, low-level mixed, hazardous, sanitary/industrial, and recyclable wastes. All of these wastes would be managed in accordance with existing procedures for controlling contaminant releases and exposures. With the exception of the depleted uranium, all of the wastes would also be generated at volumes that are well within existing management capacities. The ACP would generate approximately 42,800 cylinders of depleted UF_6, containing approximately 571,000 metric tons of material. All of this UF_6 would be converted to a more stable form at the new DOE conversion facility at Piketon, which would require DOE to significantly extend the life of this facility. The converted material would then be shipped by rail to an acceptable western disposal site, where sufficient capacity exists and where the disposal impacts should be small. Based on this analysis, the waste management impacts of the proposed action are expected to be SMALL.

8.2 Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

The construction and operation of the proposed ACP would involve the short-term commitment of resource and would permanently commit certain resources (e.g., land, water, electricity, fuel, other construction raw materials) to the facility's construction and operation. The short-term use of such resources would result in long-term socioeconomic benefits to the local area and the region through continued (and increased) employment and expenditures, as described in Section 4.2.10. Long-term

productivity would be facilitated by investments in dependent businesses in the local area and region and would provide further socioeconomic benefits to the local area and region.

8.3 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable commitment of resources for the proposed ACP would include the commitment of land, water, energy, raw materials, and other resources for the construction and operation of the ACP. The impacts of commitment of such resources would be SMALL.

Existing structures at the DOE reservation would be refurbished to accommodate the proposed ACP operations. Proposed changes made to existing facilities would be conducted on land that is already used for industrial purposes. These include the X-3001, X-3002, X2232C, X-7726, X-7727H, X-3012, and X-3324 buildings and facilities. Land in proximity to the X-3001 and X-3002 buildings would be disturbed to construct two additional process buildings and associated support structures. These include two new process buildings (each approximately 304,000 ft^2); new roads and parking areas (108,000 ft^2); and several new cylinder storage yards (totaling approximately 2,268,400 ft^2). (USEC, 2005)

Construction of the proposed ACP would use approximately 814 cubic meters per day (215,000 gallons per day) of water, and operation of the proposed ACP would use up to 1,995 cubic meters per day (527,000 gallons per day) of water (USEC, 2005). This water would be drawn from three existing well fields in the Scioto River Valley Aquifer, which presently serve the DOE reservation, and most of it would then be discharged through NPDES-permitted outfalls that eventually lead to the Scioto River. The projected peak water usage rates represent an increase of approximately 10 percent over current water use at the DOE reservation. Counting the new water demands created by the ACP together with the reservation's current water usage rate, the combined new demand for water would represent only 31 percent of the permitted withdrawal volume from the three well fields.

Energy would be expended in constructing and operating the proposed ACP, including diesel and gasoline fuel for vehicles to transport workers and construction materials to the site during site preparation and construction. Approximately 3,200,000 gallons of diesel fuel and 327,000 gallons of gasoline would be used in constructing the proposed ACP (USEC, 2005). NRC estimates that less than 650,000 gallons of diesel fuel would be used annually in facility operation.

Energy expended would also include electricity consumption for site preparation and construction and for facility operation. Approximately 650,000 megawatt hours of electricity would be consumed during facility operation (USEC, 2005).

The proposed ACP would generate recyclable and non-recyclable waste streams and depleted uranium, as described in Sections 2.1.4 and 4.2.12 of this Draft EIS. Disposal of these wastes would require irreversible and irretrievable commitment of land resources, fuel, and materials.

Additional resources anticipated to be consumed in site preparation and construction include 97,000 yards of concrete, 1,000 yards of asphalt, 15,000 yards of gravel, and 34,000 yards of steel products (USEC, 2005).

8.4 References

(USEC, 2005) United States Enrichment Corporation. "Environmental Report for the American Centrifuge Plant in Piketon, Ohio." Revision 3. Docket No. 70-7004. July 2005.

9. AGENCIES AND PERSONS CONSULTED

The following sections list the agencies and persons consulted for information and data for use in the preparation of this Draft Environmental Impact Statement (Draft EIS):

9.1 Federal Agencies

Advisory Council on Historic Preservation, Office of Federal Agency Programs. Mr. Don Klima, Director

U.S. Department of the Interior, U.S. Fish and Wildlife Service, Ecological Services, Reynoldsberg, Ohio. Mr. Jeromy Applegate

U.S. Department of the Interior, National Park Service. Mr. Tim McKeown, Archeologist

9.2 State Agencies

Ohio Historic Preservation Office, Resource Protection and Review, Columbus, Ohio. Mr. Mark Epstein and Mr. David Snyder

Ohio Environmental Protection Agency, Division of Ground Waters and Community Drinking Water, Pike County. Mr. Randy Smith

Ohio Environmental Protection Agency, Portsmouth Reservation Inspector. Mr. Eric Hart

9.3 Local Agencies

Pike County Commissioners, Waverly, Ohio. President James Brushart

9.4 Indian Tribes

Absentee Shawnee Tribe of Oklahoma, Shawnee, Oklahoma. Tribal Secretary Kenneth Daughtery.

Cayuga Nation, Versailles, New York. Chief James Leaffe

Cherokee Nation of Oklahoma, Ada, Oklahoma.

Citizen Potawatomi Nation, Shawnee, Oklahoma. Chairperson John A. Barret

Deleware Tribe of Western Oklahoma, Anardarko, Oklahoma. President Bruce Gonzales

Eastern Shawnee Tribe of Oklahoma, Seneca, Missouri. Chief Charles D. Enyart

Forest County Potawatomi, Crandon, Wisconsin. Chairperson Harold Frank

Loyal Shawnee Tribe, Jay, Oklahoma. Mr. James Squirrel

Miami Tribe of Oklahoma, Miami, Oklahoma. Mr. John Pryor

Ottawa Tribe of Oklahoma, Miami, Oklahoma. Chief Charles Todd

Peoria Tribe of Oklahoma, Miami Oklahoma. Chief John P. Froman

Prairie Band of Potawatomi Nation, Mayyetta, Kansas. Mr. Ray Kitchkumme

Seneca-Cayuga Tribe of Oklahoma, Miami, Oklahoma. Chief Jerry Dilliner

Seneca Nation of Indians, Salamanca, New York. President Calvin John

Shawnee Tribe, Miami, Oklahoma. Mr. Ron Sparkman

Turtle Mountain Band of Chippewa Indians, Belcourt, North Dakota. Mr. Kade M. Ferris

Wyandotte Nation, Wyandotte, Oklahoma. Chief Leaford Bearskin

10. LIST OF PREPARERS

10.1 U.S. Nuclear Regulatory Commission (NRC) Contributors

Matthew Blevins: EIS Project Manager
M.S., Environmental Systems Engineering, Clemson University, 1995
B.S., Chemistry, West Virginia University, 1993
Years of Experience: 10

Yawar H. Faraz: Licensing Project Manager
B.S., Nuclear Engineering, University of Maryland, 1982
Years of Experience: 23

F. Stanley Echols: Senior Project Manager
Ph.D., Environmental Engineering, University of Florida, 1973
J.D., Law, Georgetown University, 1978
B.S., Nuclear Engineering, University of Florida, 1969
Years of Experience: 30

Ron C. Linton: Project Manager
M.S., Geology, West Virginia University, 1992
B.S., Geology, James Madison University, 1984
Years of Experience: 17

B. Jennifer Davis: Environmental Review Section Chief
M.S., Materials Engineering, University of Maryland, 1995
B.S., Materials Engineering, Virginia Polytechnic Institute and State University, 1986
Years of Experience: 18

Cynthia S. Barr: Transportation Project Manager
M.S., Environmental Systems Engineering, Clemson University, 1998
B.S., Mathematics, College of Charleston, 1991
B.A., Political Science, College of Charleston, 1991
Years of Experience: 7

Alicia Mullins: Environmental Reviewer
B.A., Biology, Gallaudet University, 1990
Years of Experience: 14

10.2 ICF Consulting Contributors

Steve Wyngarden: ICF Consulting Project Manager
M.S., Environmental Management, Duke University, 1982
B.S., Applied Biology, Georgia Institute of Technology, 1980
Years of Experience: 23

Don Hammer: ICF Consulting Deputy Project Manager
B.S., Geology, Colorado State University, 1983
Years of Experience: 22

Lisa Bendixen: Transportation
M.S., Operations Research, Massachusetts Institute of Technology, 1980
B.S., Applied Mathematics, Massachusetts Institute of Technology, 1979
Years of Experience: 20

Mark Bethoney: Graphics
Somerville High School, 1986
Years of Experience: 13

Ed Carr: Air Quality
M.S., Atmospheric Science, University of Washington,1983
B.S., Meteorology, California State University, 1979
Years of Experience: 19

David Coate: Noise
M.S., Energy Technology, Massachusetts Institute of Technology, 1980
B.A., Mathematics, Westminster College, 1978
B.A., Physics, Westminster College, 1978
B.A., Chemistry, Westminster College, 1978
Years of Experience: 27

Ted Coogan: Environmental Justice, Graphics
B.S., Environmental Earth Science, Eastern Connecticut State University, 1986
Years of Experience: 22

Elizabeth Gormsen: Cost-Benefit
M.P.P., Goldman School of Public Policy, University of California, Berkeley, 2002
B.A., Economics with Honors, Colgate University, 1998
Years of Experience: 7

Lesley Jantarasami: Alternatives
B.A., Environmental Science and Policy, Duke University, 2004
Years of Experience: 1

Robert Lanza: Waste Management, Decontamination and Decommissioning, Public and Occupational Health
M.Eng., Chemical Engineering, Cornell University, 1982
B.S., Chemical Engineering, Cornell University, 1980
Years of Experience: 25

Jim Oliver: Public and Occupational Health
M.S., Nuclear Engineering, Georgia Institute of Technology, 1992
B.S., Mechanical Engineering, Georgia Institute of Technology, 1990
Years of Experience: 11

Larry O'Rourke: Transportation
M.A., Government, Johns Hopkins University, 1997
B.A., Political Science, Johns Hopkins University, 1992
Years of Experience: 8

Polly Quick: Historic and Cultural Resources
Ph.D., Anthropology, Harvard University, 1976
M.A., Anthropology, Harvard University, 1970
B.A., Anthropology, Radcliffe College, 1968
Years of Experience: 30

Jim Rice: Geology and Soils, Water Resources
M.S., Geology, New Mexico Institute of Mining and Technology, 1985
B.S., Geology, New Mexico Institute of Mining and Technology, 1981
Years of Experience: 19

Maribelle Rodriguez: Purpose and Need, Affected Environment
M.S., Environmental Engineering, Johns Hopkins University, 1995
B.S., Chemical Engineering, Massachusetts Institute of Technology, 1994
Years of Experience: 10

Todd Stribley: Ecological Resources, Land Use, Historic and Cultural Resources
B.S., Biology, St. Lawrence University, 1992
Years of Experience: 12

David Stuenkel: Transportation
Ph.D., Nuclear Engineering, University of Michigan, 1997
M.S., Nuclear Engineering, University of Michigan, 1994
B.S., Nuclear Engineering, University of Illinois, 1992
Years of Experience: 5

Alan Summerville: Deputy Project Manager
M.A., City Planning, University of Pennsylvania, 1988
B.A., Economics and Political Science, University of Vermont, 1985
Years of Experience: 16

Arun Varghese: Socioeconomics, Cost-Benefit
M.Eng., Civil and Environmental Engineering, Massachusetts Institute of Technology, 2002
M.P.A., Economics and Public Policy, Princeton University, 2001
B.Eng., Chemical Engineering, Bombay University, 1994
Years of Experience: 8

Raymond Wood: Public and Occupational Health, Waste Management
Ph.D., Nuclear/Radiological Engineering, University of Cincinnati, 1994
B.S., Nuclear Engineering, University of Cincinnati, 1980
Years of Experience: 14

APPENDIX A
ENVIRONMENTAL SCOPING SUMMARY REPORT

Docket No. 70-7004

ENVIRONMENTAL IMPACT STATEMENT SCOPING PROCESS

ENVIRONMENTAL SCOPING SUMMARY REPORT

Proposed USEC Inc.
American Centrifuge Plant
Piketon, Ohio

April 2005

U.S. Nuclear Regulatory Commission
Rockville, MD

1. INTRODUCTION

On August 23, 2004, USEC Inc. (USEC) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) for a license to construct, operate, and decommission the American Centrifuge Plant (ACP), a gas centrifuge uranium enrichment facility located on the U.S. Department of Energy (DOE) reservation in Piketon, Ohio. The ACP, if licensed, would enrich uranium for use in commercial nuclear fuel for power reactors. Feed material would be comprised of non-enriched uranium hexafluoride (UF_6). USEC proposes to use centrifuge technology to enrich the isotope uranium-235 in the UF_6 up to 10 percent. The initial license application is for a 3.5 million separative work unit (SWU)[1] facility. Because USEC indicated the potential for future expansion to 7.0 million SWU per year, the environmental review will look at the impacts from a 7.0 million SWU per year facility.

In accordance with NRC regulations in 10 CFR Part 51, and the National Environmental Policy Act (NEPA), the NRC is preparing an Environmental Impact Statement (EIS) for the proposed facility as part of its decision-making process. The proposed action is the issuance of an NRC license for USEC to possess and use special nuclear material, source material, and byproduct material at the proposed ACP. The activities to be conducted under the license would include the construction, operation and decommissioning of the proposed ACP. The EIS will examine the potential environmental impacts associated with the proposed ACP in parallel with the review of the license application. The EIS will be prepared by NRC staff with technical assistance from ICF Consulting Inc. and Trinity Engineering Associates. The NRC has not identified any cooperating agencies for the preparation of this EIS. In addition to the EIS, the NRC will prepare a Safety Evaluation Report (SER) which will document the staff's review of safety and security issues.

The NRC plans to operate on a 30-month licensing schedule with 19 months allocated for the environmental review. The current schedule for publication of the draft EIS is in August 2005, with a public meeting scheduled in September 2005 after publication of the draft EIS. The final EIS is tentatively scheduled for publication in March, 2006.

As part of the NRC's environmental review, and to comply with 10 CFR 51.26 and 51.27, scoping was initiated on October 15, 2004, with the publication in the *Federal Register* of a Notice of Intent to prepare an EIS and to conduct a scoping process (69 *Fed. Reg.* 61268). Scoping is an early and open part of the NEPA process designed to help determine the range of actions, alternatives, and potential impacts to be considered in the EIS, and identify significant issues related to the proposed action. The NRC solicits input from the public and other agencies in order to focus on issues of genuine concern.

On January 18, 2005, the NRC staff held a public scoping meeting in Piketon, Ohio, to receive both oral and written comments from interested parties. The public scoping meeting began with NRC staff providing a description of the NRC's role, responsibilities, and mission. A brief overview of the safety review process was followed by a description of the environmental review process and a discussion of how the public can effectively participate. The majority of the meeting was reserved for attendees to ask questions and make comments on the scope of the environmental review. The NRC postponed the originally scheduled public scoping meeting in Piketon, Ohio from November 15, 2004 until January 18, 2005 after removal of public

[1] SWU relates to a measure of the work used to enrich uranium.

documents from the NRC public reading room and website for several weeks in November 2004 due to security concerns. Due to this delay, the public scoping comment period was extended from December 6, 2004 until February 1, 2005.

As part of the environmental review, NRC has begun a consultation process with the Ohio State Historic Preservation Officer (SHPO) as required by Section 106 of the National Historic Preservation Act. In accordance with 36 CFR 800.3(f), NRC will consult with Native American Tribal members identified by the SHPO and will consult with representatives of the Pike County Commission. Other consultations will include the Fish and Wildlife Service as required by Section 7 of the Endangered Species Act.

This report has been prepared to summarize the determinations and conclusions reached in the scoping process as required in 10 CFR 51.29(b). After publication of the draft EIS, the public will be invited to submit additional comments. Availability of the draft EIS, the dates of the public comment period, and information about a public meeting to be held to discuss the draft EIS will be announced in the *Federal Register*, on NRC's website (http://www.nrc.gov/materials/fuel-cycle-fac/usecfacility.html), and in the local news media when the draft EIS is distributed. After evaluating comments on the draft EIS, the NRC staff will issue a final EIS that will serve as the basis for the NRC's consideration of environmental impacts in its decision on the proposed ACP.

This report is organized into four main sections. Section 1 provides an introduction and background information on the environmental review process. Section 2 summarizes the comments and concerns expressed by government officials, agencies, and the public. Section 3 identifies the issues that the draft EIS will address and Section 4 describes those issues that are not within the scope of the draft EIS. Where appropriate, Section 4 also identifies other places in the decision-making process where issues that are outside the scope of the draft EIS may be considered.

2. ISSUES RAISED DURING THE SCOPING PROCESS

2.1 OVERVIEW

Approximately 80 individuals not affiliated with the NRC attended the January 18, 2005 public scoping meeting concerning the USEC license application for the ACP. During the meeting, five individuals asked specific questions about the scoping process. Sixteen individuals offered specific oral comments related to the proposed ACP. In addition, 24 written comments, including 1 duplicate, were received from various individuals during the public scoping period, which ended on February 1, 2005. The scoping meeting transcript (ML050590321) and the 24 written comments received by the NRC are available on the NRC website, electronic reading room, at http://www.nrc.gov/reading-rm/adams/web-based.html.

The active participation of the public in the scoping process is an important component in determining the major issues that the NRC should address in the draft EIS. Individuals providing oral and written comments addressed several subject areas related to the proposed USEC facility and the draft EIS development. In addition to private citizens, the various commenters included:

- A representative of the Governor of Ohio.
- A local official from the Village of Piketon.
- Pike and Scioto County Commissioners.
- Representatives of the Pike County Chamber of Commerce and the Chillicothe/Ross County Chamber of Commerce.
- Representatives of State of Ohio agencies or departments.
- Representatives of local businesses.
- Representatives of other organizations including:
  - Public Citizen
  - Portsmouth/Piketon Residents for Environmental Safety
  - National Nuclear Workers for Justice
  - Paper, Allied-Industrial, Chemical and Energy Workers International Union
  - Sierra Club, Central Ohio Group and Appalachian Ohio Section
  - Southern Ohio Diversification Initiative

The following general topics categorize the comments received during the public scoping period:

- NEPA and public participation.
- Need for the proposed facility.
- Land use.
- Alternatives.
- Ecology, air quality, soil and water resources.
- Socioeconomics.
- Transportation.
- Waste management.
- Historic and cultural resources.
- Cumulative impacts.
- Decommissioning.
- Safety and risk.
- Nuclear nonproliferation and security.
- Terrorism.
- Credibility.

In addition to raising important issues about the potential environmental impacts of the proposed facility, some commenters offered opinions and concerns that typically would not be included in the subject matter of an EIS - these include general opinions about nuclear proliferation and the use of nuclear energy. Comments of this type do not fall within the scope of environmental issues to be analyzed. Other statements may be relevant to the proposed action, but they have no direct bearing on the evaluation of alternatives or on the decision-making process involved in the proposed action. For instance, general statements of support for or opposition to the proposed action fall into this category. Again, comments of this type have been noted but are not used in defining the scope and content of the draft EIS.

Section 2.2 summarizes the comments received during the public scoping period. Most of the issues raised have a direct bearing on the NRC's analysis of potential environmental impacts.

2.2 SUMMARY OF ISSUES RAISED

As noted above, a number of commenters expressed support for the facility. Several individuals, on the other hand, raised concerns regarding the construction and operation of the proposed ACP. The following summary groups the comments received during the scoping period by technical area and issue.

2.2.1 NEPA and public participation

Several commenters expressed general support for the ACP stating that the facility would be beneficial to the economy. One commenter questioned the role of members of the public not located in the Piketon area and their possible impact on the decision-making process. The commenter stated that the focus of public participation should be on those members of the public most directly affected by the proposed facility. However, another commenter disagreed, stating that because materials, including wastes, would be shipped from the facility to various points around the country, everyone who is potentially affected by the facility should be included in the public participation process.

A number of commenters requested an extension of the time period for submitting comments on the scope of the draft EIS. These commenters cited several reasons for the extension request, but the reason cited most often was the lack of availability of documents on NRC's website because of security concerns. Two commenters noted that the public was not made aware of a public meeting on November 9, 2004, where USEC's record of accidents and contamination releases was discussed. Several commenters also noted that some of the information on NRC's website is not accessible, including information on reportable events such as releases from the plant. One commenter also noted that answers to questions that she submitted to the NRC on December 2, 2004 had not yet been answered.

Several commenters raised concerns regarding the availability of information contained in the license application and the Environmental Report. One commenter stated that some of the information related to the application has been classified as confidential for security purposes and therefore the public does not have access to it. Another commenter stated that the public should have access to all the information it may reasonably be expected to have known about. This commenter requested that NRC make all redactions in the ER available to the public, including Appendices B, D, and E. If not, the commenter requested an explanation as to why the information was redacted. Another commenter stated that restricting the public from information for reasons other than security protection constitutes an infringement on the democratic involvement of the people in the actions of its government. One commenter noted that an EIS had been completed for the Piketon site in the past, and that this document should be reviewed to determine if any information contained in that report is relevant to the proposed ACP.

Other comments included one person who indicated that she is entitled to a full copy of the license application. Another commenter stated that scoping should include perspective of those outside of the local community. A commenter also thought that it is important that impacts and alternatives must be assessed before an action is taken, not to justify a decision already made. Another commenter stated that it is expected that NRC will provide regulatory guidelines that will allow USEC to operate a plant efficiently with protection for both workers and the community.

A commenter specifically stated that the draft EIS should carry out a comprehensive evaluation that honestly takes into account the long-term environmental impacts of the proposed project. This commenter noted that this type of evaluation is especially relevant to facilities involved in the production of fuel for nuclear reactors because of the length of time the waste material is dangerous and the need for containment and monitoring for the duration of that time. Finally, two commenters requested waivers of fees for documents related to the licensing action.

2.2.2 Need for the proposed facility

A number of commenters raised concerns about the need for a uranium enrichment facility. One commenter argued that the public must agree on the need for the facility. Several commenters stated that the draft EIS must analyze the need for the proposed facility given the existing enriched uranium stockpiles that could meet the needs for nuclear energy for several years. A commenter also stated that the draft EIS should consider that the proposed LES facility in New Mexico could actually start operations first, lessening the need for the ACP. Commenters indicated that the potential for an international moratorium on uranium enrichment exists, and the ramifications of this action should be accounted for in the analysis. Other commenters indicated that recent budget cuts and uncertainty in energy policy lessen the need for additional enriched uranium production. Specifically, one commenter stated that the draft EIS should evaluate the potential for a pause in production of nuclear fuel, which would allow the NRC and other agencies to focus resources in other areas such as cleaning up existing contamination, developing safe and permanent waste disposal options, lowering transportation risks, better documenting releases and events, and encouraging development of clean, safe, well-paying jobs.

Another commenter stated, however, that there will be an increase in demand for electricity in the future and that nuclear power will be critical to ensuring this supply and promoting energy independence. The commenter noted that the ACP would play a key role in providing that energy.

Other commenters stated that the draft EIS should evaluate the development of other less expensive, renewable energy resources with less significant environmental impacts. Commenters also suggested that material from disassembled nuclear weapons could be used as an alternate source for uranium enrichment.

A commenter stated that the draft EIS should address whether the operation of the ACP will have a negative impact on the "Megatons to Megawatts" program, in which highly enriched uranium from dismantled Russian nuclear weapons is down-blended and used as fuel in U.S. nuclear power plants. Another commenter requested an explanation as to why USEC requires a license for 10 percent assay when the license application states that USEC believes its customers only require 5 percent assay UF_6.

2.2.3 Land use

A commenter expressed concern that the increased safety and security restrictions accompanying the proposed ACP would limit alternative use of the site. In addition, a commenter stated that the proposed ACP would eliminate the opportunities for cleanup and reuse of certain facilities on DOE's Portsmouth Reservation, beyond the scope of the USEC license. Another commenter asked whether the existing contamination cleanup at the site is far

enough along to ensure protection of site workers. The commenter wondered whether existing contamination could be cleaned up prior to the start of operations at the ACP. Another commenter was concerned that the ACP would restrict the possibility of public use of undeveloped parts of the site. Another commenter asked how the proposed ACP will affect farmland.

2.2.4 Alternatives

Several commenters noted that the draft EIS needs to address the full range of "reasonable alternatives." Commenters stated that alternative uses for the site, including private leasing and other governmental uses, must be developed and considered in the draft EIS. A commenter also stated that the reasonable alternatives must encompass not only the centrifuge buildings, but a "multiplicity of other uses" for other parts of the site. A commenter suggested instituting accelerated site cleanup as an alternative to allow the facility to be used for nonnuclear industry development. Another commenter suggested specifically that the draft EIS should analyze the Southern Ohio Diversification Initiative suggestion to locate a truck manufacturing company in one of the buildings. A commenter also suggested that the X-326 building could be entombed as a National Monument. A commenter stated that the draft EIS should consider expanding the "Megatons to Megawatts" program as an alternative to licensing the ACP. This commenter also stated that a reasonable alternative would be to consider reviving the Atomic Vapor Laser Isotope Separation process because the centrifuge technology concentrates uranium-234. A commenter suggested moving the environmental cleanup research program located at Oak Ridge National Laboratory to Piketon since the site will be the subject of ongoing environmental cleanup.

Another commenter stated that the cultural value of the Piketon site and the potential adverse impacts to these resources that have not been studied indicates two alternatives that should be considered including (1) moving the ACP to the Paducah site, and (2) opening part of the Piketon site as a cultural resource park with restoration of the earthworks.

Commenters also suggested that the draft EIS should analyze scenarios under which the ACP fails or the project is cancelled. A number of commenters stated that if the plant proceeds and becomes operational, this will preclude the site from any future use because of security restrictions and contamination, and will change or eliminate possibilities for reuse of certain facilities. A commenter stated that the impacts of the no-action alternative should be considered in terms of the site, not USEC's commitments to DOE to provide enriched uranium for nuclear fuel.

Another commenter stated that the draft EIS should focus on evaluating the impacts of a 3.5 million SWU per year plant and that any evaluation of impacts for a 7.0 million SWU per year plant should be done separately under a different licensing action.

2.2.5 Ecology, air quality, soil and water resources

Ecology: Several commenters stated that the wildlife of the region, including deer and fish, has been shown to be contaminated with radioactivity and expressed concern about the migration of wildlife in and out of the plant boundaries. One commenter suggested that procedures be put into place to ensure that wildlife that travel outside the plant boundaries will not carry additional contamination into the greater community. Another commenter was

concerned with the protection of birds and other animal species from future contamination. One commenter expressed general concern over the impact of air and water emissions on wildlife. Another commenter expressed the specific concern that chemical and radioactive leakage from DUF_6 cylinders might adversely affect fish downstream in the Scioto and Ohio rivers.

Air Quality and Soil: A number of commenters were concerned about the release of radioactive materials into air and soil. One commenter asked for a list of the kinds of air emissions likely to be released from the plant and another thought that emissions should be monitored by an independent agency.

Water Resources: A number of commenters were concerned with the plant's water usage, specifically the source of water and estimated volumes that will be used. Many commenters were concerned that chemical and radioactive leakage from plant operations and waste, including DUF_6 cylinders, might adversely affect the groundwater and surface water quality of the region. Several commenters asked for information about the kinds of contaminants likely to be released into the water and about current and future stream protection measures. Another stated that stream sediments have been found to have radioactivity five times the natural levels as well as increased levels of arsenic, cadmium, chromium, and mercury. The same commenter stated that Little Beaver Creek has a total uranium level nearly twice the level at which corrective action would be required at civilian nuclear plants. A commenter asked for the location of discharge points, any associated discharge standards (especially for radioactive contaminants), and the consequences for exceeding release limits. Another commenter requested information about radioactive concentration limits for discharges, and asked who was responsible for monitoring water discharges. One commenter recommended that an independent agency be in charge. A commenter recommended that storm-water analysis include scenarios of extreme climate conditions (i.e., flooding, tornados, earthquakes) that may be expected to occur over the projected lifetime of the plant. Another commenter stated that as an alternative to releases in streams and rivers, USEC should consider a "closed lid" system for managing effluents from plant operations.

2.2.6 Socioeconomics

A number of commenters expressed their support for the approximately 500 permanent high-paying, high-tech jobs and the hundreds of construction jobs that USEC expects to bring to the region. One commenter was in support of USEC's "long-term commitment to provide jobs to this region" and thought that "the plant represents an investment in the future of southern Ohio." Another expressed the desire to have future job opportunities in the area for his children and grandchildren. Many commenters stated their belief that having a new $1.5 billion plant will help boost the local economy. One commenter stated that the presence of a uranium enrichment facility has not depressed land values or resulted in a decrease in population in Pike County, like some have claimed. The commenter pointed to the existence of expensive property values and a 12.5 percent population increase in the last decade.

One commenter stated that the proposed plant would be bad for the local economy. Another said that the proposed ACP will inhibit the creation of thousands of jobs because a similar investment of $1.5 billion by any other company should generate 7,000 or 8,000 jobs instead of the 500 expected for the proposed facility.

2.2.7 Transportation

A commenter expressed satisfaction with current transportation regulations and specifications for the materials, construction, and procedures for containerizing/packaging contaminated material. The commenter stated that it would be "virtually impossible in a derailment scenario for contaminated material to get out." Another commenter expressed no confidence that USEC will actually meet the U.S. Department of Transportation's safety requirements when shipping radioactive materials. Several commenters had concerns about the safety of road conditions along the routes across Ohio and to other States like Tennessee, especially in regard to the transport of radioactive waste. They asked for information regarding evaluations of the roads for trucks and rail systems for trains and the standard procedures for transporting materials to and from the facility.

2.2.8 Waste management

General Waste Management: Several commenters stated that waste management must be analyzed in detail in the draft EIS. A commenter expressed concern that the Piketon site is already a nuclear waste disposal site and that the ACP will only add to the problem. Another commenter stated that DOE has already been shipping wastes to Piketon from other sites including Fernald, Oak Ridge, and Paducah and that the transfers would not happen if the ACP were not licensed. The commenter stated that there is a need to identify all the wastes that have been shipped to the site and what will ultimately happen to these wastes. Another commenter stated that all "newly generated" waste streams associated with the ACP should be fully characterized in the draft EIS.

Depleted UF_6 Storage and Disposal: An issue raised by numerous commenters concerned the plans for management of the DUF_6 tails currently stored onsite from past operations, similar wastes from other sites, and those tails expected to be generated as part of the ACP operations. These commenters stated that the draft EIS must address how much waste will be generated by the ACP, where the tails will ultimately go, and whether they could potentially be left onsite for long-term storage. Several commenters indicated that long-term storage of DUF_6 onsite at Piketon is not a reasonable waste management alternative. Two commenters noted that the possible conversion of DUF_6 by the DOE could take years (possibly up to 25 years), with the material being stored onsite in the meantime. A commenter stated that there are currently thousands of these waste cylinders at Piketon and they present a higher risk of radiation contamination to the environment. Another commenter noted that the ACP will only add to the amount of existing DUF_6 that needs to be converted or disposed.

Commenters also stated that, prior to licensing, a contract should be in place describing how and where DUF_6 tails will be disposed. A commenter recommended that the draft EIS describe in detail how much tails disposal will cost and consider the cost of disposal on USEC's ability to pay for the ACP (including decommissioning). Another commenter asked what limitations would be placed on the onsite storage of DUF_6 and whether any fines for noncompliance would be sufficient to motivate USEC to remove the wastes from the site for disposal.

2.2.9 Historic and cultural resources

Two commenters stated support for NRC to conduct a separate cultural resources assessment under Sections 106 and 110 of the National Historical Preservation Act (NHPA) at the Piketon site. These commenters indicated that DOE, which owns the site, has failed to conduct such

reviews previously. One commenter indicated that DOE has never attempted to identify properties that qualify for historic preservation on or near its land in Piketon.

A commenter stated that NRC must consider that in failing to conduct its own Section 106 review properly, DOE may have undermined the legal basis of its agreement with USEC to turn over its facilities for USEC's use.

One commenter stated that omissions of known archaeological sites in the DOE "Risk-Based End-State" report has allowed DOE to avoid its obligation of conducting a thorough cultural resource impact assessment of the site.

These same commenters indicated that the Piketon site has tremendous historical and prehistorical value that has never been studied. One commenter indicated that Pike County has two prehistoric sites (the Piketon Works and the Scioto Township Works), one on DOE's property and the other extending onto it. The commenter noted a third site (the Barnes Home) borders the proposed plant and once included land underneath the existing centrifuge plant. The commenter stated that the Barnes Home is currently under consideration for listing on the National Register of Historic Places, which qualifies it for full protection.

One commenter stated that the Piketon Works (National Register site 74001599) is located in the area where DOE uses earthen embankments to shield its water wells, which provide water to the site. The commenter indicated that pumping from these wells would resume with the operation of the ACP, but the possible effects of the pumping on the Piketon Works have not been studied. This same commenter stated that there has not been a recent survey of the Scioto Township Works (National Register site 74001600).

A commenter stated that DOE should make public a report that was used by USEC to support its contention that no important cultural resources survive on the site, so that the public can evaluate its contents.

One commenter argued that claims by DOE, USEC, and NRC that responsibility for adverse impacts extends only as far as the footprint of the proposed centrifuge plant is incorrect. This commenter stated that DOE and NRC, as Federal agencies, have the following responsibilities at the Piketon site:

- To assess the broad range of potential impacts of major Federal actions on cultural resources as part of the environmental review under NEPA;

- To assess and mitigate adverse impacts of major federal actions on sites that qualify for the National Register of Historic Places under Section 106 of the NHPA; and

- To protect and steward any historic or prehistoric resources on federal land under Section 110 of the NHPA.

The commenter went on to state that NRC must greatly expand the scope of its cultural resource impact analysis as part of the draft EIS and must conduct its own Section 106 review in compliance with NHPA. The commenter indicated that a review of the environmental impacts under NEPA is not a substitute for a Section 106 review unless the agency follows the

requirements of 36 CFR 800.8(c) regarding notifications, identification of historic properties and effects, consultation, and resolution of adverse comments. The commenter requested that NRC include in its review all kinds of effects on all kinds of properties, not simply direct effects on historic buildings or specific archaeological sites. The commenter noted that it may also be important for NRC to consider the possible need to address impacts on Native American graves and cultural items under the Native American Graves Protection and Repatriation Act; archaeological, historic, and scientific resources under the Archaeological and Historic Preservation Act; and cultural resources under NEPA.

2.2.10 Cumulative impacts

A commenter expressed concern over the cumulative effect and long-term public health impacts of building another uranium enrichment facility on the site of a retired one and stated that the draft EIS should consider this issue with increased scrutiny. Another commenter asked if the impact analysis considers that the site has existing contamination and that workers and community members have already had exposure.

2.2.11 Decommissioning

Several commenters expressed concern over USEC's financial standing and whether or not there was a funding plan for the plant's decontamination and decommissioning. There was concern that if USEC goes bankrupt, by default, DOE and taxpayer money would be utilized. Several commenters pointed out the fact that in 2004, DOE spent almost $300 million in taxpayer money for cleanup and that the same is projected for 2005. The commenters recommend that NRC require USEC to create a performance bond, escrow account, or similar fund sufficient to cover the facility's cleanup prior to issuing a license. One commenter suggested that Pike County should possibly play a role in paying for the cleanup of the facility. Others recommended that cleanup costs should be paid by USEC up-front. Commenters also recommended that a study be done to assess total cleanup, waste storage, and decommissioning costs. One commenter asked about the existence of monitoring plans for radioactive landfills when the plant decommissions. The commenter recommended some kind of written agreement in advance to ensure that the DOE reservation does not become a waste dump.

Another commenter requested a detailed account of how Paducah decontamination and decommissioning operations would impact USEC's ability to pay for the development and operation of the ACP.

2.2.12 Safety and risk

Plant Safety: A number of commenters expressed confidence in the safety of the ACP, citing USEC's skilled, highly trained employees, strong employee safety programs and past safety record, and formalized programs to mitigate potential impacts in the event of emergencies. One commenter also noted that the likelihood of an accident that could affect the public is extremely low. Another commenter expressed confidence that USEC will continue to coordinate with the Ohio Environmental Protection Agency and the NRC, and will continue to utilize the most sophisticated tools available to assure the safety of its workers and the community. Another commenter requested information on noncritical, nonexplosive, and

accidental events that are apparently not contained in USEC's Environmental Report. The commenter indicated that information on the source of the contamination and cleanup actions for these releases should be made available and reviewed. The commenter also asked for an explanation of an apparent increase in worker exposure to UF_6 over time as seen from the Contaminated Feed Cleanup Project Dose Trend described in the Environmental Report.

One commenter noted that safety violations in earlier years were due in part to an incomplete understanding of the technology, putting workers at unnecessary risk. As a result, the community has taken a stronger interest in the safe operation of the plant. The commenter noted that it is believed that centrifuge technology is a "much safer and more efficient technology." Several commenters highlighted the great improvement in plant safety and efforts by both union and management working together as a team to ensure that workers and the public are protected. One person commented that "this plant is one of the safest in the country."

One commenter requested further information about the extent of personnel training to validate USEC's statement that "continuing education of employees and a closer monitoring by management can be used to help alleviate incidents." The commenter also asked about the procedure for a public alert after accidental releases. Another commenter recommended that NRC consider the effects of fire and ruptures in process piping in its safety analysis. A commenter also requested that the draft EIS investigate the claim by USEC that no regulated substances will be stored on the site in excess of threshold levels.

One commenter suggested that USEC's training programs should be reviewed because they are inadequate to the point where the plant would be unable to operate safely. The commenter referred to a management culture that "drags its heels to cover up mistakes."

Worker Health and Safety: Several commenters expressed concern over the general health of employees on the site. One commenter asked about the extent of worker monitoring programs and if monitoring will be done by an independent entity. Another commenter stated that "health issues and premature deaths are not being considered." Another questioned how occupational health and safety will be guaranteed and how it will be different from what was previously done during operation of the gaseous diffusion plant. The commenter expressed concern that USEC needs to be forthcoming and honest about the chemicals and substances the workers will be exposed to. One commenter suggested that NRC take into account a 1985 General Accounting Office report that the Portsmouth Gaseous Diffusion Plant workers had the highest exposure of any other gaseous diffusion plant. One commenter wanted assurance from NRC that USEC will always use the latest technology to enure best possible safety practices to protect workers and the community.

A commenter also questioned the role of the Ohio Army National Guard workers at the site. The commenter asked for information on how many of these workers are at the site, where they are located, and what their role is, if any, in relation to the operation of the ACP.

2.2.13 Nuclear nonproliferation and security

Several commenters stated that operation of the ACP could have nonproliferation impacts. One of these commenters noted that the implications of the proposed ACP are international in scope. Another commenter indicated that the Carnegie report, "A Strategy for Nuclear

Security" states that production of even lower levels of enriched uranium than proposed at ACP could have a destabilizing effect on nuclear treaties and initiate a stepped-up arms race. Similarly, two commenters stated that initiatives such as operation of new uranium enrichment facilities might actually risk rather than enhance our national security by encouraging other countries' nuclear weapons initiatives.

In a separate but related comment, one person indicated that the draft EIS should model the effect of security breaches by USEC.

2.2.14 Terrorism

Two commenters expressed concern that the ACP would present a significant risk as a terrorist target, leading to increased terror alerts. Several commenters recommended studies to consider scenarios involving terrorist attacks and to assess security and terrorist risks. A commenter requested information about measures that will be taken to increase security and keep unauthorized people away from the plant.

2.2.15 Credibility

Several commenters indicated that USEC has a good record as a corporate citizen and a good safety record, and people trust that the licensing process is fair and open. These commenters stated that they believe the ACP will be operated in a safe manner, protective of public health and the environment. One commenter noted that an important factor is USEC meeting expectations. One commenter stated, however, that USEC has 16 violation notices, more than any other NRC materials licensee. The commenter noted that USEC has been ordered by NRC to pay civil penalties totaling $378,000. The commenter stated that these past violations warrant exceptional scrutiny of the license application. A commenter stated that the draft EIS should model the impacts associated with uranium enrichment in excess of 10 percent, given USEC's previous enforcement actions for exceeding its possession limit for such material. Commenters also questioned the viability of USEC to see the project through to completion. Other commenters stated that the draft EIS should critically examine the relationship between DOE and USEC.

Other commenters questioned the credibility of past operators of the site, and indicated that this lack of credibility should be considered when making a licensing decision. A few commenters described the past practices at the site as an indication that safety during past operations was a significant issue. For example, one commenter noted plutonium contamination at the site from past operations, which resulted in monetary compensation for plant workers. Another commenter noted that a 1985 GAO report states that workers at the Piketon Gaseous Diffusion Plant had the highest exposures of all the gaseous diffusion plants. Another commenter indicated that there had been several instances when apparent releases occurred at the site, but no notification was made to the public regarding these releases. One commenter stated that all indications point toward the operation failing and that USEC's promises will not be fulfilled.

3. SCOPE OF THE ENVIRONMENTAL IMPACT STATEMENT

The NEPA (Public Law 91-190, as amended), and the NRC's Implementing Regulations for NEPA (10 CFR Part 51), specify in general terms what should be included in an EIS prepared by the NRC staff. Regulations established by the Council on Environmental Quality (40 CFR

Parts 1500-1508), while not binding on NRC staff, provide useful guidance. Additional guidance for meeting NEPA requirements associated with licensing actions can be found in NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with Office of Nuclear Material Safety and Safeguards (NMSS) Programs."

Pursuant to 10 CFR 51.71(a), in addition to public comments received during the scoping process, the contents of the draft EIS will also address the matters discussed in the USEC Environmental Report. In accordance with 10 CFR 51.71(b), the draft EIS will consider major points of view and objections concerning the environmental impacts of the proposed action raised by other Federal, State, and local agencies, by any affected Indian tribes, and by other interested persons. Pursuant to 10 CFR 51.71(c), the draft EIS will list all Federal permits, licenses, approvals, and other entitlements that must be obtained in implementing the proposed action, and will describe the status of compliance with these requirements. Any uncertainty as to the applicability of these requirements will be addressed in the draft EIS.

Pursuant to 10 CFR 51.71(d), the draft EIS will include a preliminary analysis that considers and weighs the environmental effects of the proposed action; the environmental impacts of alternatives to the proposed action; and alternatives available for reducing or avoiding adverse environmental effects. In the draft analysis, due consideration will be given to compliance with environmental quality standards and regulations that have been imposed by Federal, State, regional, and local agencies having responsibilities for environmental protection. The environmental impact of the proposed action will be evaluated in the draft EIS with respect to matters covered by such standards and requirements, regardless of whether a certification or license from the appropriate authority has been obtained. Compliance with applicable environmental quality standards and requirements does not negate the requirement for NRC to weigh all environmental effects of the proposed action, including the degradation, if any, of water quality, and to consider alternatives to the proposed action that are available for reducing adverse effects. While satisfaction of NRC standards and criteria pertaining to radiological effects will be necessary to meet the licensing requirements of the Atomic Energy Act, the draft EIS will also, for the purposes of NEPA, consider the radiological and nonradiological effects of the proposed action and alternatives.

The following documents are environmental assessments and other EISs which have been prepared that are related to the action under consideration. The following list is not intended to be a comprehensive list:

- Programmatic EIS for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride (DOE/EIS-0269, March 1999)

- Environmental Assessment of the USEC Inc. American Centrifuge Lead Cascade Facility at Piketon, Ohio (DOE/EA-1495, January 2004)

- Environmental Impact Statement for Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at the Paducah, Kentucky, Site (DOE/EIS-0359, December 2003)

- Environmental Impact Statement for Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at Portsmouth, Ohio Site (DOE/EIS-0360, December 2003)

Pursuant to 10 CFR 51.71(e), the draft EIS will include a preliminary recommendation by the NRC staff with respect to the proposed action. Any such recommendation would be reached after considering the environmental effects of the proposed action and reasonable alternatives, and after weighing the costs and benefits of the proposed action.

The scoping process summarized in this report will help determine the scope of the draft EIS for the proposed facility. The draft EIS will contain a discussion of the cumulative impacts of the proposed action as referenced in NUREG-1748. The development of the draft EIS will be closely coordinated with the SER prepared by the NRC staff to evaluate the health and safety impacts of the proposed action.

One goal in writing the draft EIS is to present the impact analyses in a manner that makes it easy for the public to understand. This draft EIS will provide the basis for the NRC decision with regard to potential environmental impacts. Significant impacts will be discussed in greater detail in the draft EIS, and explanations will be provided for determining the level of detail for different impacts. This should allow readers of the draft EIS to focus on issues that were determined to be important in reaching the conclusions supported by the draft EIS. The following topical areas and issues will be contained within the draft EIS.

- *Alternatives.* The draft EIS will describe and assess the no-action alternative and other reasonable alternatives to the proposed action. Other alternatives may include alternative sites, enrichment sources, or technological alternatives to the proposed centrifuge technology.

- *Need for the Facility.* The draft EIS will provide a discussion of the need for the proposed ACP.

- *Compliance with Applicable Regulations.* The draft EIS will present a listing of the relevant permits and regulations that are believed to apply to the proposed ACP. These would include air, water, and solid waste regulations and disposal permits.

- *Land Use.* The draft EIS will discuss the potential land use impacts associated with the proposed construction, manufacturing, and operating activities.

- *Transportation.* The draft EIS will discuss the impacts associated with the transportation of construction materials, centrifuge parts, feed material, product, and waste tails during both normal transportation and under credible accident scenarios. The impacts on local transportation routes due to workers, delivery vehicles, and waste removal vehicles will be evaluated.

- *Geology and Soils.* The draft EIS will assess the potential impacts to the geology and soils of the proposed ACP site due to soil compaction, erosion, contamination, landslides, and disruption of natural drainage patterns. Evaluation of the potential for

earthquakes or any other major ground motion considerations will be addressed mainly in the SER and only in terms of possible environmental impacts in the draft EIS.

- *Water Resources.* The draft EIS will assess the potential impacts on surface water and groundwater quality and water use due to the proposed action and alternatives.
- *Ecological Resources.* The draft EIS will assess the potential environmental impacts on ecological resources including plant and animal species. Threatened and endangered species and critical habitats will also be discussed, along with the appropriate consultation as required by Section 7 of the Endangered Species Act (16 USC Section 1536(a)(2)). As appropriate, the assessment will include an analysis of mitigation measures to address potential adverse impacts.
- *Air Quality.* The draft EIS will make determinations concerning the meteorological conditions of the site location, the ambient air quality, and the contribution of other sources. In addition, the draft EIS will assess the impacts of the ACP's refurbishment, construction, and operation on local air quality.
- *Noise.* The draft EIS will discuss potential impacts associated with noise levels generated from refurbishment, construction, and operation of the proposed ACP.
- *Historic and Cultural Resources.* The draft EIS will address the potential impacts of the proposed ACP on the historic and archaeological resources of the area. Additionally, as described in a letter dated December 28, 2004 to the Ohio State Historic Preservation Officer, the EIS will also be used to fulfill NHPA Section 106 (36 CFR Part 800) requirements. Potential impacts to the overall visual and scenic character of the facility may also be addressed.
- *Socioeconomics.* The draft EIS will address the demography, economic base, labor pool, housing, utilities, public services, education, and recreation as impacted by the proposed action and alternatives. The hiring of new workers from the outside area could lead to impacts on the regional housing, public infrastructure, and economic resources. Population changes leading to changes to the housing market and demands on the public infrastructure will be assessed.
- *Costs and Benefits.* The draft EIS will address the potential cost/benefits of constructing and operating the ACP, and will discuss the cost/benefits of tails disposition options.
- *Resource Commitments.* The draft EIS will identify the unavoidable adverse impacts and irreversible and irretrievable commitments of resources. It will also address the relationship between local, short-term uses of the environment and the maintenance and enhancement of long-term productivity. Associated mitigative measures and environmental monitoring will be presented, if applicable.
- *Public and Occupational Health.* The draft EIS will include a determination of potentially adverse effects on human health that result from chronic and acute exposures to ionizing radiation and hazardous chemicals as well as from physical safety hazards. These potentially adverse effects on human health might occur during facility refurbishment, construction, or operation. Impacts associated with the implementation

of the proposed action will be assessed under normal operation and credible accident scenarios.

- *Waste Management.* The draft EIS will discuss the management of wastes, including by-product materials, generated from the refurbishment, construction, and operation of the ACP to assess the impacts of generation, storage, and disposal. Onsite storage of wastes will also be included in the assessment.

- *Depleted Uranium Disposal.* The draft EIS will discuss the DUF_6 material, or tails, that results from the enrichment operation over the lifetime of the proposed plant's operation. These concerns include the safe and secure storage and ultimate removal of the material from the site, and the potential conversion of the DUF_6 to U_3O_8 and ultimate disposition.

- *Decommissioning.* The draft EIS will include a discussion of facility decommissioning and associated impacts.

- *Cumulative Impacts.* The draft EIS will address the potential cumulative impacts from past, present, and reasonably foreseeable activities at and near the site

- *Environmental Justice.* The draft EIS will address environmental impacts of the proposed ACP on low-income or minority populations if disproportionately high and if low-income or minority populations are identified. The impacts that could be evaluated include health, ecological (including water quality), social, cultural, and economic resources.

4. ISSUES CONSIDERED TO BE OUTSIDE THE SCOPE OF THE ENVIRONMENTAL IMPACT STATEMENT

The purpose of an EIS is to assess the potential environmental impacts of a proposed action in order to assist in an agency's decision-making process – in this case, NRC's licensing decision. As noted in Section 2.2, some issues and concerns raised during the scoping process are not relevant to the draft EIS because they are not directly related to the assessment of potential impacts or to the decision-making process. The lack of in-depth discussion in the draft EIS, however, does not mean that an issue or concern lacks value. Issues beyond the scope of the draft EIS either may not yet be at the point where they can be resolved, or are more appropriately discussed and decided in other venues.

Some of the issues raised during the public scoping process (e.g., the Carnegie Report, the "Hobson Doctrine," and the "Megatons to Megawatts" program) will not be addressed in the draft EIS. Other issue areas including nonproliferation concerns, security and safety issues (e.g., the domino effect, tornado effects due to climate change), and credibility are also beyond the scope of the EIS. In *The Matter of Private Fuel Storage, LLC* (Independent Spent Fuel Storage Installation), 56 NRC 340 (2002), the Commission held that NRC staff is not required to consider terrorism in its EISs. The Commission indicated, "the possibility of a terrorist attack...is speculative and simply too far removed from the natural or expected consequences of agency action to require a study under NEPA."

Some of the issues raised during the public scoping process for the proposed facility are outside the scope of the draft EIS, but they will be analyzed in the SER. For example, health

and safety issues will be considered in detail in the SER prepared by NRC staff for the proposed action and will be summarized in the EIS. The draft EIS and the SER are related in that they may cover the same topics and may contain similar information, but the analysis in the draft EIS is limited to an assessment of potential environmental impacts. In contrast, the SER primarily deals with safety evaluations and procedural requirements or license conditions to ensure the health and safety of workers and the general public. The SER also covers other aspects of the proposed action such as demonstrating that the applicant will provide adequate funding for the proposed facility in compliance with NRC's financial assurance regulations.

APPENDIX B
CONSULTATION LETTERS

December 28, 2004

Mr. Mark Epstein, Department Head
Ohio Historic Preservation Office
Resource Protection and Review
567 East Hudson Street
Columbus, OH 43211-1030

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Epstein:

The United States Nuclear Regulatory Commission (NRC) has received a license application from USEC, Inc. (USEC) for the construction, operation, and decommissioning of a gas *centrifuge uranium enrichment facility known as the American Centrifuge Plant (ACP). The* NRC is in the initial stages of developing an Environmental Impact Statement (EIS) for the proposed facility to be located at the Department of Energy (DOE) reservation in Piketon, Ohio. USEC's license application contained an Environmental Report (ER) that will be used to support the NRC's development of an EIS for the ACP. The proposed facility will use gas centrifuge technology to enrich the isotope Uranium -235 in uranium hexaflouride (UF6), up to 10-weight percent. The proposed ACP will have a design capacity of seven million separative work units. The forthcoming EIS will document the impacts associated with the construction, operation, and decommissioning of the facility.

Two preliminary phase I archaeological surveys and one draft cultural resource report have been completed for the DOE reservation. Archaeological surveys and the cultural report results are discussed section 3.8 of the ER (enclosed). Historical and cultural resource impacts are discussed in section 4.8 of the ER (enclosed).

As required by 36 CFR 800.3 (f), the NRC is requesting any information you may have regarding other parties that may be entitled to be consulting parties by this action. As required by 36 CFR 800.4(a), the NRC is requesting the views of the State Historic Preservation Officer and your office on further actions to identify historic properties that may be affected by the proposed ACP.

As part of the EIS preparation, the NRC will be hosting a public scoping meeting on Tuesday, January 18, 2005, at the Zahns Comer Middle School in Piketon from 7:00 - 9:45. The meeting will include NRC staff presentations on the environmental review process, after which members of the public will be given the opportunity to present their comments. This scoping information, along with any information you provide, and material provided by USEC in the ER, will be used to document affects in accordance with 36 CFR 800.4 and 800.5. Additionally, we intend to use the EIS process for Section 106 purposes as described in 36 CFR 800.8.

If you any questions or comments, or need additional information, please contact Ron Linton at (301) 415-7777.

Sincerely,

/RA/

B. Jennifer Davis, Chief
Environmental and Performance
Assessment Branch
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

Ohio Historic Preservation Office

567 East Hudson Street
Columbus, Ohio 43211-1030
614/ 298-2000 Fax: 614/ 298-2037

Visit us at www.ohiohistory.org

OHIO HISTORICAL SOCIETY
SINCE 1885

February 2, 2005

Ron Linton
Environmental and Performance Assessment Branch
Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: Docket No. 70-7004, American Centrifuge Commercial Plant
Portsmouth Gaseous Diffusion Plant (PORTS), Pike County, Ohio

Dear Mr. Linton,

This is in response to correspondence from your office dated December 28, 2004 (received January 3) *regarding the above referenced project. The comments of the Ohio Historic Preservation Office (OHPO)* are submitted in accordance with provisions of the National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 [36 CFR 800]); the Department of Energy serves as the lead federal agency.

Your correspondence initiates consultation by the Nuclear Regulatory Commission (NRC) for the above referenced project. We acknowledge that the NRC will be following regulations at 36 CFR 800.8 in the review process integrating the Section 106 review with the development of the Environmental Report (ER) for this project. Your correspondence also requests information on consulting parties.

This office has previously reviewed information on the proposed project and has responded to the position that the proposed new construction will include buildings of similar design and size to the nearby buildings and that there will be similar functions carried out in these new buildings. Given the available information on the size, design, and function of the existing and the proposed buildings, we were able to offer our opinion that the proposed project will not adversely affect the Portsmouth Gaseous Diffusion Plant historic property.

As you are aware, private citizens have raised concerns about the potential for this project to affect historic properties, including prehistoric archaeological sites. The National Historic Preservation Act encourages federal agencies to include comments and concerns from the public throughout the Section 106 review process.

In addition to other consulting parties that your agency may have identified, we recommend that you consider notifying Native American Federally-Recognized Tribal authorities that are historically associated *with south-central Ohio and may have information on historic properties in this area. Attached please find* a partial list of Tribes with historical ties to Ohio. We believe that this list may be helpful in finalizing your list of potential consulting parties to whom you will be providing notification of the project.

I think that it is important for you to clearly convey to consulting parties and to the public the extent of the efforts to identify historic properties and to assess the potential for the project to adversely affect historic properties. I am concerned that the discussions in your correspondence and in the attached sections from the draft ER should be clearer and more precise. For example, the archaeological surveys were not preliminary, but their conclusions are preliminary and we are still working at interpreting the results and developing a consensus on the findings. In some cases it might be appropriate to describe an archaeological survey as preliminary, especially when the primary objective of the work for a survey is to

Mr. Ron Linton
February 2, 2005
Page 2

lay the ground work for the next phase of an intended and expected survey. The predictive model work that you reference might be described as preliminary but it also provides important information on the distribution of known sites in the vicinity of the Portsmouth Gaseous Diffusion Plant. Also, at least one additional archaeological study has been conducted within the facility at archaeological site 33-PK-210. This study may not be relevant to this project, but language in the draft ER might lead some to conclude that all of the previous archaeological work is referenced rather than only a portion of the previously completed work. The survey methods employed in the predictive model work are likely quite different from the survey methods employed in identification efforts.

I think that it would be more helpful to describe the conclusions of the Schweikart 1997 archaeological survey as recommendations, not as determinations. In the past we have encountered some confusion in descriptions of known archaeological sites both within and in the general area surrounding the facility. For example, not all archaeological sites with prehistoric components are burial grounds and many archaeological sites are quite small, less than 100 square meters.

Similar kinds of concerns could also be raised concerning the presentation of the information on architectural properties in the Environmental Report.

In summary, it would be helpful for the documentation to provide greater clarity and to provide greater precision to facilitate the integration the discussions on archaeological sites, architectural properties, and other kinds of cultural resources within the overall assessment of effects.

Any questions concerning this matter should be addressed to David Snyder at (614) 298-2000, between the hours of 8 am. to 5 pm. Thank you for your cooperation.

Sincerely,

David Snyder

David Snyder, Archaeology Reviews Manager
Resource Protection and Review

DMS/ds (OHPO Serial Number 105834)

Enclosure

To assist you in the event that consultation with federally recognized tribal authorities is needed, OHPO maintains a list of federally recognized tribal authorities including listings from the Bureau of Indian's Affairs' Tribal Leaders Directory. This list is not all-inclusive; it represents a first step in developing procedures to address issues of disposition and repatriation. There are currently no federally recognized tribal authorities in Ohio since Ohio does not have any Native American Reservations or Land. However, there are many active Native American groups and organizations in Ohio. Also, in some cases, the Ohio Historic Preservation Office may be able to assist agencies and individuals contact individuals who have expressed an interest in the issues involving reburial. If the need develops we can provide assistance to get you started in compiling a list of interested parties.

Endnote. For further information, you may wish to contact the following:

Tim McKeown, National Center for Cultural Resources, National Park Service, P.O. Box 37127, Washington, D.C. 20013-7127, (202) 343-1142

Francis McManamon, National Center for Cultural Resources, National Park Service, P.O. Box 37127, Washington, D.C. 20013-7127, (202) 343-4101

The following are representatives of Federally-recognized Tribal Authorities of some tribes having historic connections to Ohio (based on the Tribal Leaders Directory, Bureau of Indian Affairs, Division of Tribal Government Services, January 1992 - for more information phone: 202/208-4400):

Mr. James Leaffe, Chief
Cayuga Nation
P.O. Box 11
Versailles, NY 14168
Attn: Mr. Clint Halftown, THPO
Representative
Telephone: 716-532-4847

Cherokee Nation of Oklahoma
P.O. Box 948
Ada, OK 74820

Turtle Mountain Band of Chippewa Indians
P.O. Box 900
Belcourt, ND 58316
Attn: Mr. Kade M. Ferris, Tribal Historic Preservation Officer, Office of Archaeology and Historic Preservation
THPO: Mr. Kade M. Ferris

Mr. Bruce Gonzales, President
Delaware Tribe of Western Oklahoma
P.O. Box 825
Anardarko, OK 73005
Attn: Ms. Tamara Francis, Delaware Nation NAGPRA Office
Telephone: 405-247-2448
FAX: 405-247-9393
Email: aapanahkih@westerndelaware.nsn.us

Mr. John Pryor, Executive Officer
Miami Tribe of Oklahoma
P.O. Box 1326
202 South Eight Tribes Trail
Miami, OK 74355
Attn: Ms. Julie Olds, THPO
THPO: Ms. Julie Olds
Telephone: 918-542-1445 X16 (Olds)
FAX: 918-542-7260
Email: jolds@miamination.com

Mr. Charles Todd, Chief
Ottawa Tribe of Oklahoma
P.O. Box 110
Miami, OK 74355
Attn: Mr. Roy Ross
Telephone: 918-540-1536
FAX: 918-542-3214

Mr. John P. Froman, Chief
Peoria Tribe of Oklahoma
P.O. Box 1527
118 S. Eight Tribes Trail
Miami, OK 74355
Attn: Mr. Bud Ellis, Repatriation Committee Chairman
Telephone: 918-540-2535
FAX: 918-540-2538

Mr. Harold Frank, Chairperson
Forest County Potawatomi
P.O. Box 340
Community of Wisconsin Potawatomi
Crandon, WI 54520
Attn: Ms. Clarice M. Werle, NAGPRA Contact
Telephone: 715-478-7381 (Werle)
FAX: 715-478-7385

Mr. John A. Barrett, Jr., Chairperson
Citizen Potawatomi Nation
1601 S. Gordon Cooper Drive
Shawnee, OK 74801
Attn: Mr. Jeremy Finch
Telephone: 405-275-3121
FAX: 405-275-0198
800 Number: 800-880-9880

Mr. Calvin John, President
Seneca Nation of Indians
P.O. Box 231
Salamanca, NY 14779
Attn: Ms. Kathleen Mitchell, THPO
THPO: Ms. Kathleen Mitchell
Telephone: 716-945-9427
FAX: 716-945-1989
Email: snithpo@netscape.net

Mr. Jerry Dilliner, Chief
Seneca-Cayuga Tribe of Oklahoma
P.O. Box 1283
R2301 E. Steve Owens Blvd.
Miami, OK 74355
Attn: Mr. Paul Barton
Telephone: 918-542-6609
FAX: 918-542-3684
Email: maimit5@onenet.net

Mr. Charles D. Enyart, Chief
Eastern Shawnee Tribe of Oklahoma
P.O. Box 350
Seneca, MO 64865
Attn: R.C. Kissee
Telephone: 918-666-2435 X241
FAX: 918-666-3325
Email: estochief@hotmail.com

Mr. James Squirrel
Loyal Shawnee Tribe
Route 4, Box 30
Jay, OK 74346

Mr. Kenneth Daugherty, Tribal Secretary
Absentee-Shawnee Tribe of Oklahoma
2025 S. Gordon Cooper Drive
Shawnee, OK 74801-9381
Attn: Ms. Karen Kaniatobe
Telephone: 405-275-4030 X124
FAX: 405-275-1922
Email: jenniferm@astribe.com

Mr. Leaford Bearskin, Chief
Wyandotte Nation
P.O. Box 250
Wyandotte, OK 74370
Attn: Ms. Sherri Clemons

March 14, 2005

Mr. James Leaffe, Chief
Cayuga Nation
P.O. Box 11
Versailles, NY 14168
Attn: Mr. Halftown, THPO
Representative

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Leaffe:

The United States Nuclear Regulatory Commission (NRC) has received a license application from USEC, Inc. (USEC) for the construction, operation, and decommissioning of a gas centrifuge uranium enrichment facility known as the American Centrifuge Plant (ACP). The NRC is in the initial stages of developing an Environmental Impact Statement (EIS) for the proposed facility to be located at the Department of Energy (DOE) reservation in Piketon, Ohio. USEC's license application contained an Environmental Report (ER) that will be used to support the NRC's development of an EIS for the ACP. The proposed facility will use gas centrifuge technology to enrich the isotope Uranium-235 in uranium hexaflouride (UF6), up to 10-weight percent. The proposed ACP will have a design capacity of seven million separative work units. The forthcoming EIS will document the impacts associated with the construction, operation, and decommissioning of the facility.

Two phase I archaeological surveys and one draft cultural resource report have been completed for the DOE reservation. Archaeological surveys and the cultural report results are discussed section 3.8 of the ER (enclosed). Historical and cultural resource impacts are discussed in section 4.8 of the ER (enclosed). The Area of Potential Effects (APE) is defined as the DOE reservation in Piketon, Ohio.

As required by 36 CFR 800.3 (f), the NRC is requesting any information you may have regarding historic sites or cultural resources within the APE. The NRC is interested in knowing if you have specific knowledge of any sites that you believe have traditional religious and cultural significance. In addition, we are interested in knowing if you are aware of or are concerned for any site, or object, eligible for inclusion on the National Register of Historic Places. This will assure appropriate consideration in the Section 106 process.

Any information you provide may be used to document affects in accordance with 36 CFR 800.4 and 800.5. Additionally, we intend to use the EIS process for Section 106 purposes as described in 36 CFR 800.8.

If you any questions or comments, or need additional information, please contact Ron Linton at (301) 415-7777.

Sincerely,

/RA/

B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 14, 2005

Cherokee Nation of Oklahoma
P.O. Box 948
Ada, OK 74820

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Cherokee Nation of Oklahoma:

The United States Nuclear Regulatory Commission (NRC) has received a license application from USEC, Inc. (USEC) for the construction, operation, and decommissioning of a gas centrifuge uranium enrichment facility known as the American Centrifuge Plant (ACP). The NRC is in the initial stages of developing an Environmental Impact Statement (EIS) for the proposed facility to be located at the Department of Energy (DOE) reservation in Piketon, Ohio. USEC's license application contained an Environmental Report (ER) that will be used to support the NRC's development of an EIS for the ACP. The proposed facility will use gas centrifuge technology to enrich the isotope Uranium-235 in uranium hexaflouride (UF6), up to 10-weight percent. The proposed ACP will have a design capacity of seven million separative work units. The forthcoming EIS will document the impacts associated with the construction, operation, and decommissioning of the facility.

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As required by 36 CFR 800.3 (f), the NRC is requesting any information you may have regarding historic sites or cultural resources within the APE. The NRC is interested in knowing if you have specific knowledge of any sites that you believe have traditional religious and cultural significance. In addition, we are interested in knowing if you are aware of or are concerned for any site, or object, eligible for inclusion on the National Register of Historic Places. This will assure appropriate consideration in the Section 106 process.

Any information you provide may be used to document affects in accordance with 36 CFR 800.4 and 800.5. Additionally, we intend to use the EIS process for Section 106 purposes as described in 36 CFR 800.8.

If you any questions or comments, or need additional information, please contact Ron Linton at (301) 415-7777.

Sincerely,

/RA/

B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 14, 2005

Turtle Mountain Band
of Chippewa Indians
Attn: Mr. Kade M. Ferris
Tribal Historic Preservation Officer
Office of Archaeology
and Historic Preservation
P.O. Box 900
Belcourt, ND 58316

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Ferris:

The United States Nuclear Regulatory Commission (NRC) has received a license application from USEC, Inc. (USEC) for the construction, operation, and decommissioning of a gas centrifuge uranium enrichment facility known as the American Centrifuge Plant (ACP). The NRC is in the initial stages of developing an Environmental Impact Statement (EIS) for the proposed facility to be located at the Department of Energy (DOE) reservation in Piketon, Ohio. USEC's license application contained an Environmental Report (ER) that will be used to support the NRC's development of an EIS for the ACP. The proposed facility will use gas centrifuge technology to enrich the isotope Uranium-235 in uranium hexaflouride (UF6), up to 10-weight percent. The proposed ACP will have a design capacity of seven million separative work units. The forthcoming EIS will document the impacts associated with the construction, operation, and decommissioning of the facility.

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Any information you provide may be used to document affects in accordance with 36 CFR 800.4 and 800.5. Additionally, we intend to use the EIS process for Section 106 purposes as described in 36 CFR 800.8.

If you any questions or comments, or need additional information, please contact Ron Linton at (301) 415-7777.

Sincerely,

/RA/

B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 14, 2005

Mr. Bruce Gonzales, President
Delaware Tribe of Western Oklahoma
P.O. Box 825
Anardarko, OK 73005
Attn: Ms. Tamara Francis, Delaware
Nation NAGPRA Office

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Gonzales:

The United States Nuclear Regulatory Commission (NRC) has received a license application from USEC, Inc. (USEC) for the construction, operation, and decommissioning of a gas centrifuge uranium enrichment facility known as the American Centrifuge Plant (ACP). The NRC is in the initial stages of developing an Environmental Impact Statement (EIS) for the proposed facility to be located at the Department of Energy (DOE) reservation in Piketon, Ohio. USEC's license application contained an Environmental Report (ER) that will be used to support the NRC's development of an EIS for the ACP. The proposed facility will use gas centrifuge technology to enrich the isotope Uranium-235 in uranium hexaflouride (UF6), up to 10-weight percent. The proposed ACP will have a design capacity of seven million separative work units. The forthcoming EIS will document the impacts associated with the construction, operation, and decommissioning of the facility.

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B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 14, 2005

Mr. John Pryor, Executive Officer
Miami Tribe of Oklahoma
P.O. Box 1326
202 South Eight Tribes Trail
Miami, OK 74355
Attn: Ms. Julie Olds, THPO

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Pryor:

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/RA/

B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 14, 2005

Mr. Charles Todd, Chief
Ottawa Tribe of Oklahoma
P.O. Box 110
Miami, OK 74355
Attn: Mr. Roy Ross

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Todd:

The United States Nuclear Regulatory Commission (NRC) has received a license application from USEC, Inc. (USEC) for the construction, operation, and decommissioning of a gas centrifuge uranium enrichment facility known as the American Centrifuge Plant (ACP). The NRC is in the initial stages of developing an Environmental Impact Statement (EIS) for the proposed facility to be located at the Department of Energy (DOE) reservation in Piketon, Ohio. USEC's license application contained an Environmental Report (ER) that will be used to support the NRC's development of an EIS for the ACP. The proposed facility will use gas centrifuge technology to enrich the isotope Uranium-235 in uranium hexaflouride (UF6), up to 10-weight percent. The proposed ACP will have a design capacity of seven million separative work units. The forthcoming EIS will document the impacts associated with the construction, operation, and decommissioning of the facility.

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Sincerely,

/RA/

B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 14, 2005

Mr. John P. Froman, Chief
Peoria Tribe of Oklahoma
P.O. Box 1527
118 S. Eight Tribes Trail
Miami, OK 74355
Attn: Mr. Bud Ellis, Repatriation
Committee Chairman

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Froman:

The United States Nuclear Regulatory Commission (NRC) has received a license application from USEC, Inc. (USEC) for the construction, operation, and decommissioning of a gas centrifuge uranium enrichment facility known as the American Centrifuge Plant (ACP). The NRC is in the initial stages of developing an Environmental Impact Statement (EIS) for the proposed facility to be located at the Department of Energy (DOE) reservation in Piketon, Ohio. USEC's license application contained an Environmental Report (ER) that will be used to support the NRC's development of an EIS for the ACP. The proposed facility will use gas centrifuge technology to enrich the isotope Uranium-235 in uranium hexaflouride (UF6), up to 10-weight percent. The proposed ACP will have a design capacity of seven million separative work units. The forthcoming EIS will document the impacts associated with the construction, operation, and decommissioning of the facility.

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Sincerely,

/RA/

B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
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Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 14, 2005

Mr. Harold Frank, Chairperson
Forest County Potawtomi
P.O. Box 340
Community of Wisconsin Potawtomi
Crandon, WI 54520
Attn: Ms. Clarice M. Werle, NAGPRA
Contact

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Frank:

The United States Nuclear Regulatory Commission (NRC) has received a license application from USEC, Inc. (USEC) for the construction, operation, and decommissioning of a gas centrifuge uranium enrichment facility known as the American Centrifuge Plant (ACP). The NRC is in the initial stages of developing an Environmental Impact Statement (EIS) for the proposed facility to be located at the Department of Energy (DOE) reservation in Piketon, Ohio. USEC's license application contained an Environmental Report (ER) that will be used to support the NRC's development of an EIS for the ACP. The proposed facility will use gas centrifuge technology to enrich the isotope Uranium-235 in uranium hexaflouride (UF6), up to 10-weight percent. The proposed ACP will have a design capacity of seven million separative work units. The forthcoming EIS will document the impacts associated with the construction, operation, and decommissioning of the facility.

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Sincerely,

/RA/

B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
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Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 14, 2005

Mr. John A. Barret, Jr., Chairperson
Citizen Potawatomi Nation
1601 S. Gordon Cooper Drive
Shawnee, OK 74801
Attn: Mr. Jeremy Finch

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Barrett:

The United States Nuclear Regulatory Commission (NRC) has received a license application from USEC, Inc. (USEC) for the construction, operation, and decommissioning of a gas centrifuge uranium enrichment facility known as the American Centrifuge Plant (ACP). The NRC is in the initial stages of developing an Environmental Impact Statement (EIS) for the proposed facility to be located at the Department of Energy (DOE) reservation in Piketon, Ohio. USEC's license application contained an Environmental Report (ER) that will be used to support the NRC's development of an EIS for the ACP. The proposed facility will use gas centrifuge technology to enrich the isotope Uranium-235 in uranium hexaflouride (UF6), up to 10-weight percent. The proposed ACP will have a design capacity of seven million separative work units. The forthcoming EIS will document the impacts associated with the construction, operation, and decommissioning of the facility.

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B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 16, 2005

Mr. Calvin John, President
Seneca Nation of Indians
P.O. Box 231
Salamanca, NY 14779
Attn: Ms. Kathlenn Mitchell, THPO

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. John:

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B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 14, 2005

Mr. Jerry Dilliner, Chief
Seneca-Cayuga Tribe of Oklahoma
P.O. Box 1283
R2301 E. Steve Owens Blvd.
Miami, OK 74355
Attn: Mr. Paul Barton

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Dilliner:

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Environmental and Low-Level
Waste Section
Division of Waste Management
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Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 14, 2005

Mr. Charles D. Enyart, Chief
Eastern Shawnee Tribe of Oklahoma
P.O. Box 350
Seneca, MO 64865
Attn: R.C. Kissee

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Enyart:

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B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
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Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 14, 2005

Mr. Kenneth Daughtery, Tribal Secretary
Absentee-Shawnee Tribe of Oklahoma
2025 S. Gordon Cooper Drive
Shawnee, OK 74801-9381
Attn: Ms. Karen Kaniatobe

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Daughtery:

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B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
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Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 14, 2005

Mr. James Brushart
President, Pike County Commissioners
230 Waverly Plaza, Suite 1000
Waverly, Ohio 45690

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Brushart:

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B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
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Office of Nuclear Material Safety
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Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 14, 2005

Mr. Leaford Bearskin, Chief
Wyandotte Nation
P.O. Box 250
Wyandotte, OK 74370
Attn: Ms. Sherri Clemons

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Bearskin:

The United States Nuclear Regulatory Commission (NRC) has received a license application from USEC, Inc. (USEC) for the construction, operation, and decommissioning of a gas centrifuge uranium enrichment facility known as the American Centrifuge Plant (ACP). The NRC is in the initial stages of developing an Environmental Impact Statement (EIS) for the proposed facility to be located at the Department of Energy (DOE) reservation in Piketon, Ohio. USEC's license application contained an Environmental Report (ER) that will be used to support the NRC's development of an EIS for the ACP. The proposed facility will use gas centrifuge technology to enrich the isotope Uranium-235 in uranium hexaflouride (UF6), up to 10-weight percent. The proposed ACP will have a design capacity of seven million separative work units. The forthcoming EIS will document the impacts associated with the construction, operation, and decommissioning of the facility.

Two phase I archaeological surveys and one draft cultural resource report have been completed for the DOE reservation. Archaeological surveys and the cultural report results are discussed section 3.8 of the ER (enclosed). Historical and cultural resource impacts are discussed in section 4.8 of the ER (enclosed). The Area of Potential Effects (APE) is defined as the DOE reservation in Piketon, Ohio.

As required by 36 CFR 800.3 (f), the NRC is requesting any information you may have regarding historic sites or cultural resources within the APE. The NRC is interested in knowing if you have specific knowledge of any sites that you believe have traditional religious and cultural significance. In addition, we are interested in knowing if you are aware of or are concerned for any site, or object, eligible for inclusion on the National Register of Historic Places. This will assure appropriate consideration in the Section 106 process.

Any information you provide may be used to document affects in accordance with 36 CFR 800.4 and 800.5. Additionally, we intend to use the EIS process for Section 106 purposes as described in 36 CFR 800.8.

If you any questions or comments, or need additional information, please contact Ron Linton at (301) 415-7777.

Sincerely,

/RA/

B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 14, 2005

Mr. James Squirrel
Loyal Shawnee Tribe
Route 4, Box 30
Jay, OK 74346

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Squirrel:

The United States Nuclear Regulatory Commission (NRC) has received a license application from USEC, Inc. (USEC) for the construction, operation, and decommissioning of a gas centrifuge uranium enrichment facility known as the American Centrifuge Plant (ACP). The NRC is in the initial stages of developing an Environmental Impact Statement (EIS) for the proposed facility to be located at the Department of Energy (DOE) reservation in Piketon, Ohio. USEC's license application contained an Environmental Report (ER) that will be used to support the NRC's development of an EIS for the ACP. The proposed facility will use gas centrifuge technology to enrich the isotope Uranium-235 in uranium hexaflouride (UF6), up to 10-weight percent. The proposed ACP will have a design capacity of seven million separative work units. The forthcoming EIS will document the impacts associated with the construction, operation, and decommissioning of the facility.

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If you any questions or comments, or need additional information, please contact Ron Linton at (301) 415-7777.

Sincerely,

/RA/

B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 18, 2005

Mr. Ron Sparkman
Shawnee Tribe
P.O. Box 189
Miami, OK 74355

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Sparkman:

The United States Nuclear Regulatory Commission (NRC) has received a license application from USEC, Inc. (USEC) for the construction, operation, and decommissioning of a gas centrifuge uranium enrichment facility known as the American Centrifuge Plant (ACP). The NRC is in the initial stages of developing an Environmental Impact Statement (EIS) for the proposed facility to be located at the Department of Energy (DOE) reservation in Piketon, Ohio. USEC's license application contained an Environmental Report (ER) that will be used to support the NRC's development of an EIS for the ACP. The proposed facility will use gas centrifuge technology to enrich the isotope Uranium-235 in uranium hexaflouride (UF6), up to 10-weight percent. The proposed ACP will have a design capacity of seven million separative work units. The forthcoming EIS will document the impacts associated with the construction, operation, and decommissioning of the facility.

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Any information you provide may be used to document affects in accordance with 36 CFR 800.4 and 800.5. Additionally, we intend to use the EIS process for Section 106 purposes as described in 36 CFR 800.8.

If you any questions or comments, or need additional information, please contact Ron Linton at (301) 415-7777.

Sincerely,

/RA/

B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

March 18, 2005

Mr. Rey Kitchkumme
Prairie Band of Potawatomi Nation
16277 Q Road
Mayetta, KS 66509-8970

SUBJECT: INITIATION OF THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION PROCESS FOR THE PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OHIO

Dear Mr. Kitchkumme:

The United States Nuclear Regulatory Commission (NRC) has received a license application from USEC, Inc. (USEC) for the construction, operation, and decommissioning of a gas centrifuge uranium enrichment facility known as the American Centrifuge Plant (ACP). The NRC is in the initial stages of developing an Environmental Impact Statement (EIS) for the proposed facility to be located at the Department of Energy (DOE) reservation in Piketon, Ohio. USEC's license application contained an Environmental Report (ER) that will be used to support the NRC's development of an EIS for the ACP. The proposed facility will use gas centrifuge technology to enrich the isotope Uranium-235 in uranium hexaflouride (UF6), up to 10-weight percent. The proposed ACP will have a design capacity of seven million separative work units. The forthcoming EIS will document the impacts associated with the construction, operation, and decommissioning of the facility.

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As required by 36 CFR 800.3 (f), the NRC is requesting any information you may have regarding historic sites or cultural resources within the APE. The NRC is interested in knowing if you have specific knowledge of any sites that you believe have traditional religious and cultural significance. In addition, we are interested in knowing if you are aware of or are concerned for any site, or object, eligible for inclusion on the National Register of Historic Places. This will assure appropriate consideration in the Section 106 process.

Any information you provide may be used to document affects in accordance with 36 CFR 800.4 and 800.5. Additionally, we intend to use the EIS process for Section 106 purposes as described in 36 CFR 800.8.

If you any questions or comments, or need additional information, please contact Ron Linton at (301) 415-7777.

Sincerely,

/RA/

B. Jennifer Davis, Section Chief
Environmental and Low-Level
Waste Section
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosure: Section 3.8 and 4.8 Environmental Report

PEORIA TRIBE OF INDIANS OF OKLAHOMA

118 S. Eight Tribes Trail (918) 540-2535 FAX (918) 540-2538
P.O. Box 1527
MIAMI, OKLAHOMA 74355

CHIEF
John P. Froman

SECOND CHIEF
Joe Goforth

RDB

12/29/04
69FR 78058
(1)

March 23, 2005

Chief, Rules and Directives Branch
Division of Administrative Services
Mail Stop T-6 D59
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

RE: Initiation of the National Historic Reservation Act Section 106 Consultation Process for the Proposed American Centrifuge Commercial Plant, Pike County, Ohio

Thank you for notice of the referenced project. The Peoria Tribe of Indians of Oklahoma is currently unaware of any documentation directly linking Indian Religious Sites to the proposed construction. In the event any items falling under the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered during construction, the Peoria Tribe request notification and further consultation.

The Peoria Tribe has no objection to the proposed construction. However, if any human skeletal remains and/or any objects falling under NAGPRA are uncovered during construction, the construction should stop immediately, and the appropriate persons, including state and tribal NAGPRA representatives contacted.

John P. Froman
Chief

xc: Bud Ellis, Repatriation/NAGPRA Committee Chairman

SISP Review Complete

E-RIDS = ADM-03
Cc = M. Blevins (MXB6)

Template = ADM-013

Y. Faraz (YHF)

From: "Eastern Shawnee Tribe Chief Enyart" <estochief@hotmail.com>
To: <rcl1@nrc.gov>
Date: 6/3/05 4:52PM
Subject: 106 Consultation

June 3, 2005

RE: PROPOSED AMERICAN CENTRIFUGE COMMERCIAL PLANT, PIKE COUNTY, OH

To Whom It May Concern:

Thank you for notice of the referenced project(s). The Eastern Shawnee Tribe of Oklahoma is currently unaware of any documentation directly linking Indian Religious Sites to the proposed construction. In the event any items falling under the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered during construction, the Eastern Shawnee Tribe request notification and further consultation.

The Eastern Shawnee Tribe has no objection to the proposed construction. However, if any human skeletal remains and/or any objects falling under NAGPRA are uncovered during construction, the construction should stop immediately, and the appropriate persons, including state and tribal NAGPRA representatives contacted.

Sincerely,
Jo Ann Beckham, Administrative Assistant
Eastern Shawnee Tribe of Oklahoma

Seneca Nation Tribal Historic Preservation

467 Center St. Salamanca, NY 14779
Phone: (716) 945-9427 • Fax: (716) 945-0351
E-mail: snithpo@nycountry.com

Kathleen J. Mitchell
Officer

Lana K. Watt
Cultural Resource Tech.

April 5, 2005

Attention: Mr. Ron Linton
MS T7 J08
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

RE: Proposed American Centrifuge Commercial Plant, Pike County, Ohio

Dear Mr. Linton,

Our office has completed a review of submitted information regarding the above referenced project proposal. In order to further facilitate our review of the project we are requesting that copies of the Phase I Archaeological/Cultural Reports, along with any completed Phase II reports, be forwarded to our office at your earliest convenience.

These comments are offered to assist in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 80).

Respectfully,

Kathleen Mitchell

Kathleen Mitchell
Tribal Historic Preservation Officer

May 20, 2005

ACHP, Office of Federal Agency Programs
Attention: Don Klima, Director
1100 Pennsylvania Avenue NW, Suite 809
Washington, D.C. 20004

SUBJECT: COORDINATION OF NATIONAL HISTORIC PRESERVATION ACT SECTION 106 REQUIREMENTS AND NATIONAL ENVIRONMENTAL POLICY ACT REVIEW FOR THE PROPOSED AMERICAN CENTRIFUGE PLANT, PIKE COUNTY, OHIO

Mr. Klima:

The United States Nuclear Regulatory Commission (NRC) has received a license application from USEC, Inc. (USEC) for the construction, operation, and decommissioning of a gas centrifuge uranium enrichment facility known as the American Centrifuge Plant (ACP). The proposed facility is to be located at the Department of Energy (DOE) reservation in Piketon, Ohio. USEC's license application contained an Environmental Report (ER) that will be used to support the NRC's development of an environmental impact statement (EIS) as required by the NRC's National Environmental Policy Act (NEPA) implementing regulations. The proposed facility will use gas centrifuge technology to enrich the isotope uranium-235 in uranium hexaflouride (UF_6), up to 10-weight percent. The proposed ACP will have a design capacity of seven million separative work units. The forthcoming EIS will document the impacts associated with the construction, operation, and decommissioning of the proposed facility.

Two preliminary phase I archaeological surveys and one draft cultural resource report have been completed for the DOE reservation. Archaeological surveys and the cultural report results are discussed in section 3.8 of USEC's ER (enclosed). Historical and cultural resource impacts are discussed in section 4.8 of USEC's ER (enclosed).

As described in 36 CFR 800.8 we are notifying you that we intend to use the NRC's NEPA review process for Section 106 purposes. In using the NRC's NEPA process in lieu of the procedures set forth in 36 CFR 800.3 through 800.6 we will ensure the standards set forth in 800.8(c)(1) through 800.8(c)(5) are met.

We have previously notified the Ohio State Historical Preservation Officer of our intent to utilize the NRC's NEPA review process to comply with Section 106 requirements in a letter dated December 28, 2004 (enclosed). Additionally, we have solicited information from 17 Indian tribes and one local official in letters dated March 14, 2005 and March 18, 2005. Also, as part of our NEPA review process, we hosted a NEPA public scoping meeting on January 18, 2005, in Piketon, Ohio. At this meeting, we solicited information on cultural and historic properties. A full transcript of this meeting as well as all project related correspondence is available at the NRC's public web site: http://www.nrc.gov/reading-rm/adams.html.

We plan to a issue the draft EIS in September 2005 and will include you in our distribution. If you any questions or comments, or need additional information, please contact Ron Linton at (301) 415-7777.

Sincerely,

/RA/

B. Jennifer Davis, Section Chief
Environmental Review Section
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Docket No.: 70-7004

cc: USEC Service List

Enclosures:
1. Section 3.8 and Section 4.8 of USEC's Environmental Report (ML043550029)
2. December 28, 2004 letter to Ohio SHPO (ML043520095)

APPENDIX C
RADIOLOGICAL DOSE ANALYTICAL METHODOLOGY

APPENDIX C
RADIOLOGICAL DOSE ANALYTICAL METHODOLOGY

This appendix discusses the following topics:

- The dose assessment analysis for site preparation and construction activities for the proposed ACP; and

- Environmental transport and calculation of dose and risk.

C.1 Radiological Impacts from Site Preparation and Construction

Radiological impacts during site preparation and construction are primarily to the construction workers performing those activities. Exposures to off-site personnel are greatly below those of the construction workers themselves because of atmospheric dispersion of airborne material and distance from sources of external dose.

C.1.1 Dose to Construction Workers During Site Preparation and Construction

The primary modes of exposure for construction personnel are: (1) inhalation of radionuclides that are in the dust suspended by construction activities; (2) external exposure from radionuclides contained in the soil suspended in the air; (3) external exposure from radionuclides in the soil on the ground; and (4) external exposure from existing sources nearby on the site.

C.1.1.1 Construction Worker Exposure from Inhalation of Radionuclides in Air

The dose and risk calculation for inhalation is based on the methods of Federal Guidance Report 13 (EPA, 1999), which are themselves based on the models recommended by the International Commission on Radiological Protection. In this method, the computation of committed effective dose equivalent for a nuclide is arrived at by computing the intake quantity of the nuclide and multiplying that amount by a coefficient that converts intake quantity to committed effective dose equivalent.

The following linear exposure model will be used to calculate inhalation dose of the *i*th radionuclide from inhalation:

$$DSR_{inh,i} = \frac{B \times C_d \times DCF_i}{F_p} \qquad \text{(Eq. 1)}$$

where:

- B = the volume of air inhaled per hour (m^3/hr)
- C_d = the concentration of respirable dust in the air (g/m^3)
- DCF_i = the adult inhalation dose conversion factor of radionuclide *i* from Federal Guidance Report 13 (mrem/pCi)
- F_p = the assigned protection factor for respirators from 10 CFR 20 Appendix A (NRC, 1991)

Dose Conversion Factors in Federal Guidance Report 13 are a function of not just the radionuclide, but also the inhalation Type. The Type classification scheme, introduced in International Commission on Radiation Protection Publication 66 (ICRP, 1994), replaced the inhalation Class nomenclature previously used in most inhalation dose modeling. Inhalation Type is one of three values, F, M, or S. The dose conversion factor selected for a nuclide in this analysis will be the default recommended Type listed in

Federal Guidance Report 13 if one exists. If a default recommended Type does not exist, then Type M will be used.

For a few elements, the Dose conversion factor is also a function of the chemical state. For example, the Dose conversion factor for tritium (H-3) in Federal Guidance Report 13 is not only a function of Type, but also a function of whether the tritium is bound as a particulate, water vapor, organic, or in an elemental state. The element of interest in this analysis is uranium, for which Federal Guidance Report 13 has dose factors for only the particulate state.

Federal Guidance Report 13 contains dose conversion factors as a function of age. This analysis uses the adult dose conversion factors since all workers are expected to be over the age of 18. Federal Guidance Report 13 also contains risk coefficients for both mortality and morbidity that are analogous to the Dose Conversion Factors. An inhalation mortality risk for each isotope can be calculated using the same equation, but replacing the Dose Conversion Factor for an isotope with an analogous mortality risk coefficient from Federal Guidance Report 13.

The total inhalation dose from all radionuclides can be estimated by summing all the inhalation doses from the individual radionuclides.

$$\textit{Total Inhalation Dose} \quad = \quad E_d \, \Sigma (DSR_{inh,i} \times A_i) \qquad \text{(Eq. 2)}$$

where

A_i = the activity concentration of radionuclide *i* in dust (pCi/g)

E_d = the number of hours per year that the worker is exposed (hr/yr)

The inhalation analysis uses the following parameters, which provide for an analysis that should produce a high estimate of dose:

- 40 hours/week exposure, 48 weeks per year at job site (52 less 2 vacation and 2 weeks equivalent for holidays/sick time);

- No respiratory protection (F_p = 1);

- Breathing Rate is 1.4 cubic meters per hour from EPA Exposure Factors Handbook (EPA, 1997);

- The average uranium concentration in soil is 7.7 micrograms per gram soil from Table 3.3.2-1 in the ACP Environmental Report (USEC, 2004);

- On-site air contains 313 micrograms of soil per cubic meter (maximum hourly concentration from construction air modeling results);

- All the soil in the air comes from on-site soil with the average uranium concentrations; there is no contribution from off-site;

- The uranium in the soil is Type F for selecting inhalation dose conversion factors, technicium-99 is type S. These provide the maximum dose conversion factors;

- Technicium-99 activity in soil is one half of the maximum value in Table 3.3.2-1 of USEC, 2005; and

- All radioactive materials in the air exist in a fully respirable particle size.

The isotopic activity ratio for the site should average to approximately natural uranium. The mass fractions for the various isotopes of uranium are thus expected to be 0.9926 uranium-238, 0.0073 uranium-235, and 0.000054 uranium-234. The activity ratio is then the specific activity times the mass fraction as seen in Table C-1:

Table C-1 Site Isotopic Activity Ratio

Isotope	Mass Fraction	Specific Activity Ci/gram	Activity Ratio	Activity in Soil pCi/gram
U-234	5.4×10^{-05}	6.2×10^{-03}	3.4×10^{-07}	2.59
U-235	7.3×10^{-03}	2.2×10^{-06}	1.6×10^{-08}	0.12
U-238	9.9×10^{-01}	3.4×10^{-07}	3.3×10^{-07}	2.57
Tc-99	--	--	--	6.3

Notes:
Ci = curie; pCi = picocurie.

Information on isotopic ratios of natural uranium and specific activity is from the Chart of the Nuclides, Twelfth Edition, General Electric Company, San Jose, CA, 1977.

The uranium activity concentration in soil is then calculated from

$$A_i = 10^{12} \times AR_i \times C \qquad \text{(Eq. 3)}$$

where:

- A_i = the isotopic activity in soil in pCi/gram for isotope *i*;
- AR_i = the activity ratio for isotope *i* in Ci/gram of uranium;
- C = the concentration of uranium in the soil in microgram U/gram soil;
- 10^{12} = a factor to convert Ci to pCi.

Table C-2 describes the resulting dose from inhalation by isotope:

Table C-2 Inhalation Dose by Isotope

Isotope	Type	Dose Conversion Factor (mrem/pCi)	Dose (mrem/yr)
U-234	F	2.1×10^{-03}	4.5×10^{-03}
U-235	F	1.9×10^{-03}	1.9×10^{-04}
U-238	F	1.9×10^{-03}	4.0×10^{-03}
Tc-99	S	4.9×10^{-05}	2.6×10^{-04}
Total			$\mathbf{9.0 \times 10^{-03}}$

Notes:
mrem = millirem; pCi = picocurie; yr = year.

C.1.1.2 Construction Worker Exposure from Submersion

Dose to construction workers will occur from external exposure to radiation emitted by radionuclides that are in soil where the construction activities are taking place. The dominant sub-pathways for exposure to these radionuclides include air submersion and direct soil exposure. These exposures can be calculated using a method similar to that used for inhalation:

$$DSR_{sub,i} = C_d \times DCF_{sub,i} \qquad \text{(Eq. 4)}$$

$DCF_{sub,i}$ is in units of millirem per Ci-yr per meter cubed.

With the DSR known, the submersion dose can then be calculated from:

$$\textit{Total Dose from Submersion} = E_D \sum_i (DSR_{sub,i} \times A_i) \qquad \text{(Eq. 5)}$$

The dust concentrations and exposure times are the same as those used for inhalation. Table C-3 describes the dose to workers from submersion.

Table C-3 Worker Dose from Dust Submersion

Isotope	Dose Conversion Factor (mrem-m³/Ci-yr)	Submersion Dose (mrem/yr)
U-234	$7.2 \times 10^{+05}$	4.1×10^{-09}
U-235	$7.6 \times 10^{+08}$	2.0×10^{-07}
U-238	$2.9 \times 10^{+05}$	1.7×10^{-09}
Tc-99	$3.4 \times 10^{+06}$	4.6×10^{-08}
Total		**2.5×10^{-07}**

Notes:
mrem-m³ = millirem-cubic meter; Ci-yr = curie-year; mrem/yr = millirem per year.

C.1.1.3 Construction Worker External Dose from Radionuclides in Soil

Workers will also be subject to exposure from exposure to radionuclides in the soil. Dose from this exposure is calculated using the equation:

$$DSR_{ext,i} = C_s \times DCF_{ext,i} \qquad \text{(Eq. 6)}$$

$DCF_{ext,i}$, is the Dose conversion factor for exposure to external radiation in soil, is in units of millirem per pCi-yr per gram.

The exposure time and soil concentrations used are identical to those used in the inhalation calculation. Again, with the DSR known the total external dose from radionuclides in soil can be calculated from:

$$\textit{Total Dose from Radionuclides in Soil} = E_D \sum_i (DSR_{ext,i} \times A_i) \qquad \text{(Eq. 7)}$$

Table C-4 describes the total external dose to workers from radionuclides in soil.

Table C-4 Total Worker External Dose from Soil

Isotope	Dose Conversion Factor (mrem-g/pCi-yr)	External Dose (mrem/yr)
U-234	3.4×10^{-04}	2.0×10^{-04}
U-235	6.6×10^{-01}	1.7×10^{-02}
U-238	8.0×10^{-05}	4.5×10^{-05}
Tc-99	1.1×10^{-04}	1.5×10^{-04}
Total		**1.8×10^{-02}**

Notes:
mrem-g = millirem per gram; pCi-yr = picocurie-year; mrem/yr = millirem per year.

C.1.1.4 Construction Worker External Dose from Existing Sources

DOE has maintained a set of thermoluminescent dosimeters both on and offsite to measure the direct radiation exposure at various locations from the totality of on-site sources, including the cylinder storage pads and other secondary sources. Thermoluminescent dosimeters provide the best estimate of the external radiation exposure rates at various locations around the site. Work related to the proposed ACP is expected to occur primarily at and around the existing X-3001 and X-3002 buildings, with some additional work being done to build the new X-745H cylinder storage pad approximately 200 yards north of the existing X-745G cylinder storage pad.

In 2003 the environmental exposure rate in the vicinity of the X-3001 and X-3002 buildings was approximately 20 millirem per quarter based on the thermoluminescent dosimeter in that region, TLD 1404A (DOE, 2004). Environmental thermoluminescent dosimeters record information around the clock, or about 2,190 hours per quarter. Assuming a 40 hour work week for a thirteen week quarter, a construction worker in the vicinity of the X-3001 or X-3002 buildings would receive a maximum external radiation dose of 0.5 millisieverts (5 millirem) per quarter or 0.20 millisieverts (20 millirem) per year.

The ambient dose rate in the vicinity of the X-745H cylinder storage pad is expected to be greater than that near the X-3001 and X-3002 buildings. Thermoluminescent dosimeters near the existing storage yards show wide variance in their measured exposure rates; for example, the three thermoluminescent dosimeters nearest the expected location of the X-745H pad record exposure rates at approximately 20 millirem per quarter, while others slightly farther away record higher values, with one thermoluminescent dosimeter reading a value as high as 1.87 millisieverts (187 millirem) per quarter (DOE, 2004). The variation is the result of a number of factors, including the distance and geometry of the thermoluminescent dosimeter relative to the existing storage yards, and any work that may have temporarily placed a source in the vicinity of the thermoluminescent dosimeter.. Using a very conservative assumption that the exposure rate at the X-745H construction site is 1 millisievert (100 millirem) per quarter (4 millisieverts [400 millirem] per year), a construction worker working 40 hours per week for 48 weeks at that job site would receive a maximum external dose of approximately 88 millirem for the year, which is below the public dose limit of 1 millisievert (100 millirem) per year contained in 10 CFR 20.1301(a)(1). The most likely radiation dose to workers at the X-745H pad is expected to be much less, on the order of 0.20 millisieverts (20 millirem) per year, based on the readings from the nearby thermoluminescent dosimeters and the fact that the average annual dose for storage pad workers was 0.29 millisieverts (29 millirem) in 2003. A dose of 0.20 millisieverts (20 millirem), is on the same scale as the variations in individual dose caused by the fluctuation in natural background.

Background radiation dose in the United States averages approximately 3.6 millisieverts (360 millirem) per year (NRC, 2005).

The estimate for external dose from other sources is, for a number of reasons, likely to be significantly exaggerated relative to any actual dose received by a construction worker. First, construction of the pad is not expected to last a full calendar year even though the dose estimate assumes an annual exposure period. Second, the analysis implicitly assumes the same personnel are used in the higher dose rate area for the entire year regardless of the fact that the specific tasks may be changing (i.e. grading versus pouring concrete). Third, the analysis assumes that these personnel spend 100 percent of their work time in the higher dose rate region. The analysis is useful in demonstrating that even with these assumptions in place the maximum dose would still be below the applicable NRC public dose limit.

C.1.1.5 Total Potential Dose to Construction Workers

Total occupational exposures from all four pathways are expected to be less than 1 millisievert (100 millirem) per year, even for estimates combining the most conservative analytical assumptions. This dose presents a nearly negligible risk, representing a lifetime excess cancer risk of approximately 5×10^{-06} when using a risk coefficient of 5×10^{-04} risk per rem (EPA, 1994). Based on this assessment, the impact to workers, from radiological exposure during site preparation and construction is SMALL.

C.1.2 Dose to Off-Site Public from Site Preparation and Construction

Exposures to off-site personnel will be significantly smaller than that for construction workers, particularly since off-site personnel will not have any potential for measurable exposure from the depleted uranium storage pads. The off-site public will also not be exposed to dose from on-site soil containing concentrations of radionuclides above background concentrations.

Estimates of dose to the off-site public from site preparation and construction are limited to two of the pathways used in the analysis of dose to construction workers, inhalation and air submersion. The methodology used to calculate inhalation and submersion dose to the offsite public is the same as that used to calculate the doses to construction workers; only the concentration of dust in air and the exposure duration in hours per year are changed. The airborne dust concentration used in the off-site inhalation exposure is 22.7 micrograms per cubic meter, which represents the maximum fenceline one hour concentration. The exposure duration is considered to be 8,760 hours per year, or full time occupancy. Using these values in the previous models results in the following inhalation dose values in millirem per year of exposure (Table C-5):

Table C-5 Dose to the Off-Site Public

Isotope	Inhalation Dose (mSv/yr)	Submersion Dose (mSv/yr)
U-234	4.5×10^{-05}	0
U-235	1.9×10^{-06}	0
U-238	4.0×10^{-05}	0
Tc-99	2.6×10^{-06}	0
Total	**8.9×10^{-05}**	**0**

Notes:
mSv/yr = millisievert per year.
To convert millisievert to millirem multiply by 100.

The maximum exposure to off-site personnel is estimated to be much less than 0.01 millisieverts (1millirem) per year, so the impact to off-site personnel from site preparation and construction is SMALL.

C.2 Estimation of Dose and Risk

The purpose of this section is to present the mathematical models and equations used in CAP88-PC for environmental transport and estimation of dose and risk from air transport of radioactive material.

C.2.1 Environmental Transport

CAP88-PC incorporates a modified version of the AIRDOS-EPA (Moore, 1979) program to calculate environmental transport. Relevant portions of this document are reproduced here, as referenced.

C.2.1.1 Plume Rise

CAP88-PC calculates plume rise in the subroutine CONCEN using either Rupp's equation (Ru48) for momentum dominated plume rise, or Briggs' equations (Br69) for hot buoyant plumes (Mo79). CAP88-PC also accepts user-supplied values for plume rise for each Pasquill stability class. The plume rise, Dh, is added to the actual physical stack height, h, to determine the effective stack height, H. The plume centerline is shifted from the physical height, h, to H as it moves downwind. The plume centerline remains at H unless gravitational settling of particulates produces a downward tilt, or until meteorological conditions change.

Rupp's equation for momentum dominated plumes is:

$$\Delta h = \frac{1.5vd}{\mu} \qquad \text{(Eq. 1)}$$

where:

Δh = plume rise
v = effluent stack gas velocity (m/sec)
d = inside stack diameter (m)
μ = wind velocity (m/sec)

CAP88-PC models Briggs' buoyant plume rise for stability categories A, B, C, and D with:

$$\Delta h = \frac{1.6 F^{1/3} x^{2/3}}{\mu} \qquad \text{(Eq. 2)}$$

where:

Δh = plume rise
F = $3.7 \times 10^{-5} Q_H$
Q_H = heat emission from stack gases (cal/sec)
x = downwind distance (m)
μ = wind speed (m/sec)

This equation is valid until the downwind distance is approximately ten times the stack height, 10h, where the plume levels off. For downwind distances greater than 10h, the equation used is:

$$\Delta h = \frac{1.6\, F^{1/3} \times (10h)^{2/3}}{\mu} \qquad \text{(Eq. 3)}$$

Equation (2) is also used to a distance of $X = 2.4\ \mu S^{-1/2}$ for stable categories E, F, and G, beyond which the plume is assumed to level off. For higher values of x, the stability parameter, S, is used in the equation:

$$\Delta h = 2.9\, (F/\mu S)^{1/3} \qquad \text{(Eq. 4)}$$

in which:

S =	$(g/T_a)(dT_a/dz+G)$	(Eq. 5)
g =	gravitational acceleration (m/sec²)	
T_a =	air temperature (°K)	
dT_a/dz =	vertical temperature gradient (°K/m)	
z =	vertical distance above stack (m)	
G =	adiabatic lapse rate of atmosphere (0.0098° K/m)	

The value of the vertical temperature gradient, dT_a/dz, is positive for stable categories. In CAP88-PC, dT_a/dz values are:

7.280E-02 °K/m for Pasquill category E
1.090E-01 °K/m for Pasquill category F
1.455E-01 °K/m for Pasquill category G

The true-average wind speed for each Pasquill stability category is used in CAP88-PC to estimate plume rise, as it is greater than the reciprocal-averaged wind speed, and produces a smaller, more conservative plume rise. This procedure does not risk underestimating the significant contribution of relatively calm periods to downwind nuclide concentrations which could result from direct use of a plume rise calculated for each separate wind-speed category. This procedure avoids calculating an infinite plume rise when wind speed is zero (during calms), since both momentum and buoyancy plume rise equations contain wind speed in the denominator (Moore, 1979).

CAP88-PC also accepts user-supplied plume rise values, for situations where actual measurements are available or the supplied equations are not appropriate. For example, plume rises of zero may be used to model local turbulence created by building wakes.

For this analysis, the plume rise was set to zero for each Pasquill category.

C.2.1.2 Plume Dispersion

Plume dispersion is modeled with the Gaussian plume equation of Pasquill (Pasquill, 1961, and Moore, 1979), as modified by Gifford:

$$\chi = \frac{Q}{2\pi\sigma_y\sigma_z\mu}\, exp[-\tfrac{1}{2}(y/\sigma_y)^2]\{exp[-\tfrac{1}{2}((z-H)/\sigma_z)^2]+exp[-\tfrac{1}{2}((z+H)/\sigma_z)^2]\} \qquad \text{(Eq. 6)}$$

where:

χ = concentration in air (chi) at x meters downwind, y meters crosswind, and z meters above ground (Ci/m^3)

Q = Release rate from stack (Ci/sec)

μ = wind speed (m/sec)

σ_y = horizontal dispersion coefficient (m)

σ_z = vertical dispersion coefficient (m)

H = effective stack height (m)

y = crosswind distance (m)

z = vertical distance (m)

The downwind distance x comes into Equation (6) through σ_y and σ_z, which are functions of x as well as the Pasquill atmospheric stability category applicable during emission from the stack. CAP88-PC converts χ in Equation (6) and other plume dispersion equations from units of curies per cubic meter to units of picocuries per cubic centimeter.

Annual-average meteorological data sets usually include frequencies for several wind-speed categories for each wind direction and Pasquill atmospheric stability category. CAP88-PC uses reciprocal-averaged wind speeds in the atmospheric dispersion equations, which permit a single calculation for each wind-speed category. Equation (6) is applied to ground-level concentrations in air at the plume centerline by setting y and z to zero, which results in:

$$\chi = \frac{Q}{\pi \sigma_y \sigma_z \mu} \exp[-\tfrac{1}{2}(H/\sigma_z)^2] \qquad \text{(Eq. 7)}$$

The average ground-level concentration in air over a sector of 22.5° can be approximated by the expression:

$$\chi_{ave} = f\chi \qquad \text{(Eq. 8)}$$

where f is the integral of the exponential expression:

$$\exp[-\tfrac{1}{2}(y/\sigma_y)^2]$$

in Equation (6) from a value of y equals zero to infinity divided by y_s, the value of y at the edge of the 22.5° sector, which is the value of the downwind distance, x, multiplied by the tangent of half the sector angle. The expression is:

$$f = \frac{\int_0^\infty \exp\left[-\left(\frac{0.5}{\sigma_y^2}\right) y^2\right] dy}{y_s} \qquad \text{(Eq. 9)}$$

The definite integral in the numerator of Equation (9) is evaluated as

$\sigma_y (\pi/2)^{½}$

Since y_s = x tan (11.25°),

$$f = \frac{6.300836\sigma_y}{x} \qquad \text{(Eq. 10)}$$

The equation for sector-averaged ground level concentration in air is therefore:

$$\chi = \frac{Q}{0.15871\,\pi x \sigma_z \mu} \; exp[-½(H)/\sigma_z)^2] \qquad \text{(Eq. 11)}$$

This method of sector-averaging compresses the plume within the bounds of each of the sixteen 22.5° sectors for unstable Pasquill atmospheric stability categories in which horizontal dispersion is great enough to extend significantly beyond the sector edges. It is not a precise method, however, because the integration over the y-axis, which is perpendicular to the downwind direction, x, involves increasing values for x as y is increased from zero to infinity.

An average lid for the assessment area is provided as part of the input data. The lid is assumed not to affect the plume until x becomes equal to $2x_L$, where x_L is the value of x for which σ_z = 0.47 times the height of the lid (Turner, 1969). For values of x greater than $2x_L$, vertical dispersion is restricted and radionuclide concentration in air is assumed to be uniform from ground to lid.

The average concentration between ground and lid, which is the ground-level concentration in air for values of x greater than $2x_L$, may be expressed by:

$$\chi_{ave} = \int_0^\infty \frac{\chi}{L} dz \qquad \text{(Eq. 12)}$$

where χ is taken from Equation (6) and L is lid height. The value of H in Equation (6) may be set at zero since X_{ave} is not a function of the effective stack height.

The resulting simplified expression may be evaluated for constant x and y values (s_y and s_z held constant) by using a definite integral similar to that in Equation (10):

$$\chi_{ave} = \left(\frac{1}{L}\right) \int_o^\infty \left(\frac{Q}{\pi \sigma_y \sigma_z}\right) \exp\left(\frac{-Z^2}{2\sigma_Z^2}\right) \exp\left(\frac{-Z^2}{2\sigma_y^2}\right) dz \qquad \text{(Eq. 13)}$$

The result is:

$$\chi_{ave} = \frac{Q}{2.5066\,\sigma_y L \mu} \; exp[-y^2/\sigma y^2] \qquad \text{(Eq. 14)}$$

One obtains the sector-averaged concentration at ground level by replacing the exponential expression containing y by f in Equation (11):

$$\chi_{ave} = Q/0.397825xL\mu \quad \text{(Eq. 15)}$$

It should be noted at this point that for values of the downwind distance greater than $2x_L$ dispersion, as expressed in Equation (16), no longer can be said to be represented by the Pasquill equation. The model is simply a uniform distribution with a rectangle of dimensions LID and 2x tan (11.25°).

Gravitational settling is handled by tilting the plume downward after it has leveled off at height H by subtracting $V_g x/m$ from H in the plume dispersion equations. For CAP88-PC V_g is set at the default value of zero and cannot be changed by the user.

C.2.1.3 Dry Deposition

Dry deposition is modeled as being proportional to the ground-level concentration of the radionuclide (Moore, 1979):

$$R_d = V_d \chi \quad \text{(Eq. 16)}$$

where:
- R_d = surface deposition rate (pCi/cm²-sec)
- V_d = deposition velocity (cm/sec)
- χ = ground-level concentration (chi) in air (pCi/cm³)

Although V_d has units of velocity, it is only a proportionality constant and is usually higher than the actual, measured velocity of radionuclides falling to the ground. The proportionality constant must include deposition from fallout interception by foliage, which subsequently falls to the ground and so adds to ground deposition. Defaults for deposition velocity used by CAP88-PC are 3.5×10^{-02} meters per second for Iodine, 1.8×10^{-03} meters per second for particulates, and zero for gases.

C.2.1.4 Precipitation Scavenging

The deposition rate from precipitation scavenging (Moore, 1979), which occurs when rain or snow removes particles from the plume, is modeled with:

$$R_s = \Phi \chi_{ave} L \quad \text{(Eq. 17)}$$

where:
- R_s = surface deposition rate (pCi/cm²-sec)
- Φ = scavenging coefficient (sec⁻¹)
- χ_{ave} = average concentration in plume up to lid height (pCi/cm³)
- L = lid height (tropospheric mixing layer) (cm)

The scavenging coefficient, Φ (in sec^{-1}), is calculated in CAP88-PC by multiplying the rainfall rate in cm/yr, by 1.0×10^{-07} yr/cm-sec.

C.2.1.5 Plume Depletion

Radionuclides are depleted from the plume by precipitation scavenging, dry deposition, and radioactive decay. Depletion is accounted for by substituting a reduced release rate, Q^1, for the original release rate Q for each downwind distance x (Slade, 1968). The ratio of the reduced release rate to the original is the depletion fraction. The overall depletion fraction used in CAP88-PC is the product of the depletion fractions for precipitation scavenging, dry deposition and radioactive decay.

For precipitation scavenging the depletion fraction for each downwind distance (x) is:

$$\frac{Q^l}{Q} = e^{-\Phi t} \qquad \text{(Eq. 18)}$$

where:

- Φ = scavenging coefficient (sec^{-1})
- t = time (sec) required for the plume to reach the downwind distance x

The depletion fraction for dry deposition is derived by using Equation (6) with z set to zero for ground-level concentrations, and subtracting the quantity (V_g x)/U from H for a tilted plume (Van, 1968, and Moore, 1979):

$$\frac{Q^1}{Q} = \exp\left\{ -\left(\frac{2}{\pi}\right)^{1/2} \left(\frac{V_d}{\mu}\right) \int_o^x \frac{\exp\left[-\left(H - {V_g \chi}/{\mu} \right) / 2\sigma_z^2 \right]}{\sigma_z} dx \right\} \qquad \text{(Eq. 19)}$$

where:

- V_d = deposition velocity (m/sec)
- μ = wind speed (m/sec)
- σ_z = vertical dispersion coefficient (m)
- V_g = gravitational velocity (m/sec)
- H = effective stack height (m)
- x = downwind distance (m)

The integral expression must be evaluated numerically. Values for the vertical dispersion coefficient s_z are expressed as functions of x in the form x^D/F where D and F are constants with different values for each Pasquill atmospheric stability category, to facilitate integrations over x.

Values for the depletion fraction for cases where V_g is zero are obtained from the subroutine QY in CAP-88. Subroutine QY obtains depletion fractions for the conditions $V_d = 0.01$ m/sec and $\mu = 1$ m/sec for each Pasquill stability category from the data file REFA.DAT. This file contains values for release heights (meters) of:

1, 1.5, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12.5, 15, 17.5, 20, 25, 30, 35, 40, 50, 60, 70, 80, 90, 100, 120, 140, 160, 180, 200, 240, 260, 300 and 400;

and for downwind distances (meters) of:

35, 65, 100, 150, 200, 300, 400, 500, 650, 800, 1,000, 1,500, 2,000, 4,000, 7,000, 10,000, 25,000, 60,000, 90,000, and 200,000.

The stored depletion fractions were calculated numerically with a Simpson's rule routine. CAP88-PC uses a linear interpolation to produce a fraction for the required downwind value, release height and Pasquill category for $V_d = 0.01$ m/sec and $\mu = 1$ m/sec. The value is then converted to the appropriate value for the actual deposition velocity and wind speed by use of the equation:

$$(Q^1/Q)_2 = (Q^1/Q)_1^{100\,V_d/\mu} \qquad \text{(Eq. 20)}$$

in which subscript 2 refers to the desired value and subscript 1 refers to the value for $V_d = 0.01$ μ/sec and m = 1 m/sec.

For downwind distances greater than $2x_L$ where Equation 15 applies to the ground-level concentrations in air, the depletion is modeled with (Moore, 1979):

$$\frac{Q_x^1}{Q_{2x_L}^1} = \exp\left[-V_d(x - 2x_L) \Big/ L\mu\right] \qquad \text{(Eq. 21)}$$

Which shows the reduced release rates at distances x and $2x_L$, respectively.

The depletion fraction for radioactive decay is:

$$\frac{Q^1}{Q} = \exp(-\lambda_r t) \qquad \text{(Eq. 22)}$$

where:

λ_r = effective decay constant in plume
t = time required for plume travel

The decay constant used is referred to as the "effective decay constant" since it is not the true radiological decay constant in all cases. For example, if a radionuclide is a short-lived decay product in equilibrium with a longer-lived parent, the effective decay constant would be equal to the true radiological decay constant of the parent.

The atmospheric dispersion equations use the reciprocal-averaged wind speed, but neither this value nor the true average wind speed can adequately be used to calculate reduced release rates to account for radiological decay and scavenging losses because averaging of exponential terms is required. CAP88-PC uses an approximate method of calculation for this purpose, which establishes three wind speeds (1 m/sec, the average wind speed, and 6 m/sec) to simulate the actual wind-speed spectrum for each specific wind direction and Pasquill category. The wind speeds 1 and 6 m/sec were chosen because they approximate the upper and lower bounds in most meteorological data sets.

If f_1, f_2 and f_3 are designated as the time fractions for the three wind speeds, then:

$$f_1 + (\mu_a f_2) + 6f_3 = \mu$$

$$f_1 + (f_2/\mu_a) + f_3/6 = 1/\mu_r$$

and

$$f_1 + f_2 + f_3 = 1$$

where:

μ_a = Arithmetic-average wind speed
μ_r = Reciprocal-average wind speed

Solving the three simultaneous equations yields:

$$f_1 = 1 - f_2 - f_3$$

$$f_2 = \frac{(7/6) - (\mu_a/6) - (1/\mu_r)}{(7/6) - (\mu_a/6) - (1/\mu_a)}$$

$$f_3 = \frac{(\mu_a - 1)(1 - f_2)}{5}$$

The depletion fraction to account for radioactive decay is then approximated by:

$$f_1 \exp(-\lambda_r x) + f_2 \exp[-\lambda_r(x/\mu_a)] + f_3 \exp[-\lambda_r(x/6)]$$

where:

λ_r = effective decay constant in plume (sec^{-1})
μ_a = Arithmetic-average wind speed
x = downwind distance (m)

For precipitation scavenging losses, the depletion fraction is:

$$f_1 \exp(-\Phi x) + f_2 \exp[-\Phi(x/\mu_a)] + f_3 \exp[-\Phi(x/6)]$$

where Φ is the scavenging coefficient (sec^{-1}).

The overall depletion fraction is calculated by multiplying the depletion fraction for dry deposition by the fraction for radioactive decay and precipitation scavenging.

C.2.1.6 Dispersion Coefficients

Horizontal and vertical dispersion coefficients (s_y and s_z) used for dispersion calculation in CONCEN and for depletion fraction determination in QY are taken from recommendations by G.A. Briggs of the Atmospheric Turbulence and Diffusion Laboratory at Oak Ridge, Tennessee (Moore, 1979, and Gifford, 1976). The coefficients are different functions of the downwind distance x for each Pasquill stability category for open-country conditions, as shown in Table C-6:

Table C-6 Coefficients for Open-Country Conditions

Pasquill category	σ_y (m)	σ_z (m)
A	$0.22\,x\,(1+0.0001x)^{-1/2}$	$0.20\,x$
B	$0.16\,x\,(1+0.0001x)^{-1/2}$	$0.12\,x$
C	$0.11\,x\,(1+0.0001x)^{-1/2}$	$0.08\,x\,(1+0.0002x)^{-1/2}$
D	$0.08\,x\,(1+0.0001x)^{-1/2}$	$0.06\,x\,(1+0.0015x)^{-1/2}$
E	$0.06\,x\,(1+0.0001x)^{-1/2}$	$0.03\,x\,(1+0.0003x)^{-1}$
F	$0.04\,x\,(1+0.0001x)^{-1/2}$	$0.016\,x\,(1+0.0003x)^{-1}$
G	calculated by subtracting half the difference between values for categories E and F from the value for category F.	

where:

x = downwind distance

CAP88-PC uses the functions in the form of

$$\sigma_y = x^A / C$$
$$\sigma_z = x^D / F$$

to facilitate integrations over x. Values for A, C, D, and F for each stability category and downwind distance are stored in a data statement.

C.2.1.7 Ground Surface Concentrations

Ground surface and soil concentrations are calculated for those nuclides subject to deposition due to dry deposition and precipitation scavenging. The deposition accumulation time is defined by the user. This value corresponds to establishing a cutoff for the time following a release when any significant intake or external exposure associated with deposition on soil might take place.

Ingrowth from a parent radionuclide is calculated using the Bateman decay equations for all chains contained in the isotope database from Federal Guidance Report 13. Ingrowth is calculated for the entire chain based on the decay time input by the user. The default decay time is 100 years.

Radionuclide concentrations in meat, milk, and vegetables are calculated using elemental transfer factors from Report 123 of the National Council on Radiation Protection (NCRP, 1996). The concentration in soil for each isotope is multiplied by the appropriate elemental transfer factor to generate a concentration in each of the ingestion pathways media for that isotope in that sector. This information is then supplied to the dose and risk calculation models via an intermediate output file.

C.2.2 Dose and Risk Estimates

CAP88-PC uses a modified version of DARTAB (ORNL, 1981) and a database of dose and risk factors from Federal Guidance Report 13 (EPA, 1999) for estimating dose and risk. Relevant portions of these documents are reproduced here, as referenced.

Dose and risk conversion factors include the effective dose equivalent calculated with the weighting factors in International Commission on Radiation Protection Publication Number 72 (ICRP, 1996). Dose

and risk factors are provided for the pathways of ingestion and inhalation intake, ground level air immersion, and ground surface irradiation. Factors are further broken down by particle size, clearance category chemical form, and gut-to-blood transfer factors. These factors are stored in a database for use by the program. At this time CAP88-PC only uses dose and risk factors for adult populations, for particle sizes of 1 micron, and for cancer mortality.

For assessments where radon-222 decay products are not considered, estimates of dose and risk are made by combining the inhalation and ingestion intake rates, air and ground surface concentrations with the appropriate dose and risk conversion factors. CAP88-PC lists the dose and risk to the maximum individual and the collective population. CAP88-PC calculates dose to the 23 internal organs in International Commission on Radiation Protection Publication 72 (ICRP, 1996) in addition to the 50 year effective dose equivalent. Risks are estimated for 15 cancer sites, including leukemia, bone, thyroid, breast, lung, stomach, colon, liver, pancreas, ovaries, skin, kidneys, esophagus, and bladder. Doses and risks can be further tabulated as a function of radionuclide, pathway, location, and organ.

For each assessment, CAP88-PC tabulates the frequency distribution of risk, that is, the number of people at various levels of risk (lifetime risk). The risk categories are divided into powers of ten, from one in ten to one in one million. The number of health effects is also tabulated for each risk category.

C.2.2.1 Air Immersion

Individual dose is calculated for air immersion with the general equation:

$$\frac{E_{ij}(k)\ DF_{ijl}}{P(k)}\ K_j$$

where:

$E_{ij}(k)$ = exposure rate, person-pCi/cm^3
DF_{ijl} = Dose rate factor, mrem/nCi-yr/m^3
$P(k)$ = number of exposed people
K_j = 0.001 nCi/pCi x 1,000,000 cm^3/m^3 (proportionality factor)

Risk is calculated similarly, by substituting the risk conversion factor, for the dose conversion factor. The risk conversion factor is in units of risk/nCi-yr/m^3.

C.2.2.2 Surface Exposure

Individual dose is calculated for ground surface exposure with the general equation:

$$\frac{E_{ij}(k)\ DF_{ijl}}{P(k)}\ K_j$$

where:

$E_{ij}(k)$ = exposure rate, person-pCi/cm^2
DF_{ijl} = Dose rate factor, mrem/nCi-yr/m^2
$P(k)$ = number of exposed people
K_j = 0.001 nCi/pCi x 10,000 cm^2/m^2 (proportionality factor)

Risk is calculated by substituting the risk conversion factor for the dose conversion factor. The risk conversion factor is in units of risk/nCi-yr/m^2.

C.2.2.3 Ingestion and Inhalation

Individual dose is calculated for the ingestion and inhalation exposure pathway with the general equation:

$$\frac{E_{ij}(k)\ DF_{ijl}\ K_j}{P(k)}$$

where:

$E_{ij}(k)$ = exposure rate, person-pCi/cm^3
DF_{ijl} = Dose rate factor, mrem/nCi-yr/m^3
$P(k)$ = number of exposed people
K_j = 0.001 nCi/pCi x 1,000,000 cm^3/m^3 (proportionality factor)

Risk is calculated by substituting the risk conversion factor or the dose conversion factor.

C.2.2.4 Maximally-Exposed Individual

Doses for the maximally-exposed individual in population runs are estimated by CAP88-PC for the location, or sector-segment in the radial assessment grid, of highest risk where at least one individual actually resides. The effective dose equivalent for the maximally-exposed individual is tabulated in mrem/yr for a 50 year exposure. The reported risk associated with the 50 year Total Effective Dose Equivalent based on the risk coefficients contained in Federal Guidance Report 13.

When performing assessments of individual dose in CAP88-PC, the code will calculate the maximum individual dose based on the result from the highest grid point input by the user for that individual case. Alternatively, the user may specify the grid location where CAP88-PC is to generate the maximum exposed individual. This is done using the ILOC and JLOC parameters on the individual assessment grid input screen.

C.2.2.5 Collective Population

Collective population dose and risk are found by summing, for all sector segments, the intake and exposure rates multiplied by the appropriate dose or risk conversion factors from Federal Guidance Report 13. Collective population dose is reported by person-Rem per year (not millirem), and collective risk is reported in deaths per year.

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APPENDIX D
TRANSPORTATION ANALYSIS METHODOLOGY, ASSUMPTIONS, AND IMPACTS

APPENDIX D
TRANSPORTATION ANALYSIS METHODOLOGY, ASSUMPTIONS, AND IMPACTS

D.1 Introduction

This appendix presents the methodology and assumptions used to evaluate the potential impacts from the transportation of radiological materials to and from the proposed American Centrifuge Plant (ACP) near Piketon, Ohio. Transportation of radiological materials would include shipments of feed materials to the ACP, shipments of product materials from the proposed ACP, shipments of radioactive waste from the proposed ACP during the operation of the facility, and the eventual shipment of depleted uranium to a disposal site after its conversion from uranium hexafluoride (UF_6) to triuranium octaoxide (U_30_8), a chemical form more suitable for disposal.

D.2 Radioactive Materials Description

The feed material consists of natural UF_6 and is transported in Type 48Y or Type 48X cylinders. The product consists of enriched UF_6 and is transported in Type 30B cylinders. Specifications for these cylinders are given in Table D-1. Two other radioactive materials requiring transportation that result from the conversion of UF_6 are depleted U_3O_8 and calcium fluoride (CaF_2), contaminated with uranium. Assuming no change in isotopic concentration of the uranium isotopes, the U_3O_8 material would have the same isotopic ratios as the depleted UF_6 tails. The CaF_2 could have about 55 becquerels (1.5 picocuries) per gram of depleted uranium as a radioactive contaminate (DOE, 2004). Finally radioactive waste resulting from routine operations and the eventual decontamination and decommissioning (D&D) of the plant would be transported to a waste disposal site. Specifications for 55-gallon drums and B-25 boxes, used to transport radioactive waste are give in Table D-2.

Table D-1 Specifications for Type 30B, 48X, and 48Y Cylinders

Cylinder Specification	30B	48X	48Y
Nominal Diameter	76 cm	122 cm	122 cm
Nominal Length	206 cm	302 cm	380 cm
Wall Thickness	1.3 cm	1.6 cm	1.6 cm
Nominal Tare Weight	635 kg	2,000 kg	2,359 kg
Maximum Net Weight	2,300 kg	9,540 kg	12,500 kg
Nominal Gross Weight	2,900 kg	11,600 kg	14,800 kg
Minimum Volume	0.74 m^3	3.05 m^3	4.04 m^3
Basic Construction Material	Steel: ASTM-516	Steel: ASTM-516	Steel: ASTM-516
Service Pressure	1,380 kPa gage	1,380 kPa gage	1,380 kPa gage
Hydrostatic Test Pressure	2,760 kPa gage	2,760 kPa gage	2,760 kPa gage
Isotopic Content Limit (Max. with Moderation Control)	5.0 % U-235	4.5 % U-235 (5.0% in-plant use)	4.5 % U-235
Valve Used	2.54 cm valve	2.54 cm valve	2.54 cm valve

Notes:
cm = centimeter;m^3 = cubic meter; kg = kilogram; kPa = kilopascal; psi = pounds per square inch; ASTM = American Society for Testing and Materials.
To convert cm to inches multiply by 0.394.
To convert m^3 to ft^3 multiply by 35.3.
To convert kg to lb multiply by 2.2.
To convert kPa to psi multiply by 0.144.
Source: USEC, 1995.

Table D-2 Specifications for 55-Gallon Drums and B-25 Boxes

Cylinder Specification	55-Gallon Drum	B-25 Box
Nominal Diameter	61 cm	122 cm × 183 cm
Nominal Length	89 cm	122 cm
Minimum Volume	259 L	2,720 L
Material of Construction	Steel	Steel

Notes:
cm = centimeter; L = liter
To convert cm to inches multiply by 0.394.
To convert L to ft^3 multiply by 0.35.
Source: USEC, 2005.

Table D-3 provides the isotopic mass fractions used to calculate the activities of the individual radionuclides in the various shipping containers. The calculated activity of the uranium isotopes and their

most prevalent progeny are given in Table D-4. The activities of the various isotopes of protactinium and thorium are calculated assuming one year of decay. These progeny along with the uranium isotopes account for more than 99 percent of the total activity of the radioactive materials described in Section D.1. While other progeny are present in very small quantities, their contribution to the total risk is negligible.

Table D-3 Uranium Isotopic Mass Fractions

Radionuclide	Mass Fraction		
	Feed Material (%)	Product Materials (%)	Depleted Tails (%)
U-234	0.0054	0.047	0.00052
U-235	0.7	4.7	0.3
U-238	99.3	95.2	99.7

Table D-4 Activities of Uranium, Protactinium, and Thorium Radionuclides in Various Shipping Containers (becquerels)

Radionuclide	Feed Material			Product 30B Cylinder	Heels 30B Cylinder	Radioactive Waste[1]		Depleted Uranium Bulk Bag	Calcium Fluoride Bulk Bag
	48X Cylinder	48Y Cylinder	30B Cylinder			55-Gallon Drum	B-25		
Th-230	7.4×10^{5}	9.6×10^{5}	1.6×10^{6}	1.6×10^{6}	8.1×10^{3}	0	0	1.1×10^{5}	5.2×10^{-1}
Th-231	3.7×10^{9}	4.8×10^{9}	5.9×10^{9}	5.9×10^{9}	2.9×10^{7}	7.4×10^{6}	7.4×10^{7}	2.1×10^{9}	1.0×10^{4}
Th-234	8.1×10^{10}	1.0×10^{11}	1.9×10^{10}	1.9×10^{10}	9.3×10^{7}	1.2×10^{8}	1.6×10^{9}	1.2×10^{11}	5.6×10^{5}
Pa-231	7.8×10^{4}	1.0×10^{5}	1.2×10^{5}	1.2×10^{5}	5.9×10^{2}	0	0	4.4×10^{4}	2.1×10^{-1}
Pa-234	1.0×10^{8}	1.4×10^{8}	2.4×10^{7}	2.4×10^{7}	1.2×10^{5}	0	0	1.6×10^{8}	7.4×10^{2}
Pa-234m	8.1×10^{10}	1.0×10^{11}	1.9×10^{10}	1.9×10^{10}	9.3×10^{7}	1.2×10^{8}	1.6×10^{9}	1.2×10^{11}	5.6×10^{4}
U-234	8.1×10^{10}	1.0×10^{11}	1.7×10^{11}	1.7×10^{11}	8.1×10^{8}	1.2×10^{8}	1.6×10^{9}	1.1×10^{10}	5.6×10^{4}
U-235	3.7×10^{9}	4.8×10^{9}	1.6×10^{9}	1.6×10^{9}	2.9×10^{7}	7.4×10^{6}	7.4×10^{7}	2.1×10^{9}	1.0×10^{4}
U-238	8.1×10^{10}	1.0×10^{11}	1.9×10^{10}	1.9×10^{10}	9.3×10^{7}	1.2×10^{8}	1.6×10^{9}	1.2×10^{11}	5.6×10^{5}
Total Curies	3.3×10^{11}	4.1×10^{11}	2.4×10^{11}	2.4×10^{11}	1.0×10^{9}	5.2×10^{8}	6.7×10^{9}	3.7×10^{11}	1.7×10^{6}

Notes:
1 curie (Ci) = 3.7×10^{10} becquerels
[1]Source: USEC, 2005.

D.3 Transportation Routes

Transportation of radiological materials would include shipments of feed material (natural UF_6) to the proposed ACP, shipments of product materials (enriched UF_6) from the proposed ACP, and shipments of radioactive waste from the proposed ACP (USEC, 2005). Depleted UF_6 is assumed to be stored onsite until it is converted from UF_6 to U_3O_8, a more stable chemical form, and then transported by railcar to a low-level radioactive waste disposal site. According to the ACP Environmental Report, feed materials will be transported from Metropolis, Illinois; Port Hope, Ontario, Canada; and Wilmington, Delaware in Type 48Y, Type 48X , and Type 30B cylinders, respectively. Product materials will be shipped to Richland, Washington; Columbia, South Carolina; Wilmington, North Carolina; and Seattle, Washington in Type 30B cylinders. Wilmington, Delaware is the shipping port for feed materials from Russia, while Seattle is the port for product shipments to Korea, and Japan. Low-level radioactive waste (LLRW) will be shipped to Gainsville, Florida; Clive, Utah; and the Nevada Test Site. The transportation of radiological materials is subject to NRC and DOT regulations. Table D-5 presents a matrix of the shipping origins and destinations for the various radioactive materials.

In addition to the transport of radioactive materials during the operation of the proposed ACP, low-level radioactive waste will be shipped to disposal sites during decontamination and decommissioning (D&D) waste are expected to include of the proposed ACP. Shipments of decontamination and decommissioning waste are expected to be 5,100 shipments to the Nevada Test Site; 105 shipments to Clive, Utah; and 60 shipments to Kingston, Ohio.

WebTragis (ORNL, 2003) was used to generate the routing information. WebTragis is a web-based version of Tragis (Transport Routing Analysis Geographic Information System) and is used to calculate highway, rail, or waterway routes within the United States. WebTragis generates routing distance, population density within 800 meters (0.5 mile), and for the truck routes, the number of rest stops and stops for State inspections. Table D-6 presents the output from WebTragis to be used in this risk assessment. For Port Hope, Ontario, an additional 241 kilometers (150 miles) of route distance was added to the TRAGIS output to account for that portion of the route located in Canada. Even though transportation regulations by truck do not require restricted routing for the shipment of natural uranium, low-enriched uranium, or depleted uranium, routing restrictions were applied as follows (USEC, 2005):

- Highway Route Controlled Quantity preferred route with two drivers;
- Prohibit use of links prohibiting truck use; and
- Prohibit use of ferry crossing; prohibit use of roads with hazardous materials prohibition.

Table D-5 Radioactive Waste Shipment Routes

Route	Radioactive Shipments							
	Feed Material (Natural UF_6)	Product (Enriched UF_6)	Heeled Containers	LowLevel Radioactive Waste	Mixed Low- Level Radioactive Waste	Low-Level Liquid Radioactive Waste	Depleted Uranium (U_3O_8)	Calcium Fluoride (CaF_2)
Metropolis, IL to ACP	✓							
Port Huron, ON to ACP	✓							
Wilmington, DE to ACP	✓							
ACP to Richland, WA		✓	✓					
ACP to Columbia, SC		✓	✓					
ACP to Wilmington, NC		✓						
ACP to Seattle, WA		✓						
ACP to Clive, UT				✓			✓	✓
ACP to Nevada Test Site, NV				✓				
ACP to Gainsville, FL					✓			
ACP to Oak Ridge, TN						✓		

Source: USEC, 2005.

Table D-6 Route Information as Generated by TRAGIS

Destination/ Origin	Distance (km)				Elapsed Time (hh:mm)	Weighted Population (people/km²)			Population within 800 m Buffer Zone
	Rural	Suburban	Urban	Total		Rural	Suburban	Urban	
Metropolis, IL	554.1 (63.0%)	307.3 (35.0%)	17.7 (2.0%)	879.1 (100%)	9:31	20.6	282	2,193	174,192
Port Hope, ON	457.8 (50.9%)	392.7 (43.7%)	48.2 (5.4%)	898.7 (100%)	10:26	21	305.2	2,444	316,151
Wilmington, DE	474.4 (54.3%)	355.3 (40.7%)	44.3 (5.1%)	873.9 (100%)	10:06	19	330.6	2,316	308,509
Richland, WA	3,130.9 (81.4%)	653.4 (17.0%)	60.8 (1.6%)	3,844.8 (100%)	41:27	10.9	298.3	2,235	494,741
Columbia, SC	422.2 (53.8%)	331.8 (42.3%)	30.4 (3.9%)	784.3 (100%)	8:02	17.6	367	2,278	256,008
Wilmington, NC	549.2 (55.3%)	409.7 (41.3%)	33.8 (3.4%)	992.6 (100%)	10:26	18.3	359.1	2,150	305,803
Seattle, WA	3,229.9 (79.2%)	743.8 (18.2%)	103.6 (2.5%)	4,077.2 (100%)	44:09	11	320.7	2,319	695,631
Clive, UT	2,430.1 (80.7%)	520.8 (17.3%)	60.1 (2.0%)	3,010.9 (100%)	31:46	11.1	310.4	2,292	448,863
Nevada Test Site, NV	2,935.2 (80.6%)	617.7 (17.0%)	90.5 (2.5%)	3,643.1 (100%)	38:15	10.7	316.2	2,405	614,875
Gainsville, FL	875.3 (61.2%)	519.4 (36.3%)	36.3 (2.5%)	1,430.8 (100%)	14:52	15.1	334.6	2,306	343,734
Oak Ridge, TN	350.9 (59.1%)	226.6 (38.2%)	16.3 (2.8%)	593.3 (100%)	6:20	21	293.8	2,065	131,400

Notes:
km = kilometer; km² = square kilometer
To convert km to mi multiply by 0.62.
To convert from km² to mi² multiply by 0.386.

D.4 RADTRAN Modeling Inputs and Results

The radiological impacts to occupational workers and the general public from the transport of the radioactive materials were estimated using RADTRAN 5 (Osborn, 2005), a computer code that calculates the risks for both the incident-free transport of radioactive-material and for accidents. The term "incident free" means that no traffic accident or other incident resulted in the release of radioactive material to the surrounding environment. In this context, accidents refer only to incidents that result in the release of radioactive material. The risks associated with the transport of radioactive materials include injuries and fatalities from traffic accidents and an increased risk of cancer fatalities from exposure of persons near the vehicle to direct radiation.

Exposure to radiation from radioactive shipments is assumed to result in an increased risk of latent cancer to crews operating the truck or train, persons sharing the route with the shipment (on-link public), persons living alongside the route (off-link public), and persons at rest stops and inspection stops. These latent cancers do not occur immediately after exposure, but instead occur a number of years after the exposure. RADTRAN 5 estimates the number of latent cancer fatalities from the incident free transport of the materials and accidents.

D.4.1 Incident-Free Parameters

The risks from incident-free transport depend on the external radiation levels of the package being transported; the length and time duration of the route; and the number of persons sharing the route. Tables D-7 and D-8 provide a listing of the input parameters to RADTRAN that were used in this risk assessment.

Table D-7 RADTRAN "Package" Parameters

Package	RADTRAN Parameter			
	Long Dimension (m)	Dose Rate (mrem/hr)[1]	Gamma Fraction	Neutron Fraction
Feed Material (48X cylinder)	3.0	0.7	1	0
Feed Material (48Y cylinder)	3.8	0.7	1	0
Feed Material (30B cylinder)	2.1	0.7	1	0
Product Material (30B cylinder)	2.1	0.4	1	0
Heels (30B cylinder)	2.1	0.4	1	0
Waste (55-gallon drums)	0.9	1	1	0
Waste (B-25)	1.8	1	1	0
Depleted UF_6 (bulk bag)	8	1	1	0
CaF_2 (bulk bag)	8	0.0001	1	0

Notes:
[1]Dose rate is the external dose rate at 1 m from the package.
m = meter; mrem/hr = millirem per hour
To convert from m to ft multiply by 3.28.

Table D-8 RADTRAN "Link" Parameters

RADTRAN Parameter	Link		
	Rural	Suburban	Urban
Speed (km/hr)	88.5	40.2	24.1
Vehicle Density (vehicles/hr)	470	780	2,800
Persons Per Vehicle	2	2	2
Accident Rate (accidents/vehicle-hour)	3×10^{-7}	3×10^{-7}	3×10^{-7}
Zone	Rural	Suburban	Urban
Type	Primary Highway	Primary Highway	Primary Highway
Farm Fraction	1	0	0

Notes:
km = kilometer
To convert km to mi multiply by 0.62.

D.4.2 Accident Parameters

To calculate the risk associated with accidents that result in the release of radioactive material, RADTRAN 5 estimates the probability, or likelihood, of an accident and the consequences, or outcome, of such an accident. The likelihood or frequency of an accident is a function of the type of road and the number of vehicles using the road. NRC classifies accidents into eight severity categories, based on the mechanical (impact) and thermal (fire) forces involved (NRC, 1977). Category I is the least severe and Category VIII is the most severe. Less severe accidents occur more frequently, but have relatively mild consequences. More severe accidents happen less frequently, but have more significant consequences, including the release of some or all of the radioactive material in the shipment. NRC has estimated the fraction of accidents for truck and rail transport that fall within each category. Additionally, NRC has estimated the fraction of accidents in each category that occur in rural, suburban, and urban areas. As shown in Table 2-9 less severe accidents are most likely to occur in urban areas, where driving speeds are typically lower, while more severe accidents are more likely to occur in rural areas where driving speeds are higher (NRC, 1977). These estimates when combined with average accident rates are used estimate the number of latent cancer fatalities due to exposure to radiation and radioactivity from transportation accidents. Fatalities to chemical effects and bodily injury are addressed separately. Tables D-9 and D-10 provided the fractional occurrences of accidents by severity category used in this risk assessment.

Table D-9 Fractional Occurrences of Truck Accidents by Severity Category

Accident Severity Category	Fractional Occurrences of Severity Category	Fractional Occurrence by Population Zone		
		Rural	Suburban	Urban
I	0.55	0.1	0.1	0.8
II	0.36	0.1	0.1	0.8
III	0.07	0.3	0.4	0.3
IV	0.016	0.3	0.4	0.3
V	0.0028	0.5	0.3	0.2
VI	0.0011	0.7	0.2	0.1
VII	0.000085	0.8	0.1	0.1
VIII	0.000015	0.9	0.05	0.05

Source: NRC, 1977.

Table D-10 Fractional Occurrences of Rail Accidents by Severity Category

Accident Severity Category	Fractional Occurrences of Severity Category	Fractional Occurrence by Population Zone		
		Rural	Suburban	Urban
I	0.5	0.1	0.1	0.8
II	0.3	0.1	0.1	0.8
III	0.18	0.3	0.4	0.3
IV	0.018	0.3	0.4	0.3
V	0.0018	0.5	0.3	0.2
VI	0.00013	0.7	0.2	0.1
VII	0.00006	0.8	0.1	0.1
VIII	0.00001	0.9	0.05	0.05

Source: NRC, 1977.

Table D-11 provides the release fraction used for each severity category. For purposes of this analysis, all releases of material are assumed to be airborne and respirable.

Table D-11 Release Fractions for Accidents by Severity Category

Accident Severity Category	Release Fraction
I	0
II	0.01
III	0.1
IV, V, VI, VII, and VIII	1

Source: DOE, 2002.

D.4.3 RADTRAN Results

The transportation of feed material, product, heel cylinders, radioactive waste, and the products from the conversion of depleted UF_6 results in some increased risk of cancer to both the occupational workers transporting and handling the material and to members of the public driving on the roads or living along the transportation route. RADTRAN results for the transportation of radioactive materials associated with operations are given in Tables D-12 and D-13 on an annual basis. The transport of all materials is estimated to result in approximately 0.014 latent cancer fatalities per year of operation due to direct radiation exposure during incident-free transport, and an additional 0.008 latent cancer fatalities per year from accidents that result in the release of radioactive material into the environment. The total latent cancer fatalities per year is estimated to be 0.02 per year of operation or about one cancer fatality over thirty years of operation.

In addition to the transport of radioactive materials during the operation of the proposed ACP, low level radioactive waste will be shipped to disposal sites during decontamination and decommissioning (D&D) of the proposed ACP. Tables D-14 and D-15 provide the RADTRAN results for the transportation of radioactive materials associated with all decontamination and decommissioning activities of the proposed ACP. The number of latent cancer fatalities from the transportation of all decontamination and decommissioning waste is estimated to be 0.3, including 0.005 deaths resulting from the release of radioactive material from accidents.

The risk assessment described above is for product materials enriched to approximately 5 percent weight percent of uranium-235. Although it is currently believed to be unlikely, USEC may in the future enrich relatively small volumes of product up to 10 weight percent of uranium-235. There are currently no 2.5 ton cylinders certified for the shipment of UF_6. In the event this higher enrichment occurs, USEC would have to gain the appropriate certification before it shipped 10 percent product in either an existing 2.5-ton cylinder or in a new 2.5-ton cylinder. External exposure rates surrounding such a cylinder would likely be similar to those around the 30B cylinders presently used to ship 5 percent product and less than the external dose equivalent rates used in this assessment, which are considered conservative. For this reason, the risks associated with the incident free transport of the 10 percent enriched product would not be significantly than that of the 5 percent enriched product.

Table D-12 Number of Latent Cancer Fatalities Expected from the Incident-Free Transportation of Radioactive Materials for One Year of Operation

Route	Material	Latent Cancer Fatalities							
		MEI	Drivers	Off-Link Public	On-Link Public	Rest Stop	Inspect-ion Stop	Loading	Total
Metropolis, IL to ACP	Feed Material	6.2×10^{-9}	1.2×10^{-3}	6.8×10^{-5}	4.4×10^{-4}	8.1×10^{-4}	1.1×10^{-3}	3.0×10^{-3}	4.0×10^{-3}
Port Hope, ON to ACP	Feed Material	9.4×10^{-9}	1.4×10^{-3}	1.4×10^{-4}	1.1×10^{-3}	1.2×10^{-3}	6.9×10^{-4}	5.2×10^{-4}	5.1×10^{-3}
Wilmington, DE to ACP	Feed Material	1.5×10^{-9}	2.5×10^{-4}	2.2×10^{-5}	1.7×10^{-4}	2.0×10^{-4}	1.8×10^{-4}	9.7×10^{-5}	9.1×10^{-4}
ACP to Richland, WA	Product	5.0×10^{-10}	2.8×10^{-4}	1.3×10^{-5}	1.1×10^{-4}	2.6×10^{-4}	1.1×10^{-4}	6.5×10^{-5}	8.3×10^{-4}
ACP to Columbia, SC	Product	5.9×10^{-10}	8.8×10^{-5}	8.8×10^{-6}	5.2×10^{-5}	3.8×10^{-5}	7.1×10^{-5}	7.7×10^{-5}	3.3×10^{-4}
ACP to Wilmington, NC	Product	6.7×10^{-10}	1.2×10^{-4}	1.2×10^{-5}	7.0×10^{-5}	8.7×10^{-5}	6.4×10^{-5}	8.7×10^{-5}	4.4×10^{-4}
ACP to Seattle, WA (Korea)	Product	1.3×10^{-10}	1.1×10^{-4}	4.0×10^{-6}	3.6×10^{-5}	8.3×10^{-5}	3.3×10^{-5}	1.6×10^{-5}	2.8×10^{-4}
ACP to Seattle, WA (Japan)	Product	1.9×10^{-10}	1.5×10^{-4}	7.7×10^{-6}	7.0×10^{-5}	2.3×10^{-4}	5.4×10^{-5}	2.2×10^{-5}	5.4×10^{-4}
Richland, WA to ACP	Heels	8.9×10^{-11}	5.1×10^{-5}	2.3×10^{-6}	1.9×10^{-5}	4.7×10^{-5}	1.9×10^{-5}	4.9×10^{-5}	1.9×10^{-4}
Columbia, SC to ACP	Heels	8.9×10^{-11}	1.3×10^{-5}	1.3×10^{-6}	8.0×10^{-6}	5.8×10^{-6}	1.1×10^{-5}	4.9×10^{-5}	8.8×10^{-5}
ACP to Clive UT	LLW	3.5×10^{-10}	1.3×10^{-4}	7.4×10^{-6}	6.4×10^{-5}	1.6×10^{-4}	4.1×10^{-5}	7.3×10^{-5}	4.7×10^{-4}
ACP to Nevada Test Site, NV	LLW	1.4×10^{-10}	1.6×10^{-4}	3.6×10^{-6}	3.4×10^{-5}	8.1×10^{-5}	3.8×10^{-5}	3.0×10^{-5}	3.5×10^{-4}
ACP to Gainsville, FL	Mixed LLW	7.3×10^{-11}	2.5×10^{-5}	1.6×10^{-6}	9.3×10^{-6}	1.4×10^{-5}	1.4×10^{-5}	1.0×10^{-5}	7.5×10^{-5}
Piketon, OH to Clive, UT	U_3O_8	3.2×10^{-11}	2.2×10^{-7}	7.3×10^{-7}	7.3×10^{-8}	2.7×10^{-5}	0	0	2.8×10^{-5}
Piketon, OH to Clive, UT	CaF_2	3.2×10^{-15}	2.2×10^{-10}	7.3×10^{-11}	7.3×10^{-11}	2.7×10^{-9}	0	0	3.1×10^{-9}
Total		9.4×10^{-9}	4.0×10^{-3}	2.9×10^{-4}	2.2×10^{-3}	3.3×10^{-3}	2.4×10^{-3}	1.4×10^{-3}	1.4×10^{-2}

Table D-13 Number of Latent Cancer Fatalities Expected from Accidents Resulting from the Transportation of Radioactive Materials for One Year of Operation

Route	Material	Latent Cancer Fatalities				
		Ground	Inhaled	Resuspended	Cloudshine	Total
Metropolis, IL to ACP	Feed Material	5.2×10^{-6}	4.8×10^{-4}	3.2×10^{-4}	3.5×10^{-10}	8.0×10^{-4}
Port Hope, ON to ACP	Feed Material	1.3×10^{5}	1.2×10^{-3}	8.0×10^{-4}	8.8×10^{-10}	2.0×10^{-3}
Wilmington, DE to ACP	Feed Material	9.8×10^{-6}	8.0×10^{-4}	5.2×10^{-4}	2.5×10^{-10}	1.3×10^{-3}
ACP to Richland, WA	Product	7.5×10^{-6}	6.6×10^{-4}	2.1×10^{-4}	2.0×10^{-10}	8.7×10^{-4}
ACP to Columbia, SC	Product	4.9×10^{-6}	4.3×10^{-4}	1.3×10^{-4}	1.3×10^{-10}	5.6×10^{-4}
ACP to Wilmington, NC	Product	6.5×10^{-6}	5.7×10^{-4}	1.8×10^{-4}	1.8×10^{-10}	7.5×10^{-4}
ACP to Seattle, WA (Korea)	Product	2.5×10^{-6}	2.1×10^{-4}	6.9×10^{-5}	6.6×10^{-11}	2.8×10^{-4}
ACP to Seattle, WA (Japan)	Product	3.5×10^{-6}	3.0×10^{-4}	9.6×10^{-5}	9.2×10^{-11}	3.9×10^{-4}
Richland, WA to ACP	Heels	5.2×10^{-8}	3.2×10^{-6}	7.2×10^{-6}	1.0×10^{-12}	1.0×10^{-5}
Columbia, SC to ACP	Heels	2.8×10^{-8}	1.8×10^{-6}	4.0×10^{-6}	5.5×10^{-13}	5.8×10^{-6}
ACP to Clive UT	LLW	5.2×10^{-8}	4.4×10^{-6}	5.1×10^{-6}	5.7×10^{-12}	9.5×10^{-6}
ACP to Nevada Test Site, NV	LLW	8.8×10^{-9}	5.5×10^{-7}	1.7×10^{-6}	4.5×10^{-12}	2.2×10^{-6}
ACP to Gainsville, FL	Mixed LLW	2.0×10^{-9}	1.3×10^{-7}	5.7×10^{-7}	1.0×10^{-12}	7.0×10^{-7}
Piketon, OH to Clive, UT	U_3O_8	1.7×10^{-6}	7.4×10^{-4}	6.1×10^{-7}	9.1×10^{-10}	7.5×10^{-4}
Piketon, OH to Clive, UT	CaF_2	3.5×10^{-11}	2.9×10^{-9}	1.3×10^{-8}	3.6×10^{-15}	1.6×10^{-8}
Total		5.4×10^{-5}	5.4×10^{-3}	2.3×10^{-3}	3.1×10^{-9}	7.8×10^{-3}

Table D-14 Number of Latent Cancer Fatalities Expected from the Incident-Free Transportation of Radioactive Materials of All Decontamination and Decommissioning (D&D) Waste

Route	Material	Latent Cancer Fatalities							
		MEI	Drivers	Off-Link Public	On-Link Public	Rest Stop	Inspect-ion Stop	Loading	Total
ACP to Clive, UT	D&D Waste	4.1×10^{-9}	1.4×10^{-3}	8.6×10^{-5}	7.4×10^{-4}	2.2×10^{-3}	1.9×10^{-3}	4.7×10^{-4}	6.8×10^{-3}
ACP to Nevada Test Site, NV	D&D Waste	2.0×10^{-7}	8.9×10^{-2}	5.1×10^{-3}	4.8×10^{-2}	1.2×10^{-1}	3.1×10^{-2}	2.1×10^{-2}	3.1×10^{-1}
ACP to Kingston, TN	D&D Waste	1.8×10^{-10}	2.7×10^{-5}	1.5×10^{-6}	1.0×10^{-5}	1.2×10^{-5}	1.0×10^{-5}	1.1×10^{-4}	1.7×10^{-4}
Total		2.0×10^{-7}	9.1×10^{-2}	5.2×10^{-3}	4.9×10^{-2}	1.2×10^{-1}	3.2×10^{-2}	2.1×10^{-2}	3.2×10^{-1}

Table D-15 Number of Latent Cancer Fatalities Expected from Accidents Resulting from the Transportation of Radioactive Materials of All Decontamination and Decommissioning (D&D) Waste

Route	Material	Latent Cancer Fatalities				
		Ground	Inhaled	Resuspended	Cloudshine	Total
ACP to Clive, UT	D&D Waste	3.2×10^{-7}	2.5×10^{-5}	4.7×10^{-5}	3.3×10^{-11}	7.3×10^{-5}
ACP to Nevada Test Site, NV	D&D Waste	2.1×10^{-5}	1.6×10^{-3}	3.0×10^{-3}	2.1×10^{-9}	4.7×10^{-3}
ACP to Kingston, TN	D&D Waste	7.5×10^{-9}	5.3×10^{-7}	1.2×10^{-6}	4.4×10^{-12}	1.7×10^{-6}
Total		2.1×10^{-5}	1.7×10^{-3}	3.1×10^{-3}	2.1×10^{-9}	4.7×10^{-3}

However, the accident related radiological risks associated with the transport of the 10 percent enriched product would be somewhat greater than that of the 5 percent enriched product. This primarily due to the higher activity of uranium-234 in the 10 percent enriched product. Uranium-234 does not contribute significantly to the external dose rate, but is an inhalation hazard if released. Table D-16 shows the calculated latent cancer fatalities from the transport of the higher enriched product material for the same routes used previously. The number of expected latent cancer fatalities associated with the transport of product material only would be approximately a factor of three greater than that previously estimated. It should be noted that this factor of three is conservative in that it assumes all the product material is enriched to 10 percent; and that it does not account for the decreased risks associated with lower activities of uranium-234 in shipment of the conversion products.

Table D-16 Number of Latent Cancer Fatalities Expected from Accidents Resulting from the Transportation of Product Material Enriched to 10 Percent for One Year of Operation

Route	Material	Latent Cancer Fatalities				
		Ground	Inhaled	Resuspended	Cloudshine	Total
ACP to Richland, WA	Product	1.6×10^{-5}	2.3×10^{-3}	1.4×10^{-4}	3.6×10^{-10}	2.5×10^{-3}
ACP to Columbia, SC	Product	1.0×10^{-5}	1.5×10^{-3}	9.4×10^{-5}	2.4×10^{-10}	1.6×10^{-3}
ACP to Wilmington, NC	Product	1.3×10^{-5}	2.0×10^{-3}	1.3×10^{-4}	3.1×10^{-10}	2.1×10^{-3}
ACP to Seattle, WA (Korea)	Product	5.2×10^{-6}	7.5×10^{-4}	1.1×10^{-4}	1.2×10^{-10}	8.6×10^{-4}
ACP to Seattle, WA (Japan)	Product	7.3×10^{-6}	1.0×10^{-3}	1.5×10^{-4}	1.6×10^{-10}	1.2×10^{-3}
Total		5.2×10^{-5}	7.6×10^{-3}	6.2×10^{-4}	1.2×10^{-9}	8.3×10^{-3}

D.5 Chemical Impacts from Transportation Accidents

In addition to the radiological impacts during transportation described above, chemical impacts from a transportation accident involving uranium could also affect the surrounding public. Uranium compounds, in addition to being radioactive, can have toxic chemical effects (primarily on the kidneys) if inhaled or ingested. The operation of the ACP would result in the transport of UF_6 as feed and product material to and from the ACP, as well as the transport of triuranium octaoxide as a conversion product. Calcium fluoride, another conversion product, contains small amounts of uranium as a contaminant.

Uranium hexafluoride does not react with nitrogen (N_2), oxygen (O_2), carbon dioxide (CO_2) or dry air, but does react rapidly with water vapor to hydrogen fluoride (HF) and uranyl fluoride (UO_2F_2):

$$UF_6 + (2+4\,x)\,H_2O \rightarrow UO_2F_2 * 2\,H_2O + 4\,HF * x\,H_2O$$

Hydrogen fluoride is extremely corrosive and can damage the lungs and cause death if inhaled at high enough concentrations. Irreversible adverse effects resulting from sufficiently high concentrations of these chemicals include permanent organ damage or the impairment of everyday functions, and possibly death. The number of deaths resulting from the chemical effects of hydrogen fluoride and uranyl fluoride is estimated to occur in one percent of those experiencing irreversible effects (Policastro et al., 1997). In contrast to the irreversible adverse effects from exposure to higher concentrations of hydrogen fluoride and uranyl fluoride, the adverse effects from exposure to lower concentrations include skin rash and respiratory irritation.

To estimate the chemical effects of an accident involving the transport of UF_6, the Department of Energy (ANL 2001, DOE 2004) modeled the dispersion of chemical emissions released into the environment from a transportation accident involving a fire. The results were used to determine the number of people whose exposure would exceed the threshold for adverse and irreversible adverse effects. DOE estimated the chemical effects for accidents in rural, suburban, and urban areas. Table D-17 shows the potential chemical impacts to the public from a hypothetical severe transportation accident that involves a fire.

Table D-17 Potential Chemical Consequences to the Population from Severe Transportation Accidents

Material	Mode	Number of Persons with Potential Adverse Health Effects			Number of Persons with Potential Irreversible Adverse Health Effects		
		Rural	Suburban	Urban	Rural	Suburban	Urban
UF_6	Truck	6	760	1,700	0	1	3
U_3O_8	Rail	0	47	103	0	17	38

Source: DOE, 2004.

Based on the total number of trips, the length of the trips, and the mean accident rate, the estimated number of accidents involving shipments of UF_6 is 0.5 accidents per year, or an average of one accident every two years. Of these accidents, approximately 55 percent will not result in the release of any UF_6, and another 43 percent will result in a release of no more than 10 percent of the UF_6. About 2 percent of all accidents are expected to be severe enough to result in the release of all the UF_6 present. The probability of one or more of the fifteen expected accidents being this severe is about 26 percent. Such an accident is most likely to occur in a rural or suburban area.

D.6 References

(ANL, 2001) Argonne National Laboratory. "Transportation Impact Assessment for Shipment of Uranium Hexafluoride (UF6) Cylinders from the East Tennessee Technology Park to the Portsmouth and Paducah Gaseous Diffusion Plants" ANL/EAD/TM-112. Environmental Assessment Division. October 2001.

(DOE, 2002) U.S. Department of Energy. "A Resource Handbook on DOE Transportation Risk Assessment." DOE/EM/NTP/HB-01. National Transportation Program. July 2002.

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(NRC 1977) U.S. Nuclear Regulatory Commission. "Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes." NUREG-0170. 1977.

(Osborn et al., 2005) Osborn et al. "RadCat 2.0 User Guide." SAND2005-0142. Sandia National Laboratories. January 2005.

(ORNL, 2003) Oak Ridge National Laboratory. "Transport Routing Analysis Geographic Information System (TRAGIS) User's Manual." ORNL/NTRC-006. Revision 0. June 2003.

(Policastro et al., 1997) Policastro, A.J., et al., 1997, Facility Accident Impact Analyses in Support of the Uranium Hexafluoride Programmatic Environmental Impact Statement, attachment to intraoffice memorandum from Policastro et al. to H.I. Avci (Argonne National Laboratory, Argonne, Ill.), May.

(USEC, 1995) United States Enrichment Corporation. "Uranium Hexafluoride: A Manual of Good Handling Practices." USEC-651. Revision 7. January 1995.

(USEC, 2005) United States Enrichment Corporation. "Environmental Report for the American Centrifuge Plant" LA-3605-0002. Revision 3. NRC Docket No. 70-7004. July 2005.

APPENDIX E
AIR QUALITY ANALYSIS

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AIR QUALITY ANALYSIS

E.1 Air Dispersion Modeling Inputs

This section discusses the inputs used in the application of the ISCLT3 air dispersion model (EPA, 1995) to assess the non-radiological air quality impacts from site preparation and construction as well as from the operation of the proposed ACP. Modeling results can be found in Chapter 4 of the Draft EIS.

E.1.1 Emissions from Site Preparation and Construction

Emissions during the site preparation and construction phases can be divided into four parts: emissions from diesel equipment used by the work crews, emissions from gasoline-powered trucks used by the work crews, emissions from commuter vehicles and delivery trucks, and fugitive dust from construction activity for the construction of new buildings. Emissions related to work crews, crew trucks, and fugitive dust were modeled as area sources with the same footprint as the building being constructed or prepared. Emissions from on-road vehicles were modeled as elongated area sources following the most likely (shortest distance from main entrance) route of traffic.

During the construction period, four work crews are expected to be active: the steel crew, the electrical and mechanical crew, the equipment crew, and the utilities crew. Equipment and fuel proposed for use for each crew are summarized in Table E-1. (USEC, 2005) Diesel equipment is assumed to consume one gallon of fuel per 10 hp per day with equipment horsepowers were taken from the Means Open Shop Building Construction Cost Data Book (USEC, 2005). Each crew trucks is assumed to consume 10 gallons of gasoline per day.

Table E-1 Equipment and Fuel Use Associated with each Crew

Steel Crew			Electrical and Mechanical Crews		
90T Crane	275	hp	Bucket Truck	200	hp
Welding	50	hp	55T Crane	170	hp
Diesel	260	gal/day	12T Crane	40	hp
Gas	40	gal/day	Diesel	328	gal/day
			Gas	30	gal/day
Utilities Crew			**Equipment Crew**		
Excavator	240	hp	90T Crane	275	hp
Diesel	192	gal/day	Diesel	220	gal/day
Gas	10	gal/day	Gas	20	gal/day

Notes:
gal/day = gallons per day; hp = horsepower

The NONROAD model is the EPA's standard method for preparing emissions inventories for mobile sources that are not classified as being related to on-road traffic, railroads, air traffic, or water going vessels (EPA, 2002a). The model was developed to estimate county-level emission inventories, but contains all of the information needed to develop a facility specific inventory. Thus NRC used the used the supporting information from the NONROAD model for developing a site-specific emission inventory.

The NONROAD model uses the following general equation to estimate emissions separately for CO, NO_x, PM (essentially all the PM from combustion is $PM_{2.5}$), and THC:

EMS = EF * HP * LF * ACT* DF (Eq. 1)

where:

EMS = estimated emissions
EF = emissions factor in grams per horsepower hours
HP = peak horsepower
LF = load factor (assumed percentage of peak horsepower)
ACT = Activity in hours of operation per period of operation
DF = Deterioration Factor

The emissions factor (EF) is specific to the equipment type, engine size, and technology type. The technology type for diesel equipment can be "Base" (before 1988), Tier 0 (1988-1999), or Tier 1 (2000-2005). Tier 2 emissions factors are appropriate for equipment that satisfies 2006 national standards (or slightly earlier California standards). The range in years represents a phase-in by equipment type, engine size and technology. Since most construction activity is schedule for the 2007-2010 time period it was assumed that equipment would meet the Tier 1 standard. Different emissions factors are applied to different ranges of engine sizes. These size ranges are lower bound exclusive and upper bound inclusive. Thus a 175 hp diesel forklift is included in the 100-175 hp range rather than the 175-300 hp range.

The load factor (LF) is specific to the equipment type in the NONROAD model regardless of engine size or technology type and represents the average fraction of peak horsepower at which the engine is assumed to operate.

The deterioration factor (DF) is used to estimate increased emissions due to engine age and is calculated according to the following equation:

$DF = 1 + A*(AGE)^b$ (Eq. 2)

where:

A,b = factors given specified in the NONROAD model
AGE = normalized age of the engine

The normalized age of each type of engine appearing in the NONROAD model is calculated using equation 3:

AGE = (cumulative hours of operation) * LF / (median engine life) (Eq. 3)

The median engine life is specified in the NONROAD model's data files and LF is the load factor used in equation 1 above. The "cumulative hours of operation" can be calculated by multiplying the age in years of the engine by the average activity assumed by the NONROAD model. For this study we assumed a nominal equipment age of five years.

The source classification code and name associated by the NONROAD model with each piece of equipment is presented in Table E-2.

Table E-2 Equipment with Source Classification Codes and Names as they appear in the NONROAD Data Tables

Equipment	Source Classification Code	NONROAD Name
Bucket Truck	2270003010	Diesel Aerial Lift
Crane	2270002045	Diesel Crane
Excavator	2270002036	Diesel Excavator
Welding	2270006025	Diesel Light Commercial Welder

All of the information needed to estimate the facility specific emissions is available as part of the NONROAD model's data files. Sample calculations for estimating CO emissions from the 240 hp excavator follow.

From the NONROAD model data file ACTIVITY.DAT the following record is associated with diesel powered excavators (some blank spaces have been deleted):

```
2270002036 Diesel Excavators    ALL 0 9999 0.59  hrs/yr  1092  DEFAULT
```

The fields of interest are the load factor (0.59) and the average hours of operation per year (1092). The other fields appear identical for all equipment and are intended for use in a future version of the model.

The data file with emissions factors for each pollutant is called EXHCO.EMF which contains the exhaust factors for CO. The following lines are associated with diesel excavators between 175 and 300 hp (some blank spaces and additional technology types have been deleted):

```
2270002036  175  300    Base    T0      T1      T2  g/hp-hr   CO
                            3.98    4.13    1.14    1.14
```

Once again the source classification code appears followed by the minimum and maximum horsepower for the following emissions factors. Because all equipment is assumed to be Tier 1 (T1) the emissions factor will be 1.14 grams of CO per horsepower-hour. In this case an advance to Tier 2 would not produce an improvement, but it could for other pollutants and/or other equipment types and sizes.

To estimate the emissions per eight-hour day using Equation 1 all that is needed is to calculate the deterioration factor.

The following record is associated with Tier 1 diesel equipment in the file EXHCO.DAT:

```
T1                        0.101       1.0        1.0        CO
```

The second field gives factor "A" from Equation 2; the third field gives factor "b"; and the fourth field gives the emissions cap in median life units (the largest number that can be used for "age" in Equation 2).

To determine the "age" used in Equation 3 it is now necessary to know the cumulative hours of operation and the "median engine life." This information is found from equipment type population survey's available for each state. For Ohio, the equipment population file OH.POP gives the expected useful life of a diesel excavator between 175 and 300 hp as 4,667 hours (some blank spaces have been deleted):

```
39000 2000 2270002036 Dsl - Excavators 175 300 233.3 4667 DFAULT
1577.2
```

It is now possible to calculate CO emissions for the excavator.

Starting with Equation 3:

AGE = (5 years * 1092 hrs/yr)*0.59/(4667 hours) = 0.69

Then Equation 2:

$DF = 1 + 0.101*(0.69)^1 = 1.07$

Finally Equation 3:

EMS = (1.14 g/hp-hr)*(240 hp)*(0.59)*(8 hr/day)*(1.07)*(0.002205 lb/g) = 3.05 lb/day

The above process was used to estimate emissions of PM, CO, NO_x, and non-methane hydrocarbons (NMHC). All PM was assumed to be $PM_{2.5}$. SO_2 emissions were calculated by mass balance using the 2007 nonroad sulfur emission standard (500 ppm) and an average density of 7.1 lbs per gallon of diesel.

Each work crew was assumed to have one truck for every four people (USEC, 2005). Emissions were estimated assuming that each crew had a truck similar to a Ford F-150 Supercab meeting Tier 1 standards with at least 80,500 kilometers (50,000 miles) of use. Such a truck fits into the Heavy Duty-Light Truck classification. Table E-3 gives the emissions standards for this truck type. Each truck was assumed to be in use for a full eight-hour day (USEC, 2005) traveling at an average speed of five miles per hour.

Table E-3 Emissions from crew trucks

	NMHC	CO	NOx	PM
grams/mile	0.56	7.3	1.53	0.12
grams/day	22.4	292	61.2	4.8

Notes:
To convert grams to ounces multiply by 0.35.

SO_2 emissions from crew trucks were calculated by mass balance using the 2007 gasoline sulfur standard (30 ppm) and an average fuel density of 6.1 lbs per gallon of gasoline.

Emissions from on-road heavy-duty delivery trucks and commuter cars and trucks were estimated using EPA's MOBILE6.2 model (EPA, 2002b). Long-haul diesel truck emission rates were estimated based on trucks operating in 2010 using national fleet age distribution. Medium-haul diesel trucks were based on the same parameters. Commuter vehicle emissions rates were applied using national defaults for fleet age distribution, but assumed that the fleet mix was half light duty gasoline vehicles and half light duty gasoline trucks. Table E-4 gives emission rates for delivery trucks and commuter vehicles.

Table E-4 Emissions rates for on-road vehicles (grams per mile)

	NMHC	CO	NO_x	PM_{10}	SO_2
Long-Haul Heavy Duty Diesel Delivery Trucks	0.36	1.3	5.61	0.11	0.01
Medium-Haul Heavy Duty Diesel Delivery Trucks	0.44	1.9	8.32	0.16	0.01
Commuter vehicles	0.83	10.6	0.66	0.03	0.01

Notes:
To convert grams per mile to ounces per mile multiply by 0.035.

Delivery trucks were modeled as elongated area sources originating at the facility's main entrance and taking larger roads to the north end of the construction area. Commuter vehicles were modeled as elongated area sources originating at the southwest construction access entrance and following interior roads to the parking lot south of the construction area. During the construction period an average of 28 one-way truck trips (9 long-haul and 19 medium-haul) per day and 2,612 one-way commuter trips per day were modeled. This assumed that each construction worker arrived in a single occupant vehicle.

Emissions rates for fugitive dust were estimated using guidelines outlined in the Western Regional Air Partnership fugitive dust handbook (WRAP, 2004). Although these guidelines were developed for use in western states they assume standard dust mitigation activities, such as wetting, so they were deemed applicable to a Midwestern setting. The handbook offers several options for selecting PM_{10} factors depending on what information is known. Table E-5 shows the possible emissions factors and bases for choosing them.

Table E-5 PM_{10} emissions factors recommended by the Western Regional Air Partnership Handbook

Basis for Emission Factor	Recommended PM10 Emission Factor
Only area and duration known	0.11 ton/acre/month (average conditions) or 0.22 ton/acre/month (average, no mitigation) or 0.43 ton/acre/month (worst-case conditions)
Volume of earth moved known	0.011 ton/acre/month for general construction plus 0.059 ton/1000 yd3 for on-site cut-fill plus 0.22 ton/1000 yd3 for off-site cut-fill
Equipment usage known	0.13 lb/acre/work-hr for general construction plus 49 lb/scraper-hr for on-site haulage plus 94 lb/hr for off-site haulage

Notes:
lb = pounds; yd^3 = cubic yards; hr = hour

Because equipment usage is known, the third option is most appropriate for the proposed ACP. However, because the foundations have been dug and the fill has been hauled before the modeled construction period only the 0.13 pound/acre/work-hour factor was applied. Once PM_{10} was estimated, the Western Regional Air Partnership recommended fractional factor of 0.209 was used to estimate $PM_{2.5}$ from PM_{10}.

Fugitive dust emissions were only applied to new buildings and then only to the construction phase, not to other phases such as equipment installation.

E.1.2 Emissions from Plant Operations

Air emissions during plant operation were associated with the use of emergency backup generators burning diesel fuel as well as the on-road delivery trucks and commuter vehicles. These are the only non-radioactive emissions associated with the normal operation of the proposed proposed ACP.

Emissions factors for on-road vehicles were identical to those used for the construction phase. During plant operations, however, an average of 24 one-way delivery truck trips per day and 1,116 commuter one-way trips per day were modeled.

A number of diesel-powered emergency generators will be installed at the plant. The generators' total emissions rates for CO, NOx, PM_{10}, $PM_{2.5}$, SO_2, and NMHC were modeled using specifications from a proprietary appendix to the Environmental Report (USEC, 2005).

Each generator was modeled as a point source located at the assigned building as identified in a proprietary index to the Environmental Report (USEC, 2005). Stack parameters were based on a typical 1,109 hp diesel generator described in Appendix 7 of CARB's Diesel Risk Reduction Plan (CARB, 2000) with the exception that the stack height was increased from 3 meters to 10 meters to reflect good engineering practice to avoid downwash effects assuming that the stacks are located on top of the building(s). Table E-7 lists the stack parameters used in modeling the generators.

Table E-7 Stack Parameters for Diesel Generators

Stack Temperature	Stack Height	Stack Diameter	Exit Velocity
787 °K	30 m (10 m above roof)	0.25 m	59.8 m/s

Notes:
K = °Kelvin; m = meter; m/s = meters per second.
To convert °K to °F use the following formula: ° F = ((°K - 275.15) x 1.8) + 32
To convert meters to feet multiply by 3.3

E.1.3 Emissions from Manufacturing and Assembly

[The information on lines 28 through 48 is being withheld pursuant to 10 CFR 2.390.]

[The information on lines 1 through 27 is being withheld pursuant to 10 CFR 2.390.]

[The information on lines 1 through 30 is being withheld pursuant to 10 CFR 2.390.]

E.2 Meteorological Inputs

Surface meteorological data, including wind data, have been collected at the on-site meteorological tower at the 10-, 30-, and 60-meters (33-, 98-, and 197-feet) levels. The tower is in the southern part of the reservation. A comparison of annual wind roses for the period 1995 through 2001 indicates that wind patterns at the 10-m (33-ft) level are different from those at the 30-m and 60-meters (98- and 197-feet) levels. Winds at the 10-m (33-ft) level appear to be influenced by local topographical and/or vegetative features. Accordingly, wind data at the 30-meters (98-feet) level, believed to be representative of the site,

were used in this analysis. This same meteorological data set was used in the radiological air quality assessment.

Seasonal temperatures from Waverly, OH (NOAA, 2000) and mean mixing heights were obtained from Huntington, WV (Holzworth, 1972). Table E-12 lists temperature data used in modeling and Table E-13 gives the mixing heights.

Table E-12 Seasonal temperatures (°K) for Waverly, OH (Climatology:1960-1991, NOAA)

	Minimum	Maximum	Average
Winter	267	273	279
Spring	277	284	291
Summer	289	296	302
Fall	278	285	292

Notes:
°K = °Kelvin
To convert °K to °F use the following formula: ° F = ((°K - 275.15) x 1.8) + 32

Table E-13 Mean afternoon mixing heights (meters) for Huntington, WV (Holzworth, 1972)

Winter	1,079
Spring	1,986
Summer	1,641
Fall	1,340

Notes:
To convert meters to feet multiply by 3.3.

E.2 References

(CARB, 2000) California Air Resources Board. "Risk Reduction Plan to Reduce Particulate Matter from Diesel-Fueled Engines and Vehicles." Appendix 7, Sacramento, CA. October 2000.

(EPA, 1995) U.S. Environmental Protection Agency. "User's Guide for the Industrial Source Complex (ISC3) Dispersion Models." Volume 1. EPA-454/B-95-003a. September 1995.

(EPA, 2002a) U.S. Environmental Protection Agency. "User's Guide for the EPA Emissions Model Draft NONROAD 2002." EPA-420-P-02-013. December 2002.

(EPA, 2002b) User's Guide to MOBILE6.1 and MOBILE6.2: Mobile Source Emission Factor Model (Draft). EPA420-R-02-010. March 2002.

(Holzworth, 1972) Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States, EPA, Office of Air Programs, RTP, AP-101. 1972.

(NOAA, 2000) Climatography of the United States No. 20, 1971-2000., Waverly, Ohio, National Oceanic Atmospheric Administration, National Climate Data Center, North Carolina. 2000.

(USEC, 2005) Environmental Report for the American Centrifuge Plant in Piketon, Ohio, Revision 3. LA-3605-0002, Docket No. 70-7004. July 2005.

(WRAP, 2004) Western Regional Air Partnership. "Fugitive Dust Handbook." Prepared by Countess Environmental, 4001 Whitesail Circle, Westlake Village, CA. under contract to the Western Governor Association (WGA), WGA Contract No. 30204-83. November 2004.

APPENDIX F
ENVIRONMENTAL JUSTICE ANALYSIS

APPENDIX F
ENVIRONMENTAL JUSTICE ANALYSIS

This appendix provides additional data for the assessment of the potential for disproportionately high and adverse human health or environmental effects on minority and/or low-income populations resulting from the proposed construction, operation, and decommissioning of the proposed American Centrifuge Plant (ACP).

Tables F-1 and F-2 present detailed year 2000 Census data for the environmental justice analysis at the State and county level, respectively. The tables provide minority and low-income population data for each Census tract within 80 kilometers (50 miles) of the proposed ACP. Census tracts exceeding minority or low-income criteria are shown in bold.

A summary of the number of Census tracts exceeding minority and/or low-income criteria is presented in Tables F-3 and F-4. Table F-3 summarizes information at the State level; Table F-4 summarizes information at the county level.

Refer to Chapter 3 of this Draft Environmental Impact Statement (EIS) for methods and references.

Table F-1 State Population Data, by Census Tract [a,b]

Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
State of Ohio	11353140	10.6	84.9	11.5	0.2	1.2	0.8	1.5	1.9	16
Threshold for EJ Concerns	NA	30.6	NA	31.5	20.2	21.2	20.8	21.5	21.9	36
Adams County										
39001990100	4868	22.4	96.8	0	1.3	0	0.1	1.7	0.8	3.9
39001990200	4635	13.1	98.4	0	0.2	0.2	0.1	1.1	0.6	1.9
39001990300	6212	12.6	98.8	0.1	0.1	0	0.2	0.8	0.3	1.5
39001990400	4630	17.6	97.8	0	1.3	0	0	1	0	2.2
39001990500	3454	21.7	96.3	0	1.6	0	0	2.1	0	3.7
39001990600	3531	19.6	99	0	0.1	0.1	0	0.8	0.5	1.5
Athens County										
39009972800	4272	27.7	97.4	0.4	0.8	0.4	0.3	0.6	1.8	4
39009972900	5362	29.8	90.9	3.1	0.4	3.1	0.3	2.1	0.5	9.5
39009973200	4320	17.4	87.8	3.7	0.5	4.4	0.5	2.5	2.2	13
39009973700	3967	13.9	95.7	1.2	0.6	0.8	0.2	1.6	1.4	5.7
39009973800	4642	11.3	98.4	0.2	0	0.7	0.1	0.5	0.5	2
Brown County										
39015951200	9522	6.2	98.3	0.2	0.1	0.3	0	1.1	0	1.7
39015951300	6435	12.3	98.7	0.3	0.2	0.3	0	0.5	0.3	1.6
39015951400	4408	14.4	98.6	0.4	0	0.1	0	0.8	0.5	1.9
39015951500	4896	12.3	98.5	0	0.9	0.4	0	0.2	0	1.5
39015951600	3869	16.5	97.4	1.1	0.3	0.2	0.2	0.8	1.4	3.5
39015951700	2764	15.3	92.8	4.8	0.1	0.1	0.1	2.1	0.6	7.6
39015951800	4650	12.2	97.4	2	0.2	0.1	0	0.3	0.4	2.9
39015951900	5741	12.1	99	0	0.2	0	0.3	0.5	0.6	1.2

Table F-1 State Population Data, by Census Tract (continued)

	Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
1	**Clinton County**										
2	39027994300	3871	10.3	97.6	0.9	0	0.1	0.4	1	0.1	2.4
3	39027994400	4808	4.4	98.1	0	0.7	0	0	1.2	0.2	2.1
4	39027995000	3967	7.9	99.3	0.1	0.2	0.1	0	0.4	0.1	0.7
5	39027995100	4105	8	97	0.1	1.2	0.2	0.9	0.6	1.2	3.2
6	**Fairfield County**										
7	39045031200	4901	6.1	99.3	0	0	0.1	0.3	0.3	1.3	1.8
8	39045032500	5996	6.1	83.8	14	0.4	0.1	0.3	1.1	0.7	16.2
9	39045032600	5840	5	99.1	0.1	0.2	0	0.1	0.5	0.4	1.2
10	**Fayette County**										
11	39047985800	3785	9.1	96.9	1.3	0.2	0	0.8	0.8	0.9	3.2
12	39047985900	3847	8.7	95.3	2.2	0.2	0.1	0.1	2	0.9	5.2
13	39047986000	4180	9.4	96.1	0.6	0.4	2.4	0	0.6	0.8	4.7
14	39047986100	4132	17.1	94	4	0	0	0	2	0	6
15	39047986200	4623	10.3	93	3.1	0.2	0.8	1.8	1.1	2.8	8.2
16	39047986300	3602	11	96.8	2.7	0.1	0	0	0.4	1	4
17	39047986400	4264	5.5	98.3	1	0	0	0.2	0.5	0.4	1.9
18	**Gallia County**										
19	39053953500	4929	14.3	94.5	3.4	0.3	0.8	0.2	0.8	0.4	5.7
20	39053953600	3974	19.7	95.5	2.3	0.2	0.6	0.1	1.3	0.6	4.8
21	39053953700	4067	27.4	95.6	0.7	0.2	1.2	0.2	1.9	0.3	4.6
22	39053953800	4322	19.4	98.2	0.3	0	0	0.2	1.3	0.7	2
23	39053953900	6790	13.6	94.4	4.1	0	0.4	0	1.2	0	5.6
24	39053954000	4489	17.2	92.4	3.4	0.8	1.5	0.5	1.5	0.9	8
25	39053954100	2498	20.7	93.8	3.4	0.3	0	0	2.5	0.4	6.2

Table F-1 State Population Data, by Census Tract (continued)

	Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
1	**Highland County**										
2	39071954400	3825	11	97.1	2.2	0.4	0	0.3	0	0.3	2.9
3	39071954500	4129	10.8	96.9	1.2	0	0	0.1	1.8	1.2	3.9
4	39071954600	4726	6.8	99	0.6	0	0.1	0	0.3	0	1
5	39071954700	5976	6.8	98.1	0	0.3	0.4	0	1.2	0	1.9
6	39071954800	4011	17.5	95.1	2.1	0.3	1.4	0.6	0.5	0.1	4.9
7	39071954900	3757	13.8	87.2	9	0.6	1.3	0	1.9	1	12.8
8	39071955000	4027	19.1	97.9	0.3	1.8	0	0	0	0.9	2.6
9	39071955100	5783	14	97.6	0.1	0.5	0.7	0	1	0.1	2.5
10	39071955200	4641	9.6	99.5	0	0.4	0	0	0.1	0.2	0.6
11	**Hocking County**										
12	39073964900	4400	7.3	98.7	0.3	0.7	0	0	0.4	0.1	1.4
13	39073965000	3888	15.7	99.6	0.2	0.2	0	0	0	0.7	1.1
14	39073965100	4134	10.5	97.9	0.4	0	0	0	1.7	0	2.1
15	39073965200	4302	15.9	98.7	0.8	0.2	0	0	0.3	0.2	1.5
16	39073965300	3548	10.9	99.5	0.4	0.2	0	0	0	0.1	0.7
17	39073965400	3991	18.9	96.1	0.7	0	1.6	0	1.5	0.6	4.2
18	39073965500	3978	16.2	93.5	4.6	0.1	0	0.3	1.5	0.3	6.5
19	**Jackson County**										
20	39079957200	5318	16.7	98.1	0.6	0	0.4	0.2	0.7	0.7	2.4
21	39079957300	3669	19.7	97	0.2	0.3	0.4	0.2	1.8	0.8	3.5
22	39079957400	5332	15.3	95.3	2.8	0.3	0.3	0.2	1.1	1.2	4.9
23	39079957500	5765	16	98.5	1.1	0	0.2	0	0.3	2.6	4.1
24	39079957600	2822	16.6	96.5	0.2	0.2	0.2	0	2.3	0.4	3.5
25	39079957700	5188	17.2	97.1	0.6	0.2	0.6	0	1.5	1.8	4.7
26	39079957800	4547	14.8	98.3	0.5	0.9	0	0	0.4	0.1	1.7

Table F-1 State Population Data, by Census Tract (continued)

	Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
1	**Lawrence County**										
2	39087050100	2692	15.2	95.9	2.8	0.2	0	0	1.1	0.8	4.9
3	39087050200	2524	20.8	97	2.5	0	0	0	0.5	0.3	3.3
4	39087050300	2349	33	78.1	19.6	0	1.4	0.2	0.5	0.9	22.3
5	39087050400	3155	25.1	97.8	1.6	0.3	0	0	0.3	0.4	2.3
6	39087050500	6585	19.1	97.6	0.1	0.3	1	0.2	0.7	0.9	2.9
7	39087050600	1677	28.1	94.5	1.4	0.3	0	0.4	3.5	0.4	5.5
8	39087050700	3749	26	99	0	0	0.7	0	0.3	0	1
9	39087050800	3843	22.6	97.4	1.8	0	0.7	0	0.1	0.2	2.8
10	39087050900	2279	18.4	98.3	0.3	0.4	0	0.4	0.7	1	2
11	39087051001	4475	13.9	95	3.7	0	0	0	1.3	0	5
12	39087051002	4316	14.5	96.7	1.6	0	0	0	1.7	0	3.3
13	39087051100	6977	21.2	92.2	5.7	0.6	0	0.5	1.1	0.5	7.8
14	39087051200	5299	15.7	98.6	0.3	0.3	0	0.1	0.6	1	1.9
15	39087051300	3705	18.4	98.7	0.3	0	0.1	0	1	0	1.3
16	39087051400	8694	12	97.5	1.1	0.3	0.6	0.2	0.3	0.4	2.8
17	**Madison County**										
18	39097041200	3282	7.6	97.8	0	0.1	0.9	0.2	1	1.4	3.3
19	**Meigs County**										
20	39105964200	4423	17.3	98.6	0.3	0.1	0	0.1	0.8	0.2	1.5
21	39105964300	4342	21.3	96.8	0.3	0.3	0	0.5	2	0.7	4
22	39105964400	3676	28.2	94.5	2.2	0.6	0.1	0	2.6	0	5.5
23	**Pickaway County**										
24	39129020100	2050	22.9	92.6	3.1	2.2	0	0	2.1	0.7	8.1
25	39129020200	2698	10.8	98.3	1.3	0	0	0	0.4	0.6	2.3

Table F-1 State Population Data, by Census Tract (continued)

	Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
1	39129020310	5089	6.2	96.5	1.1	0.2	0.8	0.1	1.2	0	3.5
2	39129020320	3335	6.8	93.8	2.2	1.1	1.7	1.1	0.2	2.4	7.5
3	39129020400	2543	25.6	98	1	0	0	0.2	0.8	0.3	2.2
4	39129021100	6910	5.5	97.9	0.1	0.3	0.8	0	1	0.4	2.4
5	39129021200	6424	8.9	97.3	0.3	0.9	0.1	0.1	1.3	0.5	3.1
6	39129021400	8992	7.7	88.1	9.8	0.3	0.1	0.1	1.5	0.7	12.2
7	39129021500	2987	9.2	99.2	0	0.1	0	0	0.7	1.3	1.9
8	39129021600	3528	12.7	98.1	0.4	0.5	0.1	0.1	0.9	0.1	2
9	39129021700	4506	7.1	99	0.6	0.4	0	0.1	0	1	1.9
10	**Pike County**										
11	39131952200	5592	16.2	94.2	1.9	1.4	0.2	0.6	1.8	0.3	5.9
12	39131952300	5067	18.6	95.9	1.2	0.3	0.5	0	2.1	0.4	4.4
13	39131952400	3368	10.7	95.5	1.3	1	1.4	0.1	0.7	0	4.5
14	39131952500	3753	17.7	97.9	0	0.1	0.5	0	1.5	0.6	2.1
15	39131952600	5573	20.6	96.9	0.2	2	0	0	1	0.3	3.4
16	39131952700	4342	25.7	98	0	1.1	0.3	0.3	0.3	1.7	3.4
17	**Ross County**										
18	39141955500	5388	5.2	98.6	0.1	0.2	0	0.2	0.8	0.7	1.8
19	39141955601	2047	7.5	98.5	0.8	0.4	0	0.3	0	1.9	3.4
20	39141955602	4954	4.8	57.1	39.3	0.2	0	0	4	2.2	44
21	39141955603	3861	11.8	98.3	0.6	0.1	0.5	0.2	0.3	0	1.7
22	39141955700	4267	12.5	98.5	0.4	0.4	0.1	0	0.5	0.4	1.9
23	39141955800	6824	9.8	94.9	3.5	0	0.1	0.5	1	0.7	5.4
24	39141955900	4257	10.4	87.9	8.7	0	0.8	0.2	2.5	0.1	12.2
25	39141956000	4549	12	90.1	6.8	1.3	0	0	1.8	0.2	10.1
26	39141956100	3774	9.4	84.9	11.8	0.2	0.8	0	2.3	0.3	15.4

Table F-1 State Population Data, by Census Tract (continued)

	Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
1	39141956200	2299	11	90.9	2.9	1.3	2.3	0.3	2.5	0.8	9.7
2	39141956300	2942	14.4	93.6	4.2	0	0.7	0	1.3	0.6	6.7
3	39141956400	3665	15.3	89.1	7.5	0.6	0.2	0.4	2.3	0.7	11.2
4	39141956500	4045	16.4	91.3	5.9	0.9	0	0	2	1.7	9.5
5	39141956600	5044	9.5	98.9	0.2	0	0.6	0	0.2	0.6	1.6
6	39141956700	5003	13.5	97	1	1.1	0.4	0.3	0.3	1	3.7
7	39141956800	6026	15.4	97.6	0.9	0.1	0.1	0	1.3	1.7	4
8	39141956900	4400	18	97.7	0.4	0	0.3	0	1.6	0	2.3
9	**Scioto County**										
10	39145992100	4960	17.4	98.3	0	0.2	0.1	0.6	0.7	0.6	1.7
11	39145992200	5180	12.8	79.9	16	0.4	0.1	0.3	3.4	2	20.8
12	39145992300	4867	16.1	96.7	0.2	1.5	0	0.3	1.3	0	3.3
13	39145992400	5626	21	97.2	0	0.2	0.7	0.3	1.6	1	3.2
14	39145992500	3188	17.8	95.4	0.5	0	0.6	0.5	2.9	1.5	5.1
15	39145992600	4164	16	98.2	0	0.2	0.1	0.1	1.2	1.4	2.3
16	39145992700	4538	12.5	96.7	0.2	0.2	0.2	0.1	2.5	0.4	3.3
17	39145992800	4486	18.8	95.7	2.5	1.1	0.3	0	0.4	0.3	4.7
18	39145992900	6372	15.4	98.1	0.7	0.4	0	0	0.8	0	1.9
19	39145993000	3878	20.8	96.9	0.3	0.9	1.3	0	0.6	0	3.1
20	39145993100	3495	21.9	98.5	0	0.4	0.3	0.1	0.6	0.1	1.5
21	39145993200	1861	31.5	97.6	0.3	0	0	0	2.1	0	2.4
22	39145993300	2698	14.1	94.6	2.4	0.8	1.8	0	0.5	0.9	6.3
23	39145993400	3801	28.5	93.1	3.9	0.5	0.2	0.2	2.1	0.3	7.1
24	39145993500	2859	29.3	97.2	0.2	0.8	0.2	0	1.6	1.5	4.4
25	39145993600	2596	43.4	88.8	7	0	1.2	0	2.9	0	11.2
26	39145993700	2618	24.6	75.4	20.3	0.4	0	0	4.2	1.4	25.6
27	39145993800	4689	8.1	95.6	0.7	0.2	1.9	0	1.6	0.2	4.6

Table F-1 State Population Data, by Census Tract (continued)

	Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
1	39145993900	3515	22.6	96.4	0	2.3	0.2	0	1.1	0	3.6
2	39145994000	3804	20.3	98.1	0.6	0.3	0.3	0.1	0.5	0.3	1.9
3	**Vinton County**										
4	39163953000	4509	17.8	98.3	0.3	0.5	0	0.1	0.8	0.4	2
5	39163953100	5284	21.4	97.3	0.1	0.5	0	0.2	1.9	0.8	3.4
6	39163953200	3013	20.8	98.4	0	0	0	0	1.6	0.5	2
7	**State of Kentucky**	4041769	15.8	90	7.3	0.2	0.7	0.5	1.2	1.4	10.7
8	**Threshold for EJ Concerns**	NA	35.8	NA	27.3	20.2	20.7	20.5	21.2	21.4	30.7
9	**Boyd County**										
10	21019030200	1182	25.9	81.2	9.2	0.5	4.9	1.2	3	0.6	19.4
11	21019030300	2542	32.3	96.6	3	0	0	0	0.4	0.2	3.6
12	21019030400	2072	27.9	93.1	2.3	0.2	0.2	1	3.2	2.3	7.1
13	21019030500	4489	11.1	97.3	1.6	0	0.9	0	0.2	0	2.7
14	21019030600	4169	9.9	97	1.6	0.1	0.2	0	1.1	0.2	3
15	21019030700	3578	8.7	95.8	0.8	0.5	0.1	1.1	1.6	0.4	4.3
16	21019030800	3969	29.4	97.6	0.5	0	0	0.2	1.8	1	3
17	21019030900	5772	13.7	99	0.2	0.3	0	0	0.5	0.3	1.3
18	21019031000	8122	12.6	88.7	7	0.4	0.3	1.1	2.3	4.7	14.1
19	21019031100	7764	10.9	98	0.5	0	0.2	0.1	1	0.5	2.1
20	21019031200	3374	11.5	99.1	0.9	0	0	0	0	0	0.9
21	21019031300	2719	19.2	97.1	1.1	0.2	0.3	0.1	1.3	0	2.9
22	**Carter County**										
23	21043960100	3370	26	98.5	0.7	0	0	0	0.8	0.7	2.2
24	21043960200	4334	25.5	99.3	0	0.1	0.3	0	0.3	0.2	0.9
25	21043960300	3080	20.8	100	0	0	0	0	0	0.6	0.6

Table F-1 State Population Data, by Census Tract (continued)

	Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
1	21043960400	1696	25.6	98.8	0	0.9	0.2	0	0	0	1.2
2	21043960500	4183	18	99	0.3	0.5	0	0	0.2	0	1
3	21043960600	5863	18.6	99.3	0.2	0	0.2	0.3	0	0.2	0.7
4	21043960700	4363	24.5	98.1	0	0	1.2	0	0.7	1.3	2.9
5	**Fleming County**										
6	21069980100	3949	16.6	94.9	4.5	0	0	0.1	0.5	0.8	6
7	21069980200	3184	12.9	98.4	1	0.2	0	0	0.4	1.3	2.7
8	21069980400	4085	24.1	99.1	0.9	0	0	0	0	0	0.9
9	**Greenup County**										
10	21089040100	4375	5.5	98.1	0.2	0.2	0.8	0.3	0.3	1.9	3.5
11	21089040200	7475	12.2	97.8	0.6	0.2	0.1	0.5	0.8	1.9	3.5
12	21089040300	4531	11.3	97	0.3	0	1.5	0.1	1	0.4	3.3
13	21089040400	5562	14.6	98.5	0.6	0	0.2	0.1	0.6	0.2	1.6
14	21089040500	8110	18.7	96.7	1.6	0	0.4	0.2	1.1	0.3	3.4
15	21089040600	3310	18	98.1	0	0.2	0.2	0	1.5	0	1.9
16	21089040700	3528	17.6	99.1	0	0.2	0.3	0	0.3	0	0.9
17	**Lewis County**										
18	21135990100	4716	29.1	99.7	0	0.2	0	0	0.1	0.2	0.5
19	21135990200	3990	33.6	98.9	0.4	0.2	0	0	0.5	0.5	1.6
20	21135990300	3293	22.5	97	0.8	0.6	0	0.7	0.9	0.7	3.2
21	21135990400	2093	27.1	100	0	0	0	0	0	0	0

Table F-1 State Population Data, by Census Tract (continued)

	Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
1	**Mason County**										
2	21161960100	3093	14.3	97.3	1.6	0	0	0.2	0.9	0.8	3.3
3	21161960200	3478	24.7	84.5	12.2	0.2	0	0.9	2.3	1.3	15.7
4	21161960300	4337	16.8	85.7	10.3	0.1	1.1	0.9	1.9	1.5	15.6
5	21161960400	4140	11.4	94.7	2.4	0.4	0.7	0.5	1.5	1	5.7
6	**Carter County**										
7	21205950100	6103	16.5	94.4	2.2	0.5	0.9	1	1	2	6.5
8	**State of West Virginia**	1808344	17.9	95	3.1	0.2	0.5	0.2	1	0.7	5.5
9	**Threshold for EJ Concerns**	NA	37.9	NA	23.1	20.2	20.5	20.2	21	20.7	25.5
10	**Cabell County**										
11	54011000600	1607	58.9	89.3	4	1.2	5	0.4	0	0.9	10.7
12	54011000900	1852	30.7	95.3	3.2	0	0	0.3	1.2	0.3	4.7
13	54011001000	2426	29.6	97.7	1.1	0	0	0	1.3	0.4	2.7
14	54011001100	2096	28.1	93.6	2	0	0	0	4.5	2.6	6.4
15	54011010700	7160	15.5	98.1	0.3	0	0.3	0.1	1.2	0.4	2.2
16	**Mason County**										
17	54053954800	6909	16.3	98.5	0.6	0.2	0	0	0.6	0.2	1.7
18	54053954900	6750	24	98.8	0.6	0	0.4	0	0.1	0.6	1.7
19	54053955000	5025	17.6	96.5	1.8	0	1.5	0	0.2	0.5	4
20	54053955100	7273	21.2	99	0	0.2	0.1	0	0.7	0.2	1.3
21	**Wayne County**										
22	54099005100	2181	13.7	98.4	0	0.6	0.7	0	0.3	0	1.6
23	54099005200	2086	14.1	98.8	0	0	0.9	0.3	0	0.3	1.2
24	54099020100	2545	13.1	99.3	0.4	0.4	0	0	0	0	0.7

Table F-1 State Population Data, by Census Tract (continued)

Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
54099020300	5307	16.4	99	0.4	0	0.2	0.1	0.3	0.4	1.3
54099020400	6219	11.8	99.3	0	0	0	0.2	0.5	1.1	1.6

Notes:
[a] NA = Not available.
[b] Census tracts exceeding minority/low-income criteria are shown in bold.

Table F-2 County Population Data, by Census Tract [a,b]

Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
Ohio										
Adams County	39001	6	17.4	0	0.7	0	0.1	1.2	0.4	2.4
Threshold for EJ Concerns	NA	26	NA	20	20.7	20	20.1	21.2	20.4	22.4
39001990100	4868	22.4	96.8	0	1.3	0	0.1	1.7	0.8	3.9
39001990200	4635	13.1	98.4	0	0.2	0.2	0.1	1.1	0.6	1.9
39001990300	6212	12.6	98.8	0.1	0.1	0	0.2	0.8	0.3	1.5
39001990400	4630	17.6	97.8	0	1.3	0	0	1	0	2.2
39001990500	3454	21.7	96.3	0	1.6	0	0	2.1	0	3.7
39001990600	3531	19.6	99	0	0.1	0.1	0	0.8	0.5	1.5
Ohio										
Athens County	39009	5	27.4	2.4	0.5	1.8	0.3	1.6	1	7.3
Threshold for EJ Concerns	NA	25	NA	22.4	20.5	21.8	20.3	21.6	21	27.3
39009972800	4272	**27.7**	97.4	0.4	0.8	0.4	0.3	0.6	1.8	4
39009972900	5362	**29.8**	90.9	3.1	0.4	3.1	0.3	2.1	0.5	9.5
39009973200	4320	17.4	87.8	3.7	0.5	4.4	0.5	2.5	2.2	13
39009973700	3967	13.9	95.7	1.2	0.6	0.8	0.2	1.6	1.4	5.7
39009973800	4642	11.3	98.4	0.2	0	0.7	0.1	0.5	0.5	2

Table F-2 County Population Data, by Census Tract (continued)

	Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
1	**Ohio**										
2	**Brown County**	39015	8	11.6	0.8	0.2	0.2	0.1	0.7	0.4	2.3
3	**Threshold for EJ Concerns**	NA	28	NA	20.8	20.2	20.2	20.1	20.7	20.4	22.3
4	39015951200	9522	6.2	98.3	0.2	0.1	0.3	0	1.1	0	1.7
5	39015951300	6435	12.3	98.7	0.3	0.2	0.3	0	0.5	0.3	1.6
6	39015951400	4408	14.4	98.6	0.4	0	0.1	0	0.8	0.5	1.9
7	39015951500	4896	12.3	98.5	0	0.9	0.4	0	0.2	0	1.5
8	39015951600	3869	16.5	97.4	1.1	0.3	0.2	0.2	0.8	1.4	3.5
9	39015951700	2764	15.3	92.8	4.8	0.1	0.1	0.1	2.1	0.6	7.6
10	39015951800	4650	12.2	97.4	2	0.2	0.1	0	0.3	0.4	2.9
11	39015951900	5741	12.1	99	0	0.2	0	0.3	0.5	0.6	1.2
12	**Ohio**										
13	**Clinton County**	39027	4	8.6	2.1	0.3	0.2	0.4	1.1	0.9	4.7
14	**Threshold for EJ Concerns**	NA	24	NA	22.1	20.3	20.2	20.4	21.1	20.9	24.7
15	39027994300	3871	10.3	97.6	0.9	0	0.1	0.4	1	0.1	2.4
16	39027994400	4808	4.4	98.1	0	0.7	0	0	1.2	0.2	2.1
17	39027995000	3967	7.9	99.3	0.1	0.2	0.1	0	0.4	0.1	0.7
18	39027995100	4105	8	97	0.1	1.2	0.2	0.9	0.6	1.2	3.2

Table F-2 County Population Data, by Census Tract (continued)

Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
Ohio										
Fairfield County	39045	3	5.9	2.6	0.3	0.7	0.3	1	1	5.5
Threshold for EJ Concerns	NA	23	NA	22.6	20.3	20.7	20.3	21	21	25.5
39045031200	4901	6.1	99.3	0	0	0.1	0.3	0.3	1.3	1.8
39045032500	5996	6.1	83.8	14	0.4	0.1	0.3	1.1	0.7	16.2
39045032600	5840	5	99.1	0.1	0.2	0	0.1	0.5	0.4	1.2
Ohio										
Fayette County	39047	7	10.1	2.1	0.2	0.5	0.4	1.1	1	4.8
Threshold for EJ Concerns	NA	27	NA	22.1	20.2	20.5	20.4	21.1	21	24.8
39047985800	3785	9.1	96.9	1.3	0.2	0	0.8	0.8	0.9	3.2
39047985900	3847	8.7	95.3	2.2	0.2	0.1	0.1	2	0.9	5.2
39047986000	4180	9.4	96.1	0.6	0.4	2.4	0	0.6	0.8	4.7
39047986100	4132	17.1	94	4	0	0	0	2	0	6
39047986200	4623	10.3	93	3.1	0.2	0.8	1.8	1.1	2.8	8.2
39047986300	3602	11	96.8	2.7	0.1	0	0	0.4	1	4
39047986400	4264	5.5	98.3	1	0	0	0.2	0.5	0.4	1.9
Ohio										
Gallia County	39053	7	18.1	2.6	0.2	0.7	0.2	1.4	0.4	5.3
Threshold for EJ Concerns	NA	27	NA	22.6	20.2	20.7	20.2	21.4	20.4	25.3
39053953500	4929	14.3	94.5	3.4	0.3	0.8	0.2	0.8	0.4	5.7
39053953600	3974	19.7	95.5	2.3	0.2	0.6	0.1	1.3	0.6	4.8
39053953700	4067	27.4	95.6	0.7	0.2	1.2	0.2	1.9	0.3	4.6
39053953800	4322	19.4	98.2	0.3	0	0	0.2	1.3	0.7	2

Table F-2 County Population Data, by Census Tract (continued)

	Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
1	39053953900	6790	13.6	94.4	4.1	0	0.4	0	1.2	0	5.6
2	39053954000	4489	17.2	92.4	3.4	0.8	1.5	0.5	1.5	0.9	8
3	39053954100	2498	20.7	93.8	3.4	0.3	0	0	2.5	0.4	6.2
4	**Ohio**										
5	**Highland County**	39071	9	11.8	1.5	0.5	0.4	0.1	0.8	0.4	3.4
6	**Threshold for EJ Concerns**	NA	29	NA	21.5	20.5	20.4	20.1	20.8	20.4	23.4
7	39071954400	3825	11	97.1	2.2	0.4	0	0.3	0	0.3	2.9
8	39071954500	4129	10.8	96.9	1.2	0	0	0.1	1.8	1.2	3.9
9	39071954600	4726	6.8	99	0.6	0	0.1	0	0.3	0	1
10	39071954700	5976	6.8	98.1	0	0.3	0.4	0	1.2	0	1.9
11	39071954800	4011	17.5	95.1	2.1	0.3	1.4	0.6	0.5	0.1	4.9
12	39071954900	3757	13.8	87.2	9	0.6	1.3	0	1.9	1	12.8
13	39071955000	4027	19.1	97.9	0.3	1.8	0	0	0	0.9	2.6
14	39071955100	5783	14	97.6	0.1	0.5	0.7	0	1	0.1	2.5
15	39071955200	4641	9.6	99.5	0	0.4	0	0	0.1	0.2	0.6
16	**Ohio**										
17	**Hocking County**	39073	7	13.5	1	0.2	0.2	0	0.8	0.3	2.5
18	**Threshold for EJ Concerns**	NA	27	NA	21	20.2	20.2	20	20.8	20.3	22.5
19	39073964900	4400	7.3	98.7	0.3	0.7	0	0	0.4	0.1	1.4
20	39073965000	3888	15.7	99.6	0.2	0.2	0	0	0	0.7	1.1
21	39073965100	4134	10.5	97.9	0.4	0	0	0	1.7	0	2.1
22	39073965200	4302	15.9	98.7	0.8	0.2	0	0	0.3	0.2	1.5
23	39073965300	3548	10.9	99.5	0.4	0.2	0	0	0	0.1	0.7
24	39073965400	3991	18.9	96.1	0.7	0	1.6	0	1.5	0.6	4.2

Table F-2 County Population Data, by Census Tract (continued)

Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
39073965500	3978	16.2	93.5	4.6	0.1	0	0.3	1.5	0.3	6.5
Ohio										
Jackson County	39079	7	16.5	0.9	0.3	0.3	0.1	1.1	1.2	3.6
Threshold for EJ Concerns	NA	27	NA	20.9	20.3	20.3	20.1	21.1	21.2	23.6
39079957200	5318	16.7	98.1	0.6	0	0.4	0.2	0.7	0.7	2.4
39079957300	3669	19.7	97	0.2	0.3	0.4	0.2	1.8	0.8	3.5
39079957400	5332	15.3	95.3	2.8	0.3	0.3	0.2	1.1	1.2	4.9
39079957500	5765	16	98.5	1.1	0	0.2	0	0.3	2.6	4.1
39079957600	2822	16.6	96.5	0.2	0.2	0.2	0	2.3	0.4	3.5
39079957700	5188	17.2	97.1	0.6	0.2	0.6	0	1.5	1.8	4.7
39079957800	4547	14.8	98.3	0.5	0.9	0	0	0.4	0.1	1.7
Ohio										
Lawrence County	39087	15	18.9	2.4	0.2	0.3	0.1	0.8	0.5	4.2
Threshold for EJ Concerns	NA	35	NA	22.4	20.2	20.3	20.1	20.8	20.5	24.2
39087050100	2692	15.2	95.9	2.8	0.2	0	0	1.1	0.8	4.9
39087050200	2524	20.8	97	2.5	0	0	0	0.5	0.3	3.3
39087050300	2349	33	78.1	19.6	0	1.4	0.2	0.5	0.9	22.3
39087050400	3155	25.1	97.8	1.6	0.3	0	0	0.3	0.4	2.3
39087050500	6585	19.1	97.6	0.1	0.3	1	0.2	0.7	0.9	2.9
39087050600	1677	28.1	94.5	1.4	0.3	0	0.4	3.5	0.4	5.5
39087050700	3749	26	99	0	0	0.7	0	0.3	0	1
39087050800	3843	22.6	97.4	1.8	0	0.7	0	0.1	0.2	2.8
39087050900	2279	18.4	98.3	0.3	0.4	0	0.4	0.7	1	2
39087051001	4475	13.9	95	3.7	0	0	0	1.3	0	5

Table F-2 County Population Data, by Census Tract (continued)

	Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
1	39087051002	4316	14.5	96.7	1.6	0	0	0	1.7	0	3.3
2	39087051100	6977	21.2	92.2	5.7	0.6	0	0.5	1.1	0.5	7.8
3	39087051200	5299	15.7	98.6	0.3	0.3	0	0.1	0.6	1	1.9
4	39087051300	3705	18.4	98.7	0.3	0	0.1	0	1	0	1.3
5	39087051400	8694	12	97.5	1.1	0.3	0.6	0.2	0.3	0.4	2.8
6	**Ohio**										
7	**Madison County**	39097	1	7.8	6	0.2	0.5	0.2	1.5	0.7	8.7
8	**Threshold for EJ Concerns**	NA	21	NA	26	20.2	20.5	20.2	21.5	20.7	28.7
9	39097041200	3282	7.6	97.8	0	0.1	0.9	0.2	1	1.4	3.3
10	**Ohio**										
11	**Meigs County**	39105	3	19.8	0.6	0.3	0.2	0.3	1.3	0.6	3
12	**Threshold for EJ Concerns**	NA	23	NA	20.6	20.3	20.2	20.3	21.3	20.6	23
13	39105964200	4423	17.3	98.6	0.3	0.1	0	0.1	0.8	0.2	1.5
14	39105964300	4342	21.3	96.8	0.3	0.3	0	0.5	2	0.7	4
15	39105964400	3676	28.2	94.5	2.2	0.6	0.1	0	2.6	0	5.5
16	**Ohio**										
17	**Pickaway County**	39129	11	9.5	5.7	0.5	0.3	0.2	1.1	0.8	8.3
18	**Threshold for EJ Concerns**	NA	31	NA	25.7	20.5	20.3	20.2	21.1	20.8	28.3
19	39129020100	2050	22.9	92.6	3.1	2.2	0	0	2.1	0.7	8.1
20	39129020200	2698	10.8	98.3	1.3	0	0	0	0.4	0.6	2.3
21	39129020310	5089	6.2	96.5	1.1	0.2	0.8	0.1	1.2	0	3.5
22	39129020320	3335	6.8	93.8	2.2	1.1	1.7	1.1	0.2	2.4	7.5
23	39129020400	2543	25.6	98	1	0	0	0.2	0.8	0.3	2.2

Table F-2 County Population Data, by Census Tract (continued)

	Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
1	39129021100	6910	5.5	97.9	0.1	0.3	0.8	0	1	0.4	2.4
2	39129021200	6424	8.9	97.3	0.3	0.9	0.1	0.1	1.3	0.5	3.1
3	39129021400	8992	7.7	88.1	9.8	0.3	0.1	0.1	1.5	0.7	12.2
4	39129021500	2987	9.2	99.2	0	0.1	0	0	0.7	1.3	1.9
5	39129021600	3528	12.7	98.1	0.4	0.5	0.1	0.1	0.9	0.1	2
6	39129021700	4506	7.1	99	0.6	0.4	0	0.1	0	1	1.9
7	**Ohio**										
8	**Pike County**	39131	6	18.6	0.8	1	0.4	0.2	1.3	0.5	4
9	**Threshold for EJ Concerns**	NA	26	NA	20.8	21	20.4	20.2	21.3	20.5	24
10	39131952200	5592	16.2	94.2	1.9	1.4	0.2	0.6	1.8	0.3	5.9
11	39131952300	5067	18.6	95.9	1.2	0.3	0.5	0	2.1	0.4	4.4
12	39131952400	3368	10.7	95.5	1.3	1	1.4	0.1	0.7	0	4.5
13	39131952500	3753	17.7	97.9	0	0.1	0.5	0	1.5	0.6	2.1
14	39131952600	5573	20.6	96.9	0.2	2	0	0	1	0.3	3.4
15	39131952700	4342	25.7	98	0	1.1	0.3	0.3	0.3	1.7	3.4
16	**Ohio**										
17	**Ross County**	39141	17	12	5.7	0.4	0.3	0.1	1.4	0.8	8.5
18	**Threshold for EJ Concerns**	NA	37	NA	25.7	20.4	20.3	20.1	21.4	20.8	28.5
19	39141955500	5388	5.2	98.6	0.1	0.2	0	0.2	0.8	0.7	1.8
20	39141955601	2047	7.5	98.5	0.8	0.4	0	0.3	0	1.9	3.4
21	39141955602	4954	4.8	57.1	39.3	0.2	0	0	4	2.2	44
22	39141955603	3861	11.8	98.3	0.6	0.1	0.5	0.2	0.3	0	1.7
23	39141955700	4267	12.5	98.5	0.4	0.4	0.1	0	0.5	0.4	1.9
24	39141955800	6824	9.8	94.9	3.5	0	0.1	0.5	1	0.7	5.4

Table F-2 County Population Data, by Census Tract (continued)

	Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
1	39141955900	4257	10.4	87.9	8.7	0	0.8	0.2	2.5	0.1	12.2
2	39141956000	4549	12	90.1	6.8	1.3	0	0	1.8	0.2	10.1
3	39141956100	3774	9.4	84.9	11.8	0.2	0.8	0	2.3	0.3	15.4
4	39141956200	2299	11	90.9	2.9	1.3	2.3	0.3	2.5	0.8	9.7
5	39141956300	2942	14.4	93.6	4.2	0	0.7	0	1.3	0.6	6.7
6	39141956400	3665	15.3	89.1	7.5	0.6	0.2	0.4	2.3	0.7	11.2
7	39141956500	4045	16.4	91.3	5.9	0.9	0	0	2	1.7	9.5
8	39141956600	5044	9.5	98.9	0.2	0	0.6	0	0.2	0.6	1.6
9	39141956700	5003	13.5	97	1	1.1	0.4	0.3	0.3	1	3.7
10	39141956800	6026	15.4	97.6	0.9	0.1	0.1	0	1.3	1.7	4
11	39141956900	4400	18	97.7	0.4	0	0.3	0	1.6	0	2.3
12	**Ohio**										
13	**Scioto County**	39145	20	19.3	2.6	0.5	0.5	0.2	1.5	0.6	5.5
14	**Threshold for EJ Concerns**	NA	40	NA	22.6	20.5	20.5	20.2	21.5	20.6	25.5
15	39145992100	4960	17.4	98.3	0	0.2	0.1	0.6	0.7	0.6	1.7
16	39145992200	5180	12.8	79.9	16	0.4	0.1	0.3	3.4	2	20.8
17	39145992300	4867	16.1	96.7	0.2	1.5	0	0.3	1.3	0	3.3
18	39145992400	5626	21	97.2	0	0.2	0.7	0.3	1.6	1	3.2
19	39145992500	3188	17.8	95.4	0.5	0	0.6	0.5	2.9	1.5	5.1
20	39145992600	4164	16	98.2	0	0.2	0.1	0.1	1.2	1.4	2.3
21	39145992700	4538	12.5	96.7	0.2	0.2	0.2	0.1	2.5	0.4	3.3
22	39145992800	4486	18.8	95.7	2.5	1.1	0.3	0	0.4	0.3	4.7
23	39145992900	6372	15.4	98.1	0.7	0.4	0	0	0.8	0	1.9
24	39145993000	3878	20.8	96.9	0.3	0.9	1.3	0	0.6	0	3.1
25	39145993100	3495	21.9	98.5	0	0.4	0.3	0.1	0.6	0.1	1.5

Table F-2 County Population Data, by Census Tract (continued)

	Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
1	39145993200	1861	31.5	97.6	0.3	0	0	0	2.1	0	2.4
2	39145993300	2698	14.1	94.6	2.4	0.8	1.8	0	0.5	0.9	6.3
3	39145993400	3801	28.5	93.1	3.9	0.5	0.2	0.2	2.1	0.3	7.1
4	39145993500	2859	29.3	97.2	0.2	0.8	0.2	0	1.6	1.5	4.4
5	39145993600	2596	43.4	88.8	7	0	1.2	0	2.9	0	11.2
6	39145993700	2618	24.6	75.4	20.3	0.4	0	0	4.2	1.4	25.6
7	39145993800	4689	8.1	95.6	0.7	0.2	1.9	0	1.6	0.2	4.6
8	39145993900	3515	22.6	96.4	0	2.3	0.2	0	1.1	0	3.6
9	39145994000	3804	20.3	98.1	0.6	0.3	0.3	0.1	0.5	0.3	1.9
10	**Ohio**										
11	**Vinton County**	39163	3	20	0.1	0.4	0	0.1	1.4	0.6	2.5
12	**Threshold for EJ Concerns**	NA	23	NA	20.1	20.4	20	20.1	21.4	20.6	22.5
13	39163953000	4509	17.8	98.3	0.3	0.5	0	0.1	0.8	0.4	2
14	39163953100	5284	21.4	97.3	0.1	0.5	0	0.2	1.9	0.8	3.4
15	39163953200	3013	20.8	98.4	0	0	0	0	1.6	0.5	2
16	**Kentucky**										
17	**Boyd County**	21019	12	15.5	2.2	0.2	0.3	0.4	1.2	1.1	5
18	**Threshold for EJ Concerns**	NA	32	NA	22.2	20.2	20.3	20.4	21.2	21.1	25
19	21019030200	1182	25.9	81.2	9.2	0.5	4.9	1.2	3	0.6	19.4
20	21019030300	2542	32.3	96.6	3	0	0	0	0.4	0.2	3.6
21	21019030400	2072	27.9	93.1	2.3	0.2	0.2	1	3.2	2.3	7.1
22	21019030500	4489	11.1	97.3	1.6	0	0.9	0	0.2	0	2.7
23	21019030600	4169	9.9	97	1.6	0.1	0.2	0	1.1	0.2	3
24	21019030700	3578	8.7	95.8	0.8	0.5	0.1	1.1	1.6	0.4	4.3

Table F-2 County Population Data, by Census Tract (continued)

Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
21019030800	3969	29.4	97.6	0.5	0	0	0.2	1.8	1	3
21019030900	5772	13.7	99	0.2	0.3	0	0	0.5	0.3	1.3
21019031000	8122	12.6	88.7	7	0.4	0.3	1.1	2.3	4.7	14.1
21019031100	7764	10.9	98	0.5	0	0.2	0.1	1	0.5	2.1
21019031200	3374	11.5	99.1	0.9	0	0	0	0	0	0.9
21019031300	2719	19.2	97.1	1.1	0.2	0.3	0.1	1.3	0	2.9
Kentucky										
Carter County	21043	7	22.3	0.2	0.2	0.3	0.1	0.3	0.4	1.3
Threshold for EJ Concerns	NA	27	NA	20.2	20.2	20.3	20.1	20.3	20.4	21.3
21043960100	3370	26	98.5	0.7	0	0	0	0.8	0.7	2.2
21043960200	4334	25.5	99.3	0	0.1	0.3	0	0.3	0.2	0.9
21043960300	3080	20.8	100	0	0	0	0	0	0.6	0.6
21043960400	1696	25.6	98.8	0	0.9	0.2	0	0	0	1.2
21043960500	4183	18	99	0.3	0.5	0	0	0.2	0	1
21043960600	5863	18.6	99.3	0.2	0	0.2	0.3	0	0.2	0.7
21043960700	4363	24.5	98.1	0	0	1.2	0	0.7	1.3	2.9
Kentucky										
Fleming County	21069	3	18.6	1.8	0.1	0	0	0.4	0.8	3
Threshold for EJ Concerns	NA	23	NA	21.8	20.1	20	20	20.4	20.8	23
21069980100	3949	16.6	94.9	4.5	0	0	0.1	0.5	0.8	6
21069980200	3184	12.9	98.4	1	0.2	0	0	0.4	1.3	2.7
21069980400	4085	24.1	99.1	0.9	0	0	0	0	0	0.9

Table F-2 County Population Data, by Census Tract (continued)

	Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
1	Kentucky										
2	Greenup County	21089	7	14.1	0.6	0.1	0.4	0.2	0.8	0.8	2.8
3	Threshold for EJ Concerns	NA	27	NA	20.6	20.1	20.4	20.2	20.8	20.8	22.8
4	21089040100	4375	5.5	98.1	0.2	0.2	0.8	0.3	0.3	1.9	3.5
5	21089040200	7475	12.2	97.8	0.6	0.2	0.1	0.5	0.8	1.9	3.5
6	21089040300	4531	11.3	97	0.3	0	1.5	0.1	1	0.4	3.3
7	21089040400	5562	14.6	98.5	0.6	0	0.2	0.1	0.6	0.2	1.6
8	21089040500	8110	18.7	96.7	1.6	0	0.4	0.2	1.1	0.3	3.4
9	21089040600	3310	18	98.1	0	0.2	0.2	0	1.5	0	1.9
10	21089040700	3528	17.6	99.1	0	0.2	0.3	0	0.3	0	0.9
11	Kentucky										
12	Lewis County	21135	4	28.5	0.3	0.3	0	0.2	0.4	0.4	1.4
13	Threshold for EJ Concerns	NA	24	NA	20.3	20.3	20	20.2	20.4	20.4	21.4
14	21135990100	4716	**29.1**	99.7	0	0.2	0	0	0.1	0.2	0.5
15	21135990200	3990	**33.6**	98.9	0.4	0.2	0	0	0.5	0.5	1.6
16	21135990300	3293	22.5	97	0.8	0.6	0	0.7	0.9	0.7	3.2
17	21135990400	2093	**27.1**	100	0	0	0	0	0	0	0

Table F-2 County Population Data, by Census Tract (continued)

	Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
1	**Kentucky**										
2	**Mason County**	21161	4	16.8	6.4	0.1	0.5	0.9	1.5	1.4	9.9
3	**Threshold for EJ Concerns**	NA	24	NA	26.4	20.1	20.5	20.9	21.5	21.4	29.9
4	21161960100	3093	14.3	97.3	1.6	0	0	0.2	0.9	0.8	3.3
5	21161960200	3478	24.7	84.5	12.2	0.2	0	0.9	2.3	1.3	15.7
6	21161960300	4337	16.8	85.7	10.3	0.1	1.1	0.9	1.9	1.5	15.6
7	21161960400	4140	11.4	94.7	2.4	0.4	0.7	0.5	1.5	1	5.7
8	**Kentucky**										
9	**Carter County**	21043	7	22.3	0.2	0.2	0.3	0.1	0.3	0.4	1.3
10	**Threshold for EJ Concerns**	NA	27	NA	20.2	20.2	20.3	20.1	20.3	20.4	21.3
11	21205950100	6103	16.5	94.4	2.2	0.5	0.9	1	1	2	6.5
12	**West Virginia**										
13	**Cabell County**	54011	5	19.2	4	0.2	0.9	0.3	1.3	0.6	7
14	**Threshold for EJ Concerns**	NA	25	NA	24	20.2	20.9	20.3	21.3	20.6	27
15	54011000600	1607	58.9	89.3	4	1.2	5	0.4	0	0.9	10.7
16	54011000900	1852	30.7	95.3	3.2	0	0	0.3	1.2	0.3	4.7
17	54011001000	2426	29.6	97.7	1.1	0	0	0	1.3	0.4	2.7
18	54011001100	2096	28.1	93.6	2	0	0	0	4.5	2.6	6.4
19	54011010700	7160	15.5	98.1	0.3	0	0.3	0.1	1.2	0.4	2.2

Table F-2 County Population Data, by Census Tract (continued)

Census Tract	Persons	Below Poverty Level (%)	Whites (%)	African American/ Black (%)	Native American (%)	Asian and Pacific Islander (%)	Other Races (%)	Two or More Races (%)	Hispanic or Latino (%)	Minorities (%)
West Virginia										
Mason County	54053	4	19.9	0.7	0.1	0.4	0	0.4	0.4	2
Threshold for EJ Concerns	NA	24	NA	20.7	20.1	20.4	20	20.4	20.4	22
54053954800	6909	16.3	98.5	0.6	0.2	0	0	0.6	0.2	1.7
54053954900	6750	24	98.8	0.6	0	0.4	0	0.1	0.6	1.7
54053955000	5025	17.6	96.5	1.8	0	1.5	0	0.2	0.5	4
54053955100	7273	21.2	99	0	0.2	0.1	0	0.7	0.2	1.3
West Virginia										
Wayne County	54099	5	19.6	0.1	0.2	0.2	0.1	0.5	0.3	1.4
Threshold for EJ Concerns	NA	25	NA	20.1	20.2	20.2	20.1	20.5	20.3	21.4
54099005100	2181	13.7	98.4	0	0.6	0.7	0	0.3	0	1.6
54099005200	2086	14.1	98.8	0	0	0.9	0.3	0	0.3	1.2
54099020100	2545	13.1	99.3	0.4	0.4	0	0	0	0	0.7
54099020300	5307	16.4	99	0.4	0	0.2	0.1	0.3	0.4	1.3
54099020400	6219	11.8	99.3	0	0	0	0.2	0.5	1.1	1.6

Notes:
[a] NA = Not available.
[b] Census tracts exceeding minority/low-income criteria are shown in bold.

Table F-3 Number of Census Tracts Exceeding State Environmental Justice Threshold [a]

County	Below Poverty Level	African American/ Black	Native American	Asian and Pacific Islander	Other Races	Two or More Races	Hispanic or Latino (All Races)	Minorities (Racial Minorities plus White Hispanics)	Total Minority Tracts
State of Ohio (%)	10.6	11.5	0.2	1.2	0.8	1.5	1.9	16	--
Threshold for EJ Concerns (%)	30.6	31.5	20.2	21.2	20.8	21.5	21.9	36	--
Adams	0	0	0	0	0	0	0	0	0
Athens	0	0	0	0	0	0	0	0	0
Brown	0	0	0	0	0	0	0	0	0
Clinton	0	0	0	0	0	0	0	0	0
Fairfield	0	0	0	0	0	0	0	0	0
Fayette	0	0	0	0	0	0	0	0	0
Gallia	0	0	0	0	0	0	0	0	0
Highland	0	0	0	0	0	0	0	0	0
Hocking	0	0	0	0	0	0	0	0	0
Jackson	0	0	0	0	0	0	0	0	0
Lawrence	1	0	0	0	0	0	0	0	NA
Madison	0	0	0	0	0	0	0	0	0
Meigs	0	0	0	0	0	0	0	0	0
Pickaway	0	0	0	0	0	0	0	0	0
Pike	0	0	0	0	0	0	0	0	0
Ross	0	1	0	0	0	0	0	1	NA
Scioto	2	0	0	0	0	0	0	0	NA
Vinton	0	0	0	0	0	0	0	0	0
Total Ohio Counties	3	1	0	0	0	0	0	1	NA

Table F-3 Number of Census Tracts Exceeding State Environmental Justice Threshold (continued)

County	Below Poverty Level	African American/ Black	Native American	Asian and Pacific Islander	Other Races	Two or More Races	Hispanic or Latino (All Races)	Minorities (Racial Minorities plus White Hispanics)	Total Minority Tracts
State of Kentucky (%)	15.8	7.3	0.2	0.7	0.5	1.2	1.4	10.7	--
Threshold for EJ Concerns (%)	35.8	27.3	20.2	20.7	20.5	21.2	21.4	30.7	--
Boyd	0	0	0	0	0	0	0	0	0
Carter	0	0	0	0	0	0	0	0	0
Fleming	0	0	0	0	0	0	0	0	0
Greenup	0	0	0	0	0	0	0	0	0
Lewis	0	0	0	0	0	0	0	0	0
Mason	0	0	0	0	0	0	0	0	0
Carter	0	0	0	0	0	0	0	0	0
Total Kentucky Counties	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
State of West Virginia (%)	17.9	3.1	0.2	0.5	0.2	1	0.7	5.5	--
Threshold for EJ Concerns (%)	37.9	23.1	20.2	20.5	20.2	21	20.7	25.5	--
Cabell	1	0	0	0	0	0	0	0	NA
Mason	0	0	0	0	0	0	0	0	0
Wayne	0	0	0	0	0	0	0	0	0
Total West Virginia Counties	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	NA

Table F-3 Number of Census Tracts Exceeding State Environmental Justice Threshold (continued)

County	Below Poverty Level	African American/ Black	Native American	Asian and Pacific Islander	Other Races	Two or More Races	Hispanic or Latino (All Races)	Minorities (Racial Minorities plus White Hispanics)	Total Minority Tracts
Grand Total (3 States)	4	1	0	0	0	0	0	1	NA

Notes:

[a] NA = Not available.

Table F-4 Number of Census Tracts Exceeding County Environmental Justice Threshold [a]

County	Below Poverty Level	African American/ Black	Native American	Asian and Pacific Islander	Other Races	Two or More Races	Hispanic or Latino (All Races)	Minorities (Racial Minorities plus White Hispanics)	Total Minority Block Groups
State of Ohio (%)	10.6	11.5	0.2	1.2	0.8	1.5	1.9	16	--
Threshold for EJ Concerns (%)	30.6	31.5	20.2	21.2	20.8	21.5	21.9	36	--
Adams	0	0	0	0	0	0	0	0	0
Athens	2	0	0	0	0	0	0	0	NA
Brown	0	0	0	0	0	0	0	0	0
Clinton	0	0	0	0	0	0	0	0	0
Fairfield	0	0	0	0	0	0	0	0	0
Fayette	0	0	0	0	0	0	0	0	0
Gallia	1	0	0	0	0	0	0	0	NA
Highland	0	0	0	0	0	0	0	0	0
Hocking	0	0	0	0	0	0	0	0	0
Jackson	0	0	0	0	0	0	0	0	0
Lawrence	0	0	0	0	0	0	0	0	0
Madison	0	0	0	0	0	0	0	0	0
Meigs	1	0	0	0	0	0	0	0	NA
Pickaway	0	0	0	0	0	0	0	0	0
Pike	0	0	0	0	0	0	0	0	0
Ross	0	1	0	0	0	0	0	1	NA
Scioto	1	0	0	0	0	0	0	1	NA
Vinton	0	0	0	0	0	0	0	0	0
Total Ohio Counties	**5**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	NA

Table F-4 Number of Census Tracts Exceeding County Environmental Justice Threshold (continued)

County	Below Poverty Level	African American/ Black	Native American	Asian and Pacific Islander	Other Races	Two or More Races	Hispanic or Latino (All Races)	Minorities (Racial Minorities plus White Hispanics)	Total Minority Block Groups
State of Kentucky (%)	15.8	7.3	0.2	0.7	0.5	1.2	1.4	10.7	--
Threshold for EJ Concerns (%)	35.8	27.3	20.2	20.7	20.5	21.2	21.4	30.7	--
Boyd	1	0	0	0	0	0	0	0	NA
Carter	0	0	0	0	0	0	0	0	0
Fleming	1	0	0	0	0	0	0	0	NA
Greenup	0	0	0	0	0	0	0	0	0
Lewis	3	0	0	0	0	0	0	0	NA
Mason	1	0	0	0	0	0	0	0	NA
Total Kentucky Counties	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	NA
State of West Virginia (%)	17.9	3.1	0.2	0.5	0.2	1	0.7	5.5	--
Threshold for EJ Concerns (%)	37.9	23.1	20.2	20.5	20.2	21	20.7	25.5	--
Cabell	4	0	0	0	0	0	0	0	NA
Mason	1	0	0	0	0	0	0	0	0
Wayne	0	0	0	0	0	0	0	0	0
Total West Virginia Counties	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	NA
Grand Total (3 States)	**16**	**1**	**0**	**0**	**0**	**0**	**0**	**2**	NA

Notes:

* NA = Not available.

APPENDIX G
COST BENEFIT ANALYSIS

APPENDIX G
COST BENEFIT ANALYSIS

G.1 Introduction

This appendix describes the methodology used in preparing the incremental cost benefit analysis that is summarized in Section 7.2.

An incremental cost benefit analysis measures the impacts of each alternative relative to a baseline, which is how things would be if the alternative were not imposed (i.e., the no-action alternative). The baseline used in this analysis assumes full licensee compliance with existing NRC requirements, including current regulations. This is consistent with the *Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission* (NRC, 2004), which state that "...in evaluating a new requirement for existing plants, the staff should assume that all existing NRC and Agreement State requirements have been implemented" (NRC, 2004).

The incremental cost benefit analysis described in this appendix compares the proposed action (construction and operation of the proposed ACP at Piketon, Ohio) with the no-action alternative. For the purposes of this analysis, the no-action alternative is defined as continued operation of the Paducah Gaseous Diffusion Plant at Paducah, Kentucky. This appendix presents full details of construction and operating costs and the results of a net present value analysis estimating the economic impact of implementing the proposed action compared to the no-action alternative under different discount rates and production capacity assumptions.

G.2 Methodology and Assumptions

The incremental cost benefit analysis presented in Section 7.2 considers a limited number of costs and benefits in assessing the net present value of implementing the proposed action compared to the no-action alternative. Specifically, the analysis quantitatively assesses direct costs such as construction costs, manufacturing costs, and decontamination and decommissioning costs. The only benefits assessed are those resulting from operating cost savings associated with implementing the proposed action compared to the no-action alternative. Some of the indirect impacts and costs described in Section 7.1.1 are not included as part of this comparative analysis because the effect of these impacts is assumed to be either (1) equal for the proposed action and the no-action alternative as defined above, or (2) too small an impact to materially affect the comparative cost benefit analysis.

The estimates in this analysis reflect costs and benefits to the U.S. economy and not to USEC. All costs and benefits in this analysis are measured in 2005 real dollars (denoted hereafter as 2005$). Costs and benefits are assumed to accrue at the beginning of the calendar year over which they actually occur.

G.3 Costs of the Proposed Action

Construction Costs: The construction phase of the proposed alternative is estimated to cost $1,449 million between calendar years 2006 and 2010 (USEC, 2005b). Construction costs are assumed to accrue evenly in each of the calendar years of the construction phase of the proposed action. The construction cost figure USEC provided is not expressed in constant dollars. To be conservative, NRC staff treat these costs as 2005$. This approach overestimates costs, and is therefore a conservative assumption.

Manufacturing Costs: The manufacturing and assembly phase of the proposed alternative is estimated to cost $1,423 million between calendar years 2004 and 2013 (USEC, 2005b). Manufacturing costs are assumed to accrue evenly in each of the calendar years of the manufacturing phase of the proposed action. Again, the USEC cost estimates are not expressed in constant dollars. Similar to the assumption made for construction costs, the costs derived from the manufacturing and assembly phase are treated as 2005$ in the cost benefit analysis. This is a conservative assumption that likely overstates costs.

Decontamination and Decommissioning Costs: Decontamination and decommissioning of the proposed alternative is estimated to cost $435 million (2004$) (USEC, 2005b). These costs are adjusted to reflect 2005$ (NASA, 2005). Decontamination and decommissioning costs are assumed to accrue evenly over six years, commencing 30 years after the first year of operation. The cost benefit analysis does not factor in costs associated with tails disposition. It is assumed that for a given production level, the amount of tails generated by the proposed ACP will be equivalent to the amount of tails that would have been generated using Paducah Gaseous Diffusion Plant (USEC, 2005b). Therefore, no incremental tails disposition costs result from the proposed action relative to the no-action alternative.

G.4 Costs of the No-Action Alternative

No construction or manufacturing costs are associated with the no-action alternative.

The decontamination and decommissioning schedule and costs associated with the Paducah Gaseous Diffusion Plant are considered independent of the proposed alternative and are not included in this analysis.

In addition, this section does not consider the costs and benefits associated with actions pertaining to the Portsmouth Gaseous Diffusion Plant. USEC closed the Portsmouth Gaseous Diffusion Plant in May 2001 to reduce operating costs. The NRC staff do not believe that there has been any significant change in the factors that were considered by USEC in its decision to cease uranium enrichment at Portsmouth. For the purposes of this cost benefit analysis, actions pertaining to the Portsmouth Gaseous Diffusion Plant, such as decontamination and decommissioning, are considered unrelated to the no-action alternative and the proposed action.

G.5 Benefits of the Proposed Action Relative to the No-Action Alternative

Benefits in a given year are computed as the difference between the operating costs per separative work unit of the no-action alternative and the proposed alternative multiplied by the level of production substituted in that year. Two scenarios are assumed:

(i) the proposed action substitutes 4.6 million separative work units of production at the Paducah Gaseous Diffusion Plant (this figure reflects the anticipated production levels at the Paducah Gaseous Diffusion Plant in 2005); and,
(ii) the proposed action substitutes 7 million separative work units of production at the Paducah Gaseous Diffusion Plant.

In both scenarios, the proposed ACP is assumed to be producing at the 7 million separative work unit capacity level. The difference is that in the first scenario, the proposed ACP is replacing only 4.6 million separative work units that would otherwise have been produced at the Paducah Gaseous Diffusion Plant. This analysis assumes that the proposed ACP's excess production (2.4 million separative work units) substitutes production from sources that are no more expensive than the proposed ACP. Therefore, incremental benefits from the proposed action do not accrue beyond the 4.6 million separative work units level. In the second scenario, the proposed ACP is substituting 7 million separative work units that would

otherwise have been produced at the Paducah Diffusion Gaseous Plant; the benefits are therefore higher in the second scenario.

In both scenarios, separative work unit production at the proposed ACP is expected to phase-in according to USEC's proposed schedule (USEC, 2005b). Specifically, the proposed ACP is expected to reach an annual capacity of 1 million separative work units per year in 2010, and is projected to have an annual capacity of 3.5 million separative work units per year in 2011 (USEC, 2005b). The proposed ACP is assumed to reach full capacity by 2015. These milestones are factored into the cost benefit analysis.

Operating costs under the no-action alternative are estimated to be approximately four times higher than under the proposed action. These costs are considered to be proprietary and have been withheld here pursuant to 10 CFR 2.390.

G.6 Discount Rates

Three different real discount rates are applied to estimate the net present value of the proposed alternative – zero percent, three percent, and seven percent. These discount rates are consistent with those recommended in NUREG/BR-0184, *Regulatory Analysis Technical Evaluation Handbook* (NRC, 1997). The higher discount rate places a lower value on benefit streams occurring in the future. Net present value estimates are lower under the higher real discount rate because most of the costs associated with the proposed alternative occur up front while benefits are distributed evenly over time.

G.7 Limitations

The cost benefit analysis presented here does not quantitatively estimate potential impacts such as public health effects, occupational health effects, and property value impacts.

Furthermore, certain benefits associated with the proposed alternative, including domestic energy security policy objectives, are not captured in this economic analysis.

As stated in Chapter 7, this analysis does not attempt a dynamic general equilibrium modeling of the economic effects of a cheaper source of enriched uranium for nuclear power plants. No attempt is made to model the effects of reduced enriched uranium prices on the ratio of nuclear and non-nuclear power in the domestic economy, on overall power demand and price, and on the potential economic benefits to consumers and suppliers. Instead, the analysis focuses on estimating the economic savings to society from replacing Paducah Gaseous Diffusion Plant production by a cheaper and less resource-intensive source based on centrifuge technology.

G.8 Results

Table G-1 presents the net present value of implementing the proposed action instead of the no-action alternative for the two scenarios described above at three alternative real discount rates. The figures represent net benefits of the proposed action when compared to the no-action alternative.

Table G-1 Net Present Value of the Net Benefits of Proposed Alternative Relative to the No-action Alternative

Scenario 1: Proposed ACP Substitutes 4.6 Million Separative Work Units of Paducah Gaseous Diffusion Plant Production	
Net Present Value (3 percent) in 2005 in Millions 2005$	$3,630
Net Present Value (7 percent) in 2005 in Millions 2005$	$966
Net Present Value (0 percent) in 2005 in Millions 2005$	$7,992
Scenario 2: Proposed ACP Substitutes 7 Million Separative Work Units of Paducah Gaseous Diffusion Plant Production	
Net Present Value (3 percent) in 2005 in Millions 2005$	$6,417
Net Present Value (7 percent) in 2005 in Millions 2005$	$2,290
Net Present Value (0 percent) in 2005 in Millions 2005$	$13,212

G.9 Conclusions

The analysis indicates that the incremental economic benefits of implementing the proposed action instead of the no-action alternative are substantially positive under both the scenarios and the three discount rates considered, even after accounting for all project-related costs.

G.10 References

(NASA, 2005) National Aeronautics and Space Administration. "Gross Domestic Product Deflator Inflation Calculator." <http://www1.jsc.nasa.gov/bu2/inflateGDP.html> May 25, 2005.

(USEC, 2005a) United States Enrichment Corporations. "Additional Responses to Request for Additional Information Regarding the Environmental Report (TAC No. L32307) - Proprietary Information." April 21, 2005.

(USEC, 2005b) United States Enrichment Corporation. "Environmental Report for the American Centrifuge Plant in Piketon, Ohio." Revision 3. NRC Docket No. 70-7004. July 2005.

(NRC, 1997) U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research. "Regulatory Analysis Technical Evaluation Handbook, Final Report," NUREG/BR-0184. January 1997.

(NRC, 2004) U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research. "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," NUREG/BR-0058. September 2004.

APPENDIX H
ACCIDENT ANALYSIS FOR THE PROPOSED ACP

The text in this appendix is being withheld pursuant to 10 CFR 2.390.

APPENDIX I
GLOSSARY

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Acid rain: Rain with a pH of less than 5.6.

Agreement State: A state that has signed an agreement with the Nuclear Regulatory Commission under which the state regulates the use of byproduct, source, and small quantities of special nuclear material in that state.

Air pollutant: Any substance in air which could, if in high enough concentration, harm humans, other animals, vegetation, or material. Pollutants may include almost any natural or artificial composition of matter capable of being airborne.

Air quality: A measure of the quantity of pollutants, measured individually, in the air. These levels are often compared to regulatory standards.

ALARA: Acronym for "as low as (is) reasonably achievable." An approach to keep radiation exposures (both to the workforce and the public) and releases of radioactive material to the environment at levels that are as low as social, technical, economic, practical, and public policy considerations allow. ALARA is not a dose limit; it is a practice whose objective is the attainment of dose levels as far below applicable limits as possible.

Alluvium: Loose gravel, sand, silt, or clay deposited by streams or running water.

Alpha particle: A positively charged particle ejected spontaneously from the nuclei of some radioactive elements. It is identical to a helium nucleus that has a mass number of 4 and an electrostatic charge of +2. It has low penetrating power and a short range (a few centimeters in air). The most energetic alpha particle will generally fail to penetrate the dead layers of cells covering the skin and can be easily stopped by a sheet of paper. Alpha particles are hazardous when an alpha-emitting isotope is inside the body.

Ambient Air Quality Standards: Standards established on a State or Federal level, that define the limits for airborne concentrations of designated "criteria" pollutants (nitrogen dioxide, sulfur dioxide, carbon monoxide, total suspended particulates, ozone, and lead), to protect public health with an adequate margin of safety (primary standards) and to protect public welfare, including plant and animal life, visibility, and materials (secondary standards).

Aquifer: A permeable body of rock capable of yielding quantities of groundwater to wells and springs.

Area of potential effects: The geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking (See 36 CFR § 800.16).

Assay: The qualitative or quantitative analysis of a substance often used to determine the proportion of isotopes in radioactive materials.

***Atomic Energy Act of 1954 as amended*:** A federal law that created the Atomic Energy Commission, which later split into the Nuclear Regulatory Commission and the Energy and Research and Development Administration (ERDA). ERDA became part of the Department of Energy in 1977. This act encouraged the development and use of nuclear energy and research for the general welfare and the security of the United States. This act authorized the Nuclear Regulatory Commission to regulate and license fuel fabrication facilities that seek to receive, possess, use, or transfer special nuclear material.

Attainment area: A region that meets the U.S. EPA National Ambient Air Quality Standards (NAAQS) for a criteria pollutant under the *Clean Air Act*.

Background radiation: Radiation from cosmic sources, naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material), and global fallout as it exists in the environment from the testing of nuclear explosive devices. It does not include radiation from source, byproduct, or special nuclear materials regulated by the Nuclear Regulatory Commission. The typically quoted average individual exposure from background radiation is 360 millirems per year.

Becquerel (Bq): A unit used to measure radioactivity. One Becquerel is that quantity of a radioactive material that will have one transformation in one second. There are 3.7×10^{10} Bq in one curie (Ci).

Best Management Practices (BMP): Structural, nonstructural, and managerial techniques recognized to be the most effective and practical means to reduce surface water and groundwater contamination while still allowing the productive use of resources.

Beta particle: A charged particle emitted from a nucleus during radioactive decay, with a mass equal to 1/1837 that of a proton. A negatively charged beta particle is identical to an electron. A positively charged beta particle is called a positron. Large amounts of beta radiation may cause skin burns, and beta emitters are harmful if they enter the body. Beta particles may be stopped by thin sheets of metal or plastic.

Bound: To estimate or describe a lower or upper limit on a potential environmental or health consequence when uncertainty exists.

Buffer area: A designated area of land that is designed to permanently remain vegetated in an undisturbed and natural condition in order to protect an adjacent aquatic or wetland site from upland impacts and to provide habitat for wildlife.

Byproduct material: The tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content. See also, Source Material.

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

Census tract: An area usually containing between 2,500 and 8,000 persons that is used for organizing and monitoring census data. The geographic dimensions of census tracts vary widely, depending on population density. Census tracts do not cross county borders.

Climatology: The science devoted to the study of the conditions of the natural environment (rainfall, daylight, temperature, humidity, air movement) prevailing in specific regions of the earth.

Cold standby: Cold standby involves placing those portions of the Gaseous Diffusion Plant needed for 3 million separative work units per year production capacity in a non-operational condition. It also includes performing surveillance and maintenance activities necessary to retain the ability to resume operations after a set of restart activities are conducted.

Contamination: Undesired radioactive material that is deposited on the surface of, or inside structures, areas, objects, or people.

Cooling water: Water circulated through a nuclear reactor or processing plant to remove heat.

Cost-benefit analysis: A formal quantitative procedure comparing costs and benefits of a proposed project or act under a set of preestablished rules.

Council on Environmental Quality: The President's Council on Environmental Quality (CEQ) was established by the enactment of *National Environmental Policy Act* (NEPA). The CEQ is responsible for developing regulations to be followed by all federal agencies in developing and implementing their own specific NEPA implementation policies and procedures.

Criteria pollutants: Common air pollutants for which National Ambient Air Quality Standards have been established by the U.S. EPA under Title I of the *Clean Air Act*. Criteria pollutants include sulfur dioxide, nitrogen oxides, carbon monoxide, ozone, particulate matter (PM_{10} and $PM_{2.5}$), and lead. Standards for these pollutants were developed on the basis of scientific knowledge about their health effects.

Critical habitat: Specific areas within the geographical range of an endangered species that is formally designated by the U.S. Fish and Wildlife Service under the *Endangered Species Act* as essential for conservation.

Cumulative impacts: Potential impacts when the proposed action is added to other past, present, and reasonable foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Curie (Ci): The basic unit used to describe the intensity of radioactivity in a sample of material. The curie is equal to 37 billion (3.7×10^{10}) disintegrations per second, which is approximately the activity of 1 gram of radium. A curie is also a quantity of any radionuclide that decays at a rate of 37 billion disintegrations per second. It is named for Marie and Pierre Curie, who discovered radium in 1898.

Day-Night Average Noise Level (DNL): DNL is a noise metric combining the levels and durations of noise events and the number of events over an extended time period. It is a cumulative average computed over a set of 24-hour periods to represent total noise exposure. DNL also accounts for more intrusive *night time noise, adding a 10 dB penalty for sounds after 10:00 p.m. and before 7:00 a.m.*

Decibel (dB): A standard unit for measuring sound-pressure levels based on a reference sound pressure of 0.0002 dyne per square centimeter. This is the smallest sound a human can hear. In general, a sound doubles in loudness with every increase of slightly more than 3 decibels.

Decibel, A-weighted (dBA): A number representing the sound level which is frequency weighted according to a prescribed frequency response established by the American National Standards Institute and accounts for the response of the human ear.

Decommissioning: The process of closing down a facility followed by reducing residual radioactivity to a level that permits the release of the property for unrestricted use (see 10 CFR 20.1003).

Decontamination: The reduction or removal of contaminating radioactive material from a structure, area, object, or person. Decontamination may be accomplished by (1) treating the surface to remove or decrease the contamination, (2) letting the material stand so that the radioactivity is decreased as a result of natural radioactive decay, or (3) covering the contamination to shield or attenuate the radiation emitted (see 10 CFR 20.1003 and 20.1402).

Depleted uranium: Uranium having a percentage of uranium-235 smaller than the 0.7 percent found in natural uranium. It is obtained from spent (used) fuel elements or as byproduct tails, or residues, from uranium isotope separation.

Depleted uranium hexafluoride (DUF_6): A compound of uranium and fluorine from which most of the uranium-235 isotope has been removed.

Direct jobs: The number of workers required at a site to implement an alternative.

Dose: The absorbed dose, given in rads (or in SI units, grays), that represents the energy absorbed from the radiation in a gram of any material. Furthermore, the biological dose or dose equivalent, given in rem or sieverts, is a measure of the biological damage to living tissue from radiation exposure.

Dosimetry: The theory and application of the principles and techniques involved in the measurement and recording of radiation doses. Its practical aspect is concerned with the use of various types of radiation instruments with which measurements are made (i.e., film badge, thermoluminescent dosimeter, and Geiger counter).

Effluent: A gas or fluid discharged into the environment, treated or untreated. Most frequently, the term applies to wastes discharged to surface waters.

Emissions: Substances that are discharged into the air.

Endangered species: Any species (plant or animal) that is in danger of extinction throughout all or a significant part of its range. Requirements for declaring a species endangered are found in the *Endangered Species Act.*

***Endangered Species Act of 1973*:** An act requiring federal agencies, with the consultation and assistance of the Secretaries of the Interior and Commerce, to ensure that their actions will not likely jeopardize the continued existence of any endangered or threatened species or adversely affect the habitat of such species.

Erosion: The wearing away of the land surface by wind, water, ice, or other geologic agents. Erosion occurs naturally from weather or runoff but is often intensified by human land use practices.

Exposure: Being exposed to ionizing radiation or to radioactive material.

Exposure pathways: A route or sequence of processes by which a radioactive or hazardous material may move through the environment to humans or other organisms. Each exposure pathway includes a source or release from a source, an exposure point, and an exposure route.

Floodplain: Low-lying areas adjacent to rivers and streams that are subject to natural inundations typically associated with precipitation.

Fuel cycle: The series of steps involved in supplying fuel for nuclear power reactors. It can include mining, milling, isotopic enrichment, fabrication of fuel elements, use in a reactor, chemical reprocessing to recover the fissionable material remaining in the spent fuel, reenrichment of the fuel material, refabrication into new fuel elements, and waste disposal.

Fugitive Dust: Any solid particulate matter (PM) that becomes airborne, other than that emitted from an exhaust stack, directly or indirectly as a result of the activities of man. Fugitive dust may include emission from haul roads, wind erosion of exposed soil surfaces, and other activities in which soil is either removed or redistributed.

Geology and Soils: Those Earth resources that may be described in terms of landforms, geology, and soil conditions.

Gray (Gy): The international system (SI) unit of absorbed dose. One gray is equal to an absorbed dose of 1 Joule/kilogram (one gray equals 100 rads) (see 10 CFR 20.1004).

Groundwater: Water, both fresh and saline, that is stored below the Earth's surface in pores, cracks, and crevices below the water table.

Hazardous Air Pollutants (HAPs): A group of 188 chemicals identified in the *1990 Clean Air Act Amendments*. Exposure to these pollutants can cause or contribute to cancer, birth defects, genetic damage, and other adverse health effects.

Hazardous waste: According to the *Resource Conservation and Recovery Act*, a waste that, because of its characteristics, may (1) cause or significantly contribute to an increase in mortality or an increase in serious irreversible illness, or (2) pose a substantial hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. Hazardous wastes possess at least one of the following characteristics: ignitability, corrosivity, reactivity, or toxicity. Hazardous waste is nonradioactive.

Heels: In the uranium enrichment process, heels refers to the residual solid uranium hexafluoride left after the feed rate declines to a predetermined level.

Highly enriched uranium (HEU): Uranium enriched in the isotope uranium-235 to 20% or above, which thus becomes suitable for nuclear weapons use.

Historic and Cultural Resources: Cultural resources include any prehistoric or historic district, site, building, structure, or object resulting from, or modified by, human activity. Historic properties are cultural resources listed in, or eligible for listing in, the National Register of Historic Places.

Holding ponds: Engineered depressions in the land that contain storm-water runoff until it can slowly seep back into the ground or evaporate.

Impacts: An assessment of the meaning of changes in all attributes being studies for a given resource. An aggregation of all of the adverse effects, usually measured using a qualitative and nominally subjective technique.

Indirect jobs: Jobs generated or lost in related industries within a regional economic area as a result of a change in direct employment.

Ingestion: To take in by mouth. Material that is ingested enters the digestive system.

Inhalation: To take in by breathing. Material that is inhaled enters the lungs.

Isotope: Any two or more forms of an element having identical or very closely related chemical properties and the same atomic number but different atomic weights or mass numbers.

Land Use: The way land is developed and used in terms of the kinds of anthropogenic activities that occur (e.g., agriculture, residential areas, industrial areas).

Lead: A heavy metal element formerly added to gasoline and paint for improved performance characteristics. Lead can be inhaled and ingested in food, water, soil, or dust. High exposure to lead can cause seizures, mental retardation, and/or behavioral disorders. Low exposure to lead can lead to central nervous system damage.

Low-enriched uranium (LEU): Uranium enriched in the isotope uranium-235, greater than 0.7% but less than 20% of the total mass. Naturally occurring uranium contains about 0.7% uranium-235, almost all the rest is uranium-238.

Low-level mixed waste: Low-level waste that also contains hazardous chemical components regulated under the *Resource Conservation and Recovery Act*.

Low-level radioactive waste: Wastes containing source, special nuclear, or byproduct material are acceptable for disposal in a land disposal facility. For the purposes of this definition, low-level waste has the same meaning as in the *Low-Level Radioactive Waste Policy Act*, that is, radioactive waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or byproduct material as defined in section 11e.(2) of the *Atomic Energy Act* (uranium or thorium tailings and waste).

Maximally exposed individual (MEI): A hypothetical person who—because of proximity, activities, or living habits—could receive the highest possible dose of radiation or of a hazardous chemical from a given event or process.

Meteorology: The science dealing with the atmosphere and its phenomena, especially as relating to weather.

Microcurie: One millionth of a curie. That amount of radioactive material that disintegrates (decays) at the rate of 37 thousand atoms per second.

Mitigation: A series of actions implemented to ensure that projected impacts will result in no net loss of habitat value or wildlife populations. The purpose of mitigative actions is to avoid, minimize, rectify, or compensate for any adverse environmental impact.

Millirem (mrem): One thousandth of a rem (0.001 rem).

Mixing height: The height above the earth's surface through which relatively strong vertical mixing of the atmosphere occurs.

Modified Mercalli Intensity: A measurement of earthquake intensity based on the effects to people and structures. Ranges from I (low) to XII (total destruction), as opposed to the Richter scale, which measures the energy of the earthquake. Mercalli scale is often used to classify earthquakes that were not recorded on modern seismographs.

***National Environmental Policy Act (NEPA) of 1969*:** A federal law constituting the basic national charter for protection of the environment. The act calls for the preparation of an environmental impact statement (EIS) for every major federal action that may significantly affect the quality of the human or natural environment. The main purpose is to ensure that environmental information is provided to decision makers so that their actions are based on an understanding of the potential environmental and socioeconomic consequences of a proposed action and the reasonable alternatives.

***National Historic Preservation Act (NHPA)*:** A federal law providing that property resources with significant national historic value be placed on the National Register of Historic Places. It does not require permits; rather, it mandates consultation with the proper agencies whenever it is determined that a proposed action might impact a historic property.

National Pollutant Discharge Elimination System (NPDES): A federal permitting system controlling the discharge of effluents to surface waters of the United States and regulated through the *Clean Water Act*, as amended.

National Register of Historic Places (NRHP): A list of districts, sites, buildings, structures, and objects of prehistoric or historic local, state, or national significance. The list is maintained by the Secretary of the Interior.

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

Non-Attainment Areas: An area that has been designated by the Environmental Protection Agency, or the appropriate state air quality agency, as exceeding one or more national or state Ambient Air Quality Standards.

Normal operations: Conditions during which facilities and processes operate as expected or designed. In general, normal operations include the occurrence of some infrequent events that, although not considered routine, are not classified as accidents.

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

Outfall: The place where effluent is discharged into receiving waters.

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

Personnel monitoring: The use of portable survey meters to determine the amount of radioactive contamination on individuals; or, the use of dosimetry to determine an individual's occupational radiation dose.

Pigtail operations: Refers to the activities related to the connection and disconnection of the valving and hosing associated with feed and withdrawal operations.

Point source: A source of effluents that is small enough in dimensions that it can be treated as if it were a point. A point source can be either a continuous source or a source that emits effluents only in puffs for a short time.

Pollutant: Any material entering the environment that has undesired effects.

Pollution: The addition of an undesirable agent to the environment in excess of the rate at which natural processes can degrade, assimilate, or disperse it.

Pollution prevention: The use of any process, practice, or product that reduces or eliminates the generation and release of pollutants, hazardous substances, contaminants, and wastes, including those that protect natural resources through conservation or more efficient utilization.

Prime farmland: Land with the best combination of physical and chemical characteristics for economically producing high yields of food, feed, forage, fiber, and oilseed crops with minimum inputs of fuel, fertilizer, pesticides, and labor. Prime farmland includes cropland, pastureland, rangeland, and forestland.

Rad: The special unit for radiation absorbed dose, which is the amount of energy from any type of ionizing radiation (e.g., alpha, beta, gamma, neutrons, etc.) deposited in any medium (e.g., water, tissue, air). A dose of one rad means the absorption of 100 ergs (a small but measurable amount of energy) per gram of absorbing tissue (100 rad = 1 gray).

Radiation (ionizing radiation): Alpha particles, beta particles, gamma rays, x-rays, neutrons, high-speed electrons, high-speed protons, and other particles capable of producing ions. Radiation, as used in 10 CFR Part 20, does not include non-ionizing radiation, such as radio- or microwaves, or visible, infrared, or ultraviolet light. (see also 10 CFR 20.1003)

Radiation standards: Exposure standards, permissible concentrations, rules for safe handling, regulations for transportation, regulations for industrial control of radiation, and control of radioactive material by legislative means.

Radioactivity: The spontaneous decay or disintegration of unstable atomic nuclei, accompanied by the emission of radiation. Eventually the unstable nuclei reach a stable state.

Radionuclide: An atom that exhibits radioactive properties. Radionuclides can be man-made or naturally occurring, can have a long life, and can have potentially mutagenic or carcinogenic effects on the human body.

Region of influence (ROI): The physical area that bounds the environmental, sociological, economic, or cultural features of interest for the purpose of analysis. A site-specific geographic area that includes the counties where approximately 90% of the site's current employees reside.

Rem: The acronym for roentgen equivalent man is a standard unit that measures the effects of ionizing radiation on humans. The dose equivalent in rems is equal to the absorbed dose in rads multiplied by the quality factor of the type of radiation (see 10 CFR 20.1004).

Remediation: Action taken to permanently remedy a release, or threatened release, of a hazardous or radioactive substance to the environment, instead of or in addition to removal.

***Resource Conservation and Recovery Act (RCRA)*:** A federal law that provides for a "cradle-to-grave" regulatory program for hazardous waste, including a system for managing hazardous waste from its generation to its ultimate disposal.

Restricted area: Any area to which access is controlled for the protection of individuals from exposure to radiation and radioactive materials.

Roentgen: A unit of exposure to ionizing radiation. It is the amount of gamma or x-rays required to produce ions resulting in a charge of 0.000258 coulombs/kilogram of air under standard conditions. Named after Wilhelm Roentgen, the German scientist who discovered x-rays in 1895.

Runoff: The portion of rainfall that is not absorbed by soil, evaporated, or transpired by plants, but finds its way into streams directly or as overland surface flows.

Sanitary/industrial waste: Nonhazardous, nonradioactive liquid and solid waste generated by normal housekeeping activities.

Sediment: Eroded soil particles that are deposited downhill or downstream by surface runoff.

Shielding: Any material or obstruction that absorbs radiation and thus tends to protect personnel or materials from the effects of ionizing radiation.

Sievert (Sv): A unit of radiation dose used to express a quantity called equivalent dose. This relates the absorbed dose in human tissue to the effective biological damage of the radiation by taking into account the kind of radiation received, the total amount absorbed by the body, and the tissues involved. Not all radiation has the same biological effect, even for the same amount of absorbed dose. One sievert is equivalent to 100 rem.

Site characterization: An onsite investigation at a known or suspected contaminated waste or release site to determine the extent and type(s) of contamination.

Source material: Uranium or thorium ores containing 0.05 percent Uranium or Thorium regulated under the *Atomic Energy Act*. In general, this includes all materials containing radioactive isotopes in concentrations greater than natural and the byproduct (tailings) from the formation of these concentrated materials

Special nuclear material: Plutonium, uranium-233, or uranium enriched in the isotopes uranium-233 or uranium-235.

State Historic Preservation Officer (SHPO): The state officer charged with the identification and protection of prehistoric and historic resources in accordance with the *National Historic Preservation Act*.

Subsidence: The process of sinking or settling of a land surface due to natural or artificial causes.

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

Surface water: Water located on the surface of the Earth in water bodies such as lakes, rivers, streams, ponds, wetlands, and the ocean.

Tails: In the uranium enrichment process, tails refers to gas with a reduced concentration of the uranium-235 isotope.

Threatened Species: Plant and wildlife species that are likely to become endangered in the foreseeable future.

***Toxic Substances Control Act (TSCA)*:** A federal law authorizing the U.S. Environmental Protection Agency to secure information on all new and existing chemical substances and to control any of these substances determined to cause unreasonable risk to public health or the environment. This law requires that the health and environmental effects of all new chemicals be reviewed by the EPA before such chemicals are manufactured for commercial purposes.

Uranium: A radioactive element with the atomic number 92 and, as found in natural ores, an atomic weight of approximately 238. The two principal natural isotopes are uranium-235 (0.7 percent of natural uranium), which is fissile, and uranium-238 (99.3 percent of natural uranium), which is fissionable by fast neutrons and is fertile. Natural uranium also includes a minute amount of uranium-234.

Visual Resource Management (VRM): A process devised by the Bureau of Land Management to assess the aesthetic quality of a landscape and to design proposed activities in a way that would minimize their visual impact on that landscape. The process consists of a rating of site visual quality followed by a measurement of the degree of contrast between the proposed development activities and the existing landscape.

Visual and Scenic Resources: Natural or developed landscapes that provide information for an individual to develop their perceptions of the area. The size, type, gradient, scale, and continuity of landforms, structures, land use patterns, and vegetation are all contributing factors to an area's visual character and how it is perceived.

Volatile Organic Compounds (VOCs): Organic compounds that easily volatize or evaporate and can break down through photodestructive mechanisms. VOCs contribute to air pollution, especially the generation of tropospheric ozone (O_3).

Waste management: The planning, coordination, and direction of functions related to generation, handling, treatment, storage, transportation, and disposal of waste. It also includes associated pollution prevention and surveillance and maintenance activities.

Waste minimization: An action that economically avoids or reduces the generation of waste by source reduction and recycling; or reduces the toxicity of hazardous waste, improving energy usage.

Water resources: This term includes both freshwater and marine systems, wetlands, floodplains, and ground water.

Well field: Area containing one or more wells that produce usable amounts of water.

Wetlands: Land or areas exhibiting the following characteristics: hydric soil conditions; saturated or inundated soil during some part of the year and plant species tolerant of such conditions; also, areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, under normal circumstances, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

NRC FORM 335 (9-2004) NRCMD 3.7 U.S. NUCLEAR REGULATORY COMMISSION **BIBLIOGRAPHIC DATA SHEET** *(See instructions on the reverse)*	1. REPORT NUMBER (Assigned by NRC, Add Vol., Supp., Rev., and Addendum Numbers, if any.) NUREG-1834
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10. SUPPLEMENTARY NOTES

11. ABSTRACT *(200 words or less)*

USEC Inc. (USEC) has submitted an application to the U.S. Nuclear Regulatory Commission (NRC) for a license to construct, operate, and decommission the American Centrifuge Plant (ACP), a gas centrifuge uranium enrichment facility located on the U.S. Department of Energy (DOE) reservation in Piketon, Ohio. The American Centrifuge Plant, if licensed, would enrich uranium for use in commercial nuclear fuel for power reactors. Feed material would be comprised of non-enriched uranium hexafluoride (UF6). USEC proposes to enrich uranium up to 10 percent by weight of uranium-235. The initial license application is for a 3.5 million separative work unit1 (SWU) per year facility. Because USEC indicated the potential for future expansion to 7.0 million SWU per year, the environmental review looks at the impacts from a 7.0 million SWU per year facility. The proposed ACP would be licensed in accordance with the provisions of the Atomic Energy Act. Specifically, an NRC license under Title 10, "Energy," of the U.S. Code of Federal Regulations (10 CFR) Parts 30, 40, and 70 would be required to authorize USEC to possess and use special nuclear material, source material, and byproduct material at the proposed ACP site.

This Draft Environmental Impact Statement (Draft EIS) was prepared in compliance with the National Environmental Policy Act and the NRC regulations for implementing the Act. This Draft EIS evaluates the potential environmental impacts of the proposed action and its reasonable alternatives. This Draft EIS also describes the environment potentially affected by USEC's proposal, presents and compares the potential environmental impacts resulting from the proposed action and its alternatives, and describes USEC's environmental monitoring program and mitigation measures.

12. KEY WORDS/DESCRIPTORS *(List words or phrases that will assist researchers in locating the report.)*	13. AVAILABILITY STATEMENT: unlimited
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