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Environmental Report

for the American Centrifuge Plant
in Piketon, Ohio

~~Revision 16~~Proposed Change

Docket No. 70-7004

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LA-3605-0002

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in Piketon, Ohio

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EXECUTIVE SUMMARY

This Environmental Report (ER) is submitted by ~~the Licensee (Centrus Energy Corp. [Centrus], formerly known as United States Enrichment Corporation Inc. [USEC] Inc. (USEC)~~American Centrifuge Operating, LLC (ACO), the applicant for a license to construct and operate the American Centrifuge Plant at the U.S. Department of Energy (DOE) reservation located in Piketon, Ohio (the DOE reservation) in accordance with the *Atomic Energy Act* of 1954, as amended, 10 *Code of Federal Regulations* (CFR) Parts 70, 40 and 30, and other applicable laws and regulations. ~~USEC is the parent company of the United States Enrichment Corporation, which is the current holder of a U.S. Nuclear Regulatory Commission (NRC) Certificate of Compliance issued under 10 CFR Part 76.~~

This ER is organized in accordance with the guidance in NUREG-1748, *Environmental Review Guidance for Licensing Actions Associated with NMSS Programs.*

Introduction

The American Centrifuge Plant (ACP) encompasses the construction, manufacturing, start-up, operation, maintenance, and decommissioning of a uranium enrichment process using American Centrifuge technology. The license requested is for the construction and operation of an 3.8 million separative work unit (SWU) plant but this ER has also examined the impacts of an annual capacity of 7.6 million SWU (four process buildings and support facilities) to facilitate licensing for future expansion from a 3.8 million SWU licensed plant. Thus, the anticipated environmental impacts described in this ER are conservative with respect to the initial construction activities and plant operations authorized by the license requested by ~~USEC~~(ACO)the Licensee. The Licensee would seek future license amendments, as needed, to authorize additional construction or operation authority, but expects the environmental impacts of such additional activities to be bounded by the analysis in this ER. This advanced second-generation enrichment technology was originally developed by DOE. ~~USEC~~ The Licensee has updated the gas centrifuge technology from that used in the GCEP program, but the American Centrifuge components remain compatible with existing infrastructure and buildings/facilities. It is the Licensee's plan to utilize existing buildings and adjacent areas that were previously designated, designed and improved as part of earlier construction in the 1980s for a DOE centrifuge uranium enrichment plant, located on the DOE reservation, which includes the Portsmouth Gaseous Diffusion Plant (PORTS) facilities that were built to support the gaseous diffusion process begun in the 1950s. ~~PORTS is operated by USEC's wholly owned subsidiary, the United States Enrichment Corporation, under a Certificate of Compliance issued by the NRC pursuant to 10 CFR Part 76.~~

~~USEC~~ The Licensee is the only non-governmental corporation providing enrichment services to the nuclear industry and the only ~~U.S. producer of~~domestically owned supplier of enriched uranium. Deployment of the ACP is important to advancing the national energy security goals of maintaining a reliable and economical domestic source of enriched uranium. Former Secretary Spencer Abraham, U.S. Secretary of Energy, ~~has~~ stated: "As a clean, affordable and reliable energy source, nuclear energy is important to the nation's future energy supply … USEC, and its partners in the nuclear industry, continue to take important steps enhancing national energy security with private sector development of advanced American technology." In creating ~~USEC~~ the Licensee and privatizing the U.S. government's enrichment operations, Congress intended that

~~USEC~~ the Licensee would, among other things, conduct research and development as required to evaluate alternative technologies for uranium enrichment, and to help maintain a reliable and economical domestic source of enriched uranium. Deployment of the ACP is also important for meeting the commercial needs of the corporation to replace higher cost and aging production with new lower cost production. ~~conduct research and development as required, to evaluate alternative technologies for uranium enrichment, and help maintain a reliable and economical domestic source of enriched uranium. Deployment of the ACP is also important for meeting the commercial needs of the corporation to replace higher cost and aging production with new lower cost production.~~

To support these statutory and commercial objectives, on June 17, 2002, USEC and the U.S. government, represented by the DOE, entered into an agreement (DOE-USEC Agreement), which has, as one of its fundamental objectives, to facilitate the deployment of cost effective centrifuge enrichment technology in the United States. Assuming the successful demonstration of the technology, the DOE-USEC Agreement requires that ~~USEC~~ the Licensee begin operation of a commercial centrifuge enrichment plant with an annual capacity of 1 million SWU in accordance with certain milestones.

The DOE-USEC Agreement contemplated~~s~~ three steps toward the deployment of a commercial centrifuge enrichment plant, as discussed below.

The first step~~, which is already underway, is~~ was to upgrade existing American Centrifuge technology and demonstrate an economically attractive gas centrifuge and enrichment process using American Centrifuge technology. This ~~is being~~was accomplished through a Cooperative Research and Development Agreement ~~between USEC~~ the Licensee ~~and~~with the University of Tennessee-Battelle through which ~~USEC's~~ the demonstration activities in Oak Ridge, Tennessee and Lead Cascade activities in Piketon, Ohio ~~are~~ were supported. ~~DOE regulates centrifuge activities in Oak Ridge.~~ DOE prepared an Environmental Assessment regarding USEC's work in Oak Ridge in October 2002 and issued a Finding of No Significant Impact (FONSI) (DOE 2002b). The Demonstration Project ended and final decommissioning efforts were completed in 2019.

The second step in the DOE-USEC Agreement ~~is~~ was to install and operate a gas centrifuge Lead Cascade inside existing buildings at the DOE reservation based on up to 240 full-scale gas centrifuges and components. NRC has performed an Environmental Assessment (USEC 2004b), which resulted in a FONSI. In order to operate the American Centrifuge Demonstration Facility (Lead Cascade), a 10 CFR Part 70 license was issued to USEC on February 24, 2004 to possess and use small quantities of enriched uranium up to 250 kilograms of uranium hexafluoride (UF_6).

While the purpose of the testing in Oak Ridge ~~is~~ was focused on the centrifuge only, the purpose of the Lead Cascade ~~is~~ was to provide reliability, performance, cost, and other vital data of the enrichment process as a full-scale system. The Lead Cascade ~~will~~ did not produce enriched uranium for sale to customers. The cascade ~~will~~ operated in a recycling "closed loop" mode where the enriched product stream ~~is~~ was recombined with the depleted uranium stream prior to being re-fed in to the cascade. No enriched material ~~will be~~was withdrawn, with the exception of laboratory samples that ~~will be~~were used to assess the performance of the cascade. The

information provided during system testing ~~is~~ was the principal benefit of the Lead Cascade. The Lead Cascade operated from 2007 to 2016. Decommissioning efforts of the Lead Cascade were completed in 2018.

The ACP is the third step in the plan to deploy the American Centrifuge technology. The ACP encompasses the construction, startup, operation, maintenance, and decommissioning of a uranium enrichment process to produce, as an initial target, 3.8 million SWU per year, potentially expandable to 7.6 million SWU per year, using American Centrifuge technology. The ACP utilizes existing buildings located on the DOE reservation near Piketon, Ohio, that were built to support the gaseous diffusion process beginning in the 1950s and the gaseous centrifuge process beginning in the 1980s, in addition to several newly constructed buildings and facilities. This license application includes the High Assay Low Enriched Uranium (HALEU) Demonstration Program which is designed to enrich and safely contain and handle UF_6 with an operational limit that is less than 20 wt. percent ^{235}U.

~~The final step under the DOE-USEC Agreement is to construct and operate a commercial centrifuge plant using American Centrifuge technology.~~

Proposed Action

A license ~~application~~ amendment request to ~~for~~ the existing ACP license is being submitted pursuant to the *Atomic Energy Act* of 1954 as amended, 10 CFR Part 70, and other applicable laws and regulations. The ACP is designed to enrich and safely contain and handle UF_6 up to 10-weight (wt.) percent uranium-235 (^{235}U~~U-235~~). ~~USEC~~ The Licensee is submitting this ER to support the NRC's preparation of an Environmental Impact Statement (EIS) for the commercial centrifuge plant. Deployment of the ACP supports the national energy security goal of maintaining a reliable and economical domestic source of enriched uranium. It also meets the corporation's need to replace aging production facilities with more efficient technology.

The American Centrifuge Plant encompasses the construction, startup, operation, and maintenance of a uranium enrichment process to produce, as an initial target, 3.8 million SWUs annually using American Centrifuge technology with the option to expand to 7.6 million SWUs. It is the intent of the Licensee to deploy portions of the ACP in a modular fashion to accommodate market demand on a scalable, economical gradation. This modular deployment will encompass utilization of cascades of low enriched uranium (LEU) production for customer product or feed material into High Assay Low Enriched Uranium (HALEU) cascades (See Section 1.0.2 for details). The evaluation within this ER encompasses the larger 7.6 million SWUs program, thereby, bounding the impacts of the initial phases of the ACP.

The proposed phased deployment of the ACP environmental impacts is bound by the previous EIS and this ER.

The ACP uses portions of the DOE reservation and the former DOE Gas Centrifuge Enrichment Plant (GCEP) along with eight new proposed facilities. The ACP utilizes existing utilities and infrastructure that support the DOE reservation including the utilities and infrastructure that were intended to support GCEP. New proposed facilities may be necessary for feed, withdrawal, sampling, and blending/transfer operations. The Licensee has updated the

American Centrifuge technology from that used in the GCEP program, but the American Centrifuge components remain compatible with existing infrastructure and facilities.

The initial step of the Proposed Action will consist of the HALEU Demonstration Program, which will only reuse existing buildings recently utilized by the Lead Cascade Demonstration project and will not involve any new construction.

Accordingly, the Proposed Action that is the subject of this ER is the licensing of the ACP in Piketon, Ohio. In this ER, the Proposed Action is compared to a range of reasonable alternatives. These alternatives include: the No Action Alternative (i.e., not licensing the ACP) and the siting alternative of Paducah, Kentucky. Since the DOE-USEC Agreement requires that the ACP be sited either at the DOE reservation in Piketon, Ohio, or the Paducah Gaseous Diffusion Plant (PGDP) in Paducah, Kentucky, the only siting alternative considered was PGDP.

Results of Analyses

The results of the analyses in this ER can be summarized as follows. The Proposed Action will satisfy the national energy security goal of maintaining a reliable and economical domestic source of uranium enrichment as well as corporation's commercial need for a new production facility. There is a clear need for the Proposed Action. The No Action Alternative will not meet the national energy goal, will have serious economic impact on the region around the proposed ACP and will not meet the commercial needs of the corporation.

Consideration of reasonable alternatives demonstrates that no alternate enrichment technology, and no other site, is obviously superior to an ACP at the Piketon, DOE reservation. ~~USEC~~ The Licensee considered alternate technologies—Atomic Vapor Laser Isotopic Separation (AVLIS) and Separation of Isotopes by Laser Excitation (SILEX)—that utilize lasers to enrich uranium. The Licensee~~USEC~~ determined in 1999 that AVLIS was not an economically viable technology, and suspended its development. The Licensee~~USEC~~ ended its funding for research and development of the SILEX laser-based uranium enrichment process in April 2003 with the decision to focus advanced technology resources on the demonstration and deployment of the American Centrifuge uranium enrichment technology. For siting, the DOE-USEC Agreement requires that the ACP be located at either the DOE reservation in Piketon, Ohio, or PGDP. Regardless, no sites other than the DOE reservation in Piketon, Ohio, or PGDP offer the unique combination of existing skilled work force, and existing environmental data, regulatory programs and infrastructure relevant to uranium enrichment. Both the DOE reservation in Piketon, Ohio and PGDP sites are environmentally suitable. ~~UF_6 production will ultimately cease at PGDP if the Proposed Action is approved and becomes operational, resulting in reduced emissions and resource use at PGDP.~~ The ACP can be located in Piketon, Ohio, within existing buildings, newly constructed facilities and adjacent areas that were previously designated, designed and improved as part of earlier construction in the 1980s for a DOE centrifuge uranium enrichment plant (ERDA 1977). PGDP could only accommodate the ACP with the construction of a new, 114,380 square meter (1,231,172 square foot) process building and additional buildings for feed, withdrawal and other support functions, and associated infrastructure. This construction would add cost and increase schedule risk, compared to siting the ACP at the DOE reservation in Piketon, Ohio. Accordingly, Piketon, Ohio was chosen as the site for the ACP.

Impacts

Analyses conducted as part of this ER demonstrate that there are no significant environmental impacts resulting from the Proposed Action. The ACP will be located in newly constructed facilities and within several existing buildings and adjacent areas that were previously designated, designed and improved as part of earlier construction in the 1980s for a DOE centrifuge uranium enrichment plant at the DOE reservation in Piketon, Ohio. The uranium enrichment production and operations facilities currently located on the DOE reservation ~~ar~~were leased to the ~~United States Enrichment Corporation~~Licensee by the DOE, and comprised about 223 hectares (ha) (550 acres) within the approximately 1,497 ha (3,700 acres) DOE reservation. Although uranium enrichment operations at the DOE reservation in Piketon, Ohio, ceased in May 2001, the area remains industrialized as it has been since enrichment operations began in the 1950s. The gaseous diffusion plant (GDP) transitioned to Cold Shutdown status on October 1, 2005 and the Decontamination & Decommissioning (D&D) of inactive facilities began. D&D of multiple

facilities started in 2010 and at present remains ongoing~~Uranium enrichment equipment and facilities are being maintained in a Cold Standby status~~. The area is largely devoid of trees, with grass and paved roadways dominating the open space.

Site utility usage would increase slightly but would still be within existing capacities and historic usages. Existing facilities will be refurbished and a few new buildings constructed to accommodate the ACP.

There are no wetlands, critical habitat, cultural, historical or visual resources that will be adversely affected by the refurbishment, construction or operation of the ACP at the DOE reservation in Piketon, Ohio. Modeling indicates that the maximally exposed individual (MEI) is a hypothetical individual living on the DOE reservation boundary 1.1-kilometers (0.68 mile) south-southwest of the ACP. The maximum individual effective dose equivalent (EDE) rate at this location is modeled to be 0.80 millirem (mrem)/year (yr). The maximum individual EDE rate for the on-reservation tenant organizations is 0.40 mrem/yr. The calculated MEI doses are well below the U.S. Environmental Protection Agency (EPA) National Emissions Standards for Hazardous Air Pollutants (NESHAP) limit of 10 mrem/yr and the NRC Total Effective Dose Equivalent (TEDE) limit of 100 mrem/yr.

Wastes generated during manufacturing and operation will include classified and unclassified low-level radioactive wastes, non-regulated wastes and wastes regulated under the *Resource Conservation and Recovery Act*, including low-level mixed wastes.

Precautions will be taken in accordance with applicable laws and best management practices to avoid accidental releases to the environment (i.e., liquid effluent tanks, holding ponds with oil diversion devices, spill response and equipment, procedures, training, etc.).

There are no environmental justice issues associated with the ACP.

Connected to the Proposed Action is the commercial manufacture of centrifuge components. The manufacturing/assembly process will be an ongoing activity through the production of approximately 12,000 completed centrifuges for a 3.8 million SWU plant and 24,000 completed centrifuges and sufficient spares to operate a 7.6 million SWU plant. The production rate capability will be developed to ramp up to approximately 16 completed centrifuges per day. Manufacturing impacts are evaluated in this ER.

Refurbishment and construction of the ACP will create approximately 518 construction contractor jobs for the 3.8 million SWU plant and 1,036 construction contractor jobs for the 7.6 million SWU plant. The projected level of employment for the operations phase is projected to be approximately 500 for a 3.8 million SWU plant and 600 full-time equivalents (FTEs) for a 7.6 million SWU plant.

Conclusion

In conclusion, the environmental impacts of the Proposed Action are clearly outweighed by the benefits of supporting the national energy security goal of maintaining a reliable and economical domestic source of enriched uranium and meeting the corporation's need for a new production facility. The No Action Alternative is denial of a license to construct and operate the ACP at the DOE reservation. The consequence of the No Action Alternative is that the demonstrated need for a domestic advanced technology uranium enrichment facility will not be met. Long-term national energy security goals will be in jeopardy and it will have a significant impact on the reliability of an adequate nuclear fuel supply in the global marketplace and the corporation's need to replace higher cost ageing production will not be met. The No Action Alternative will adversely impact national energy security. The primary benefit of the No Action Alternative is the avoidance of the few insignificant impacts associated with the Proposed Action. The alternative of siting the ACP at PGDP would also meet the need but would result in slightly greater environmental impacts due to the need to construct a larger number of buildings and supporting infrastructure. There would also be cost and schedule impacts associated with constructing the ACP at PGDP. Piketon, Ohio was chosen as the site for the ACP on the basis of ~~USEC's~~ the Licensee's overall assessment of how to meet the need for such a facility considering environmental and other impacts, and cost and schedule. This ER demonstrates that the preferred alternative is clearly the construction and operation of the ACP at the selected location on the Piketon, Ohio DOE reservation.

1.0 INTRODUCTION

~~USEC Inc. (USEC)~~American Centrifuge Operating, LLC (ACO), the Licensee is the applicant for a license to construct and operate a uranium enrichment facility. ~~USEC~~ The Licensee is the only private corporation providing enrichment services to the nuclear industry and the only ~~U.S. producer of enriched uranium~~domestic supplier of enriched uranium. The license authorizes ~~USEC~~ the Licensee to possess and use special nuclear, source, and by-product material in the American Centrifuge Plant (ACP). As required by 10 *Code of Federal Regulations* (CFR) Part 51, this Environmental Report (ER) is being submitted to the U.S. Nuclear Regulatory Commission (NRC) by the Licensee~~USEC~~ to support licensing of the ACP. The ACP is an important step toward advancing the national energy security goals of maintaining a reliable and economical domestic source of enriched uranium. ~~USEC~~ The Licensee proposes — as the Proposed Action — to locate the ACP at the U.S. Department of Energy (DOE) reservation in Piketon, Ohio in accordance with the *Atomic Energy Act* of 1954, as amended, 10 CFR Parts 70, 40, and 30, and other applicable laws and regulations. ~~USEC is the parent company of the United States Enrichment Corporation, which is the current holder of a NRC Certificate of Compliance issued under 10 CFR Part 76.~~

This ER is organized in accordance with the guidance contained in NUREG-1748, *Environmental Review Guidance for Licensing Actions Associated with NMSS Programs*, dated August 2003. Chapter 1.0 provides an introduction and background on the history of the site, and discusses why ~~USEC~~ the Licensee is requesting, from the NRC, a license to construct and operate a uranium enrichment facility. Chapter 2.0 discusses the Proposed Action and alternatives including the No Action Alternative and siting alternatives. Chapter 3.0 discusses the existing environmental conditions at the DOE reservation in Piketon, Ohio, and Chapter 4.0 discusses how those conditions would be modified, if any, by the ACP. Chapter 5.0 discusses any mitigation measures employed by the ACP. Chapter 6.0 discusses the environmental measurement and monitoring program utilized for the ACP. Chapter 7.0 discusses the Cost Benefit Analysis. Chapter 8.0 provides the summary of any environmental consequences from deployment of the ACP. Chapters 9.0 and 10.0 contain a list of references and preparers, respectively. Chapter 11.0 contains a Glossary of terms used in this ER. Appendices contain Acronyms and Abbreviations; Chemicals and Units of Measure; Metric/English Conversion Chart; Metric Prefixes; Consultation Letters; Environmental Impact of Decommissioning; Proprietary Cost Benefit Analysis; and ER Tables and Figures.

This ER has bounded the size and schedule of the ACP at an annual 7.6 million SWU (four process buildings and support facilities) to facilitate the license amendment process for future expansion from a 3.8 million SWU licensed plant.

1.0.1 Background

The DOE reservation is located at latitude 39°00'30" north and longitude 83°00'00" west measured at the center of the DOE reservation on approximately 1,497 ha (3,700 acres) in Pike County, Ohio, one of the state's lesser populated counties. The DOE reservation is located between Chillicothe and Portsmouth, Ohio, approximately 113 kilometers (km) (70 miles [mi]) south of Columbus, Ohio.

The general location is an area of steep to gently rolling hills, with average elevations of 37 meters (m) (120 feet [ft]) above the Scioto River valley. The steep hills characteristically are forested, while the rolling hills provide marginal farmland. With the exception of the Scioto River and its floodplain, the floodplains and valleys are narrow and are occupied by small farms.

There are no unrelated industrial, commercial, institutional, or residential structures within the DOE reservation. ~~DOE leases facilities on the DOE reservation to the Ohio National Guard. The Ohio National Guard does not store weapons on the DOE reservation. There are no other military installations located near the DOE reservation.~~

Roadways within the fenced limited access or protected area of the DOE reservation consist of several miles of paved surface. Several paved roads branch out from the DOE reservation to the Perimeter Road that surrounds the limited access area. The west access to the DOE reservation extends from U.S. 23 to the Perimeter Road. Shyville Road connects U.S. 32/124 to the north side of the DOE reservation. Other access roads connect to secondary county roads. ~~Access to the DOE reservation is controlled at the west access point. Other access points to the DOE reservation are currently secured.~~

Rail and roadways are available for cylinder movements to the DOE reservation. The rail spur enters the DOE reservation from the north and branches to several areas inside the limited access area. In addition, cylinders are transported around the DOE reservation using a variety of devices, including cylinder carriers, stackers, rail cars, forklifts, trucks, and wagons.

Rivers or major streams do not traverse the DOE reservation area. However, Big Beaver Creek and Little Beaver Creek cross the northern edge of the DOE reservation. Runoff water flows from the area through three streams: Little Beaver Creek, Big Run Creek, and a drainage ditch to the Scioto River.

The DOE reservation consists of approximately 1,497 ha (3,700 acres) with approximately a 526 ha (1,300 acres) central area surrounded by the Perimeter Road. The DOE reservation land outside the Perimeter Road 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.

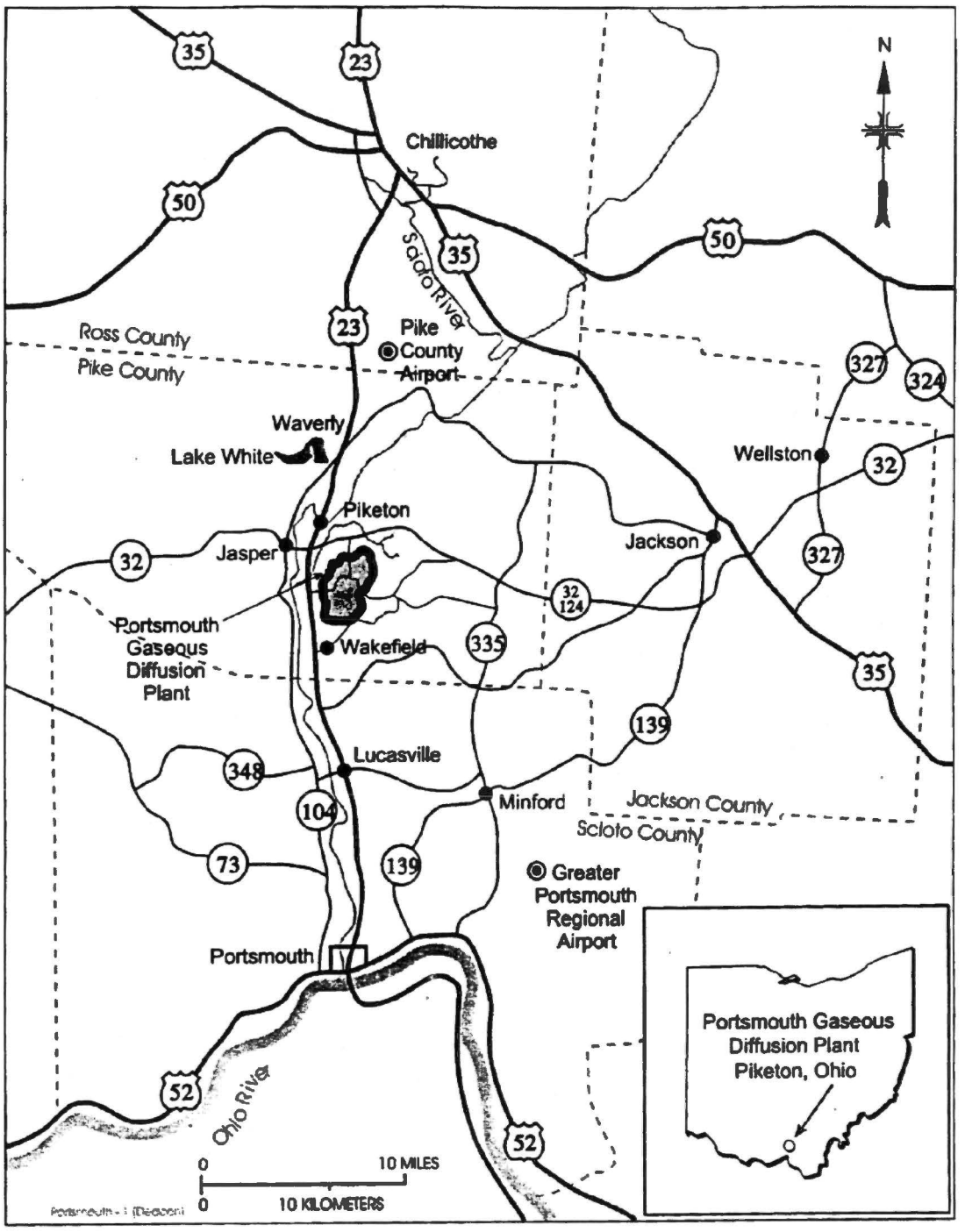
Most of the improvements are located within the fenced core area. The core area is largely devoid of trees, with grass and paved roadways dominating the open space.

The ACP is situated on approximately 81 ha (200 acres) of the southwest quadrant of the Controlled Access Area.

~~The gaseous diffusion plant (GDP) occupies approximately 223 ha (550 acres) of the remaining Controlled Access Area.~~ The Portsmouth Gaseous Diffusion Plant (PORTS) ~~has been~~began ~~in~~ operation ~~since~~in the mid-1950s as an active uranium enrichment facility supplying enriched uranium for government and commercial use. The process buildings were constructed from 1952 to 1954 as gaseous diffusion facilities for the isotopic enrichment of uranium and ~~are~~were designed to operate at a capacity of 8.6 million separative work units (SWUs). ~~The GDP~~

~~process buildings contain approximately 763,000 square meters (m^2) (8,210,000 gross square feet [ft^2]).~~

In the late 1970s, the DOE reservation was the site selected by the DOE for a new enrichment facility using gas centrifuge technology. Construction of the Gas Centrifuge Enrichment Plant (GCEP) began in 1979, but was halted in 1985 because the projected demand for enriched uranium decreased. Figure 1.0.1-1 shows the regional area surrounding the DOE reservation. Figure 1.0.1-2 shows the DOE reservation in Piketon, Ohio.



Source: DOE 2001b.

Figure 1.0.1-1 Location of Portsmouth Gaseous Diffusion Plant in relation to the geographic region

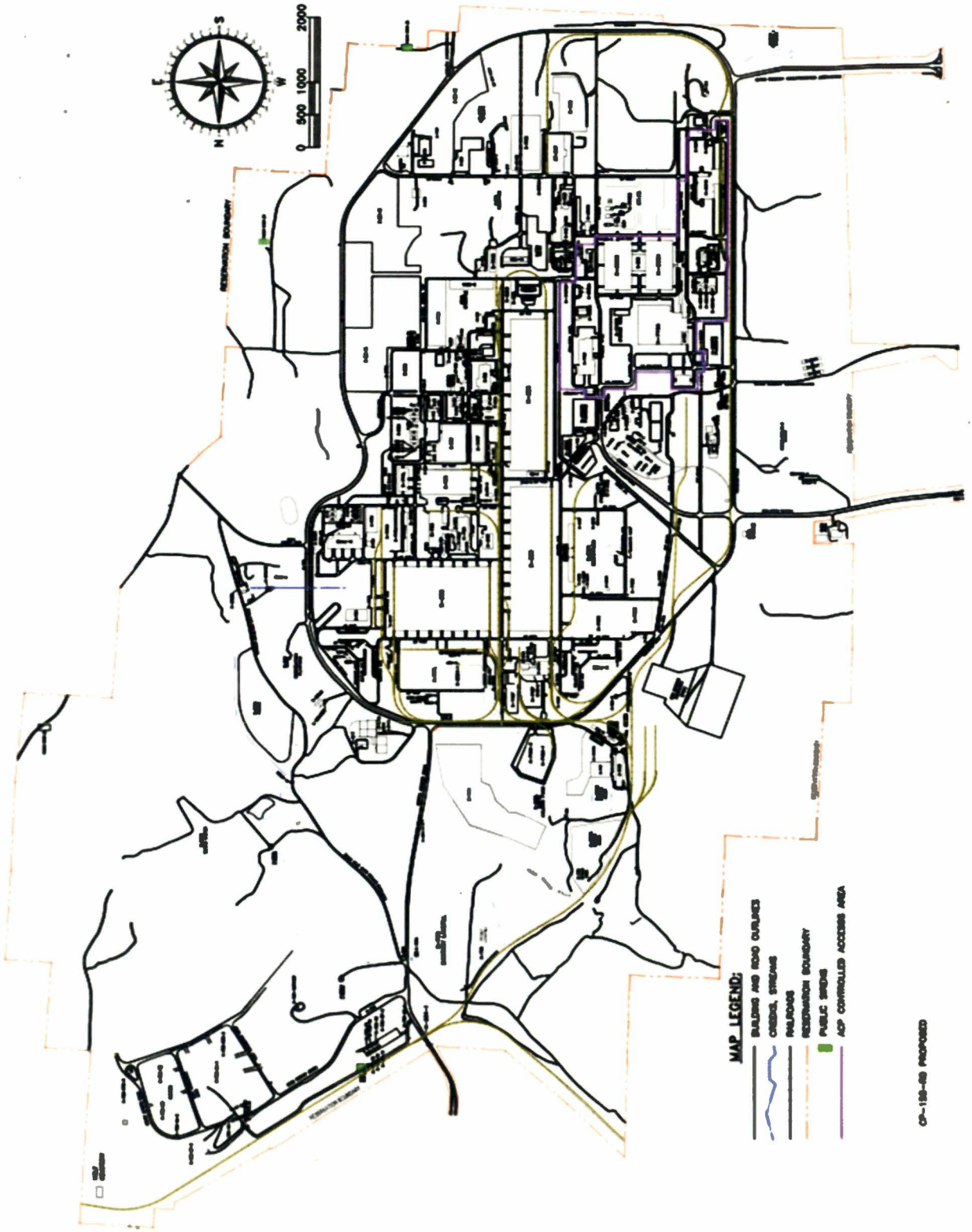
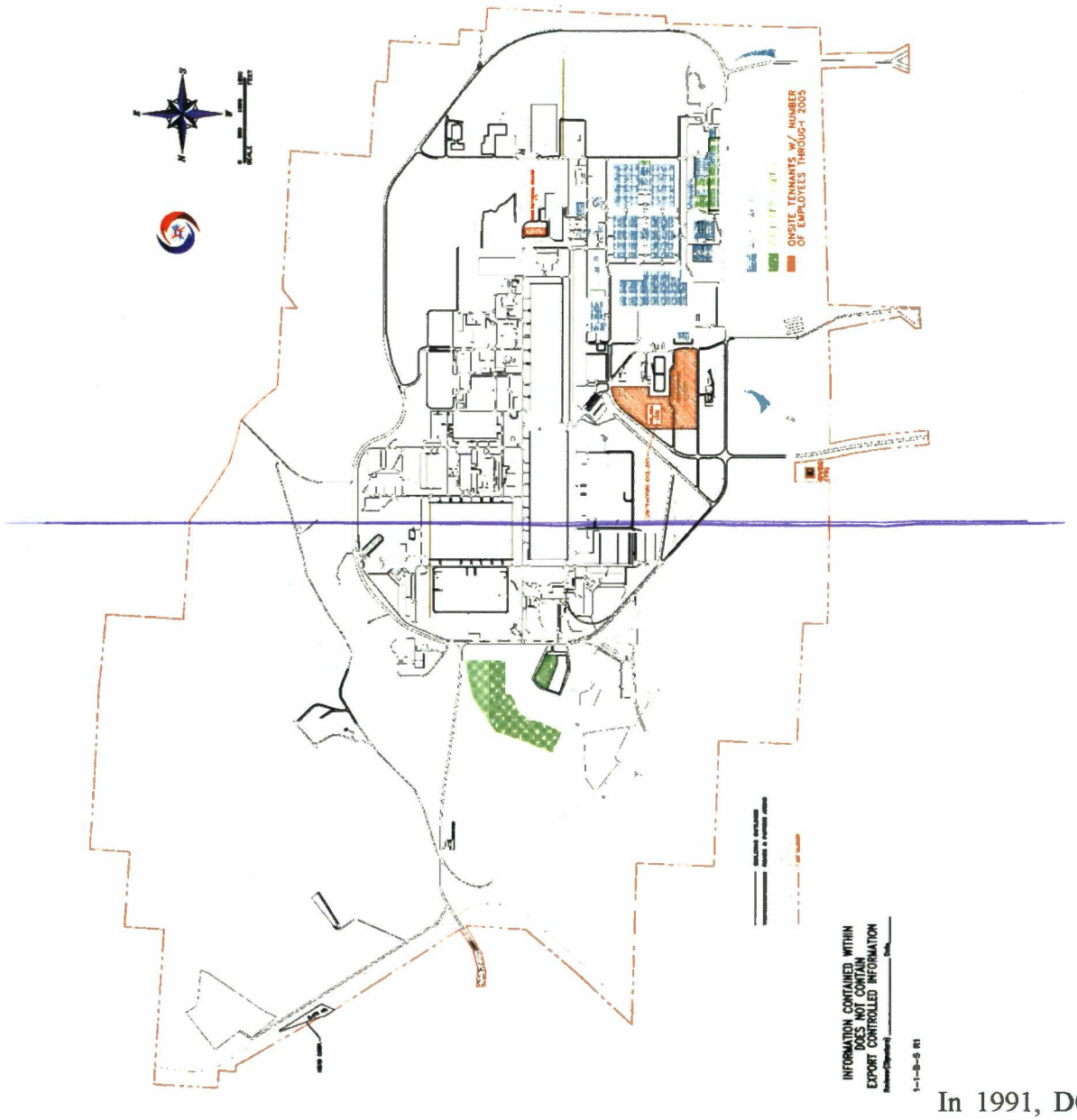


Figure 1.0.1-2 U.S. Department of Energy Reservation in Piketon, Ohio



In 1991, DOE suspended production of highly enriched uranium (HEU) at PORTS. The plant continued to produce low enriched uranium (LEU) for use by commercial nuclear power plants until May 2001. The GDP transitioned to Cold Shutdown status on October 1, 2005 and the Decontamination & Decommissioning (D&D) of inactive facilities began. In August of 2010 the DOE awarded the contract for complete D&D of the GDP (excluding facilities supporting other reservation entities, including the Lead Cascade and ACP). D&D of multiple facilities started in 2010 and at present remains ongoing (FBP-ER-RCRA-WD-RPT-0288).

In accordance with the *Energy Policy Act* of 1992, the United States Enrichment Corporation, a newly created government corporation, assumed full responsibility for uranium enrichment operations at PORTS on July 1, 1993. DOE retains certain responsibilities for decontamination and decommissioning, waste management, depleted uranium hexafluoride

cylinders, and environmental remediation. The NRC granted the United States Enrichment Corporation a Certificate of Compliance for operation of the GDP pursuant to 10 CFR Part 76 on November 26, 1996 and the GDP was officially transferred to NRC oversight on March 3, 1997. USEC subsequently became a publicly held private corporation on July 28, 1998.

The DOE leases portions of the Portsmouth Gaseous Diffusion Plant to the United States Enrichment Corporation (USEC) through the GCEP Lease Agreement. Pursuant to an amendment to the lease agreement, Centrus subleased space for the Lead Cascade and American Centrifuge Plant (ACP) from USEC. Centrus, with approval from DOE, assigned the sublease for the ACP to American Centrifuge Operating LLC (ACO). ~~The DOE leases the uranium enrichment production and operations facilities to the United States Enrichment Corporation.~~ In addition to the GDP buildings, extensive support facilities are required to maintain the diffusion process. The support facilities include administration buildings, a steam plant, electrical switchyards, cooling towers, cleaning and decontamination facilities, water and wastewater treatment plants, fire and security headquarters, maintenance shops, warehouses, and laboratory facilities.

~~In May 2001, the United States Enrichment Corporation ceased uranium enrichment operations at PORTS and consolidated enrichment operations at its Paducah Gaseous Diffusion Plant (PGDP). The United States Enrichment Corporation continued to operate its transfer and shipping activities at the PORTS DOE reservation until July 2002 in support of its enrichment business. At the request of DOE, the cascade was placed in cold standby, a condition under which the plant could be returned to a portion of its previous production in approximately 18 – 24 months if DOE determines that additional domestic enrichment capacity is necessary.~~

~~GDP enrichment operations are now in cold standby status, which involves maintaining those portions of the gaseous diffusion plant needed for 3 million SWU per year production capacity in a non-operational condition. In addition, necessary surveillance and maintenance activities must be conducted to retain the ability to resume operations after a set of restart activities are conducted (USEC 2004b).~~

~~The GDP currently operates in accordance with an NRC Certificate of Compliance issued pursuant to 10 CFR Part 76 requirements. These operations include maintaining the GDP in cold standby status under a contract with DOE, performing uranium deposit removal activities in the cascade facilities, and removing technetium-99 (^{99}Tc) from potentially contaminated uranium feed in accordance with the June 17, 2002, agreement between USEC and DOE. On January 27, 2004, the NRC published an Environmental Assessment in the Federal Register (69 Federal Register 3956) for the Lead Cascade Demonstration Facility. The Environmental Assessment resulted in a Finding of No Significant Impact (FONSI) (USEC 2004c, USEC 2004b). On February 24, 2004, a license was issued to USEC to possess and use special nuclear, source, and by-product material in the Lead Cascade Demonstration Facility in Piketon, Ohio. The Lead Cascade Demonstration Facility is a test and demonstration facility designed to provide information on American Centrifuge technology that will factor into the operation of the ACP. Operation of the Lead Cascade Demonstration Facility is scheduled to begin in 2005.~~

1.0.2 American Centrifuge Plant Program Overview

Following the suspension of development of the Atomic Vapor Laser Isotopic Separation (AVLIS) enrichment technology in June 1999, USEC began an evaluation of centrifuge and other technologies to replace its gaseous diffusion technology. Gaseous diffusion technology requires large amounts of power. These power requirements significantly affect the cost of production of enriched uranium. Since the use of foreign centrifuge technology and other third generation technologies including the Separation of Isotopes by Laser Excitation (SILEX), a laser-based technology under development in Australia, have the potential to lower the cost of production, these alternative enrichment technologies were also investigated. As part of the evaluation, USEC, in partnership with University of Tennessee-Battelle, the operator of DOE's Oak Ridge National Laboratory, undertook to refine gas centrifuge technology under a DOE approved Cooperative Research and Develop Agreement (CRADA).

USEC began design of an improved centrifuge by taking advantage of commercial advances in materials of construction and manufacturing methods. The improved centrifuge technology is intended to achieve performance levels approximately equivalent to those demonstrated in DOE's earlier testing programs, but at a substantially reduced cost.

On June 17, 2002, USEC and the U.S. Government, represented by the DOE, entered into an agreement, which has as one of its fundamental objectives to facilitate the deployment of new, cost effective centrifuge enrichment technology in the U.S. (DOE-USEC Agreement). Assuming successful demonstration of the technology, the DOE-USEC Agreement requires that USEC begin operation of a commercial enrichment plant with annual capacity of 1 million SWU in accordance with certain milestones.

The DOE-USEC Agreement contemplates three steps towards the development of a Commercial Centrifuge Plant, as discussed below. The environmental impacts of the first step, research and development of the centrifuge components (Demonstration Project) in Oak Ridge, were examined in a DOE Environmental Assessment (DOE 2002b) and a Finding of No Significant Impact (FONSI) was issued on October 18, 2002. The environmental impacts of the second step, deployment and system testing through a Lead Cascade Demonstration Facility, were covered in a NRC Environmental Assessment (USEC 2004b) and a FONSI was issued on February 24, 2004. The environmental impacts of an independent third step, a Commercial Centrifuge Plant, are the subject of this ER.

The buildings/facilities and grounds used for this project have been studied and characterized extensively by both the DOE and the Licensee.

Demonstration Project

The Demonstration Project ~~will~~ demonstrated centrifuge performance in Oak Ridge, Tennessee under DOE regulatory oversight. The standard measure of enrichment in the uranium enrichment industry is the SWU. The Demonstration Project ~~will~~ demonstrated that the centrifuge machine design is capable of economically producing 300+ SWU per year. The Demonstration Project ~~will~~ verify~~ied~~ the integrated centrifuge design while maintaining 300+ SWU per year performance, provided a solid basis for the centrifuge cost estimate, and obtained initial reliability data. The demonstration centrifuges were operated and SWU performance was optimized in highly instrumented test stands in DOE's East Tennessee Technology Park (ETTP) in Oak Ridge,

Tennessee. Additional centrifuges were operated in other test stands to evaluate the initial reliability of an integrated centrifuge design. The Demonstration Project ended and final decommissioning efforts were completed in 2019.

American Centrifuge Lead Cascade Demonstration Facility

For the Lead Cascade Demonstration Facility, the NRC previously issued a 10 CFR Part 70 license to possess and use special nuclear material. The Lead Cascade Demonstration Facility consisted of up to 240 operating centrifuges at the DOE reservation in Piketon, Ohio. The Lead Cascade Demonstration Facility ~~is~~ was a real time demonstration of the basic building block for a gas centrifuge enrichment process in a multiple stage configuration and ~~will~~ provided data that is vital to provide reliability, performance, and cost information.

All or part of the centrifuges for the Lead Cascade were manufactured and balanced in Oak Ridge, Tennessee or at the Piketon DOE reservation. ~~Centrifuge components manufactured off the DOE reservation will be shipped to the Lead Cascade Demonstration Facility for assembly, installation, checkout, and start-up.~~ Locating the Lead Cascade Demonstration Facility at the DOE reservation required the refurbishment of existing equipment and buildings of the former GCEP. ~~The refurbishment is scheduled to be complete in time to begin testing in 2005. Operation of the Lead Cascade Demonstration Facility will demonstrate the reliability of the centrifuges machines; assist in the design and optimization of the cascade and balance of the plant; and also will provide information important to determining the cost, and design of the Commercial Centrifuge Plant. The Lead Cascade Demonstration Facility will operate on recycle with no withdrawal of enriched product, except for laboratory samples.~~ The Lead Cascade operated from 2007 to 2016 and associated releases to air and water, exposure to personnel, and personnel injuries/illnesses were monitored to enable assessment of environmental impacts. Based on this monitoring, it was concluded that operation of the Lead Cascade did not result in any unanticipated releases, discharges, or exposures to the environment, the public, or employees (DP-2605-0001). Decommissioning efforts of the Lead Cascade were completed in 2018.

American Centrifuge Plant

~~The centrifuge plant design is highly modular, with the basic building block of enrichment capacity being a cascade of centrifuges. Information and work performed during the Demonstration and Lead Cascade Projects will be used to develop the final detailed design of the ACP. Additional information on SWU performance, reliability, and economics will be available from the Lead Cascade operation and will be used to demonstrate the economics of the ACP and to enable USEC and investors to make a final decision to commit funds for the construction of the ACP. Given the significant time required for licensing, USEC considers that it is beneficial to request an NRC license for the ACP in order to meet it's schedule objectives.~~ The ACP was the third step in the plan to deploy the American Centrifuge technology. The ACP encompasses the construction, startup, operation, maintenance, and decommissioning of a uranium enrichment process to produce, as an initial target, 3.8 million SWU per year, potentially expandable to 7.6 million SWU per year, using American Centrifuge technology. The ACP utilizes existing

buildings located on the DOE reservation near Piketon, Ohio, that were built to support the gaseous diffusion process beginning in the 1950s and the gaseous centrifuge process beginning in the 1980s, in addition to several newly constructed buildings and facilities.

American Centrifuge technology is modular, with the basic building block of enrichment capacity being a cascade of centrifuges. Information gained and work performed during the Demonstration Project and Lead Cascade included vital information on performance, reliability, and economics that will be used in the final construction of the ACP.

A license application for the ACP was prepared pursuant to the *Atomic Energy Act* of 1954 as amended, 10 *Code of Federal Regulations* (CFR) Parts 70, 40, 30, and other applicable laws and regulations. The ACP LEU cascade is designed to enrich and safely contain and handle uranium hexafluoride (UF_6) up to 10 weight (wt.) percent ^{235}U.

The ACP uses portions of the DOE reservation and the former DOE GCEP along with eight new proposed facilities. The ACP utilizes existing utilities and infrastructure that support the DOE reservation including the utilities and infrastructure that were intended to support GCEP. New proposed facilities may be necessary for feed, withdrawal, sampling, and blending/transfer operations. The Licensee has updated the American Centrifuge technology from that used in the GCEP program, but the American Centrifuge components remain compatible with existing infrastructure and facilities.

On October 31, 2019, ACO signed a three-year contract with the DOE to deploy a cascade of centrifuges to demonstrate production of high-assay, low-enriched uranium (HALEU) fuel with existing United States origin enrichment technology and provide DOE with HALEU for near term use in its research and development for the advancement of civilian nuclear energy and national security, as well as other programmatic missions. HALEU is a component for advanced nuclear reactor fuel that is not commercially available today and may be required for a number of advanced reactor designs currently under development in both the commercial and government sectors. The program has been under way since the Licensee and DOE signed a preliminary letter agreement on May 31, 2019, which allowed work to begin while the full contract was being finalized.

The Licensee's long-term goal is to resume commercial enrichment production consistent with market demand. It is the intent of the Licensee to deploy portions of the ACP in a modular fashion to accommodate market demand on a scalable, economical gradation. This modular deployment will encompass utilization of cascades of LEU production for customer product or feed material into High Assay Low Enriched Uranium (HALEU) cascades. The HALEU cascades will be deployed as part of the DOE's HALEU Demonstration Program which has two primary objectives:

1) Deploy a 16-centrifuge AC-100M HALEU cascade in the Piketon facility to produce 19.75 percent wt. ^{235}U enriched product.
2) Demonstration of the capability to produce HALEU.

Results from the operation of the HALEU demonstration program will be used in preparation of the design for the full-scale ACP facility. The HALEU Demonstration will be designed to enrich

and safely contain and handle uranium hexafluoride (UF_6) up to but less than 20 weight (wt.) percent ^{235}U.

During the process of remediation, construction, infrastructure modification, manufacturing, and test operations for the scope of this ER, the design for these elements are reviewed for compliance with regulatory standards for releases, emissions, and wastes generated and for minimization of the quantity and toxicity of the materials used and wastes generated.

1.1 Purpose and Need for the Proposed Action

Nuclear power generates about 20 percent of the electricity for the United States. Construction and operation of a gas centrifuge plant utilizing the US-origin advanced technology is key to supporting DOE's national energy security goals by providing a reliable and secure domestic source of enriched uranium. The primary purpose of this action is to allow the Licensee to construct and operate a plant to enrich uranium up to 10 weight (wt.) percent with an initial capacity of approximately 3.8 million SWU expandable to 7.6 million SWU, at the Licensee's option, using advanced U.S. centrifuge technology at the DOE reservation located in Piketon, Ohio.

The gas centrifuge is an enrichment process that increases the concentration of ~~uranium-235~~ (^{235}U), the isotope desired for production of nuclear energy. The gas centrifuge process has three inherent characteristics that make it particularly attractive: (1) it is a proven technology; (2) it has low operating cost; and (3) it is amenable to modular architecture. The low energy requirements of gas centrifuge technology, approximately 5 percent of that required by a comparably-sized Gaseous Diffusion Plant, provide for considerably lower operating costs (electricity usage comparison shown in Table 1.1-1). The modularity of gas centrifuge technology allows for a flexible deployment of enrichment capacity, enabling responsiveness to market demand.

Table 1.1-1 Electricity Usage Estimates

Resource	Paducah Usage 4.6 M SWU	American Centrifuge Plant Usage 7.6 M SWU
Electricity (megawatt hr)	11,000,000 (CY 2005 estimate)	650,000

The ACP is a crucial step toward advancing the national energy security goal of maintaining a reliable and economical domestic source of enriched uranium. The plant uses American Centrifuge enrichment technology that supports the national energy security goals. Congress privatized the U.S. Government's uranium enrichment operations creating USEC to, among other things, conduct research and development as required to evaluate alternative technologies for uranium enrichment, and to help maintain a reliable and economical domestic source of enriched uranium. It is also important for meeting the commercial needs of the corporation to replace higher cost and aging production with new lower cost production.

To support these statutory and commercial objectives, on June 17, 2002, USEC and the U.S. Government, represented by the DOE, entered into the DOE-USEC Agreement. Assuming successful demonstration of the technology, the DOE-USEC Agreement requires that USEC begin operations of an enrichment facility at the DOE reservation in Piketon, Ohio, or PGDP using advanced technology with annual capacity of 1 million SWU (expandable to 3.8 million SWU) in accordance with certain milestones ~~(see Table 1.1-2)~~. The milestone schedule containsed target dates for various steps including milestones associated with testing, NRC licensing, financing, and construction. The milestones required, among other things, that a centrifuge facility (1) begin commercial operations in Piketon, Ohio, no later than January 2009 and achieve an annual capacity of 1 million SWU by March 2010 or (2) begin commercial operations in Paducah, Kentucky, no later than January 2010 and achieve an annual capacity of 1 million SWU by March 2011. Due to a variety of factors, construction of the facility has not started to date, and the estimated construction and operation dates are unknown. It is expected that construction of the facility will take approximately two years. However, it should be noted, that construction of the HALEU portion of the ACP is scheduled to begin in 2020.

~~**Table 1.1-2 Milestones in the DOE-USEC Agreement (June 17, 2002) Related to Development of the American Centrifuge Plant**~~

~~Date~~	~~Milestone~~
~~March 2005~~	~~Submit License Application to NRC for Commercial Centrifuge Plant~~
~~May 2005~~	~~NRC dockets Commercial Centrifuge Plant application~~
~~October 2006~~	~~Satisfactory reliability and performance data obtained from Lead Cascade operations~~
~~January 2007~~	~~Financing commitment secured for a 1 million SWU Centrifuge Plant~~
~~June 2007~~	~~Begin Commercial Centrifuge Plant construction/refurbishment~~
~~January 2009~~	~~Begin Commercial Centrifuge Plant operations~~
~~March 2010~~	~~Centrifuge Plant annual capacity at 1 million SWU per year~~
~~September 2011~~	~~Centrifuge Plant (if expanded at the Licensee's option) projected to have an annual capacity at 3.8 million SWU per year~~

The American Centrifuge will play a major role in supporting our nation's energy security and national security interests while providing a reliable, competitive fuel source for nuclear power plants around the world. Former Secretary Spencer Abraham, U.S. Secretary of Energy, has stated: "As a clean, affordable and reliable energy source, nuclear energy is important to the nation's future energy supply … USEC, and its partners in the nuclear industry, continue to take important steps enhancing national energy security with private sector development of advanced American technology." In addition to advancing national energy security goals, the ACP supports ~~USEC's~~ the Licensee's corporate goal of remaining a competitive and reliable domestic provider of enriched uranium to the nuclear industry. USEC's subsidiary, the United States Enrichment Corporation, ~~currently~~ previously produceds about 5 million SWU per year using gaseous diffusion technology at Paducah Gaseous Diffusion Plant (PGDP), and ~~. The PGDP is over 50~~

~~years old and~~ the power costs to produce SWU a~~w~~ere significant. Electricity at the Paducah plant represente~~d~~s about 60 percent of production cost. Global LEU suppliers compete primarily in terms of price, and secondarily on reliability of supply and customer service.

~~In addition, as Executive Agent for the U.S. Government, the United States Enrichment Corporation agreed to purchase, if made available by the Russian Executive Agent, 5.5 million SWU per year of LEU that is derived from down-blending of HEU from Russian warheads (Megatons to Megawatts Program). The agreement under which the United States Enrichment Corporation supplies LEU from this source expires in 2013. Nearly every commercial nuclear power reactor in the United States has been refueled at some point in the past decade with low-enriched uranium from this program. About one in ten homes and businesses in the United States are powered with fuel from the Megatons to Megawatts program.~~

~~Oliver Kingsley, President and Chief Executive Officer of Exelon Corporation, one of USEC's customers, has stated: "We are pleased to partner with USEC as our primary supplier of low-enriched uranium through 2010. Through our long-term purchase contract, Exelon Generation will play an important role in the demonstration and deployment of the American Centrifuge enrichment technology". In 2003 USEC supplied enrichment for approximately 56 percent of the North American market and 30 percent of the world market. Going forward, USEC is focused on continuing to serve our utility customers through additional long-term contracts well into the period when the ACP would be operating.~~

~~USEC~~ The Licensee is committed to being competitive on price, delivering superior customer service, meeting national energy security goals and fulfilling its commitments in the DOE-USEC Agreement. Hence, ~~USEC~~ the Licensee needs to deploy a domestic competitive fuel source for nuclear power plants utilizing advanced centrifuge technology ~~towards the end of this decade~~.

1.2 Proposed Action

The Proposed Action is to refurbish, construct and operate a plant to enrich uranium up to 10 wt. percent ^{235}U with an initial capacity of approximately 3.8 million SWU expandable to 7.6 million SWU using advanced American Centrifuge technology at the DOE reservation located in Piketon, Ohio. Existing facilities and land formerly used for GCEP will be leased from the DOE and utilized for the ACP (Figures 4.1.3-1 and 4.1.3-2). The Proposed Action includes refurbishment of existing facilities, construction, start-up and operation of up to four process buildings with full-scale gas centrifuges and components.

~~USEC~~ The Licensee is seeking a license for the construction and operation of a plant to enrich uranium up to 10 wt. percent with a capacity of approximately 3.8 million SWU. The ACP may be expanded as market conditions require. The ACP will operate~~s~~ up to four process buildings with approximately 24,000 centrifuges in cascade configurations at an annual capacity of approximately 7.6 million SWU. Enrichment operations will begin as cascades are installed, tested, and filled with process gas. Additional centrifuges may be available for other uses (e.g., spares). The plant may enrich uranium up to 10 wt. percent ^{235}U. The enriched product stream from each cascade is combined with the enriched product streams of other cascades producing the

same assay. The combined stream is routed to the withdrawal facilities where the product is sublimed into a cold trap. Similarly, the depleted (tails) stream from each cascade is combined with the tails streams from other cascades and is also sublimed in the tails withdrawal area. Samples of uranium are periodically taken for laboratory analysis to assess the performance of the cascades.

Operations that are performed to support the primary process includes: equipment and machinery repair; modification; manufacturing of specialized equipment (including the centrifuges themselves); and assembly and test of centrifuges. These activities may be conducted with equipment contaminated with uranium bearing material. The uranium bearing material could be UF_6, uranium tetrafluoride (UF_4), uranyl fluoride (UO_2F_2), or an intermediate oxy-fluoride.

Other ACP support functions include: meteorological tower, 345 kilovolts (kV) electrical utilities, communications, sewage treatment, water treatment, laboratory services, security, fire department, health physics, industrial hygiene, industrial safety, environmental compliance, and waste management.

At the end of the useful life of the ACP, the plant will be decommissioned consistent with the decommissioning plan contained in Chapter 10.0 of the License Application and Decommissioning Funding Plan for the American Centrifuge Plant. Impacts of decommissioning are analyzed in this ER.

1.3 Applicable Regulatory Requirements, Permits, and Required Consultations

The ACP must comply with the applicable regulations under the *Atomic Energy Act* of 1954, as amended; 10 CFR Part 40; and 10 CFR Part 70 to hold a license to possess and use source and SNM. In addition, the ACP must comply with pertinent NRC regulations in 10 CFR Part 20 related to radiation dose limits to individual workers and members of the public. ~~USEC~~ The Licensee is submitting an Environmental Report to the NRC in accordance with 10 CFR Part 51.

As described in previous sections, the ACP will require PTIs from the State of Ohio to install all new air emission sources followed by a modification to the existing Title V air permit for the operation of those sources. The ACP will also be subject to the Radionuclide NESHAP administered by the EPA Region V. An additional PTI from the State of Ohio will be needed if the ACP installs any new wastewater lines. A modification to the existing NPDES permit will be needed to allow construction and operation of the ACP by the Licensee. These are the only Federal, State and local permits or other authorizations that the Licensee expects will be necessary for the ACP. ~~Table 9.2-9 gives a full listing of the Federal, State and local permits and other authorizations and consultations that potentially could be required and the current status of each.~~

The ACP permit and reporting requirements will be incorporated and administered in the ~~United States Enrichment Corporation~~Licensee's permits and reporting requirements until a ~~Licensee~~ compliance organization is established. The Lead Cascade Demonstration Facility, X-

3001 purge vacuum and evacuation vacuum system, is currently incorporated in the ~~United States Enrichment Corporation~~Licensee's Title V air permit (~~PTI n~~Number P011512706-07470).

Informal consultations have been made with the responsible agencies in compliance with the following:

- Section 7 of the *Endangered Species Act*
- *Fish and Wildlife Coordination Act*
- *National Historic Preservation Act* (NHPA), Section 106
- *Farmland Protection Policy Act* (FPPA)/Farmland Conservation Impact Rating

Consultation letters and responses are included in Appendix B of this ER.

Table 1.3-1 identifies the Federal, State and local permits and other authorizations and consultations that potentially could be required and the current status of each.

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	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 (NSPS), or sources subject to National Emission Standards for Hazardous Air Pollutants (NESHAPs).	Ohio Environmental Protection Agency (OEPA); U.S. Environmental Protection Agency (EPA)	*Clean Air Act*, 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 Centrus Energy Corporation~~American Centrifuge Operating, LLC (the Licensee) is the holder of a final Title V Operating Permit (Facility ID 0666000000) with an issue date of July ~~31~~27, 201~~703~~ and effective ~~expiration~~ date of August ~~21~~71, 20~~03~~22~~17~~. The plant is subject to *Code of Federal Regulations*, Title 40, 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 (PTI): Required for (1) any source to which one or more of the following *Clean Air Act* programs would apply: prevention of significant deterioration (PSD), nonattainment area, NSPS, and/or NESHAPs; 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.	OEPA	*Clean Air Act*, Title I, Sections 160-169 (42 USC 7470-7479); OAC 3745-31-02	~~USEC~~ The Licensee has determined that the PSD, nonattainment area, and NSPS programs do not apply to the ACP. However, air emission sources requiring an Ohio PTI would apply to the ACP and ~~USEC~~ the Licensee will submit a timely PTI application to the OEPA.

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
Air Quality Protection (Cont.)			
Ohio Permit to Operate: Required for (1) any source to which one or more of the following *Clean Air Act* programs would apply; PSD, nonattainment area, NSPS, NESHAPs; 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.	OEPA	*Clean Air Act*, Title I, Sections 160-169 (42 USC 7470-7479); OAC 3745-35-02	~~United States Enrichment Corporation~~The Licensee is the holder of a final Title V Operating Permit (Facility ID 0666000000) with an issue date of July ~~31~~27, 20~~03~~17 and effective date of August ~~21~~17, 20~~0322~~17. Sources requiring a PTI will be incorporated in the Title V Operating Permit.
Risk Management Plan (RMP): Required for any stationary source that has regulated substance (e.g., chlorine, hydrogen fluoride, nitric acid) in any process (including storage) in a quantity that is over the threshold level.	EPA; OEPA	*Clean Air Act*, Title 1, Section 112(r)(7) (42 USC 7412); 40 CFR Part 68; OAC 3745-104	~~USEC~~ The Licensee has determined that no regulated substances would be stored at the ACP in quantities that exceed the threshold levels. Accordingly, an RMP will not be required.

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
Air Quality Protection (Cont.)			
***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.	OEPA	*Clean Air Act*, Title 1, Section 176 (c) (42 USEC 7506); 40 CFR 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 (NAAQS) for the criteria pollutants.
Water Resources Protection			
National Pollutant Discharge Elimination System (NPDES) 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 5 acres (2 ha) of land.	OEPA	*Clean Water Act* (CWA) (33 USC 1251 et seq.); 40 CFR Part 122; OAC-3745-33-02, 3745-38-02, and 3745-38-06	~~USEC~~ The Licensee has determined that construction of the ACP and new cylinder storage yards would require an NPDES Permit for the construction site storm water discharges. ~~United States Enrichment Corporation~~Centrus ~~Energy Corp.~~ The Licensee is the holder of NPDES Permit number 0IS00023~~B~~D~~D~~ED. If requested, a Storm Water Pollution Prevention Plan (SWPP) will be submitted to the OEPA at the appropriate time. Storm water will discharge through existing outfalls covered by a NPDES Permit.

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
Water Resources Protection (Cont.)			
National Pollutant Discharge Elimination System (NPDES) Permit: Industrial Facility **Storm Water:** Required before making point source discharges into waters of the state of storm water from an industrial site.	OEPA	CWA (33 USC 1251 et seq.); 40 CFR Part 122; OAC-3745-33-02, 3745-38-02, and 3745-38-06	~~USEC~~ The Licensee has determined that storm water would be discharged from the ACP site during operations. Storm water will discharge through existing outfalls covered by a NPDES Permit.
National Pollutant Discharge Elimination System (NPDES) Permit: Process Water Discharge: Required before making point source discharges into waters of the state of industrial process wastewater.	OEPA	CWA (33 USC 1251 et seq.); 40 CFR Part 122; OAC-3745-33-02, 3745-38-02, and 3745-38-06	The ACP will process industrial wastewater through an existing NPDES permitted facility and through existing outfalls covered by the NPDES Permit.
Ohio Surface Water PTI: Required before constructing sewers or pump stations.	OEPA	OAC-3745-31-02	If required, before construction of sewer lines and pump stations at the ACP a PTI to modify the existing NPDES permit would be submitted to the OEPA at the appropriate time.
Ohio Surface Water PTI: Required before constructing any wastewater treatment or collection system or disposal facility.	OEPA	OAC-3745-31-02	If required, a PTI to modify the existing NPDES permit would be submitted to the OEPA at the appropriate time.

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
CWA Section 404 (Dredge and Fill) Permit: Required to place dredged or fill material into waters of the United States, 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 (USACE)	CWA (33 USC 1251 et seq.); 33 CFR Parts 323 and 330	~~USEC~~ The Licensee believes that construction of the ACP would not result in dredging or placement of fill material into wetlands within the jurisdiction of the USACE. If construction activities are subject to the CWA Section 404 Permit program, they may be covered under a USACE Nationwide CWA Section 404 Permit (i.e., No. 14 [Linear Transportation Projects], 18 [Minor Discharges], or 19 [Minor Dredging]). If necessary, the Licensee will consult with the USACE concerning the project and, if appropriate, submit either a pre-construction notification about activities covered by a nationwide permit or an application for an individual Section 404 Permit.
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 0.5 acre (0.20 ha) or less.	OEPA	*Ohio Revised Code* (ORC) Sections 6111.021-6111.029	The Licensee~~USEC~~ believes that construction of the ACP would not result in dredging or placement of fill material into wetlands within the jurisdiction of the OEPA isolated wetlands program. However, if necessary, submit to the OEPA a Pre-Activity Notice of activities covered under the General Permit for Filling Isolated Wetlands.

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
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 0.5 acre (0.20 ha) for Category 1 isolated wetlands and/or greater than 0.5 acre (0.20 ha) but not exceeding 3 acres (1.21 ha) for Category 2 isolated wetlands.	OEPA	ORC Sections 6111.021-6111.029	The Licensee~~USEC~~ believes that construction of the ACP would not result in dredging or placement of fill material into wetlands within the jurisdiction of the OEPA isolated wetlands program. Accordingly, the Licensee will consult, if necessary, with the OEPA concerning the project and, if appropriate, submit to the OEPA an application for an Individual Isolated Wetland Permit.
Spill Prevention Control and Countermeasures (SPCC) Plan: Required for any facility that could discharge oil in harmful quantities into navigable waters or onto adjoining shorelines.	EPA	CWA (33 USC 1251 et seq.); 40 CFR Part 112	SPCC plan ESH-343-09-018 has been developed and approved for the American Centrifuge Plant~~A SPCC plan would be required. USEC will revise the existing SPCC plan to include ACP operations at the appropriate time (POEF-EW-17 current version).~~
CWA 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.	OEPA	CWA, Section 401 (33 USC 1341); ORC Chapters 119 and 6111; OAC Chapters 3745-1, 3745-32, and 3745-47	The Licensee~~USEC~~ believes that it would not be required to obtain a CWA Section 401 Water Quality Certification for construction or operation of the ACP or new cylinder storage yards. If ~~USEC~~ the Licensee determines that a federal license or permit is required (e.g., a CWA Section 404 Permit), a CWA Section 401 Water Quality Certification will be requested from the OEPA at the appropriate time.

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
Water Resources Protection (Cont.)			
Public Water System: A completed application for an initial public water system license is required prior to the operation of the public water system.	OEPA	OAC-3745-84-01(B)(b)	The Licensee will procure services from a qualified vendor.
Underground Storage Tank (UST) Installation Permit: Required before beginning installation of a UST 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 [CERCLA], except those hazardous substances that are also defined as hazardous waste by the *Resource Conservation and Recovery Act* (RCRA~~RCRA~~).	Ohio Department of Commerce, Ohio Bureau of Underground Storage Tank Regulations (BUSTR)	OAC 1301:7-9-06(D)	~~Two~~ One UST system is currently in operation~~are installed~~ at the ACP. Registration number: 66005107-R00010 Tank Number: ~~T00007~~ T00016
New UST System Registration: Required within 30 days of bringing a new UST system into service.	EPA; Ohio BUSTR	RCRA, as amended, Subtitle I (42 USC 6991a-6991i); 40 CFR 280.22; OAC 1301:7-9-04	If new UST systems would be installed at the ACP the Registration would be filed at the appropriate time.

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
Water Resources Protection (Cont.)			
Above Ground Storage Tank (AST): A PTI 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	AST fuel storage tanks will be required for the ACP. Permits to install will 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.	OEPA	OAC 3745-52-11	Upon characterization of newly generated waste streams from the ACP, notification would be made to the OEPA.
Registration and Hazardous Waste Generator Identification Number: Required before a person who generates over 220 lb (100 kg) per calendar month of hazardous waste ships the hazardous waste off-reservation.	EPA; OEPA	*Resource Conservation and Recovery Act* (RCRA), as amended (42 USC 6901 et seq.), Subtitle C; OAC 3745-52-12	~~United States Enrichment~~Centrus Energy Corporation, American Centrifuge Operating, LLC Hazardous Waste Generator Identification Number OHD987054723.

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
Waste Management and Pollution Prevention (Cont.)			
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.	OEPA or Pike County Board of Health	OAC 3745-37-01	Construction debris would not be disposed of on site at the 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	The Licensee will file a Low-Level Radioactive Waste Generator Report with the Ohio Department of Health at the appropriate time. ODH ID Number 52-2109255.

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
Waste Management and Pollution Prevention (Cont.)			
Hazardous Waste Facility Permit: Required if hazardous waste will undergo nonexempt treatment by the generator, be stored on site for longer than 90 days by the generator of 2,205 lb (1,000 kg) or more of hazardous waste per month, be stored on site for longer than 180 days by the generator of between 220 and 2,205 lb (100 and 1,000 kg) of hazardous waste per month, disposed of on site, or be received from off-reservation for treatment or disposal.	EPA; OEPA	RCRA, as amended (42 USC 6901 et seq.), Subtitle C; OAC 3745-50-40	Hazardous waste would not be disposed of on site at the ACP. Also, the Licensee does not plan to store any hazardous wastes that are generated on site for ~~more~~ greater than 90 days. However, should waste require storage on site for greater than 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.
Low-Level Mixed Waste (LLMW): LLMW is a waste that contains both low-level radioactive waste and RCRA hazardous waste.	OEPA	OAC 3745-266; 40 CFR Part 266 Subpart N	The Licensee will manage LLMW 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.	OEPA	OAC 3745-29-06	Industrial solid waste would not be disposed of on site at the ACP. Therefore, no Industrial Solid Waste Landfill Permit to Install would be required.

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
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 on site in excess of their threshold quantities.	Local Emergency Planning Commission (LEPC); Ohio State Emergency Response Commission (SERC)	*Emergency Planning and Community Right-to-Know Act* of 1986 (EPCRA), Section 311 (42 USC 11021); 40 CFR 370.20; OAC 3750-30-15	The Licensee will 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 SERC; local fire department	EPCRA, Section 312 (42 USC 11022); 40 CFR 370.25; OAC 3750-30-01	~~United States Enrichment Corporation~~The Licensee will prepare and submit an Annual Hazardous Chemical Inventory Report each year. ~~United States Enrichment~~Centrus Energy Corporation Facility ID Number 45661NTDST3930U

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
Emergency Planning and Response (Cont.)			
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 SERC	EPCRA, Section 304 (42 USC 11004); 40 CFR 355.30; OAC 3750-20-05	~~United States Enrichment Corporation~~The Licensee will 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 ACP. Facility ID Number 45661NTDST3930U
Annual Toxic Release Inventory (TRI) Report: Required for facilities that have 10 or more full-time employees and are assigned certain Standard Industrial Classification (SIC) codes.	EPA:OEPA	EPCRA, Section 313 (42 USC 11023); 40 CFR Part 372; OAC 3745-100-07	~~United States Enrichment Corporation~~The Licensee will prepare and submit a TRI Report to the EPA each year as appropriate. Facility ID Number 45661NTDST3930U.

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
Emergency Planning and Response (Cont.)			
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 (DOT)	*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 Centrus Energy Corporation~~ American Centrifuge Operating, LLC. Certificate of Registration Number 071618550082AB~~052803005022LN~~.

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
Emergency Planning and Response (Cont.)			
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.	DOT	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, the Licensee will comply with DOT packaging, labeling, and routing requirements.

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
Other			
Land Resources			
Farmland Protection and Policy Act (FPPA): 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 (FPPA) 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, paragraph 658	Consultation letters are included in Appendix B of this ER.
Biotic Resources			
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; 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 ER.

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
Cultural Resources			
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 (SHPO)	*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)	~~USEC~~ The Licensee has consulted with the Ohio SHPO regarding previous archeological and architectural surveys at the DOE reservation. Consultation letters are included in Appendix B.

Table 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
Other (cont.)			
Environmental Report (ER): Required by 10 CFR Part 51, this ER is being submitted to the U.S. Nuclear Regulatory Commission (NRC) to support licensing of the ACP.	NRC	*National Environmental Policy Act* of 1969, as amended (NEPA) (42 USC 4321 et seq.); 40 CFR Parts 1500-1508; 10 CFR Part 1021; 10 CFR Part 51 P.L. 91-190	This ER was prepared in accordance with the *U.S. Code of Federal Regulations*, 10 CFR Part 51, which implements the requirements of the National Environmental Policy Act (NEPA) of 1968, as amended (P.L.91-190).
Depleted UF_6 Management Measures: Establishes requirements for management, inspection, testing, and maintenance associated with the ACP Depleted UF_6 storage yards and cylinders owned by ~~USEC~~ the Licensee at the DOE reservation as stipulated in the ACP License Application.	OEPA	OAC 3745-266; 40 CFR Part 266 Subpart N	The Licensee will manage the ACP 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 1.3-1 Potentially Applicable Consents for the Construction and Operation of the American Centrifuge Plant

License, Permit, or Other Consent	Responsible Agency	Authority	Relevance and Status
Other (Cont.)			
Standard Industrial Classification (SIC): The SIC system serves as the structure for collection, aggregation, presentation, and analysis of the U.S. economy. An industry consists of a group of establishments primarily engaged in producing or handling the same product or group of products or in rendering the same services.	OSHA	SIC system	SIC 2819 Industrial Inorganic Chemicals, Not Elsewhere Classified~~North American Industry Classification System (NAICS) Code #236210 for Nonresidential Building Construction. NAICS Code # 325188 for Basic Inorganic Chemical Manufacturing~~.

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2.0 ALTERNATIVES

This section describes the alternatives discussed in detail in this ER, as well as those alternatives that were not considered to be reasonable and which were therefore, eliminated from further study. This section also includes a discussion of cumulative effects, as well as a table (Table 2.4-1) comparing potential environmental impacts of the Proposed Action, the PGDP Siting Alternative, and the No Action Alternative.

2.1 Detailed Description of the Alternatives

2.1.1 No Action Alternative

This alternative involves not deploying the ACP ~~and continuing to operate the PGDP~~. This alternative does not meet the need underlined in the Congressional mandate to privatize USEC and provide the nation with an assured source of domestic uranium enrichment capability or the business need for lower cost production and to replace the ~~ageing~~ former GDP. The No Action Alternative is also not consistent with the DOE-USEC Agreement. The DOE-USEC Agreement requires ~~USEC~~ the Licensee to deploy an advanced technology enrichment facility.

~~The No Action Alternative would result in the continued uranium enrichment at the PGDP. A gaseous diffusion process is used at PGDP to enrich uranium. In the gaseous diffusion enrichment plant, the solid UF_6 from the conversion process is heated in its container until it becomes a liquid. The cylinder becomes pressurized as the UF_6 vapor fills the cylinder void space above the liquid. The UF_6 gas is fed into the plant's pipelines where it is pumped through special filters called barriers or porous membranes without interacting with one another. The holes are so small that the UF_6 molecules diffuse through the holes. The isotope enrichment occurs because the lighter UF_6 gas molecules (with the uranium-234 [^{234}U] and ^{235}U atoms) tend to diffuse faster through the holes than the heavier UF_6 gas molecules containing uranium-238 (^{238}U).~~

~~It takes many hundreds of barriers, one after the other, before the UF_6 gas is enriched with enough ^{235}U to be used in light-water reactors. At the end of the process, the enriched UF_6 gas stream is withdrawn from the pipelines and condensed back into a liquid and drained into cylinders. The depleted UF_6 gas stream is also withdrawn and condensed into a liquid and drained into separate cylinders. Both liquid forms of UF_6 (depleted and enriched) are then allowed to cool and solidify in the cylinder.~~

~~A plant utilizing the gaseous diffusion process requires significantly more electricity than a corresponding centrifuge plant. Two coal-fired electrical plants routed through four switchyards provide the electrical supply necessary to operate the gaseous diffusion process at PGDP. If the No Action Alternative is pursued, then USEC must continue to rely upon the existing gaseous diffusion process with no possibility of a more efficient uranium enrichment process for many years.~~

~~A plant utilizing the gaseous diffusion process requires large-scale use of Freon, electricity, and non-contact cooling water, which results in leakage to the environment. The ACP does not require this large-scale use of electricity and Freon, and requires much less use of cooling water.~~

Other activities on the DOE Reservation will continue, such as the recently constructed depleted uranium hexafluoride (DUF_6) Conversion Facility on the reservation adjacent to the ACP, activities related to the D&D of the ~~PGDP~~ former PORTS GDP, and environmental restoration activities in a number of locations on the reservation. ~~UF_6 production will continue at PGDP under the No Action Alternative, resulting in continued emissions and resource use at PGDP.~~

2.1.2 Proposed Action

As discussed in section 1.2 above, the Proposed Action is to refurbish, construct and operate the ACP at the DOE reservation in Piketon, Ohio. The purpose of the ACP is to meet the DOE-USEC Agreement requirements for ~~USEC~~ the Licensee to deploy an advanced technology enrichment plant and meet the need for lower cost production and for replacement of the ~~aging~~ former GDP. ~~UF_6 production will ultimately cease at PGDP after the ACP becomes operational, resulting in reduced emissions and resource use (i.e., water, electricity and Freon). Decontamination and Decommissioning (D&D)~~ of the~~ose~~ GDP facilities will continue~~currently leased to the United States Enrichment Corporation will begin once the GDP ceases operation~~ (DOE 2004b).

Corporate Identity

~~USEC is a global energy company and a leading supplier of enriched uranium fuel for commercial nuclear power plants. USEC, including its wholly owned subsidiaries, was organized under Delaware law in connection with the privatization of the United States Enrichment Corporation. USEC is the only private corporation providing enrichment services to the nuclear industry and the only U.S. producer of enriched uranium. In 2003 USEC, through its subsidiary, supplied enrichment for approximately 56 percent of the North American market and approximately 30 percent of the world market.~~

~~USEC's~~ The Licensee's principal office is located at 6903 Rockledge Drive, Bethesda, MD 20817. ~~USEC is listed on the New York Stock Exchange under the ticker symbol USU.~~ Private and institutional investors own the outstanding shares of the Licensee~~USEC~~. The principal officers of the Licensee~~USEC~~ are citizens of the United States.~~The NRC has issued Certificates of Compliance to the United States Enrichment Corporation, a wholly owned subsidiary of USEC, to operate the Paducah and Portsmouth Gaseous Diffusion Plants (Docket Numbers 70-7001 and 70-7002, respectively). Consistent with the requirements in 10 CFR 76.22 and in connection with the issuance of these Certificates, the NRC has determined that USEC is neither owned, controlled, nor dominated by an alien, a foreign corporation, or a foreign government.USEC's subsidiary, the United States Enrichment Corporation, is also the exclusive agent for a United States Government agreement program to convert highly enriched uranium taken from dismantled Russian nuclear warheads into LEU fuel for peaceful use in nuclear power plants. USEC's performance in this activity demonstrates its commitment to this important nonproliferation and national security initiative.~~

Proposed Site Location

The DOE reservation is located at latitude 39°00'30" north and longitude 83°00'00" west

measured at the center of the DOE reservation on approximately 1,497 ha (3,700 acres) in Pike County, Ohio, one of the state's lesser populated counties. The DOE reservation is located between Chillicothe and Portsmouth, Ohio, approximately 113 km (70 mi) south of Columbus, Ohio. Figure 1.0.1-1 shows the regional area surrounding the DOE reservation.

The DOE reservation consists of approximately 1,497 ha (3,700 acres) with approximately a 526 ha (1,300 acre) central area surrounded by the Perimeter Road. The DOE reservation land outside the Perimeter Road 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 of the improvements are located within the fenced core area. The core area is largely devoid of trees, with grass and paved roadways dominating the open space.

The ACP ~~would be~~is situated on approximately 81 ha (200 acres) of the southwest quadrant of the Controlled Access Area.

In June 2004, DOE issued a *Final Environmental Impact Statement for Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility* at the Portsmouth, Ohio site that described the preferred alternative for managing depleted UF_6 (DOE 2004). DOE issued a Record of Decision on July 20, 2004 (DOE 2004c).

In addition, in 2008, DOE ~~has proposed to~~ constructed ~~and operate~~ a conversion facility at the DOE reservation in Piketon, Ohio, which is currently operated by Mid-America Conversion Services, LLC. The facility ~~would~~ converts DOE's inventory of depleted UF_6 ~~now located at~~from the DOE reservation in Piketon, Ohio, and at the ETTP in Oak Ridge, Tennessee, to a more stable chemical form 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 in a safe and environmentally acceptable manner. The ~~proposed~~ location of the conversion facility is depicted in Figure 3.1-2. The time period considered is ~~a construction period of two years,~~ an operational period of 18 years, with a 3-year period for D&D of the facility. ~~Current plans call for construction to begin in the summer of 2004.~~ This assessment is based on the conceptual conversion facility design proposed by the selected contractor, Uranium Disposition Services, LLC (UDS) (DOE 2004).

HALEU Demonstration Program

The initial stage of Uranium Enrichment activities will consist of deploying a 16-centrifuge AC-100M HALEU cascade to produce 19.75 weight (wt.) percent ^{235}U enriched product as a demonstration project, with enrichment not to exceed 20 wt. percent ^{235}U. On October 31, 2019, the Licensee signed a three-year contract with the DOE to operate this project. The program has been under way since the Licensee and DOE signed a preliminary letter agreement on May 31, 2019, which allowed work to begin while the full contract was being finalized.

The HALEU demonstration program will be similar to, but at a much smaller scale than the full project discussed below. Components for the HALEU centrifuges will be manufactured

at the Licensee's facilities located in both Piketon, Ohio and Oak Ridge, Tennessee. The project will utilize the four existing facilities recently used in the Lead Cascade Project, and no facilities will be constructed.

The X-3001 Process Building will be used to house the centrifuges and support systems necessary to perform the actual enrichment process, as well as UF_6 cylinder receipt and storage. The X-7725 Recycle/Assembly Building will be used for an area where centrifuges can be manufactured, assembled, tested, and maintained. In the HALEU Demonstration, the X-7725 building will only be used for temporary storage, heat shield manufacturing shortly before centrifuge assembly, and for interior transport to and from the X-7726 facility. The casings are prepared in the X-7726 facility before being assembled. Some assembly activities may be performed in the X-3001 building including any further preparations of the centrifuges. Areas of the X-7725 building are also designed for shipping, receiving, and storage of materials. The X-7726 Centrifuge Training and Test Facility contains areas where material and components are received; components or subassemblies are inspected and tested; components are manufactured; the components are assembled as centrifuges; casing and component preparation; and the final assembly is evacuated and leak checked. The X-7727H Interplant Transfer Corridor will be used for transport of centrifuges and other materials between the X-7725 building to the process building(s) or back as necessary and movement of feed cylinders. It will also serve as a shipping and receiving area for equipment and components during construction and operation activities. The X-3012 Process Support Building will be used to house the operational area, maintenance area (For HALEU, this is only non-uranium bearing maintenance), and the transfer aisleway that services the X-3002 Process Building.

Design of the full-scale uranium enrichment facilities will be performed after the results of the three-year HALEU demonstration program have been received.

Full Scale Uranium Enrichment Activities

Under the Proposed Action, refurbishment, construction and operations activities will occur within newly constructed and existing facilities with a production capacity of approximately 3.8 million SWU. This environmental report also examines the impacts of construction of two new process buildings and support facilities that would increase the plant production capacity to approximately 7.6 million SWU annually. Construction of a manufacturing area, process support building, a new withdrawal building, the expansion of the existing feed building and a number of cylinder storage pads are also planned as part of the Proposed Action.

Connected manufacturing/assembly operations may consist of the manufacturing of centrifuge components, assembly and testing of sub-assemblies and assemblies. The option for this manufacturing/assembly process will be an ongoing activity through the production of approximately 12,000 completed centrifuges and sufficient spares to operate a 3.8 million SWU plant and approximately 24,000 centrifuges for the 7.6 million SWU plant. The production rate capability will be developed to ramp up to approximately 16 completed centrifuges per day.

Centrifuge manufacturing could take place on site or at a commercial manufacturing plant located off the DOE reservation. The impacts of manufacturing on the DOE reservation are considered as part of the Proposed Action. The impacts of manufacturing at a commercial

manufacturing plant off of the DOE reservation would be similar. Centrifuge manufacturing and assembly operations could be conducted in the X-7725 building or other comparable site building. The manufacturing/assembly operations consist of the manufacturing of centrifuge components, assembly, and testing of sub-assemblies and assemblies. The manufacturing/assembly process will be an ongoing activity through the production of approximately 24,000 completed centrifuges and sufficient spares to operate a 7.6 million SWU per year plant. Each of the manufacturing/assembly areas has multiple workstations and equipment sets to allow for the production of up to 16 centrifuges per day. Manufacturing of a centrifuge includes a filament winding process. This process requires a combination of resins, curing agents or hardeners and filaments.

Some completely assembled centrifuges ~~are~~ will be tested in the gas test stands using UF_6 to verify the proper operation of the centrifuge. This gas test ~~is~~ will be performed in the X-7725 building prior to movement to the process building for installation. This area includes a separate room used for the handling of the small quantities of UF_6 for the gas test operation.

The Proposed Action includes the following seven distinct activities. These identifiable activities will take place at the Piketon DOE reservation. The second and third items below were also analyzed and presented in another ~~*National Environmental Policy Act* (~~NEPA~~)~~ document, DOE/EA-1451, *Environmental Assessment for the Leasing of Facilities and Equipment to USEC Inc.* (DOE 2002b). The ER was limited in scope and did not assess the manufacturing and transportation of up to 24,000 centrifuges. Chapter 4.0 of this ER will address the potential impacts associated with these activities:

- Refurbishment and construction of the facilities at Piketon
- Manufacture of the gas centrifuges
- Transportation of gas centrifuges and centrifuge components to Piketon
- Installation and startup of the ACP
- Operation of the ACP
- Repair and maintenance of the ACP
- Decontamination and decommissioning

2.1.2.1 Plant Layout

The ACP is comprised of various buildings and areas that house systems and equipment necessary to support the uranium enrichment process. A diagram of the plant layout is presented in Figure 4.1.3-1. The buildings directly involved in the enrichment process are the X-3001, X-3002, X-3003, and X-3004 Process Buildings; X-2232C Interconnecting Process Piping; X-3012 and X-3034 Process Support Buildings; X-3344 Customer Services Building; X-3346 Feed and Withdrawal Building; X-3346A Feed and Product Shipping and Receiving Building, and X-3366 Product and Tails Withdrawal Building. Other buildings and areas that provide direct support functions to the enrichment process are the X-7725 Recycle/Assembly Building; X-7725A Waste

Accountability Facility; X-7725C Chemical Storage Building; X-7726 Centrifuge Training and Test Facility; X-7727H Interplant Transfer Corridor; X-745G-2 Cylinder Storage Yard; X-745H Cylinder Storage Yard; and X-7746S, X-7746W Cylinder Storage Yards (Table 2.1.2.1-1), and the GDP X-6619 Sewage Treatment Plant (STP). Table 2.1.2.1-2 lists facilities to be constructed. These buildings/facilities and areas are where licensed material and hazardous material can be found and are considered to be the primary facilities in their functional support of the uranium enrichment process. Descriptions of the primary facilities used to support a 3.8 million SWU facility and their functions are provided in Section 1.1 of the license application and in Section 2.2 of the Integrated Safety Analysis (ISA) Summary for the American Centrifuge Plant.

Table 2.1.2.1-1 American Centrifuge Plant Cylinder Yards

American Centrifuge Plant Cylinder Yards		
Number	**Cylinder Yard Designation**	**Size**
X-745H	Cylinder Storage Yard	1,060,000 ft^2
X-745G-2 (existing)	Cylinder Storage Yard	135,000 ft^2
X-7766S	Cylinder Storage Yard	14,000 ft^2
X-7746S	Cylinder Storage Yard	47,000 ft^2
X-7746W	Cylinder Storage Yard	132,000 ft^2
Total		**1,388,000 ft^2**

Table 2.1.2.1-2 American Centrifuge Plant Facilities to be Constructed

Number	Designation	Size (approximate)
X-3003[1]	Process Building	304,000 ft^2
X-3004[1]	Process Building	304,000 ft^2
X-2232C[1]	Interconnecting Process Piping for X-3003, X-3004, and X-3366	3,000 L ft
X-3034[1]	Process Support Building	48,000 ft^2
X-3344	Customer Services Building	42,500 ft^2
X-3346A	Feed and Product Shipping and Receiving Building	22,800 ft^2
X-3366[1]	Product and Tails Withdrawal Building	42,300 ft^2
X-7725C	Chemical Storage Building	15,000 ft^2
X-7727H[1]	Interplant Transfer Corridor extension	26,000 ft^2
X-745H	Cylinder Storage Yard	1,060,000 ft^2
X-7766S[1]	Cylinder Storage Yard	14,000 ft^2
X-7746S	Cylinder Storage Yard	47,000 ft^2
X-7746W	Cylinder Storage Yard	132,000 ft^2
Total New Facility Construction		**2,060,600 ft^2**

[1] Facilities required for 7.6 million SWU capacity plant.

In addition to the primary facilities, there are a number of secondary buildings and areas that provide indirect support to the enrichment process. The support buildings include various electrical utilities, communications, hot water production, compressed air, and others. Some specific buildings are the X-7721 Maintenance, Stores and Training Building; X-6000 Cooling Tower Pump House, Air Plant, and Air Plant Support Systems; and X-6002 Boiler System. Descriptions of the buildings and their functions are provided in Chapter 1 of the License Application for the American Centrifuge Plant.

The primary facilities are located in the southwest quadrant region of the DOE reservation and are adjacent to each other, with the exception of the X-745G-2 and X-745H. Stockton Street and Tailor Street bound the primary facilities on the north, on the east by Grebe Avenue, on the west by Perimeter Road and on the south by Lewis Street as depicted in Figure 4.1.3-1. The X-745G-2 and X-745H are located in the northeast part of the DOE reservation bounded on the south by the Perimeter Road as depicted in Figure 4.1.3-2.

~~Various activities potentially need to be performed prior to turning over the existing facilities from DOE to USEC~~ the Licensee ~~to begin ACP upgrade activities. These activities, under DOE oversight, include preliminary facility repairs and modifications; relocation of DOE operations; cleanout and disposal of material from the X-3001 and X-3002 Process Buildings (e.g., old centrifuges/equipment/parts, classified material, records, miscellaneous equipment); relocation of the X-6002 Heat Plant from the northeast corner of the X-3002 to an area adjacent to X-6002A; disposition of hazardous waste stored in certain areas of the X-7725 building; and subsequent modification of the DOE *Resource Conservation and Recovery Act* (RCRA) Part B permit (DOE 2001b).~~

2.1.2.2 Process Description

The centrifuge consists of a large rotating cylinder and piping for the feeding of the UF_6 gas and the withdrawal of depleted and enriched UF_6 gas streams. The rotating cylinder, called a rotor, is contained within another cylinder, called a casing that maintains the rotating cylinder in a vacuum and provides physical containment of components in the unlikely event of a catastrophic failure of the gas centrifuge (see Figure 2.1.2.2-1). Other major components of a gas centrifuge include upper and lower suspension systems and a motor and control system.

Cascade separating elements are connected in series, called stages, to achieve the desired assay of ^{235}U enrichment. Many separating elements are also connected in parallel in the centrifuge process to achieve the desired mass flows forming a cascade. Figure 2.1.2.2-2 schematically presents a cascade and multiple stage configurations and the flow arrangement between stages. Through this configuration, feed enters the cascade at the middle of the configuration with the product streams being enriched in ^{235}U to the top and the tails streams being depleted of ^{235}U to the bottom.

The high peripheral velocity of a gas centrifuge required the rotor to operate in a high vacuum to minimize friction. Each centrifuge casing is therefore fitted with a ~~diffusion~~ pump to produce the required vacuum between the rotor and the casing. For the HALEU Demonstration Program, a molecular pump will be used in place of a diffusion pump. A purge vacuum (PV)

system maintains a suitably low pressure for efficient operation of the diffusion pumps. The output of the diffusion pumps discharges to the PV system. Any UF_6 and light gases that may escape from the rotor and any light gases entering the vacuum system due to in-leakage are removed. The main sources of gases to be removed are air in-leakage; hydrogen fluoride (HF) that originates from the cascade feed and from the reaction of UF_6 and moisture from air in-leakage; UF_6 leakage into the centrifuge-casing vacuum; and residual inert gas.

The evacuation vacuum (EV) pump system, which interfaces with the PV system at the diffusion pump and at the chemical traps, shares with the PV system the chemical traps, the exhaust gas analyzer, and the building vent piping to the outside environment. A manual interlock prevents the centrifuge from being valved into the EV and PV systems simultaneously. The purpose of the EV system is to reduce the casing pressure of newly installed or replacement centrifuges from atmospheric pressure to a sufficiently low value that ensures the centrifuge casing can be connected to the PV system without upsetting PV system operation. The EV system also evacuates the service module process headers. Additionally, for HALEU, there is also a bank of Sodium Fluoride (NaF) traps to facilitate a removal of UF_6 inventory from centrifuges should it be necessary. The discharge of the NaF traps is subsequently routed to PV/EV systems

The PV and EV systems are monitored to ensure proper operation of chemical traps to minimize potential releases of radionuclides. ~~The EV system has the capability to bypass the chemical traps during initial start-up and to pump down service modules, piping, and new centrifuges prior to gas introduction (see Figure 2.1.2.2-3).~~

The machine cooling water (MCW) system services the EV and PV pumps by providing cooling water. This system contains circulating water pumps, filter, heat exchanger, an expansion tank, and a piping tie-in to the chemical feed, deionizer, and sanitary water systems (see Figure 2.1.2.2-4). Water treatment chemicals are used to maintain cooling water chemistry. An alarm system is used to monitor water levels and makeup.

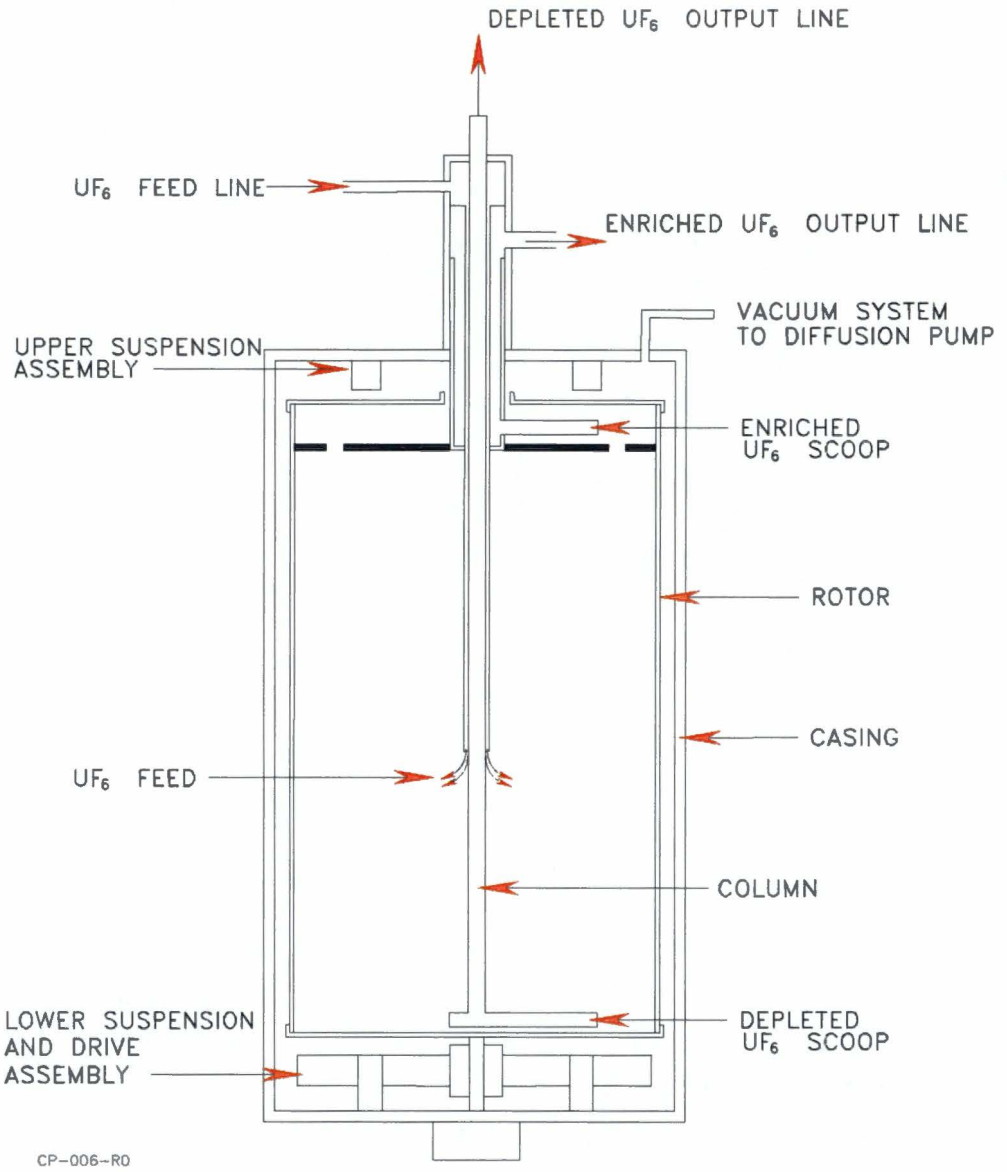

Figure 2.1.2.2-1 Simplified Schematic of Centrifuges

Note: For HALEU Demonstration, a molecular pump will be used in place of a diffusion pump.

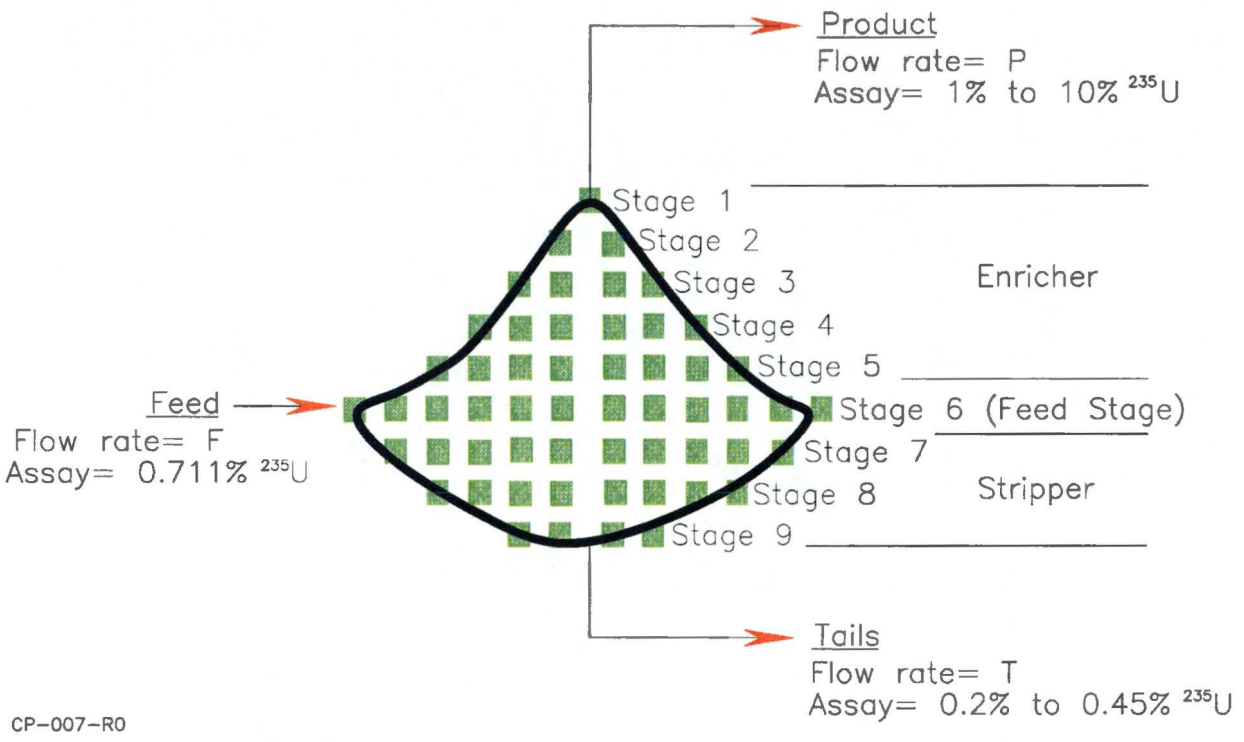

Figure 2.1.2.2-2 Example Cascade Schematic

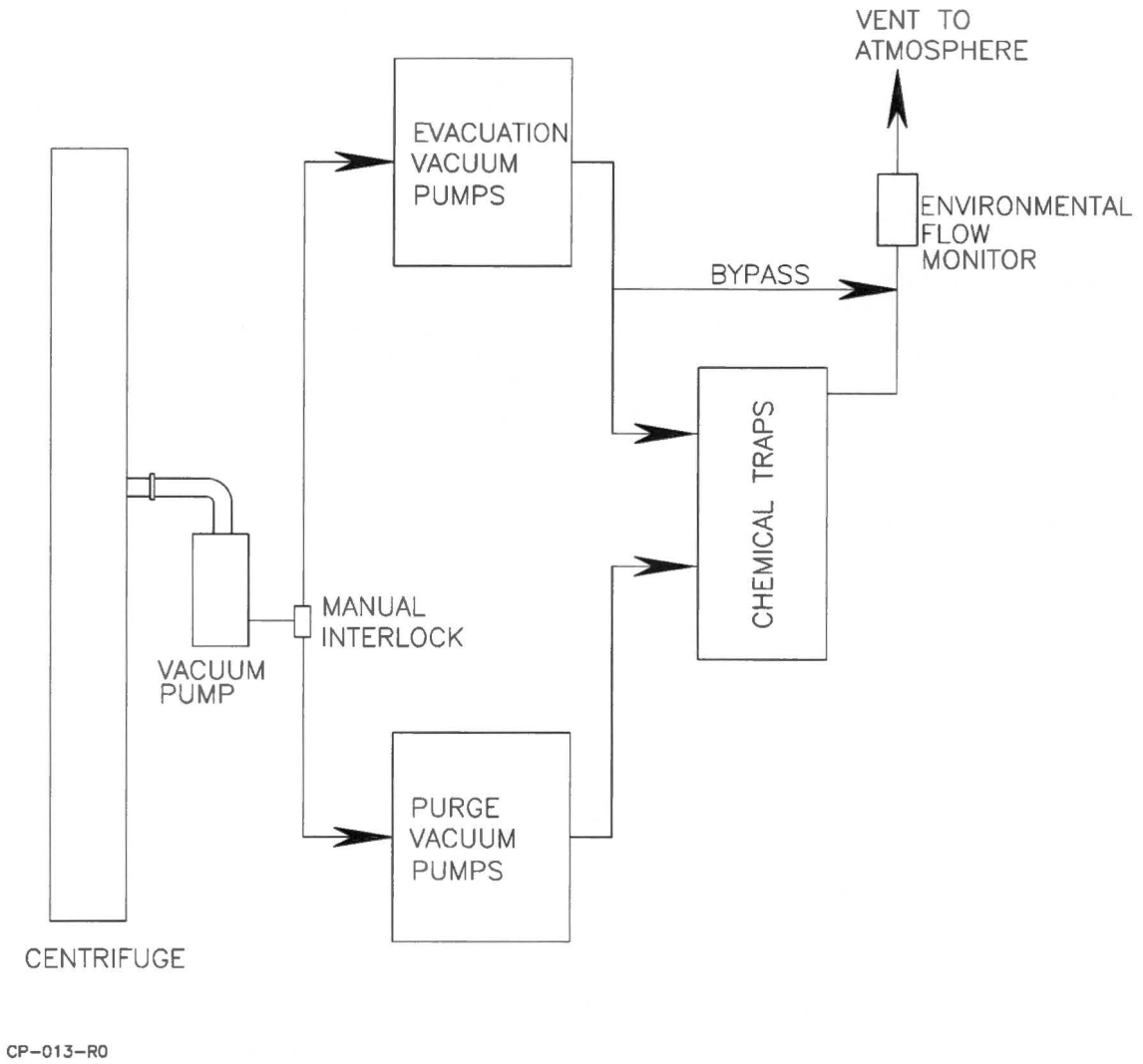

Figure 2.1.2.2-3 Purge and Evacuation Vacuum System Schematic

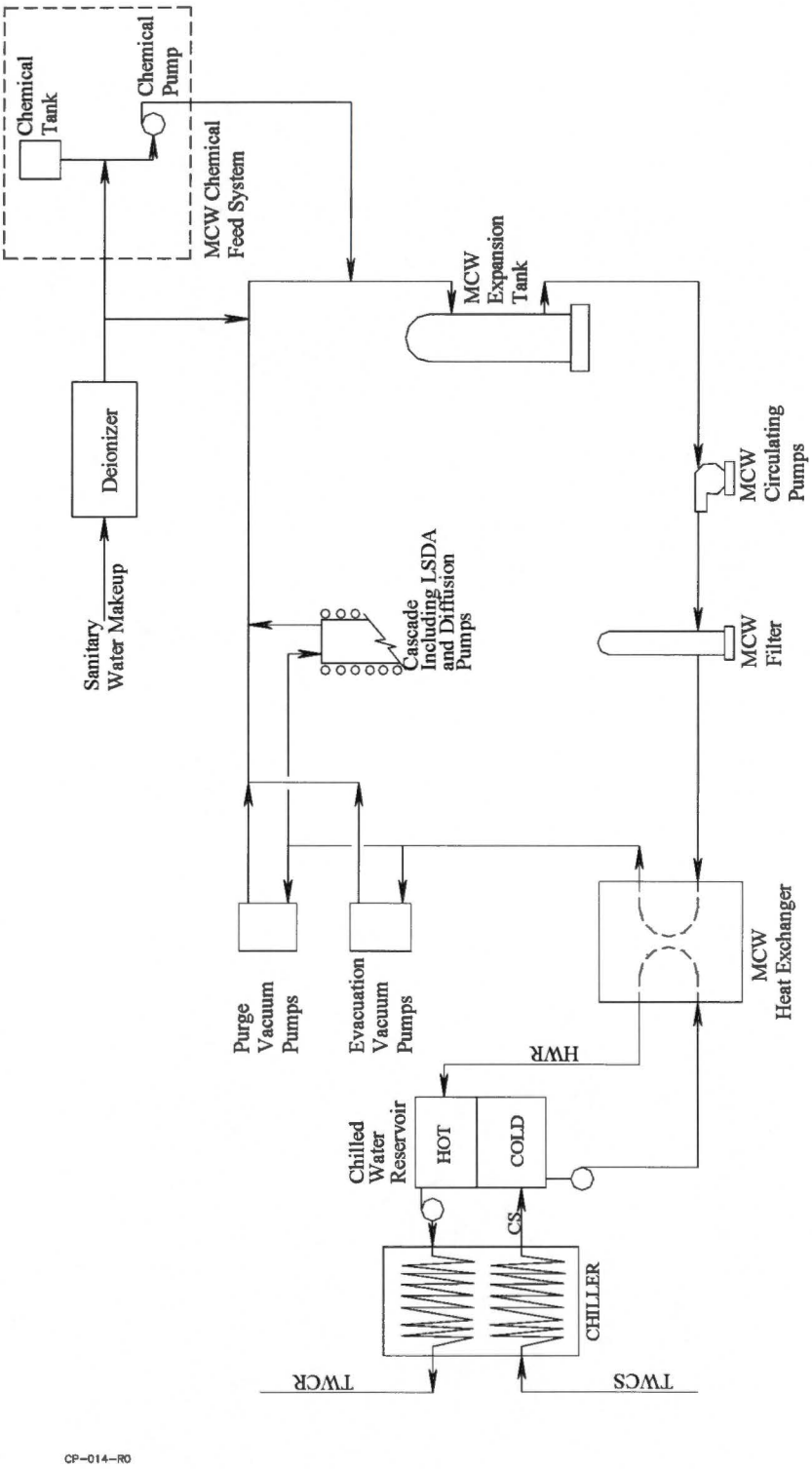

Figure 2.1.2.2-4 Machine Cooling Water

Note: For the HALEU Demonstration Program, a molecular pump will be used in place of a diffusion pump.

The centrifuges and PV/EV vacuum pumps are cooled by a closed-loop MCW system to minimize the amount of water potentially contaminated by uranium. There is no routine blowdown from the MCW system. Waste heat from the MCW system is discharged via heat exchangers to the Tower Water Cooling (TWC) system, which is cooled by a single cooling tower. Waste heat from the cold trap refrigeration systems in the X-3346 building is also discharged to the TWC system. Currently, the TWC discharges its blowdown to the GDP Recirculating Cooling Water (RCW) system under a service agreement, which in turn discharges its blowdown directly to the Scioto River via an underground pipeline (National Pollutant Discharge Elimination System [NPDES] Outfall 004). The RCW system does not provide any treatment of the TWC blowdown; it simply provides a convenient pathway to a suitable permitted discharge point. At some point in the future, the TWC blowdown will likely be modified to bypass the RCW system and discharge directly to the RCW discharge pipeline. There should be no licensed material in the TWC blowdown.

In the interim, the GDP RCW system has ample capacity to accept the TWC effluent without either physical modification or adjustment to its discharge limits. Discharges from the RCW 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 NPDES-mandated analyses. This data is available to the ACP as assurance that no unanticipated discharge of licensed material has occurred.

Quantities of hazardous materials are currently stored in the ACP facilities. These materials include acetone, solvents, and oils that are used for manufacturing, assembly and maintenance activities. These materials are reported annually to the Federal and State Environmental Protection Agencies as required by the *Superfund Amendments Reauthorization Act* (SARA).

2.1.2.3 Environmental Measurement and Monitoring Program

Based on historic experience and operating plans, the radionuclides anticipated being present in gaseous effluents are ^{234}U, ^{235}U, and ^{238}U. The intention is to not introduce feedstock contaminated with significant concentrations of other nuclides into the process. Feed material that meets the American Society for Testing and Materials (ASTM) specification for recycled feed may be used in the ACP, which may contain radionuclides such as uranium-236 (^{236}U) and ^{99}Tc. (For HALEU Demonstration, the feed will be LEU that meets the requirements of ASTM Standard C996, "Standard Specification for Uranium Hexafluoride Enriched to Less Than 5 percent ^{235}U or ASTM standard C787, "Standard Specification for Uranium Hexafluoride for Enrichment.") Due to historic contamination of the nuclear feed cycle and of the site, however, ^{99}Tc may eventually appear in some gaseous effluents. The radionuclides anticipated to be present in liquid effluents are ^{234}U, ^{235}U, ^{238}U, and ^{99}Tc, due to historic contamination of the site. Consequently, effluents will be analyzed for these four nuclides routinely.

Table 6.0-1 lists the Environmental Monitoring Program sampling locations and frequency (Figures 6.0-1 through 6.0-3).

Quality Assurance/Quality Control

Quality Control (QC) for environmental samples and data management are addressed to assure sample and analytical integrity. Sampling QC includes use of field blanks, duplicate samples, and chain-of custody protocols. The Analytical Laboratory performs analyses according to regulator's methods (i.e., EPA or National Institute for Occupational Health and Safety [NIOSH]) and in other cases use other approved methods (i.e., ASTM). Such standard methods are supplemented with standard operating procedures and operator aids which provide guidance for activities such as routine and special internal QC (i.e., field blanks; duplicate samples; chain of custody practices [from point of sampling through disposal]; lab matrix spikes; matrix spike duplicates; replicate samples; check samples; and blind and double blind QC samples; external control programs; calibrating/verification of equipment; traceability standards; maintenance of instruments; record keeping; proper labeling; etc.). (For HALEU, analytical services will be procured from qualified vendor and will meet equivalent standards) The Environmental Measurement and Monitoring Program is discussed in Chapter 9.0 of the License Application for the American Centrifuge Plant.

2.1.2.4 Decontamination and Decommissioning

At the end of useful plant life, the ACP will be decommissioned such that the facilities will be returned to the DOE in accordance with the requirements of the Lease Agreement with DOE and applicable NRC license termination requirements. The environmental analysis is based on a 7.6 million SWU plant bounding the impacts of a 3.8 million SWU plant.

A detailed Decommissioning Plan (DP) for the ACP will be submitted by the Licensee in accordance with 10 CFR 70.38(g) and prior to the time of license termination. Prior to decommissioning, an assessment of the radiological status of the ACP will be made. Enrichment equipment will be removed, leaving only the building shells of leased facilities and the plant infrastructure, including equipment that existed at the time of lease with the DOE (e.g., rigid mast crane, utilities, etc.). For newly constructed facilities, the cost estimate prepared and presented in the Decommissioning Funding Plan (DFP) includes funds to completely decontaminate and decommission the facilities. Remaining facilities will be decontaminated where needed to the NRC Free Release Criteria. Classified material, components, and documents will be destroyed or disposed of in accordance with the Security Program for the American Centrifuge Plant. Requirements for nuclear material control and accountability will be maintained during decommissioning in a manner similar to the programs in force during ACP operation. Depleted UF_6 material (tails), if not sold or disposed of prior to decommissioning, will be sold, or converted to a stable, non-volatile uranium compound and disposed of in accordance with regulatory requirements. Radioactive wastes will be disposed of at licensed low-level waste disposal sites. Hazardous wastes will be treated or disposed of in permitted hazardous waste facilities. Following decommissioning activities, the facilities will be de-leased and returned to the DOE in accordance with the requirements of the Lease Agreement. For the HALEU Demonstration a special arrangement exists per Section 10.1 of the License Application: At the conclusion of the HALEU

Demonstration Program, the facilities will be either returned to the Department in accordance with the requirements of the GCEP Lease Agreement or the Licensee will amend the ACP Materials License to allow phased implementation of expanded centrifuge enrichment cascades as described in Section 1.1.8 of the license application. At that time, a revised decommissioning funding plan, including an updated decommissioning cost estimate would be provided to the NRC for prior review and approval.

2.1.3 Reasonable Alternatives

A reasonable alternative to the Proposed Action was to construct and operate the ACP at the PGDP.

This alternative was eliminated after an analysis of factors that included the following:

- Environmental, safety, and health factors
- Cost to construct and operate the ACP
- Schedule to deploy the ACP
- Community support and socioeconomic factors
- Factors that will lower the costs of ~~USEC's~~ the Licensee's current operations.

In particular, the Licensee~~USEC~~ considered a range of financial, qualitative, regulatory and environmental factors. Based upon that analysis, ~~USEC~~ the Licensee concluded that siting the ACP at Portsmouth rather than Paducah, resulted in superior financial conditions, significant qualitative advantages, and slightly better regulatory and environmental conditions.

The Licensee~~USEC~~ considered environmental and socioeconomic impacts, and ability to construct and operate in accordance with applicable NRC and other legal and regulatory requirements. The Licensee~~USEC~~ concluded that while both sites are suitable on the basis of environmental, socioeconomic and regulatory factors, selection of PGDP 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. In addition, seismic factors at PGDP would increase the cost of construction and could make the engineering and NRC licensing effort more complex.

The financial analysis considered construction and capital costs, startup and operating costs and scheduling consideration. The results of that analysis demonstrated that the Portsmouth siting alternative produced a significant cost advantage over siting at PGDP.

The qualitative analysis considered the advantages and disadvantages of both sites with respect to, among other things, ability to achieve cost and schedule targets, ability to achieve incentives legislation, local, state and federal relations and community acceptance. Based upon this analysis, the Licensee~~USEC~~ concluded that the Portsmouth siting alternative offered the advantage of being able to utilize existing facilities, provided a schedule advantage that would benefit ~~USEC's~~ the Licensee's market position, and provided lower uncertainties associated with seismic considerations, which would reduce, among other things, engineering effort.

Based on the above analysis, ~~USEC~~ the Licensee concluded that siting at Portsmouth was the preferred alternative.

In addition, it should be noted that in connection with the previously-planned AVLIS facility, the Licensee~~USEC~~ conducted a site selection screening process which, although not completed, also had identified PORTS as one of a number of acceptable sites for that facility. Furthermore, it should also be noted that most recently the site selection process for Louisiana Energy Services' proposed National Enrichment Facility included PORTS as one of six sites that passed their screening process and was considered in detail in choosing their preferred site. (NEF 2004)

Design Alternatives

During the detailed design and engineering process of construction, infrastructure modification, manufacturing, and test operations for the facilities within the scope of this ER, the design for these elements are reviewed for compliance with regulatory standards, and for opportunities to minimize the quantity and reduce the toxicity of any releases, emissions, effluents or wastes generated from the construction, operation, maintenance or decommissioning of the facilities and for minimization of the quantity and toxicity of the materials used and wastes generated.

An example of this design and engineering review process to reduce environmental impacts of the ACP is the refrigeration and cooling requirements for the X-3344 Customer Services Building and the X-3346 Feed and Withdrawal Building. The proposed primary refrigeration system for the facilities is FC-84, a perfluorocarbon brine heat transfer system, which replaces the R-11, hydrochlorofluorocarbons (HCFCs), used in the original GCEP design. The proposed heat transfer brine product for the primary refrigeration system under consideration is hydrogen free and chemically stable over the required operating range, has a low vapor pressure, low toxicity, is commercially available, and has zero ozone depletion potential.

2.2 Alternatives Considered but Eliminated

Alternatives to the Proposed Action that were considered and eliminated include the following:

- Construct and operate the American Centrifuge Plant at alternative locations at the U.S. Department of Energy reservation in Piketon, Ohio

- Construct and operate a non-centrifuge alternate enrichment technology plant
- Construct and operate the American Centrifuge Plant at a non-Gaseous Diffusion Plant location
- Replace high cost Separative Work Unit production with equivalent Separative Work Units from down-blended Highly Enriched Uranium from nuclear warheads

A discussion of the reasons the above alternatives were eliminated is provided below:

Construct and operate the American Centrifuge Plant at alternative locations at the U.S. Department of Energy Reservation in Piketon, Ohio

The DOE reservation in Piketon, Ohio was evaluated to identify alternative locations for the ACP. The three alternative locations identified at the DOE reservation, denoted Locations A, B, and C, are shown in Figure 2.2-1.

Location A is the preferred location for the ACP and is discussed in detail as the Proposed Action.

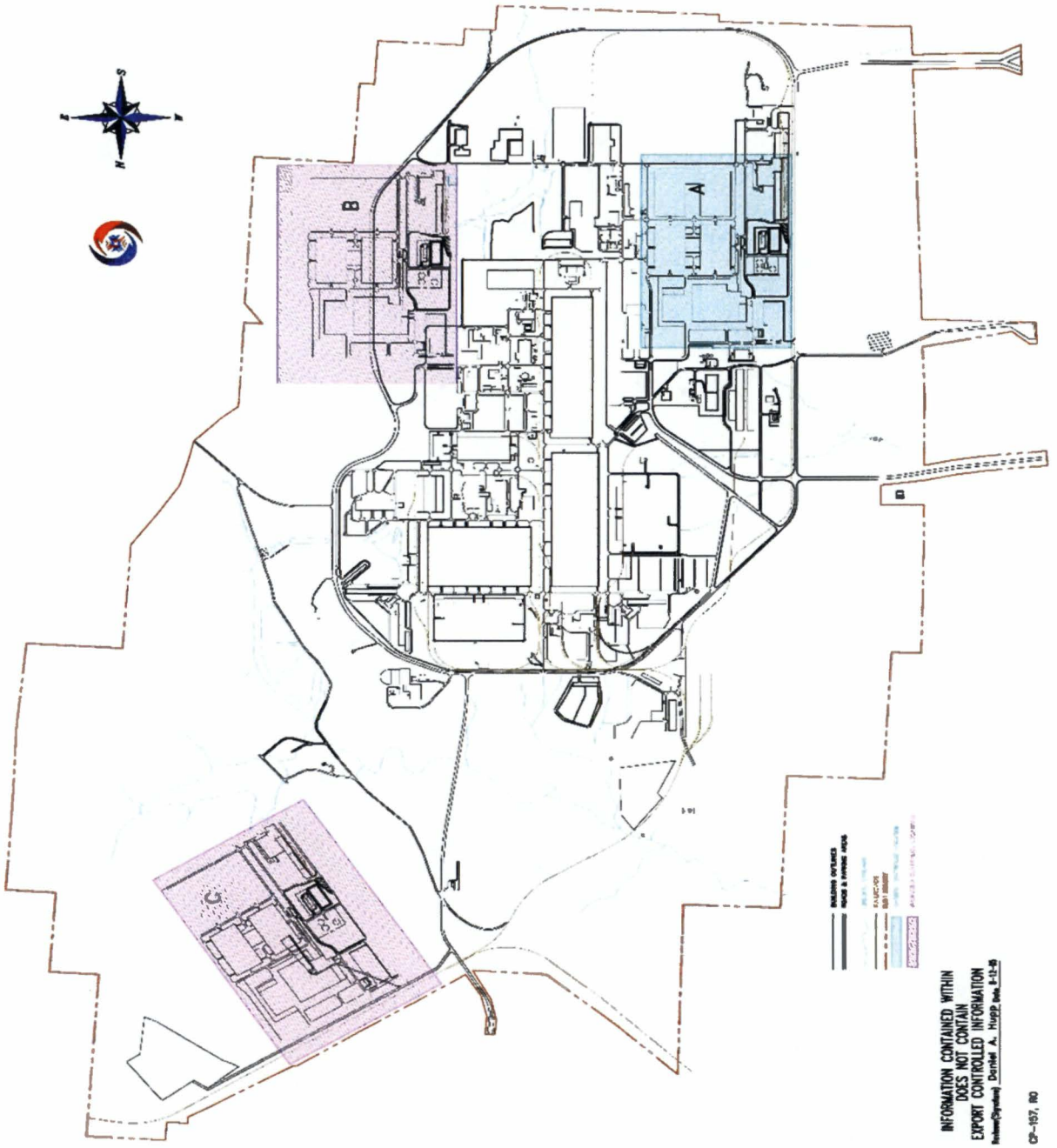

Figure 2.2-1 American Centrifuge Plant Alternative Locations on the U.S. Department of Energy Reservation

Location B is located in the southeast portion of the site and has an area of about 81 ha (200 acres). 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 Portsmouth 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 has an area of about 81 ha (200 acres). This location consists of a level to very gently rolling grass field to a rolling forested hill. The level area was graded during the operation of the Portsmouth Gaseous Diffusion Plant and has been maintained as grass fields.

Alternatives B and C were not selected as the preferred alternative primarily due to the lack of existing buildings, extensive site preparation, access to utility service, and new construction required to house the ACP process. Neither location had an environmental advantage over location A or afforded the advantages offered by location A, the site of the former GCEP buildings.

Construct and operate a non-centrifuge alternate enrichment technology plant

Non-centrifuge alternate enrichment technologies ~~have been and continue to be evaluated~~were previously evaluated by USEC~~the Licensee~~ and USEC eliminated the alternatives to the centrifuge. For example, as a private corporation, USEC continued development work on the Atomic Vapor Laser Isotopic Separation (AVLIS) enrichment process that utilizes lasers to enrich uranium. In 1999~~, the Licensee~~USEC evaluations concluded that the return on investment was not sufficient to outweigh the risks and ongoing capital expenditures necessary to continue work on AVLIS. In 1999, USEC suspended development of AVLIS. ~~The Licensee~~USEC continued to evaluate the use of lasers to enrich uranium by supporting the development of the SILEX enrichment process. SILEX offered a number of important advantages over the AVLIS process. However, in 2003, USEC announced that it was ending its funding for research and development of the SILEX laser-based uranium enrichment process because it was unlikely that the SILEX technology could be utilized to meet ~~the Licensee~~USEC's need. Specifically, SILEX is still in an early stage of development, and could not be deployed within the time frames required by the DOE-USEC Agreement. With the termination of ~~the Licensee~~USEC's support, the rights to develop the SILEX technology for uranium enrichment have reverted back to Silex Systems Limited.

Construct and operate the American Centrifuge Plant at a non-Gaseous Diffusion Plant location

This alternative involves constructing and operating the ACP at a "green field" or a disturbed site other than one of the GDPs 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 GDP sites provide schedule, regulatory, and cost advantages over other sites. The DOE-USEC Agreement stipulates that ~~the Licensee~~USEC ~~deploy~~ the ACP be deployed at either the DOE reservation in Piketon, Ohio or the PGDP. 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. Without readily accessible environmental data (as in a green field situation) there

would be a delay in assembling and evaluating environmental factors. Without available skilled labor with uranium enrichment experience, the Licensee~~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. In addition, it should be noted that in connection with the previously-planned AVLIS facility, ~~the Licensee~~USEC conducted a site selection screening process which, although not completed, identified PORTS as one of a number of acceptable sites for that facility. Furthermore, it should be noted that the site selection process for Louisiana Energy Services' proposed National Enrichment Facility included PORTS as one of six sites that passed the screening process and was considered in detail in choosing the preferred site (NEF 2004).

Replace high cost Separative Work Unit production with equivalent Separative Work Units from down-blended Highly Enriched Uranium from nuclear warheads

This alternative involves not constructing a domestic uranium enrichment plant to replace the SWU production of PGDP. Instead, equivalent SWU would be obtained from down blending HEU from either U.S. or Russian nuclear warheads. 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 1.1 above. ~~As discussed previously in Section 1.1 of this ER, USEC~~ the Licensee ~~is the Executive Agent for a U.S. Government agreement that purchases LEU that is derived from down blending of HEU from Russian warheads. In February 1993, the U.S. Government agreed to purchase from Russia 500 metric ton (MT) of HEU extracted from dismantled Russian nuclear weapons over a 20-year period, which expires 2013. It is uncertain whether this agreement will be extended beyond 2013. Currently, the equivalent SWU from down blended HEU complements domestic SWU production at PGDP. While the U.S. Government, on the one hand, may wish to extend this arrangement to continue the reduction of the number of nuclear weapons in the world, it is doubtful that the U.S. Government would extend this agreement to replace rather than complement domestic SWU production. The *Energy Policy Act* of 1992, which created the United States Enrichment Corporation, characterizes uranium enrichment as a "strategically important domestic industry" of "vital national interest," "essential to the national security and energy security of the U.S.," and necessary "to avoid dependence on imports."~~ The environmental impacts of this alternative would be those associated with down-blending operations and would be minimal to U.S. residents for those operations that take place overseas. Further, this alternative also fails to meet the commercial needs of the corporation. the Licensee~~USEC~~ is committed to being competitive on price and delivering superior customer service. ~~Hence, because of the age of PGDP, the cost of power, and the currently scheduled expiration of the HEU agreement, USEC needs to deploy a lower cost and domestic advanced technology towards the end of this decade.~~

None of the alternatives considered but eliminated would be obviously superior to siting the ACP at the DOE reservation in Piketon, Ohio.

2.3 Cumulative Effects

Cumulative impacts are those effects that result from the incremental impacts of an action considered additively with the impacts of other past, present, and reasonably foreseeable future actions. Cumulative impacts are considered regardless of the agency or person undertaking the other actions (40 CFR 1508.7, CEQ 1997) and can result from the combined or synergistic effects of individually minor actions over a period of time. This section describes actions that are considered pertinent to the analysis of cumulative impacts for the Proposed Action. The No Action Alternative is typically included as a baseline against which cumulative effects are evaluated.

The cumulative impacts presented in this ER are based on the potential effects of the ACP when added to impacts from past, present, and reasonably foreseeable actions. On-going operations currently at the Piketon DOE reservation include the DOE Decontamination and Decommission (D&D) operations by FLUOR BWXT ~~United States Enrichment Corporation's Cold Standby, Deposit Removal, and removal of technetium from potentially contaminated feed projects;~~ and the DOE's waste management and environmental restoration activities. These activities are independent of the ACP and are expected to decrease in scope over time.

The ACP is consistent with existing land use at the Piketon DOE reservation. Construction and refurbishment activities will be conducted in areas known to be devoid of cultural and historical resources. New buildings for the ACP will be consistent with the character of the adjoining buildings. Architectural features will follow established guidelines consistent with the existing building color schemes, styling, and construction within the property's setting that contribute to its historic significance.

Cumulative resource consumption would include DUF_6 operations, GDP D&D operations, ACP and DOE environmental restoration activities~~UDS, United States Enrichment Corporation, ACP and DOE~~. Consumption of power and water and use of sewage treatment facilities would be less than capacity. Cumulative land use in the regions surrounding the GDPs would not change substantially from existing land uses and would remain largely rural.

Potential cumulative effects from management of hazardous materials would be minimal. ~~UDS~~DUF_6 Operations, the Licensee~~United States Enrichment Corporation~~, ACP and DOE environmental restoration activities follow ~~the same~~similar regulatory requirements, perform required inspections, and manage hazardous materials in a manner that is protective of the environment.

Wastes would continue to be generated by DUF_6 operations, GDP D&D operations, ACP and DOE environmental restoration activities.~~UDS, the LicenseeUnited States Enrichment Corporation, ACP and DOE~~. ~~USEC~~ The Licensee would manage its wastes with the intent to store on-site only as a last resort. Any future LLW waste that will be generated by the ACP will be placed in an existing facility or a new facility that will be permitted according to NRC and EPA regulations.~~DOE is decreasing its permitted waste storage management areas in order to provide increased space available for USECs advanced technology centrifuge program. United States~~

~~Enrichment Corporation would continue to utilize DOE storage facilities for hazardous and mixed wastes that it must keep on-site for more than 90 days but would continue to store its LLW independent of DOE, and ship as much of its waste as possible off-site for recycle, treatment, and disposal.~~

Cumulative effects to air resources would be minimal and would include continuing emissions from DUF_6 operations, GDP D&D operations, ACP and DOE environmental restoration activities. ~~UDS, the LicenseeUnited States Enrichment Corporation, ACP and DOE activities~~ at the Piketon DOE reservation and PGDP, as well as from surrounding industries. Ambient air quality in the regions surrounding both plants, which has historically been good, is expected to remain good because no large population increases, or industrial growth or changes would occur in the region.

The potential Committed Effective Dose Equivalent to the maximally exposed off-site individual from all DUF_6 operations, GDP D&D operations, ACP and DOE environmental restoration activities ~~UDS, the LicenseeUnited States Enrichment Corporation, ACP and DOE~~ releases would be approximately 0.6 mrem/yr. Radionuclides and chemical contaminants have been found in sediments and surface waters in the areas around the GDPs. However, none have been found in significant concentrations.

There will be no introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features. Under the Proposed Action, existing and new facilities used for uranium enrichment would be used for the commercial centrifuge uranium enrichment project. Noise levels would be consistent with previous uranium enrichment activities. Ground disturbance and exterior renovation would be temporary. Refurbishment of existing facilities and construction of new uranium enrichment process buildings would be consistent with existing site architectural features. Neither these changes nor the new construction would significantly alter the existing visual characteristics of the site or environs.

No disproportionately high minority or low-income populations were identified that would require further analysis of environmental justice concerns. Accordingly, ~~USEC~~ the Licensee has concluded that no disproportionately high minority or low-income populations.

An activity that will increase over time at the DOE reservation is the ~~construction and~~ operation of a ~~the UDS~~ conversion facility that ~~will~~ converts tails (deleted uranium hexafluoride, DUF_6) into a more stable oxide form for off the DOE reservation disposal (DOE 2004, DOE 2004c).

The ~~UDS~~ time period considered in DOE's EIS ~~i~~was a construction period of approximately two years, an operational period of 18 years, and a 3-year period for the D&D of the conversion facility. ~~Current plans call for construction to begin in the summer of 2004~~This facility was constructed in 2008 and is currently in operation. ~~The UDS construction schedule does not overlap the ACP construction schedule.~~ Impacts of ~~construction and~~ operations of the ~~UDS~~ DUF_6 facility would be small, as would be the cumulative impacts ~~from UDS, United States Enrichment Corporation,~~ ACP and DOE operations (DOE 2004, DOE 2004c).

The cumulative radiological exposure from all pathways on the DOE reservation to the off the DOE reservation population would be well below the maximum NRC dose limit of 100 mrem/yr committed Effective Dose Equivalent (CEDE) and below the 40 CFR Part 190 limit of 25 mrem for whole body or organ, 75 mrem/yr for thyroid, as well as the 40 CFR 61 Subpart H limit of 10 mrem/yr CEDE.

The total number of shipments of DUF_6, non- DUF_6, triuranium octaoxide (U_3O_8), and crushed heel cylinders, form ~~UDS~~ DUF_6 operations is estimated to be 12,300 truck shipments and 6,800 rail shipments over the 18 year operating life of the facility. Radiological impacts resulting from transportation of all materials under both modes would be small, as would be the cumulative impacts (DOE 2004, DOE 2004c).

No cumulative noise impacts are expected for the alternatives considered. Noise energy dissipates within a short distance from the source.

No significant cumulative impacts on ecology for the alternatives considered are anticipated. No tree removal that could provide habitat for the Indiana bat is anticipated for the Proposed Action; this federally endangered species is not known to utilize this area, Figure 3.5.4-1. No significant impacts are expected due to the Proposed Action, or from the cumulative impacts from ~~UDS~~the DUF_6 facility, the Licensee~~United States Enrichment Corporation~~, ACP, and DOE operations.

Section 3113(a) of the USEC Privatization Act [42 USC 2297h-11(a)] requires DOE to accept low-level waste (LLW), including depleted uranium that has been determined to be LLW, for disposal upon the request and reimbursement of costs by a NRC uranium facility licensee. DOE has stated in its EIS that depleted uranium transferred under this provision of law in the future, would most likely be in the form of DUF_6, thus adding to the inventory of material needing conversion at a DUF_6 conversion facility. DOE in its EIS 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 2004).

~~DOE has initiated accelerated cleanup of the GCEP facilities at Portsmouth for use by USEC in the development of an advanced uranium enrichment process. On December 4, 2002, USEC announced that it would construct its demonstration centrifuge uranium enrichment test facility at the Portsmouth site. This announcement followed a June 17, 2002, agreement between DOE and USEC in which USEC will deploy an advanced centrifuge uranium enrichment plant by 2010-2011. PORTS was selected in December 2002 as the location for the Lead Cascade Demonstration Facility and it was announced in January 2004 that PORTS will be the location for full deployment of the American Centrifuge Uranium Enrichment Plant (DOE 2004a).~~

D&D of the PORTS GDP will be a very large project (potentially the largest cleanup in Ohio) that will require a significant funding commitment from DOE (estimated at $1-2 billion) and create thousands of jobs over several years. Those facilities not intended for reindustrialization, reuse, continued operation, remediation, or long-term stewardship will be demolished. In August of 2010 the DOE awarded the contract for complete D&D of the former Portsmouth GDP (excluding facilities supporting other reservation entities, including the Lead Cascade and ACP). D&D of multiple facilities started in 2010 and at present remains ongoing

(FBP-ER-RCRA-WD-RPT-0288). ~~It is anticipated that the majority of GDP facilities will undergo D&D, and that the waste generated would be disposed of in a potential on-site waste disposal facility (DOE 2004a).~~

DOE obtained approval from the OEPA in June 2015 to construct an Onsite Solid Waste Disposal Facility (OSWDF) in the northeast portion of the DOE reservation. The record of decision for site-wide waste disposition was concurred with by Ohio EPA in June 2015. Approval of Phase I and Phase II of the remedial design/remedial action work plan for the OSWDF was obtained in September and October 2015, respectively, which allowed initial site construction activities such as tree clearing, fencing, utility installation, and installation of erosion and sediment controls, retention ponds for surface water runoff, and installation of office trailers. These activities began after approval of the work plan and are continuing (FBP-ER-RCRA-WD-RPT-0288). ~~DOE is evaluating the costs, benefits, and concerns regarding construction of a potential on-site waste disposal facility at PORTS. Waste generated during plant D&D activities as well as waste resulting from deferred environmental remediation activities could be placed in such a facility. D&D and deferred remediation activities at PORTS are expected to generate approximately 3 million yd^3 of waste. Approval of a disposal facility at PORTS would require in-depth discussions with both local and state stakeholders and regulatory agencies. The facility would be approved, constructed, operated, and closed in accordance with regulatory requirements (DOE 2004a).~~

In addition to uranium enrichment at the ~~PGDP~~ DOE reservation, DOE ~~will~~ have both a uranium conversion mission and an environmental cleanup mission. The uranium conversion involves the construction and operation of a facility that will convert DUF_6 to less reactive oxides, which was constructed in 2008~~17~~. ~~The contract to construct the facility was awarded to UDS. Construction began in July 2004. Currently it is expected that the conversion facility construction will take approximately two years and will operate for approximately 25 years and a three-year period for the D&D of the facility (DOE 2004b).~~

~~UF_6 production will ultimately cease at PGDP after the Proposed Action becomes operational, resulting in reduced emissions and resource use (i.e., water, electricity and Freon). D&D of those facilities currently leased to United States Enrichment Corporation will begin once the GDP ceases operation (DOE 2004b).~~

The total cumulative impacts and effects of the Proposed Action are expected to be insignificant when compared to the federal, state, and local regulatory limits and the positive cumulative effects of job opportunities and revenues generated by the Proposed Action.

2.4 Comparison of the Reasonably Foreseeable Environmental Impacts

A comparison of the predicted environmental impacts of the ACP, the No Action Alternative and the PGDP siting alternative for each of the environmental areas of interest, is provided in Table 2.4-1.

Table 2.4-1 Comparison of the Predicted Environmental Impacts

Environmental Area Assessed	Proposed Action	PGDP Siting Alternative	No Action Alternative
Land Use	No significant impact; refurbishment and new building construction will be consistent with historical uranium enrichment operations	No significant impact; new building construction will be consistent with historical uranium enrichment operations; a significant amount of land will be utilized reducing future use options to industrial/commercial	No impact
Transportation	No significant impact	No significant impact	No impact
Geology, Soils, and Seismicity	No significant impact; low probability of minor seismic event; temporary soil profile disturbance during construction activities.	No Significant impact; low probability of major seismic event; temporary soil profile disturbance during construction activities	No impact
Water Resources	No significant impact; precautions taken to avoid accidental discharges	No significant impact; precautions would be taken to avoid accidental discharges	No impact
Ecological Resources	No significant impact; refurbishment and construction of new facilities would not impact natural habitat for any rare, threatened, or endangered species or designated wetlands	No significant impact; construction of new facilities would not impact natural habitat for any rare, threatened, or endangered species or designated wetlands	No impact
Air Quality			
Non-Radiological	No significant impact; slight increase in HF concentrations (1.96×10^{-3} $\mu g/m^3$); slight increase in emissions from standby electrical generators	No significant impact; slight increase in HF concentrations (2.27×10^{-3} $\mu g/m^3$); slight increase in emissions from standby electrical generators	No impact
Radiological	No significant impact; slight increase in dose to the Maximum Exposed Individual (MEI) (0.55 mrem/yr)	No significant impact; slight increase in dose to the MEI (0.9 mrem/yr)	No impact
Noise	No significant impact; no increase in noise level outside facilities	No significant impact; no increase in noise level outside facilities	No impact

Table 2.4-1 Comparison of the Predicted Environmental Impacts (Continued)

Environmental Area Assessed	Proposed Action	PGDP Siting Alternative	No Action Alternative
Historic and Cultural Resources	No significant impact; new facilities, with like architectural characteristics, would be constructed in previously disturbed area	No significant impact; new facilities, with like architectural characteristics, would be constructed in previously disturbed area	No impact
Visual/Scenic Resources	No significant impact; new facilities would be constructed architecturally consistent with existing strategic structures	No significant impact; new facilities would be constructed architecturally consistent with existing strategic structures	No impact
Socioeconomic	No significant impact; no impact to housing nor increase in population; slight increase in tax revenue	No significant impact; no impact to housing nor increase in population; slight increase in tax revenue	No impact
Environmental Justice	No impact	No impact	No impact
Public and Occupational Health	No significant impact; slight increase in HF emissions (1.2×10^{-4} $\mu g/m^3$); slight increase in dose to the MEI (0.023 mrem/yr); no significant increase in recordable injury/illness rates	No significant impact; slight increase in HF emissions (3.1×10^{-5} $\mu g/m^3$); slight increase in dose to the MEI (0.0066 mrem/yr)); no significant increase in recordable injury/illness rates	No impact
Waste Management	No significant impact; slight increase in waste generation	No significant impact; slight increase in waste generation	No impact

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3.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

This chapter describes the various resources present on and around the DOE reservation in Piketon, Ohio, as a baseline for the incremental impacts of the Proposed Action and analyzed alternatives. It also provides a general description of the physical, biological, aesthetic, and cultural features of the site and adjacent areas. This chapter summarizes information gathered from site surveys, literature, and other publicly available sources for each resource area pertinent to the proposed project. The scope of the discussion varies by resource to ensure that relevant issues are included. Descriptions of the existing environment provide a basis for understanding the direct, indirect, and cumulative effects of the Proposed Action on the environment.

3.1 Land Use

This section discusses the existing land use and visual resources of the proposed project at and around the DOE reservation.

The DOE reservation is located at latitude 39°00'30" north and longitude 83°00'00" west measured at the center of the DOE reservation on approximately 1,497 ha (3,700 acres) in Pike County, Ohio, one of the state's lesser populated counties. The DOE reservation is located between Chillicothe and Portsmouth, Ohio, approximately 113 km (70 mi) south of Columbus, Ohio. Figure 1.0.1-1 shows the regional area surrounding the DOE reservation.

The general location is an area of steep to gently rolling hills, with average elevations of 37 m (120 ft) above the Scioto River valley. The steep hills characteristically are forested, while the rolling hills provide marginal farmland. With the exception of the Scioto River and its floodplain, the floodplains and valleys are narrow and are occupied by small farms.

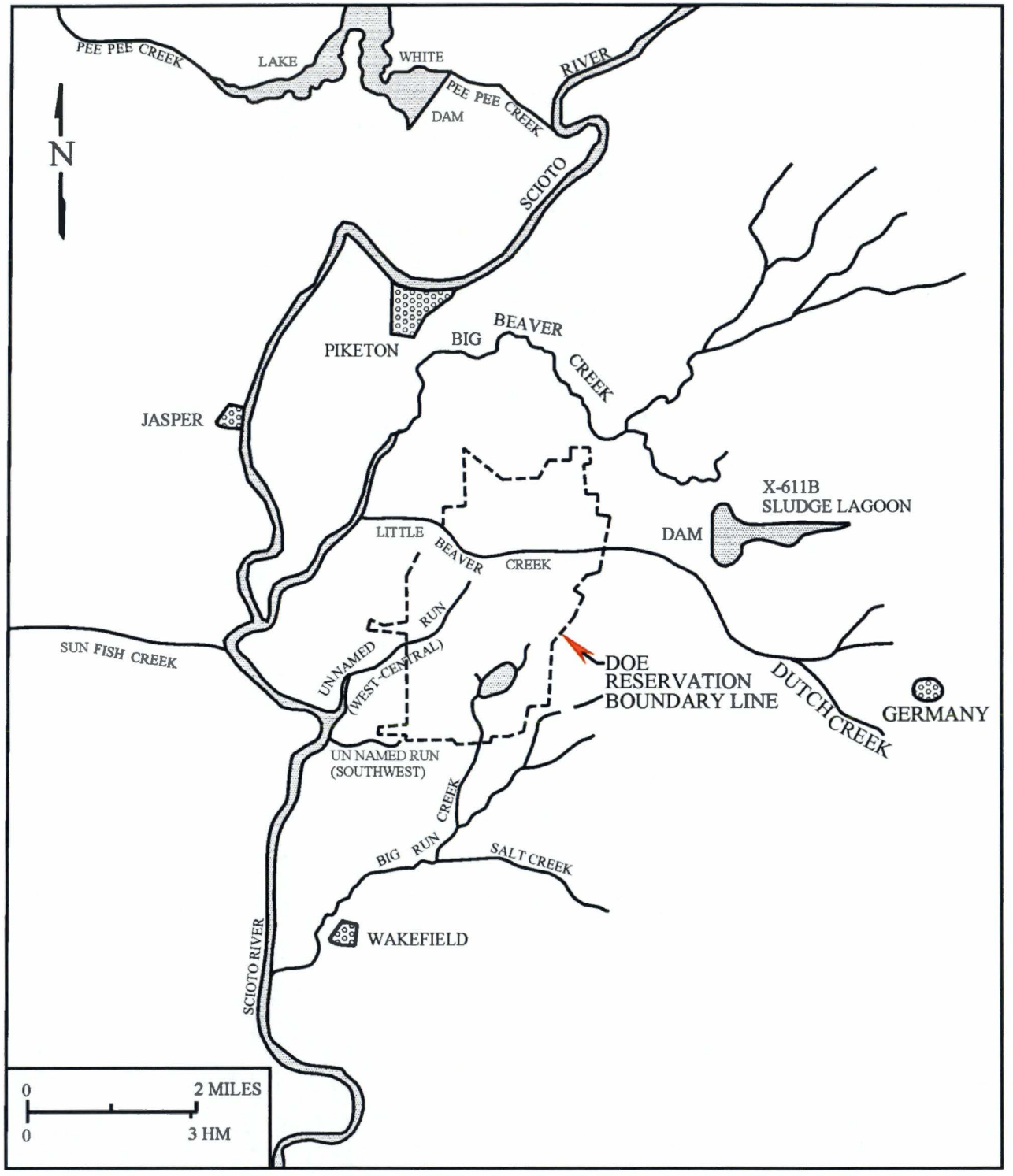
There are no unrelated industrial, commercial, institutional, or residential structures within the DOE reservation. ~~DOE leases facilities on-site to the Ohio National Guard. The Ohio National Guard does not store weapons on-site. There are no other military installations located near the DOE reservation.~~

Roadways within the fenced limited access or protected area of the DOE reservation consist of several miles of paved surface. Several paved roads branch out from the DOE reservation to the Perimeter Road that surrounds the limited access area. The west access to the DOE reservation extends from U.S. 23 to the Perimeter Road. Shyville Road connects U.S. 32/124 to the north side of the DOE reservation. Other access roads connect to secondary county roads. ~~Access to the DOE reservation is controlled at the west access point. Other access points to the DOE reservation are secured.~~

Rail and roadways are available for cylinder movements to the DOE reservation. The rail spur enters the DOE reservation from the north and branches to several areas inside the limited access area. In addition, cylinders are transported around the DOE reservation using a variety of devices, including cylinder carriers, stackers, rail cars, forklifts, trucks, and wagons.

Rivers or major streams do not traverse the DOE reservation area. However, Big Beaver

Creek and Little Beaver Creek cross the northern edge of the DOE reservation. Runoff water flows from the area through three streams: Little Beaver Creek, Big Run Creek, and a drainage ditch to the Scioto River (Figure 3.1-1).



P-038-R0

Figure 3.1-1 Locations of Lakes, Rivers, and Creeks in the Vicinity of the U.S. Department of Energy Reservation

The DOE reservation consists of approximately 1,497 ha (3,700 acres) with approximately a 526 ha (1300 acre) central area surrounded by the Perimeter Road. The DOE reservation land outside the Perimeter Road 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 (Figure 1.0.1-2).

Most of the improvements are located within the fenced core area. The core area is largely devoid of trees, with grass and paved roadways dominating the open space.

The ACP is situated on approximately 81 ha (200 acres) of the southwest quadrant of the Controlled Access Area.

~~The GDP occupies approximately 223 ha (550 acres) of the remaining Controlled Access Area.~~

Usage of Lake White State Park (Figure 3.1-1), located approximately 9.7 km (6 mi) north of the DOE reservation, is occasionally heavy and concentrated on the 37 ha (92 acres) of land closest to the lake. Most of the land surrounding the lake is privately owned. The 136 ha (337-acre) Lake White offers recreations (i.e., boating, fishing, water skiing, and swimming). There are 10 non-electric campsites for primitive overnight camping (ODNR 2004).

Land within five miles of the DOE reservation is used primarily for farms, forests, and urban or suburban residences (see Table 3.1-1). About 10,291 ha (25,430 acres) of farmland, including cropland, wooded lot, and pasture, lie within five miles of the DOE reservation. The cropland is located mostly on or adjacent to the Scioto River flood plain and is farmed extensively, particularly with grain crops. The hillsides and terraces are used for cattle pasture. Both beef and dairy cattle are raised in the area. Other farm animals such as horses, pigs, sheep, goats, and chickens are raised to a lesser extent. Commercial woodlands (excluding sapling-seedling stands) are predominantly saw-timber stands. Pole-timber stands are of lesser proportion. Lands within or adjacent to the Scioto River floodplain are farmed intensively, particularly with grain crops such as corn and wheat. Other products such as potatoes, cabbage, and fruits are also cultivated in the area.

Table 3.1-1 Percentage of Different Land Uses in the Region of Influence in 20000020

County	Total Hectares (Acres)	Developed, Lower Intensity	Developed, Higher Intensity	Wooded	Pasture and Farmland	Other[a]
Jackson	109,126 (269,656)	6.02%	0.67%	64.73%	22.87%	5.72%
Pike	114,917 (283,967)	4.79%	1.01%	64.15%	24.47%	5.57%
Ross	179,348 (443,179)	5.45%	1.00%	46.95%	43.56%	1.49%
Scioto	159,755 (394,764)	5.88%	1.20%	70.10%	18.68%	4.14%

~~County~~	~~Total Hectares (Acres)~~	~~Urban~~	~~Agriculture~~	~~Wooded~~	~~Other[a]~~
~~Jackson~~	~~109,126 (269,656)~~	~~2%~~	~~32%~~	~~60%~~	~~6%~~
~~Pike~~	~~114,917 (283,967)~~	~~1%~~	~~27%~~	~~66%~~	~~6%~~
~~Ross~~	~~179,348 (443,179)~~	~~1%~~	~~48%~~	~~45%~~	~~6%~~
~~Scioto~~	~~159,755 (394,764)~~	~~2%~~	~~21%~~	~~72%~~	~~5%~~

[a] Other: Water/barren/scrub.
Source: ODOD, 20~~0~~20.

Approximately 9,874 ha (24,400 acres) of forest lie within 8 km (5 mi) of the reservation. This includes some commercial woodlands and a very small portion of Brush Creek State Forest ~~(USEC-02)~~.

Three major forest types represent the vegetation of Pike County, all of them second growth: mixed mesophytic (upland mixed hardwoods), mixed oak (oak-hickory), and bottomland hardwoods. The upland hardwood areas include green ash, northern red oak, tulip poplar, red maple, and several additional species. The oak-hickory areas include white oak, northern red oak, post oak, shagbark hickory, pignut hickory, and various other associated species. The bottomland hardwoods include sycamore, sugar maple, flowering dogwood, and American beech as well as less important species. Several areas that once were cleared have been allowed to lie fallow and are now in various stages of succession. Several small plantations of pines are located on the DOE reservation, and several small wetland areas have developed around holding ponds and in ditch lines.

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 FPPA of 1981 which seeks "... to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmlands to nonagricultural uses..." (7 USC 4201[b]). According to the Soil Survey of Pike County, Ohio, (USDA 1990) 22 soil types occur within the DOE reservation property boundary with the predominant soil type being Omulga Silt Loam. These soils are well drained and have a surface layer of dark grayish-brown friable silt loam. The underlying soils are approximately 54 in. thick and are distinguished by their yellowish-brown, mottled, and friable characteristics. Most of the area within the active portion of the site is classified as Urban land-Omulga complex with a 0- to 6-percent slope that consists of Urban land soils and a deep, nearly level to gently sloping, and moderately well-drained Omulga soil in preglacial valleys. The Urban land is covered by roads, parking lots, buildings, and railroads and is so obscure or altered that soil identification is not feasible (USEC 2004b).

~~USEC~~ The Licensee consulted with the U.S. Department of Agriculture (DOA), Natural Resources Conservation Service (NRCS) in preparation of the Lead Cascade ER (USEC 2004b) and this ER. The Pike County Soil Conservation Service determined that, according to the Soil Survey for Pike County, Ohio, soils within and adjacent to the confines of the DOE reservation are of marginal significance and not prime farmland (i.e., of low fertility as defined by the Soil Survey for Pike County, Ohio). A copy of the letter is provided in Appendix B of this ER.

~~Approximately 190 facilities are located within the DOE reservation as well as the utility structures on the site. In general, the X-100 through X-700 series of buildings are directly related to the GDP. Most of the buildings in this series are located within the 223 ha (550 acre) fenced area. The X-200 and X-300 series are the production buildings and related infrastructure facilities. Most of the buildings and infrastructure included in the X-1000 through X-7000 series of buildings are located within the 81 ha (200 acre) GCEP expansion area. The facilities containing the administrative activities include the facilities numbered in the X-100 series for the GDP and X-1000 series for the more recent construction. The facilities house such activities as administrative offices, engineering, cafeteria, medical services, security, and fire station.~~

The GDP transitioned to Cold Shutdown status on October 1, 2005. The D&D of the GDP process buildings and associated facilities is proceeding in accordance with the April 13, 2010 Director's Final Findings and Orders for Removal Action and Remedial Investigation and Feasibility Study and Remedial Design and Remedial Action (which includes the July 16, 2012 Modification thereto) (DFF&O). The DFF&O is a legal agreement between OEPA and DOE that governs the process for D&D of the buildings/structures that are no longer in use on the DOE reservation.

~~The United States Enrichment Corporation maintains the GDP in cold standby. Cold standby involved placing those portions of the GDP needed for 3 million SWU per year production capacity in a non-operational condition and performing surveillance and maintenance activities necessary to retain the ability to resume operations after a set of restart activities are conducted. Feed and withdrawal systems are also in standby. A cadre of cascade operators, utilities operators, and maintenance staff are retained and form the basis for future restart, operations, and maintenance. The power load to support Cold Standby is about 15 MW.~~ The current total DOE reservation load is 25 to 35 MW depending on the summer-winter variation. The total DOE reservation capacity is approximately ~~2,000~~100 MW with full redundancy for the ACP and GDP.

In June 2004, DOE issued a *Final Environmental Impact Statement for Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility* at the Portsmouth, Ohio site that described the preferred alternative for managing depleted UF_6 (DOE 2004). DOE issued a Record of Decision on July 20, 2004 (DOE 2004c).

~~DOE has proposed to construct and operate a conversion facility at the DOE reservation in Piketon, Ohio. The facility would convert DOE's inventory of depleted UF_6 now located at the DOE reservation in Piketon, Ohio, and the ETTP in Oak Ridge, Tennessee, to a more stable chemical form 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 in a safe and environmentally acceptable manner.~~

~~The proposed site, in general, is bounded on the west side by C Road; on the north and east side by a truck access road; and on the east and south side by a dirt construction road. Excluded from this area are buildings X-616, X-106B, and X-106C (see Figure 3.1-2). The time period considered is a construction period of 2 years, an operational period of 18 years, and a 3-year period for D&D of the facility. The conversion facility started construction in July of 2004 and will be complete in about two years. This assessment is based on the conceptual conversion facility design proposed by the selected contractor, UDS, LLC (DOE 2004).~~

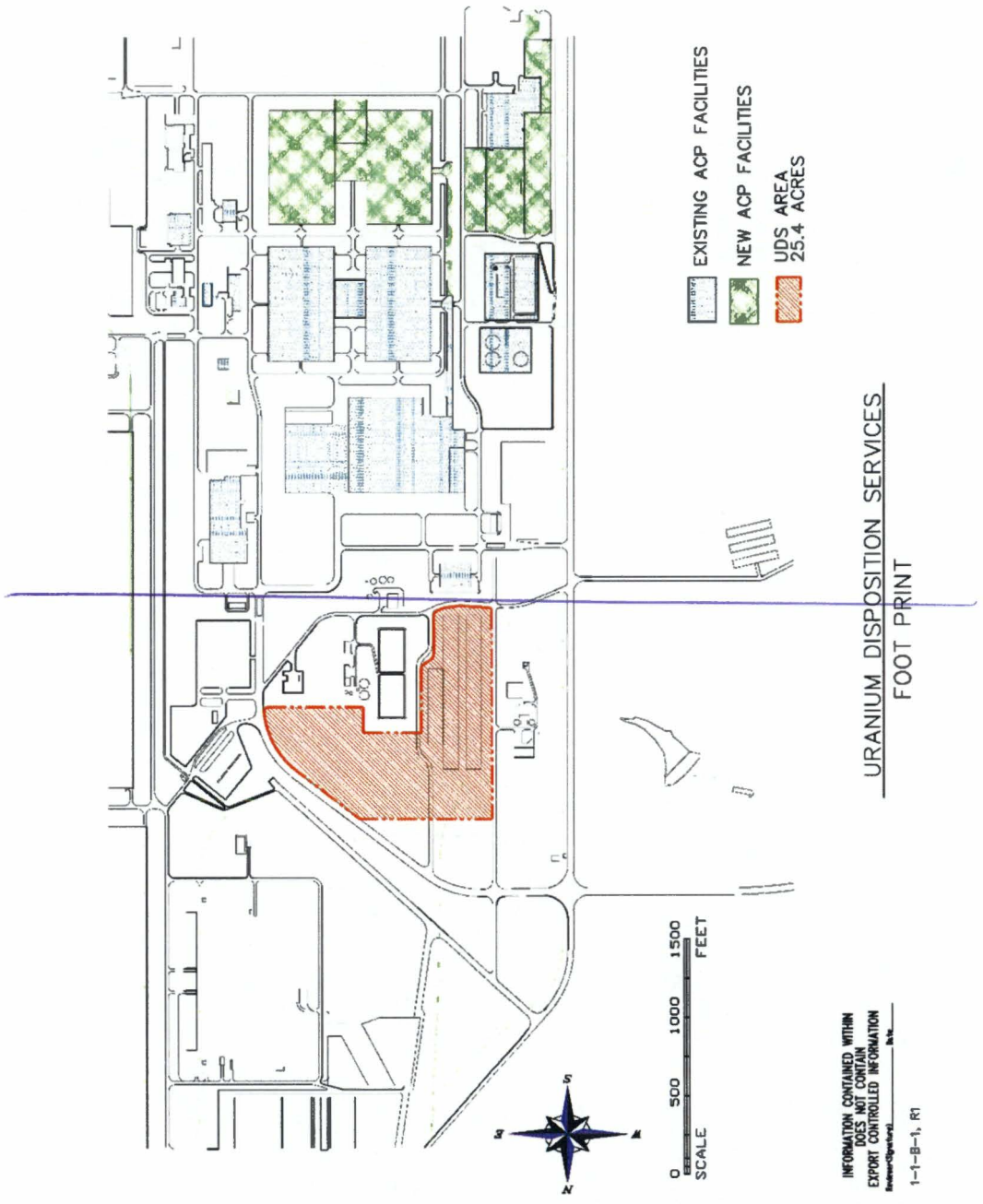
Construction of the Depleted Uranium Hexafluoride Conversion Facility was completed in 2008, and it has been in operation since 2010, managed by Mid-America Conversion Services, LLC (FBP-ER-RCRA-WD-RPT-0288). The facility was designed and constructed to convert DOE's inventory of DUF_6 produced by the former Portsmouth GDP to a more stable uranium oxide form for reuse, storage, and/or transportation and disposition. The process also produces hydrogen fluoride (HF) as a conversion co-product. Excess HF is neutralized to calcium fluoride (CaF2). The DUF_6 area consists of cylinder storage yards, a process building, support buildings, a warehouse and an administration building (DUF6-X-G-DSA-00).

There are no land areas devoted to major uses according to U.S. Geological Survey land use categories affected by the Proposed Action.

There are no special land-use classifications affected by the Proposed Action.

The DOE reservation is consistent with a U.S. Bureau of Land Management (BLM) visual rating of Class IV, which allows major modifications of the existing character of landscapes.

There are no mineral resources, unusual animals, facilities, agricultural practices; game harvests or food processing operations or commercial fishing affected by the Proposed Action.



~~Figure 3.1-2 Uranium Disposition Services Site Location~~

3.2 Transportation

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

The DOE reservation is 5.6 km (3.5 mi) 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 km (70 mi) 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 km (20 mi) southeast of Portsmouth.

SR 32/124/50 runs 298 km (185 mi) 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.

As noted in 2019, the average daily traffic for U.S. Route 23 at the location immediately north of the DOE reservation (#466) was 15,425 and the average daily traffic for Ohio State Routes 32/124 at the location west of Route 23 (#1266) was 15,007 (ODOT, 2020)~~U.S. Route 23 has an average daily traffic volume of 13,990 vehicles. Ohio SR 32/124 has an average daily volume of 7,420 vehicles (traffic in both directions is included in these values)~~. U.S. Route 23 is at 6~~0~~6 percent of design capacity with Ohio SR 32/124 at 8~~4~~0 percent of design capacity. ~~The Ohio Department of Transportation (ODOT) supplied this data from a 1999 traffic study~~. Load limits on these routes are controlled by the Ohio Revised Code at 38,556 kilograms (kgs) (85,000 pounds [lbs]) gross vehicle weight. Special overload permitting is available (DOE 2001b).

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 areas during peak morning/afternoon traffic are at locations where parking lot access roads meet the Perimeter Road. The DOE reservation has 1~~3~~2 parking lots varying in capacity from approximately ~~50~~ 2,600 to ~~800 vehicles~~56,000 square feet. Total parking capacity is ~~for~~ approximately ~~4,400 vehicles~~234,000 square feet. A security fence maintains controlled access to the DOE reservation. There is no land use restricting transportation corridors described within this ER.

3.2.1 Rail

The 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. The on-site system is currently used infrequently. The GCEP area is also connected to the existing rail configuration. Track in the vicinity of Piketon, Ohio, allows a maximum speed of 96.6 kilometers per hour (km/h) (60 miles per hour [mph]). The CSX Transportation Inc. line also provides access to other rail carriers.

3.2.2 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. 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, 7 to 9 days; and to Pittsburgh, 3 to 4 days. The U.S. Army Corps of Engineers maintains the Ohio River at a minimum channel width of 243.8 m (800 ft) and a depth of 2.74 m (9 ft).

3.2.3 Air

The Pike County Airport is located approximately 11 miles north-northeast of the DOE reservation. No commercial flights or cargo shipping occurs there. The 4,900-ft runway supports single and twin-engine planes and small jets. The Greater Portsmouth Regional Airport, located approximately 15 miles southeast of the DOE reservation, provides only light plane service (Class 1 airport). The Chillicothe-Ross County Airport is located approximately 35 miles north-northeast of the DOE reservation. The nearest commercial airports are John Glenn Columbus International Airport in Columbus, Ohio, approximately 75 miles north, Rickenbacker Airport near Columbus, Ohio approximately 60 miles away, the Tri-State Airport in Huntington, West Virginia approximately 65 miles southeast, and the Cincinnati/Northern Kentucky International Airport, approximately 100 miles west.~~Commercial air transportation is provided through the Greater Cincinnati International Airport (approximately 100 miles west), the Port Columbus International Airport (approximately 75 miles north), or the Tri-State Airport (approximately 55 miles south-east). The Greater Portsmouth Regional Airport, serving private and charter aircraft, is located approximately 15 miles southeast near Minford, Ohio, and the Pike County Airport, located just north of Waverly, is a small facility for private planes~~.

3.3 Geology and Soils

Physical characteristics of the DOE reservation have been characterized in several previous investigations. This section discusses the geology and soils found on the DOE reservation and areas in the vicinity based on these investigations.

Site soils were impacted by past releases of hazardous and radioactive materials. DOE is not on the CERCLA National Priority List of sites requiring cleanup, but is regulated under the provisions of CERCLA by a U.S. EPA Administrative Consent Order. The U.S. EPA Administrative Consent Order, issued on September 29, 1989 (amended in 1994 and 1997), and Consent Decree with the State of Ohio, issued on August 29, 1989, requires the investigation and cleanup of surface water and air releases, groundwater contamination plumes, and solid waste management units at the DOE reservation~~PORTS~~. The EPA and OEPA have chosen to oversee environmental remediation activities at DOE under RCRA Corrective Action Program (CAP) instead of the CERCLA Program.

The DOE reservation~~PORTS~~ was divided into quadrants based on groundwater flow

patterns to facilitate the expedient cleanup of contaminated sites in accordance with RCRA Corrective Action and Closure requirements (Figure 3.4.1-1). The Environmental Restoration Program at the DOE reservation~~PORTS~~ addresses requirements of the Ohio Consent Decree and the U.S. EPA Administrative Consent Order (DOE 2002a, 2003a, DOE 2004a).

Section 103 of CERCLA requires notification to the National Response Center if hazardous substances are released to the environment in amounts greater than or equal to the reportable quantity. Reportable quantities are listed in the Act and vary depending on the type of hazardous substances released. The DOE Portsmouth has not ~~During 2003, the United States Enrichment Corporation~~ had ~~no~~any reportable quantity releases of hazardous substances subject to Section 103, Notification Requirements since 2014.

On April 1~~5~~, 20~~0~~14, loose and fallen piping insulation was discovered on the west side of the X-333 Process Building. The piping insulation contained friable asbestos. Based on analysis of the piping insulation, approximately 6 lbs of friable asbestos was released. The National Response Center and Ohio EPA were notified of the release. The piping insulation was recovered and the affected area was cleaned. No additional actions were necessary. ~~at approximately 0315 hours, outside the X-326 Building at the intersection of 15th Street and Pike Avenue, an 18-inch expansion joint on an exterior steam supply line ruptured during routine utilities operations. The asbestos insulating the expansion joint was released to the ground resulting in a hazardous material spill of approximately one to two pounds of asbestos. The material was cleaned up by asbestos-trained personnel, double bagged, labeled as asbestos and containerized for proper disposal.~~

~~United States Enrichment Corporation~~
~~Ohio EPA Spill ID#0404-66-15-12~~
~~National Response Center Report #718893~~
~~Hazardous Substance Release 30-Day Follow-Up Report mailed to OEPA on May 7, 2004~~

3.3.1 Site Geology

The DOE reservation in Piketon, Ohio is located within the Appalachian Plateau physiographic province. The uppermost rock units in this region were deposited in an inland sea during the Paleozoic Era. At the end of the Paleozoic Era (230 million years ago), the region was uplifted and gently folded to form a shallow basin that trends parallel to the Appalachian Mountains. Subsequent erosion of the uplifted sediments produced the deeply dissected, knobby terrain that characterizes the region today. The geologic structure of the area is simple and dominated by relatively flat-lying Paleozoic shale and sandstones that are overlain by Pleistocene fluvial and lacustrine deposits. The near-surface geologic materials that influence the hydrologic system of the site consist of several bedrock formations and unconsolidated deposits.

The bedrock formations include (from oldest to youngest) Bedford Shale, Berea Sandstone, Sunbury Shale, and Cuyahoga Shale. These formations dip gently to the east-southeast with no known geologic faults that are located in the area; however, joints and fractures are present in the bedrock formations.

The unconsolidated deposits that overlie bedrock are comprised of clay, silt, sand, and gravel, and are classified as the Minford (Clay and Silt members) and the Gallia (Sand and Gravel

members) of the Teays formation. Prior to the Pleistocene glaciation, the Teays River and its tributaries were the dominant drainage system in Ohio.

The preglacial Portsmouth River, a tributary of the Teays, flowed north across the plant site, cutting down through the Cuyahoga Shale and into the Sunbury Shale and Berea Sandstone, and deposited fluvial silt, sand, and gravel of the Gallia member of the Teays Formation. Figure 3.3.1-1 illustrates the location of the Ancient Newark (Modern Scioto) and Teays Valleys in the DOE reservation vicinity. Figure 3.3.1-2 illustrates the geologic cross sections in the vicinity of the DOE reservation.

3.3.1.1 Bedrock Geology

Bedrock consisting of clastic sedimentary rocks underlies the unconsolidated sediments beneath the site. The geologic structure of the area is simple, with the bedrock (Cuyahoga Shale, Sunbury Shale, Berea Sandstone, and Bedford Shale) dipping gently to the east-southeast. No known geologic faults are located in the area; however, joints and fractures are present in the bedrock formations.

Bedford Shale is the lowest stratigraphic unit encountered during environmental investigative activities at the site. Bedford Shale is composed of thinly bedded shale with interbeds and laminations of grey, fine-grained sandstone and siltstone. The typical depth to the top of this formation at the site is 21 to 30 m (70 to 100 ft) below ground surface (bgs). However, Bedford Shale outcrops are present in deeply incised streams and valleys within the DOE reservation. The Bedford Shale averages 31 m (100 ft) in thickness.

Berea Sandstone is a light grey, thickly bedded, fine-grained sandstone with thin shale laminations. The top 3 to 5 m (10 to 15 ft) consists of a massive sandstone bed with few joints or shale laminae. The Berea Sandstone averages 11 m (35 ft) in thickness; however, the lower 3 m (10 ft) has numerous shale laminations and is similar to the underlying Bedford Shale. This gradational contact does not allow for a precise determination of the thickness of the Berea Sandstone. Regionally, Berea Sandstone contains naturally occurring hydrocarbons (oil and gas) in quantities sufficient for commercial production. Generally, within Perimeter Road, the Berea Sandstone is the uppermost bedrock unit beneath the western portion of the site but is overlain by the Sunbury Shale to the east.

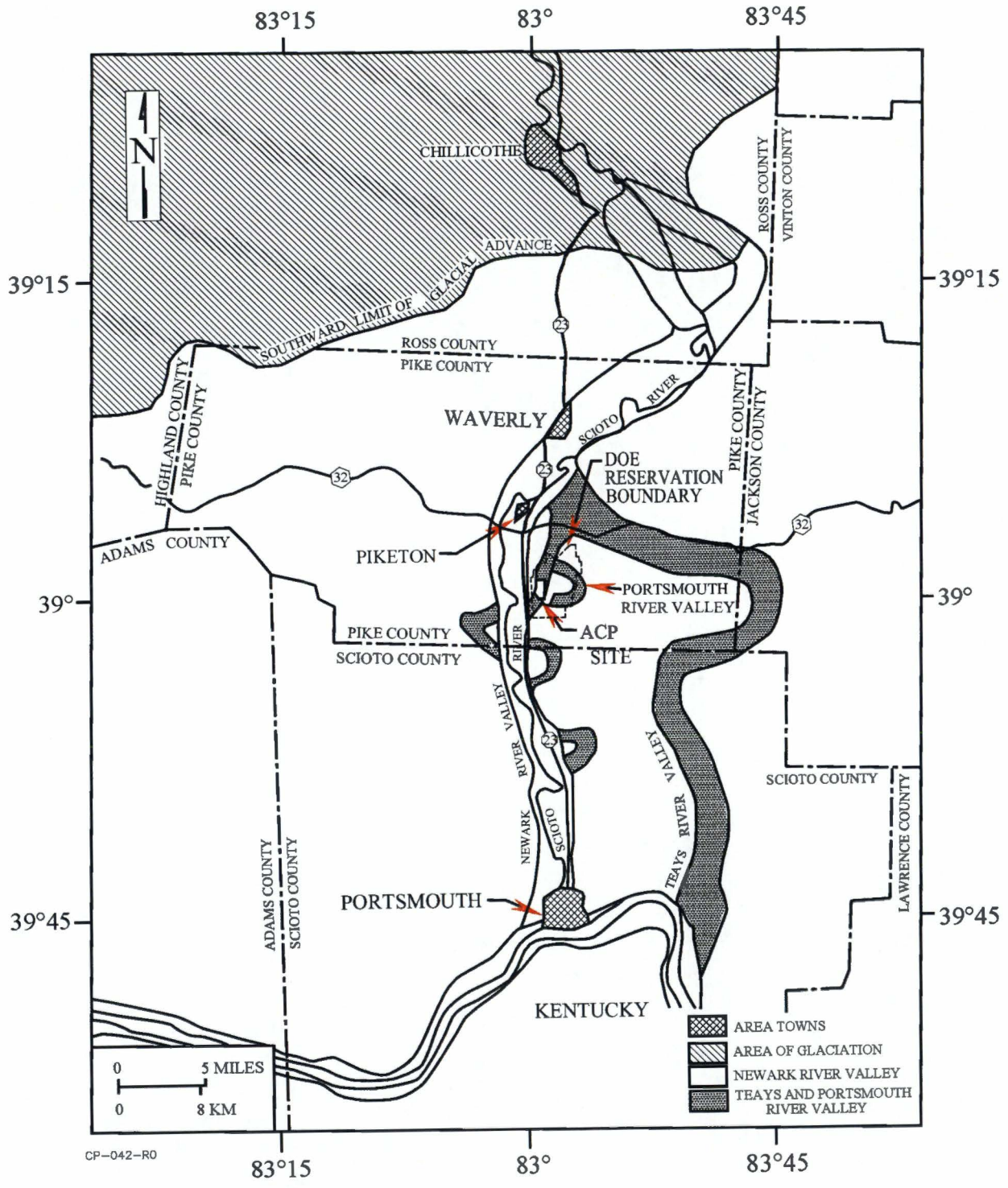


Figure 3.3.1-1 Location of Ancient Newark River

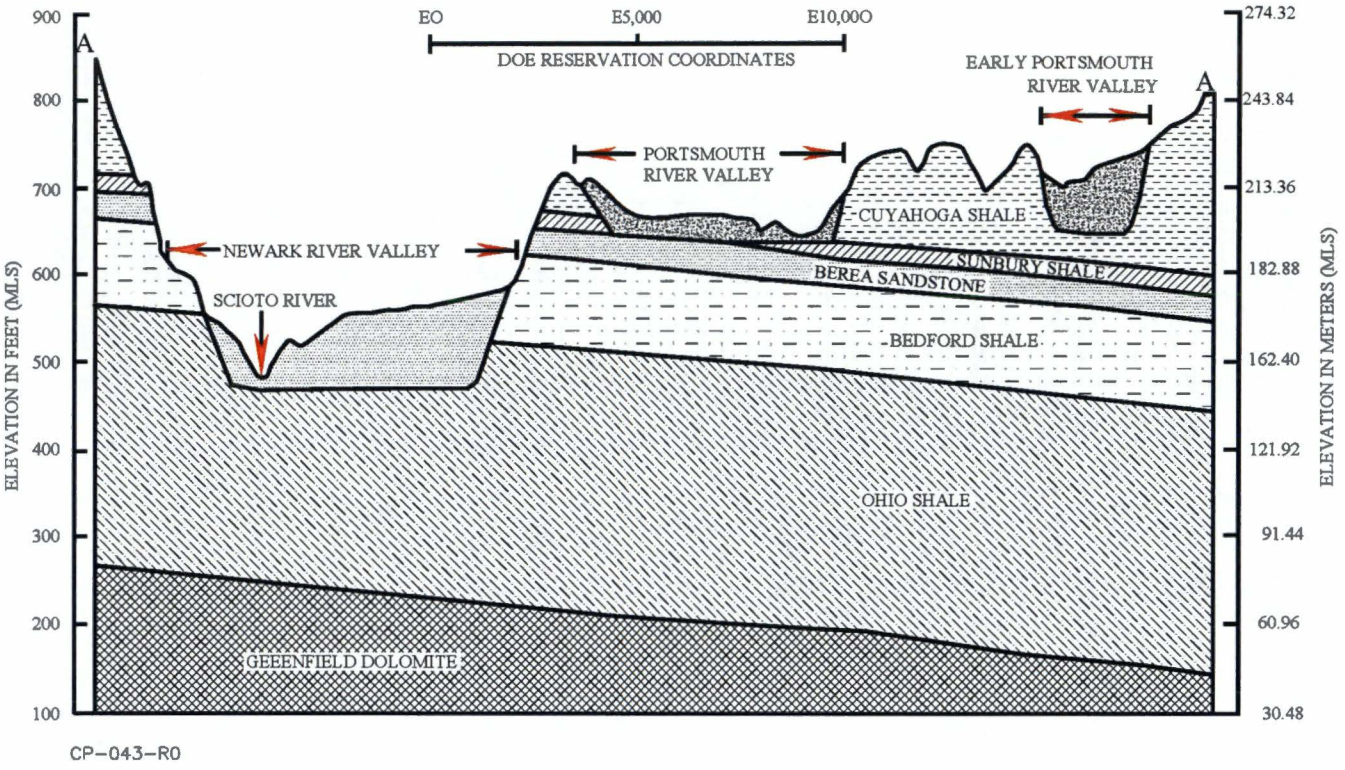


Figure 3.3.1-2 Geologic Cross Section

Sunbury Shale is a black, very carbonaceous shale. The Sunbury Shale is 6 m (20 ft) thick beneath much of the site, but thins westward as a result of erosion by the ancient Portsmouth River, and is absent on the western half of the site. The Sunbury Shale also is absent in the drainage of Little Beaver Creek downstream of the X-611A Lime Sludge Lagoons and the southern portion of Big Run Creek, where it has been removed by erosion. The Sunbury Shale underlies the unconsolidated Gallia beneath the most industrialized eastern portion of the site and underlies the Cuyahoga Shale outside of the Portsmouth River Valley.

Cuyahoga Shale, the youngest and uppermost bedrock unit at the site, forms the hills surrounding the site. The Cuyahoga Shale has been eroded from most of the active portion of the site. It consists of grey, thinly bedded shale with scattered lenses of fine-grained sandstone and regionally reaches a thickness of approximately 49 m (160 ft).

3.3.1.2 Unconsolidated Deposits

Unconsolidated deposits in the vicinity of the site fill the ancient Portsmouth River Valley to depths of approximately 9 to 12 m (30 to 40 ft). The unconsolidated deposits are divided into two members of the Teays Formation, the Minford Clay and Silt and the Gallia Sand and Gravel.

Minford is the uppermost stratigraphic unit beneath the site. The Minford averages 6 to 9 m (20 to 30 ft) in thickness and grades from predominantly silt and very fine sand at its base to

clay near the surface. The upper clay unit averages 5 m (16 ft) in thickness, is reddish-brown, plastic, and silty, and contains traces of sand and fine gravel in some locations. These thicknesses vary greatly as a result of construction cutting and filling operations, as discussed in the next paragraph. The lower silt unit averages 2 m (7 ft) in thickness, is yellow-brown and semiplastic, and contains varying amounts of clay and very fine sand.

During the initial grading of the site, the deposits within the Perimeter Road were reworked to a depth as great as 6 m (20 ft) by preconstruction cut and fill activity. In most cases, the fill is indistinguishable from the undisturbed Minford. The combination of construction activities, bedrock topography, and erosion by modern streams has influenced the areal extent and thickness of the Minford on the DOE reservation.

Gallia Sand and Gravel were deposited prior to Pleistocene glaciation when the Portsmouth River meandered north through the valley currently occupied by the site. The Gallia averages 0.9 to 1 m (3 to 4 ft) in thickness at the site and is characterized by poorly sorted sand and gravel with silt and clay. Channel migration and variation in depositional environments that occurred during deposition of the Gallia resulted in the variable thickness of the Gallia. The areas of thickest accumulation of Gallia may represent the former channel location and include areas under the southern end of the X-330 building and near the X-701B. Gallia deposits beneath the site are generally absent above an approximate elevation of 198 m (650 ft) above mean sea level (amsl).

As a result of similar depositional environments and source material, deposits from modern streams at the site often are visually indistinguishable from Gallia deposits. The modern surface-water drainage also has eroded the unconsolidated sediments and resulted in locally thin or absent Gallia and Minford.

3.3.2 Soils

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 FPPA which seeks "... to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmlands to nonagricultural uses..." (7 USC 4201[b]). According to the Soil Survey of Pike County, Ohio, (USDA 1990) 22 soil types occur within the DOE reservation property boundary with the predominant soil type being Omulga Silt Loam. These soils are well drained and have a surface layer of dark grayish-brown friable silt loam. The underlying soils are approximately 54 in. thick and are distinguished by their yellowish-brown, mottled, and friable characteristics. Most of the area within the active portion of the site is classified as Urban land-Omulga complex with a 0- to 6-percent slope that consists of Urban land soils and a deep, nearly level, gently sloping, and moderately well-drained Omulga soil in preglacial valleys. The Urban land is covered by roads, parking lots, buildings, and railroads and is so obscure or altered that soil identification is not feasible (USEC 2004b).

~~USEC~~ The Licensee consulted with the DOA NRCS in preparation of this ER. The Pike County Soil Conservation Service determined that, according to the Soil Survey for Pike County, Ohio, soils within and adjacent to the confines of the DOE reservation are of marginal significance

and not prime farmland (i.e., of low fertility as defined by the Soil Survey for Pike County, Ohio). A copy of the letter is provided in Appendix B of this ER.

Results of the 2017 soil sampling program collected from 15 locations are detailed in Table 3.3.2-1.

Table 3.3.2-1 Soil Sampling Monitoring Results

Soil Sampling Monitoring Results	
Analyte	Highest Concentration
Plutonium-239/240	0.0152 pCi/g
Uranium	2.86 pCi/g
Uranium-233/234	1.12 pCi/g
Uranium-235/236	0.0494 pCi/g
Uranium-238	0.953 pCi/g

Source: FBP-ER-RCRA-WD-RPT-0288.

Plutonium-239/240 was detected in soil at six of the 15 ambient air monitoring stations including the background monitoring station (A37). These detections were most likely present due to atmospheric fallout from nuclear weapons testing. The detections were 0.0152 pCi/g or less, which is much less than the soil screening level for plutonium-239/240 – 3.78 pCi/g. These screening levels were calculated using the exposure assumptions in the Methods for Conducting Human Health Risk Assessments and Risk Evaluations at the Portsmouth Gaseous Diffusion Plant (DOE 2017e).

Uranium, uranium-233/234, uranium-235/236, and/or uranium-238 were detected in soil at each of the sampling locations. Uranium and uranium isotopes are usually detected at similar levels at all the soil sampling locations, including the background location (A37), which suggests that the uranium detected in these samples is due to naturally-occurring uranium.

A dose assessment was completed based on the detections of radionuclides in soil at the off-site ambient air station with the concentrations of radionuclides that could cause the highest dose to a member of the public (station A12, east of PORTS on McCorkle Road). Detections of uranium-233/234 (0.513 pCi/g), uranium-235/236 (0.0285 pCi/g), and uranium-238 (0.435 pCi/g) result in a calculated dose of 0.018 mrem/year, which is well below the DOE limit of 100 mrem/year in DOE Order 458.1 (FBP-ER-RCRA-WD-RPT-0288). Complete details on the most current DOE reservation soil sampling results are detailed in FBP-ER-RCRA-WD-RPT-0288.

~~In 2002, soil samples in the process area at 15 DOE sampling locations and 46 United States Enrichment Corporation sampling locations indicated the following measurable ranges of contamination (see Table 3.3.2-1).~~

~~Table 3.3.2-1 Soil Sampling Monitoring Results~~

~~Soil Sampling Monitoring Results~~	
~~Uranium~~	~~0.68-15.4 µg/g~~

^{99}Tc	0.14-12.6 pCi/g
Beta activity	8.4-57.8 pCi/g
Alpha activity	4.1-58.8 pCi/g

Source: DOE 2003a, USEC 2004d

The 15 DOE sampling locations were also analyzed for ^{241}Am, ^{237}Np, ^{238}Pu, and $^{239/240}$Pu. No detectable concentrations of any of these nuclides were found.

The higher results for detected parameters were found inside the security fence, with one sampling location accounting for all of the maximum values. Analytical results for alpha activity, beta activity, and total uranium from the external samples collected near the DOE reservation are not appreciably different from results of samples collected 16.1 km (10 mi) from the DOE reservation. ^{99}Tc was detected at 1.5 picocuries per gram (pCi/g) or less at two external soil-sampling locations and at less than 0.5 pCi/g at four other external soil-sampling locations (DOE 2003a, USEC 2004d).

For sediment samples, ^{99}Tc is usually detected in locations downstream from the DOE reservation. In 2002, ^{99}Tc was detected in one of both of the samples collected from upstream and downstream sampling locations on Little Beaver Creek and Big Beaver Creek. ^{99}Tc was detected in one of both downstream samples collected from Big Run Creek and the Scioto River. ^{99}Tc was also detected in the sediment samples collected from the X-2230N and X-2230M discharges and one of the background sampling locations 16.1 km (10 mi) from the DOE reservation. Many of the detections of ^{99}Tc were at or close to the detection limit for the analytical method. In general, levels of ^{99}Tc are consistent with results from 1999 through 2001, with the exception of RM-8 (DOE 2003a).

Results of the 2017 soil sampling program collected from 18 locations are detailed in Table 3.3.2-2.

Table 3.3.2-2 Sediment Sampling Monitoring Results

	2003	2017
Technicium-99	13.4 µCi/g	3.62 pCi/g
Neptunium-237	None detected	0.00975 pCi/g
Plutonium-239/240	None detected	0.00961 pCi/g
Uranium	5.44 µg/g	4.57 µg/g
Uranium-233/234	7.01 µCi/g	6.88 pCi/g
Uranium-235/236	0.358 µCi/g	0.291 pCi/g
Uranium-238	1.80 µCi/g	1.52 pCi/g

Source: FBP-ER-RCRA-WD-RPT-0288

A dose assessment was completed based on the detections of radionuclides in sediment at the off-site sediment sampling location with the detections of radionuclides that could cause the highest dose to a member of the public (RM-7 on Little Beaver Creek). Detections of technetium-99 (3.42 pCi/g), uranium-233/234 (2.55 pCi/g), uranium-235/236 (0.128 pCi/g), and uranium-238 (0.774 pCi/g) result in a calculated dose of 0.019 mrem/year, which is well below the DOE standard of 100 mrem/year in DOE Order 458.1 (FBP-ER-RCRA-WD-RPT-0288). Complete details on the most current DOE reservation soil sampling results are detailed in FBP-ER-RCRA-WD-RPT-0288.

~~In 2002, sediment samples from each sampling location were analyzed for uranium isotopes ($^{233/234}$U, ^{235}U, ^{236}U, and ^{238}U) and transuranic radionuclides (^{241}Am, ^{237}Np, ^{238}Pu, and $^{239/240}$Pu). Total uranium and uranium isotope concentrations were consistent with results from 1999 through 2001, with the exception of RM-8. Transuranics were not detected, with the exception of RM-8 (DOE 2003a).~~

~~In the fall of 2002, ^{99}Tc, ^{237}Np, $^{239/240}$Pu and uranium were detected at elevated levels at sampling location RM-8 in Little Beaver Creek. This location is downstream of the discharge from the X-230L North Holding Pond and upstream of the DOE reservation boundary (DOE 2003a). When RM-8 was re-sampled in spring of 2003, concentrations had returned to normal levels (USEC 2004d). The measured concentrations are depicted in Table 3.3.2-2.~~

~~**Table 3.3.2-2 Sediment Sampling Monitoring Results**~~

~~Sediment Sampling Monitoring Results~~			
		~~Fall 2002~~	~~Spring 2003~~
~~^{99}Tc~~	~~pCi/g~~	~~689~~	~~13.4~~
~~^{237}Np~~	~~pCi/g~~	~~0.262~~	~~Not detected~~
~~$^{239/240}$Pu~~	~~pCi/g~~	~~0.0701~~	~~Not detected~~
~~Uranium~~	~~µg/g~~	~~35.1~~	~~5.44~~
~~$^{233/234}$U~~	~~pCi/g~~	~~37.9~~	~~7.01~~
~~^{235}U~~	~~pCi/g~~	~~1.84~~	~~0.358~~
~~^{238}U~~	~~pCi/g~~	~~11.6~~	~~1.80~~

~~Source: DOE 2003a, USEC 2004d~~

3.3.3 Seismicity

The New Madrid Seismic Zone (NMSZ) dominates the seismicity of the Midwest region, which includes the DOE reservation. The four great shocks in the years 1811-1812 were each large enough to produce intensities capable of causing minor damage in the southern Ohio region (e.g., broken windows, fallen plaster). Three historical earthquakes not associated with the NMSZ were found capable of producing this level of damage. All but one of the epicenters of these seismic events are at least 100 km (62 mi) from the DOE reservation (U.S. Geologic Survey [USGS] 1997).

The closest known fault to the DOE reservation, the Kentucky River fault zone, is within 40 km (25 mi) of the site, and no seismicity has been recorded on it. Soil testing for the GCEP facility indicated that the potential for earthquake-induced soil liquefaction is relatively low. The potential for soil-structure interaction (ground-motion magnification) is also slight. Pike County is not one of the potential jurisdictions listed in Appendix VI of 40 CFR Part 264 for which compliance with seismic standards must be demonstrated (USEC 2003a).

There are no major geologic fault structures in the vicinity of the site~~, and there have been no historical earthquake epicenters within less than 25 miles from the site~~. However, two small earthquakes have occurred since 2014. On December 21, 2014, a magnitude 2.0 event occurred in Union Township of Pike County, approximately four miles southeast of the DOE reservation. On March 20, 2019, a magnitude 2.1 event occurred in Minford, Scioto County, approximately 12 miles southeast of the DOE reservation (OGS, 2020).

~~However, t~~There have been eight other earthquake epicenters within 50 miles of the DOE reservation. The maximum event had an epicenter intensity of over IV on the Modified Mercalli (MM) scale. These events were at the site with intensities between IV and I. The maximum peak ground acceleration (PGA) of a MM level IV event roughly corresponds to 0.02 gravity. Historically, the maximum earthquake-induced PGA experienced at the site was in 1955 and had a value of only 0.005 gravity.

In the Preliminary Safety Analysis Report developed for GCEP during the 1980s, the DOE documented the results of studies of the historic seismicity of the area surrounding the DOE reservation. Data was developed on probable seismic activity and the intensity levels were converted into acceleration values. The maximum earthquake was defined as one with a mean recurrence interval of 1,000 years. This corresponds to an earthquake with a horizontal PGA of 0.15 gravity. Thus, the DOE considered that it was sufficient to design the structures, systems, and components necessary for safety to withstand this level earthquake without leading to undue risk to the health and safety of workers, the public or the environment. That is, the 1,000-year return earthquake was the design basis earthquake (DBE) for GCEP.

3.3.3.1 Surface Faulting

The geologic setting of the site suggests there is a low probability of faulting within five miles of the site. No data from the three extensive geotechnical studies at the site (rock shearing, sharp changes in strata dip, and flexures) are characteristic of faulted rocks. The available data indicates the site bedrock is not faulted.

3.3.3.2 Liquefaction Potential

Three extensive exploration and laboratory testing programs (data sets) have been completed at the site, with the total number of approximately 960 exploratory borings. These borings and accompanying laboratory test results were used at the site to analyze the response of soil to ground shaking caused by earthquakes.

The laboratory classification tests, shear strength tests, and consolidation test data were used to define the general engineering characteristics of the soil. Analysis of the data indicates that there is a low potential for soil liquefaction at the site, even in the unlikely event of the occurrence of an earthquake of magnitude 5.25 with a maximum PGA of 0.15 gravity. Consequently, settlement in the site area due to liquefaction is unlikely.

3.4 Water Resources

This section discusses surface water and groundwater resources present in the vicinity of the ACP.

3.4.1 Groundwater

The groundwater system at the site includes two water-bearing units (the bedrock Berea Sandstone and the unconsolidated Gallia) and two aquitards (the Sunbury Shale and the unconsolidated Minford). The basal portion of the Minford is generally grouped with the Gallia to form the uppermost and primary aquifer at the facility. The hydraulic properties of these units and groundwater flow at the site have been well defined (USEC 2004b).

Groundwater recharge and discharge areas include both natural and manmade recharge and discharge areas. Natural recharge to the groundwater flow system at the site comes from precipitation. Land use and the presence of thick upper Minford Clay and the Sunbury Shale effectively reduce recharge to underlying units. Recharge to the Minford and Gallia is reduced because a large percentage of the land is paved or covered by buildings. However, recharge to the Berea Sandstone from the overlying Gallia is increased as a result of the absence of the Sunbury Shale beneath the site (USEC 2004b).

For the purposes of DOE environmental restoration activities previously performed at the DOE reservation, the site was divided into four quadrants based on groundwater flow patterns. Each quadrant roughly corresponds to a distinct groundwater flow cell within the primary water-bearing unit beneath the site (DOE 2004a) (Figure 3.4.1-1).

Quadrant I - includes the southern portion of the DOE reservation and contains X-749 and X-120 area

Quadrant II - includes the eastern portion of the DOE reservation and contains X-701B Holding Pond

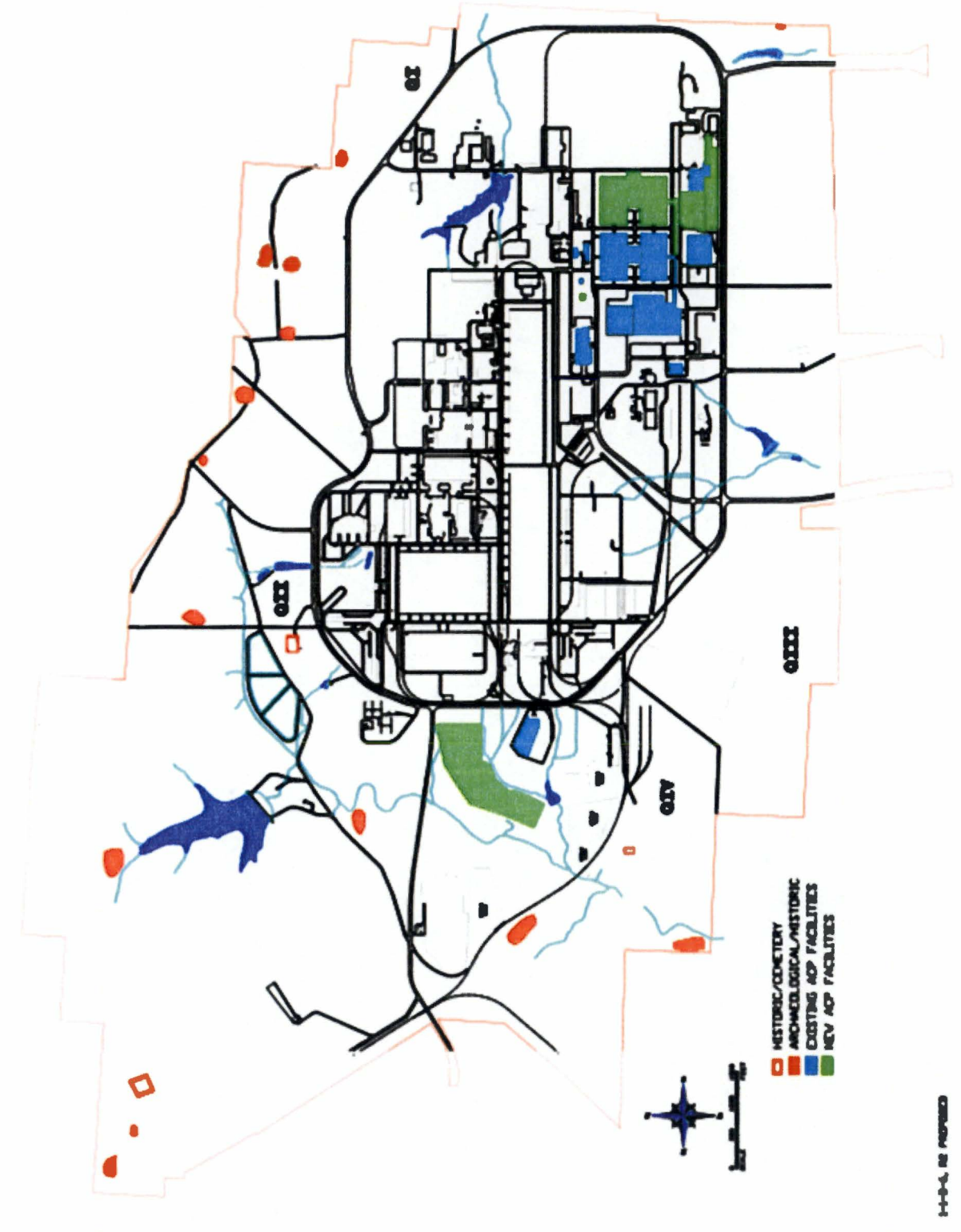
Quadrant III - includes the western portion of the DOE reservation and contains X-616 and X-740 area

Quadrant IV- includes the northern portion of the DOE reservation and contains X-611A and X-735 area

Groundwater at the site discharges primarily to surface streams. Groundwater in the eastern and northern portions of the facility discharges to the East and North Drainage Ditches and to the Little Beaver Creek. In the southern portion of the ACP, groundwater discharges to the Big Run Creek and to the unnamed Southwest drainage ditch. Along the western boundary of the site, the West Drainage Ditch serves as a local discharge area for the geologic units (USEC 2004b).

Groundwater recharge and discharge areas at the site are also affected by manmade features including the storm sewer system, the sanitary sewer system, the RCW system, water lines, and building sumps.

Groundwater is used as a domestic, municipal, and industrial water supply in the vicinity of the DOE reservation. Most municipal and industrial water supplies in Pike County are developed from the Scioto River Valley buried aquifer. Domestic water supplies are obtained from either unconsolidated deposits in preglacial valleys, major tributaries to the Scioto River Valley, or from fractured bedrock encountered during drilling. Groundwater in the Berea sandstone and Gallia sand formations that underlie the DOE reservation is not used as a domestic, municipal, or industrial water supply (USEC 2004b).


HISTORIC/CEMETERY
ARCHAEOLOGICAL/HISTORIC
EXISTING ACP FACILITIES
NEW ACP FACILITIES

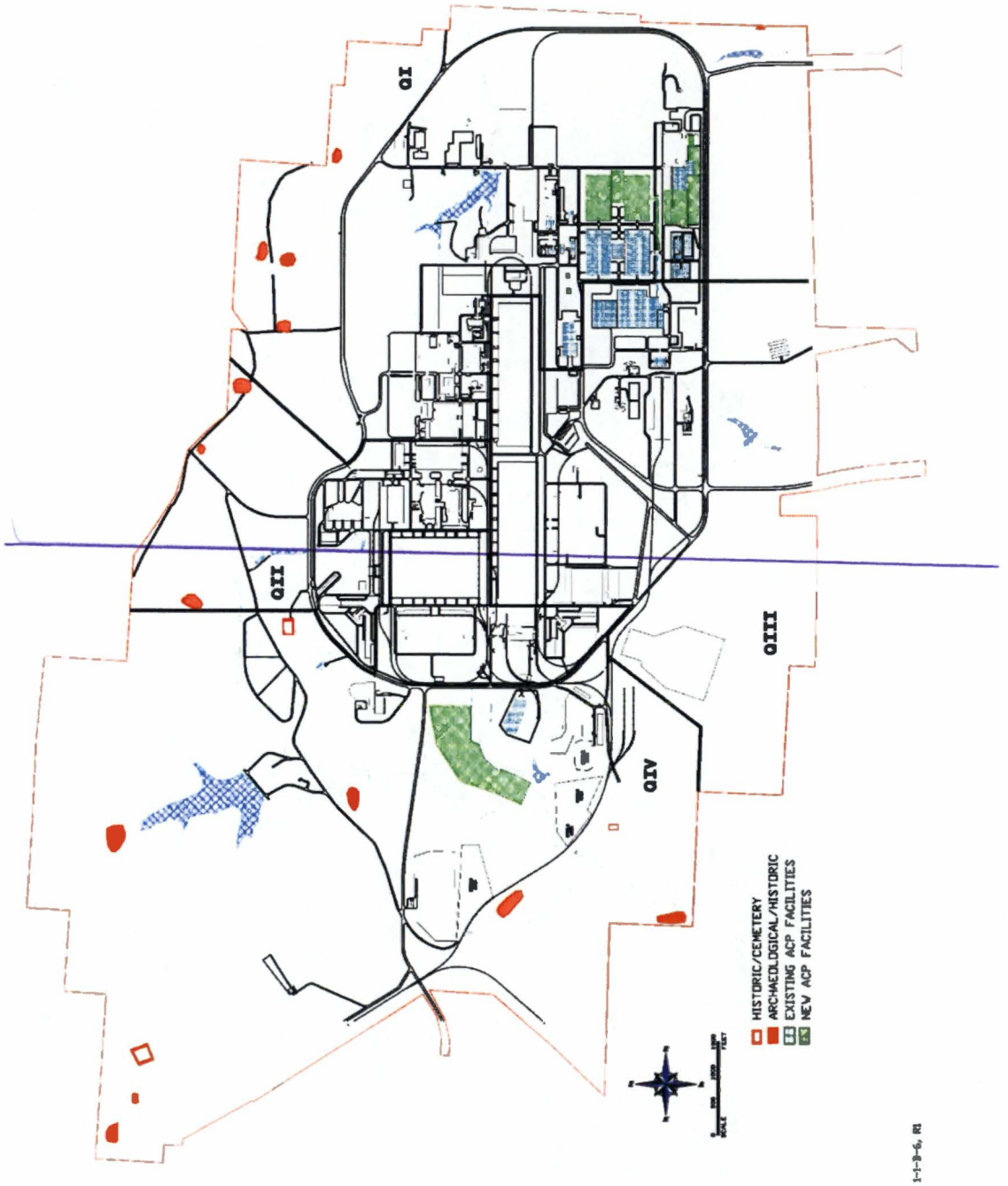


Figure 3.4.1-1 U.S. Department of Energy Environmental Restoration Quadrants

The DOE reservation obtains its water from water supply well fields, which are next to the Scioto River south of Piketon. The wells tap the Scioto River Valley buried aquifer. The maximum potential water production for the DOE reservation water system is ~~49,000 cubic meters (m^3) daily (~~1320 million gallons per day [MGD]) for the entire site, including ~~USEC~~ Licensee activities. Current water usage is ~~less than 19,000 m^3 daily (5~~approximately 2.5 MGD~~) (USEC 2004b)~~.

In 200217, a combined annual total of approximately ~~107,500 m^3/yr (28.4~~35.5 million gallons per year [gal/yr]) of contaminated groundwater was treated through DOE Groundwater Treatment Facilities. Approximately ~~545 liters (L) (~~14421 gallons [Gal]) of trichloroethylene (TCE) were removed from the groundwater. All processed water was discharged through NPDES outfalls before exiting the site (FBP-ER-RCRA-WD-RPT-0288~~DOE 2003a~~).

Five NPDES outfalls discharge groundwater that is recovered and treated for volatile organic compounds (VOC). ~~These outfalls discharged the following maximum concentrations: trichloroethene (11 micrograms per liter [µg/L]), and 1,2 trans-dichloroethene (<1 µg/L) in 2002. The maximum trichloroethene concentration occurred twice at the X-623 Groundwater Treatment Facility. The maximum allowable concentration at this outfall is 10 µg/L. Other than this, a~~All groundwater discharges were within NPDES discharge limitations in 2017 (FBP-ER-RCRA-WD-RPT-0288). ~~(DOE 2003a).~~

Eleven groundwater-monitoring areas exist at the DOE reservation. Three of these areas are within close proximity to the buildings proposed to house the ACP facilities: the X-749/X-120/Peter Kiewit Landfill Monitoring Area (located just to the south of the ACP in Quadrant I), the Quadrant I Groundwater Investigative Area/X-749A Classified Materials Disposal Facility (located just to the east of the ACP), and the former X-616 Chromium Sludge Surface Impoundments Area in Quadrant III (located just to the north of the ACP) (DOE 2003a, DOE 2004a, FBP-ER-RCRA-WD-RPT-0288).

Groundwater contamination plumes are associated with the X-749/X-120/Peter Kiewit Landfill Monitoring Area and the Quadrant I Groundwater Investigative Area/X-749A Classified Materials Disposal Facility. The most extensive and most concentrated constituent is trichloroethene. Other contaminants associated with these two plumes include xylene, vinyl chloride, cobalt, and radionuclides (uranium, ^{99}Tc, and ^{241}Am). Remediation activities are being performed through the RCRA CAP (DOE 2003a, DOE 2004a, FBP-ER-RCRA-WD-RPT-0288).

Chromium was a contaminant at the former X-616 Chromium Sludge Surface Impoundments in Quadrant III. These impoundments have undergone remediation and are currently monitored with 16 monitoring wells. Chromium has exceeded the preliminary remediation goal in one well, and Nickel has been exceeded in two wells. Low levels of volatile organic compounds have also been detected. This area is being addressed through the RCRA CAP (DOE 2003a, DOE 2004a, FBP-ER-RCRA-WD-RPT-0288).

3.4.2 Surface Water

The Piketon DOE reservation occupies an upland area bordered on the east and west by ridges of low-lying hills that have been deeply eroded by present and past drainage features. The site elevation is 200 m (670 ft) amsl, which is about 40 m (113 ft) above the normal stage of the

Scioto River. A network of tributaries of the Scioto River drains both groundwater and surface water at the site. Figure 3.1-1 shows the surface water features in the vicinity of the DOE reservation.

The Scioto River, approximately 3.2 km (2 mi) west of the DOE reservation, is a tributary of the Ohio River. The two rivers converge approximately 40 km (25 mi) south of the DOE reservation. Lake White is the only other body of water nearby, located approximately 10 km (6 mi) north of the site. Pike Water, Inc. draws water from wells for a rural public water supply. The Village of Piketon also utilizes wells along the Scioto River for public water supply (OEPA 2004). There are no known public or private water supply draws from the Scioto River ~~(USEC 02)~~.

The site is drained by several small tributaries of the Scioto River, which flow south to the Ohio River. Sources of surface-water drainage include storm-water runoff, groundwater discharge, and effluent from plant processes.

The largest stream on the site is Little Beaver Creek, which drains the northern and northwestern portions of the site before discharging into Big Beaver Creek. Little Beaver Creek is a small, high-gradient, unmodified stream that receives the majority of its flow from East, North, and Northeast Holding Ponds discharges and Ditches (USEC 2004b) (see Figures 3.1-1 and 3.4.2-1).

Big Run Creek, located in the southeastern portion of the site, receives outfall effluent from the South Holding Pond at the headwaters of the stream. Big Run Creek continues southwest from the DOE property line until it discharges into the Scioto River, approximately 6.4 km (4 mi) from the site. The substrates are predominated by gravel and cobble, and the channel has remained unmodified.

In addition, two ditches drain the western and southwestern portions of the site. Their flow is usually low to intermittent. These two drainage ditches continue west and, ultimately, discharge into the Scioto River. Storm water discharges from the proposed ACP will exit via the unnamed southwest drainage ditch or limited resource water, a designation that indicates a lower-quality habitat. The fauna in limited resource water has been substantially degraded, and recovery is realistically precluded due to natural background conditions or irretrievable human-induced conditions. The Ohio Administrative Code (OAC) has determined the unnamed southwest drainage ditch to be a "small drainage way maintenance" (i.e., a highly modified surface-water drainage way that does not possess the stream morphology and habitat characteristics necessary to support any other aquatic life habitat use). The unnamed southwest drainage ditch is considered suitable for irrigation and livestock watering without treatment, commercial and industrial uses with or without treatment, and partial body contact recreational activities (such as wading) with minimal threat to public health as a result of water quality (USEC 2004b).

The West Ditch is located on the southwest side of the DOE reservation and receives a minimal amount of storm-water runoff from the proposed site for the ACP. The unnamed southwest drainage ditch and the West Ditch eventually drain into the Scioto River, (Figure 3.4.2-2) a warm-water habitat capable of supporting and maintaining a balanced, integrated, adaptive community of warm-water organisms. The water is considered suitable for irrigation and livestock watering without treatment, commercial and industrial uses with or without treatment, and recreational activities (such as swimming, canoeing, and scuba diving) with minimal threat to public health as a result of water quality. These two drainage ditches continue west and, ultimately, discharge into the Scioto River, which is approximately 3.2 km (2 mi) west of the DOE reservation. There are no known public or private water supply draws from the drainage ditches except for agriculture.

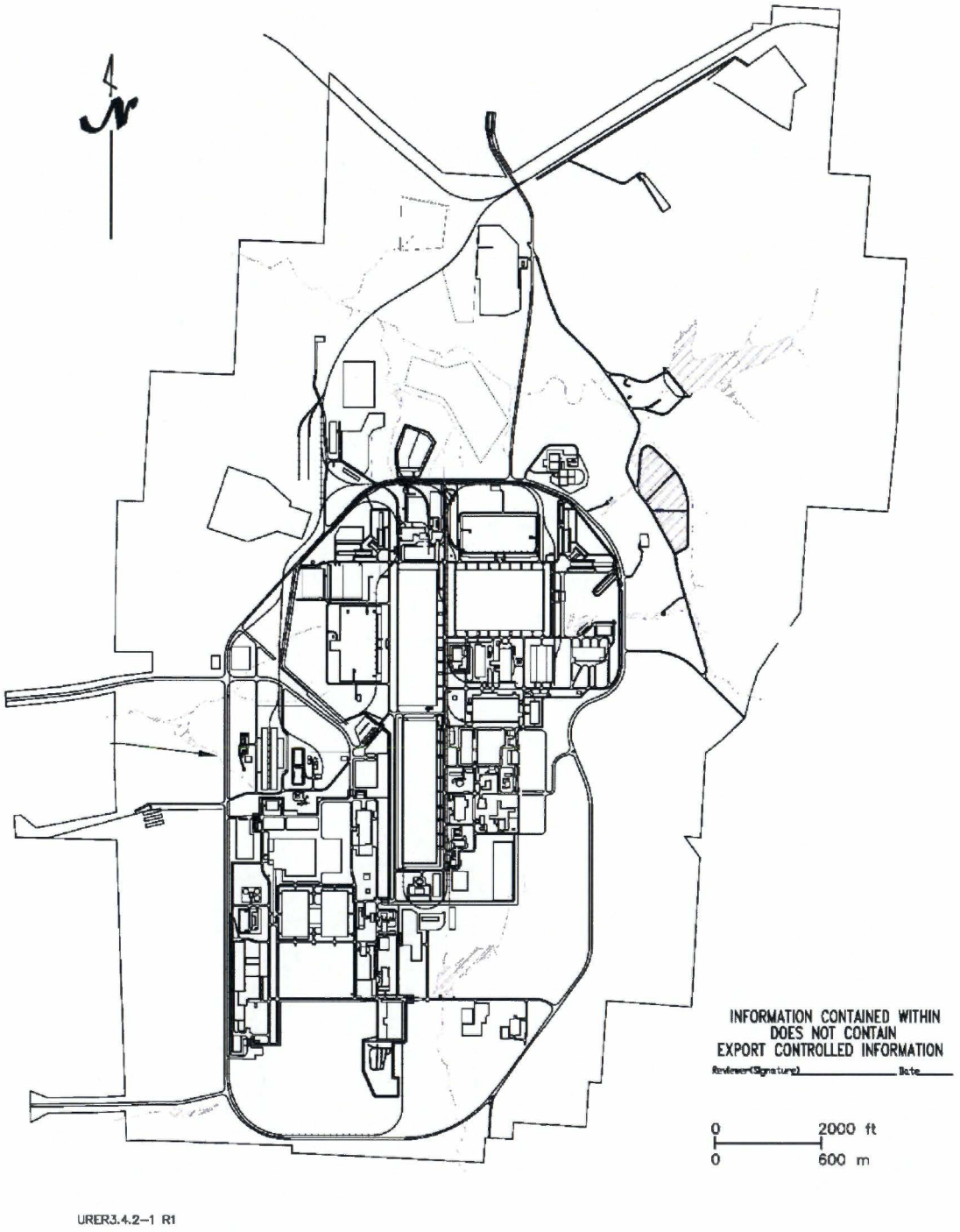
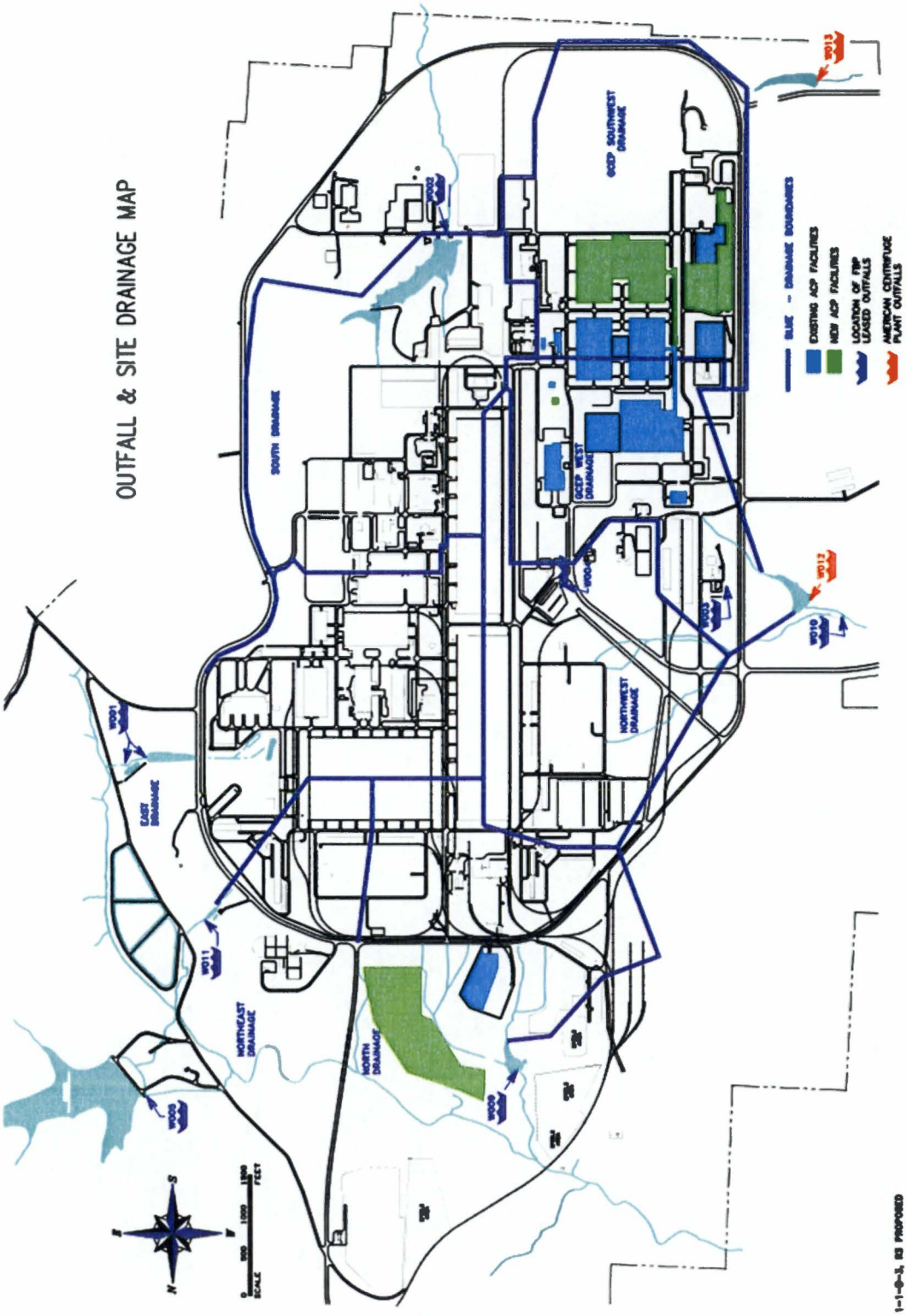


Figure 3.4.2-1 Ponds and Lagoons on the U.S. Department of Energy Reservation


OUTFALL & SITE DRAINAGE MAP
BLUE - DRAINAGE BOUNDARIES
EXISTING ACP FACILITIES
NEW ACP FACILITIES
LOCATION OF FBP LEASED OUTFALLS
AMERICAN CENTRIFUGE PLANT OUTFALLS
SOUTH DRAINAGE
EAST DRAINAGE
NORTHEAST DRAINAGE
NORTH DRAINAGE
NORTHWEST DRAINAGE
WEST DRAINAGE
SOUTHWEST DRAINAGE
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FEET
1-1-0-3, R3 PROPOSED

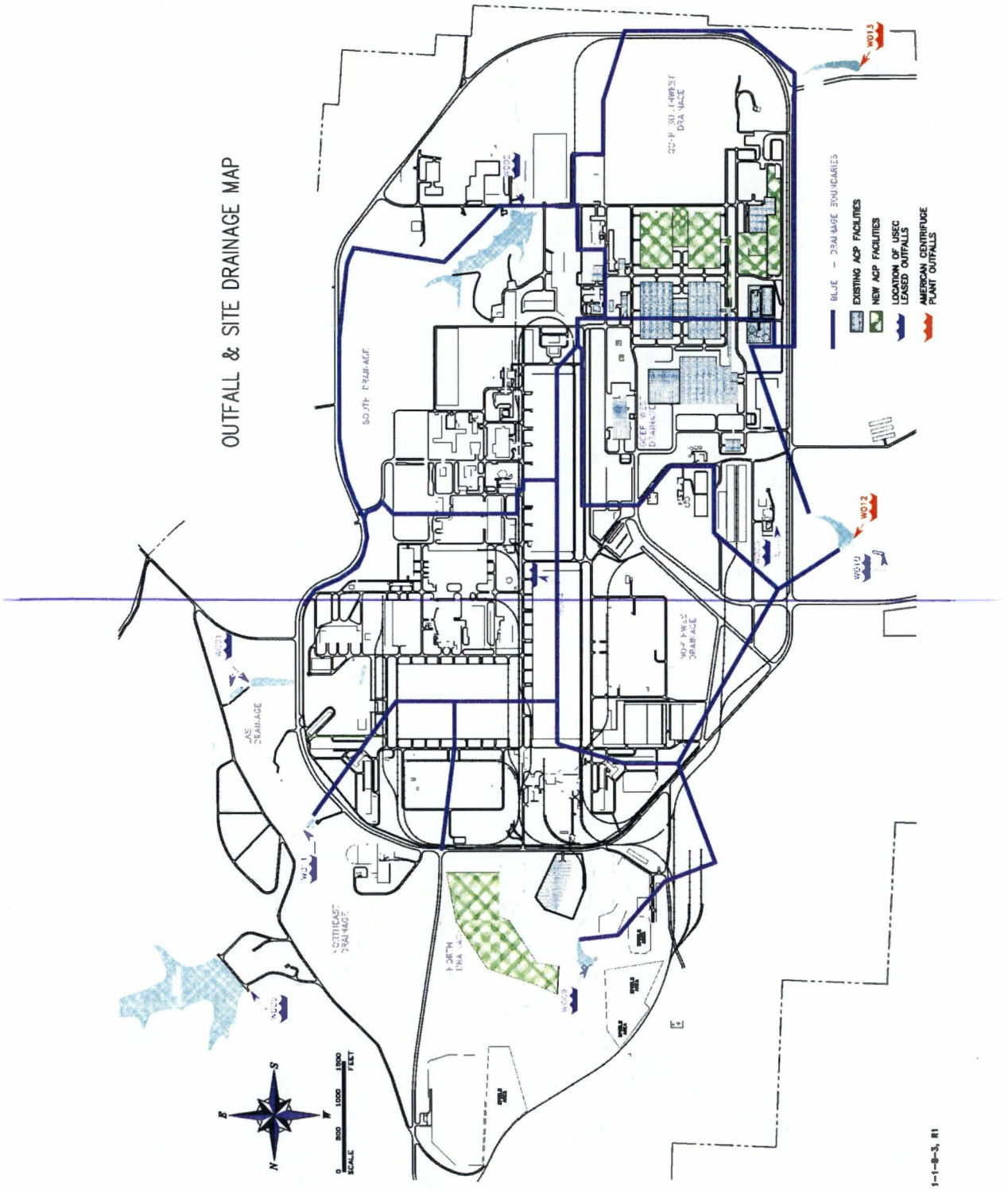


Figure 3.4.2-2 U.S. Department of Energy Reservation Drainage Map

At the Higby gauging station, which is approximately 13 miles north of the DOE reservation, the minimum river flow measured from 1930 to 200~~1~~18 was 244 cubic feet per second (cfs) on October 23, 1930 (~~USEC-02~~). The consecutive seven-day minimum discharge record of 255 cfs occurred during October 19-25, 1930 (~~USEC-02~~). The consecutive seven-day minimum discharge record of 255 cfs occurred during October 19-25, 1930 (~~USEC-02~~, USGS, 2020). The volumetric river flow is much greater than the DOE reservation's water use.

DOE has ~~eight~~ several discharge points, or outfalls, through which water is discharged from the site. In support of ACP operations, the GDP NPDES permits have been modified to transfer ownership of certain discharge points. The Licensee now has two outfalls that discharge directly to surface water and one outfall that discharges to the Fluor-BWXT Portsmouth (FBP) X-6619 Sewage Treatment Plant before leaving site through FBP Outfall 003 to the Scioto River. FBP has eight outfalls and nine internal outfalls. Mid-America Conversion Services (MCS) has one external outfall and one internal outfall ~~Three DOE outfalls discharge directly to surface water (i.e., unnamed streams that flow to the Scioto River and Little Beaver Creek); three outfalls discharge to the GDP X-6619 STP before leaving the site through the United States Enrichment Corporation Outfall 003 to the Scioto River; and two outfalls discharge to holding ponds. The United States Enrichment Corporation is responsible for 11 NPDES outfalls at the DOE reservation. Eight NPDES outfalls discharge directly to surface water (i.e., West Drainage Ditch to Scioto River, Little Beaver Creek, Big Run Creek, and the Scioto River); two outfalls discharge to the GDP X-6619 STP (Outfall 003); and one outfall discharges to the X-230K South Holding Pond (Outfall 002) (USEC 2004b)~~ (see Figures 3.4.2-3 through 3.4.2-9).

The domestic wastewater, generated by the offices and change houses, is treated locally at the GDP X-6619 STP, which is currently operating within its NPDES permit. As per ~~the United States Enrichment Corporation~~FBP's NPDES permit, the design capacity of the STP is 2,275,032 liters per day (L/d) (601,000 gallons per day [GPD]) (USEC 2004b). As per NPDES monitoring ~~over the previous year~~in 2017, it is currently operating at ~~25~~37 percent of that capacity. The following maximum contaminant concentrations were measured in the STP discharge in 200217: ~~alpha activity (46 pCi/g), beta activity (335 pCi/g),~~ ^{99}Tc (~~288~~ 55.7 pCi/g), and uranium (~~18~~2.261 µg/g). In 2017, the overall Licensee's NPDES compliance rate was 100 percent. Discharge limitations at the Licensee's NPDES monitoring locations were not exceeded. In 2017, the overall FBP's NPDES compliance rate was 99 percent, with further details being provided in FBP-ER-RCRA-WD-RPT-0288.

In 2017, the surface water sampling program collected samples from 14 upstream and downstream locations on the Scioto River, Little Beaver Creek and Big Beaver Creek. Samples were collected semiannually and analyzed for transuranic radionuclides (americium-241, neptunium-237, plutonium-238, and plutonium-239/240), technetium-99, uranium, and uranium isotopes (uranium-233/234, uranium-235/236, and uranium-238). No transuranic radionuclides were detected in the local surface water samples collected during 2017. Maximum detections of technetium-99 and uranium isotopes in local surface water samples are listed in Table 3.4.2-1.

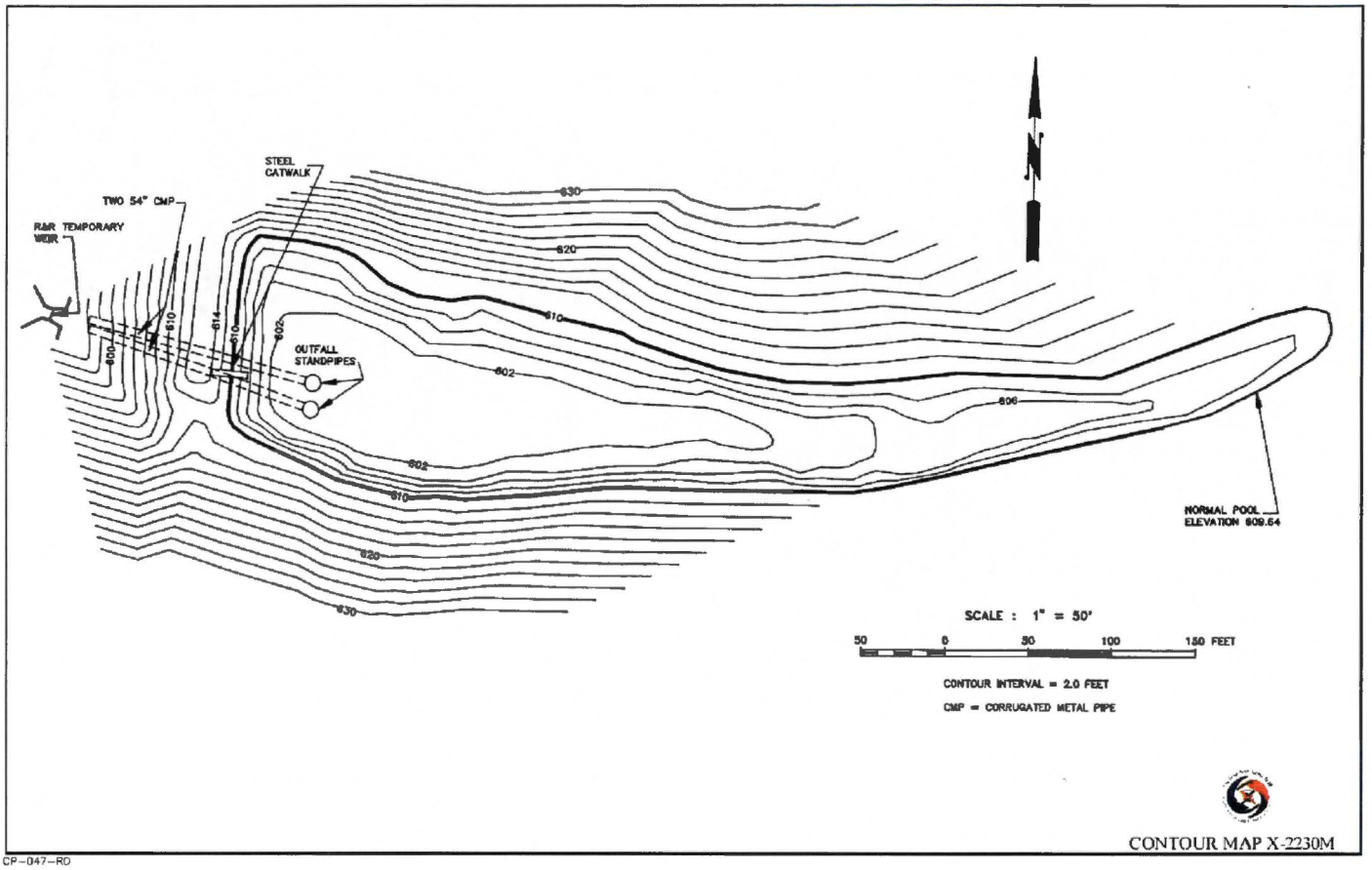


Figure 3.4.2-3 Contour Map of X-2230M

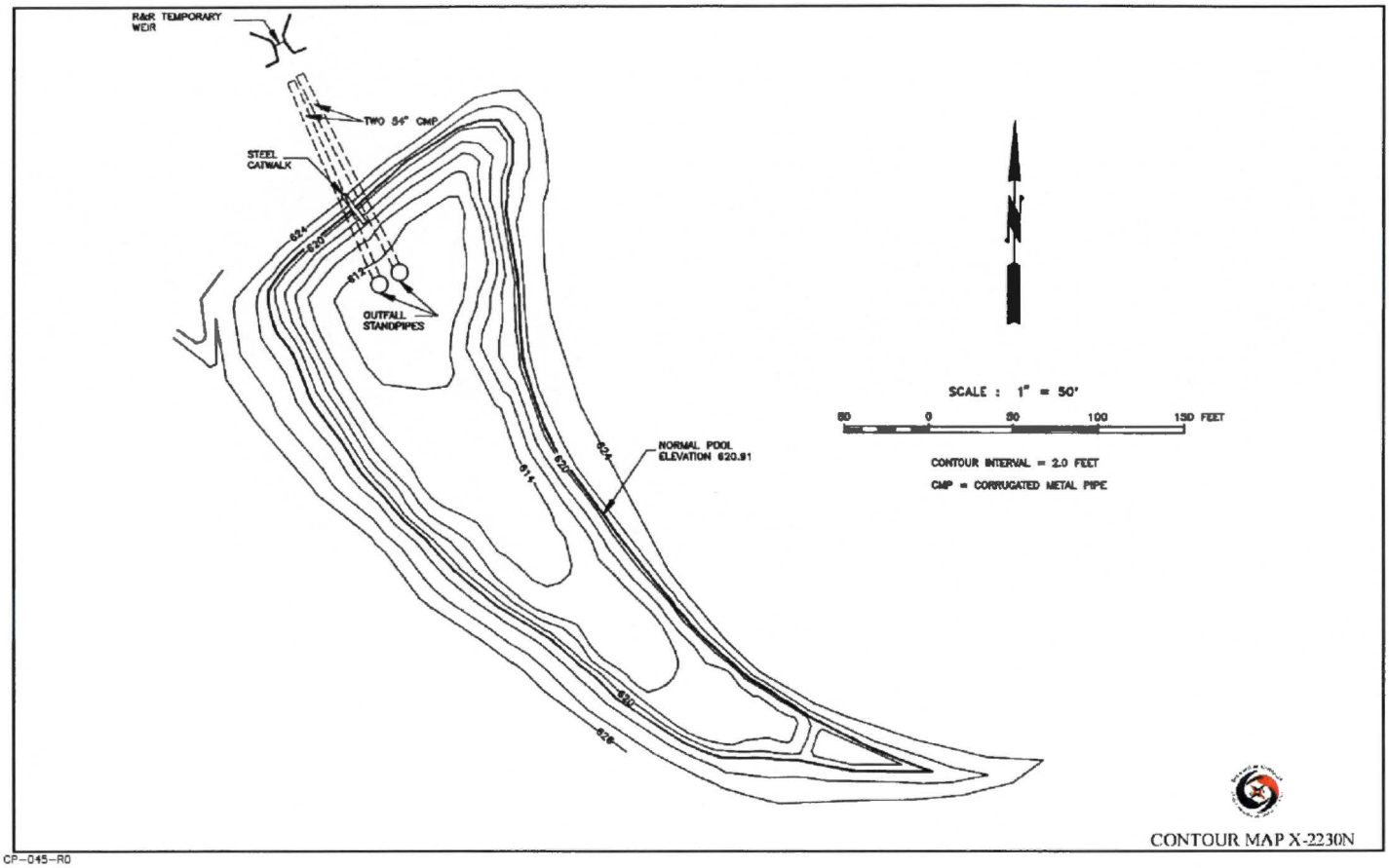


Figure 3.4.2-4 Contour Map of X-2230N

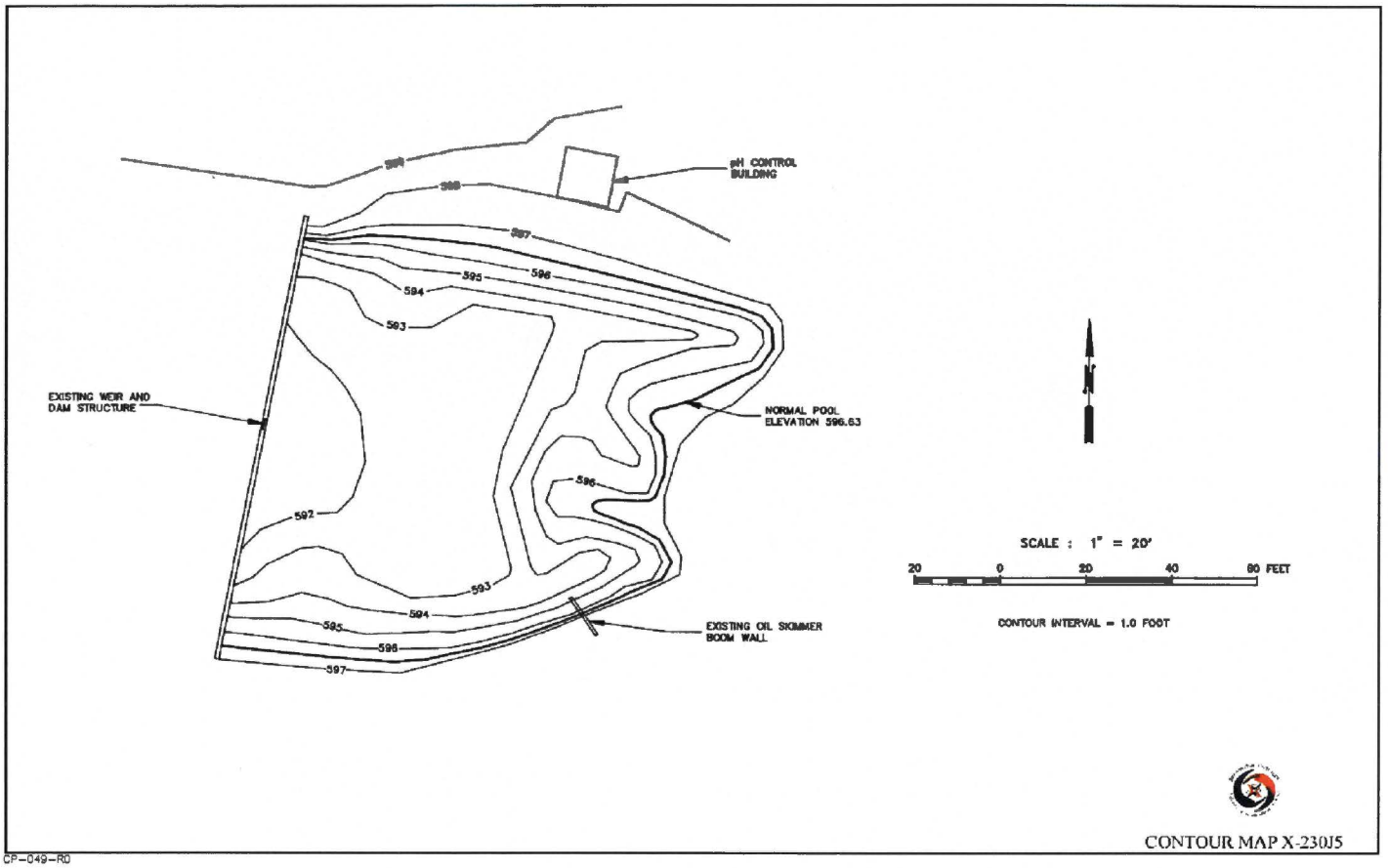


Figure 3.4.2-5 Contour Map of X-230J5

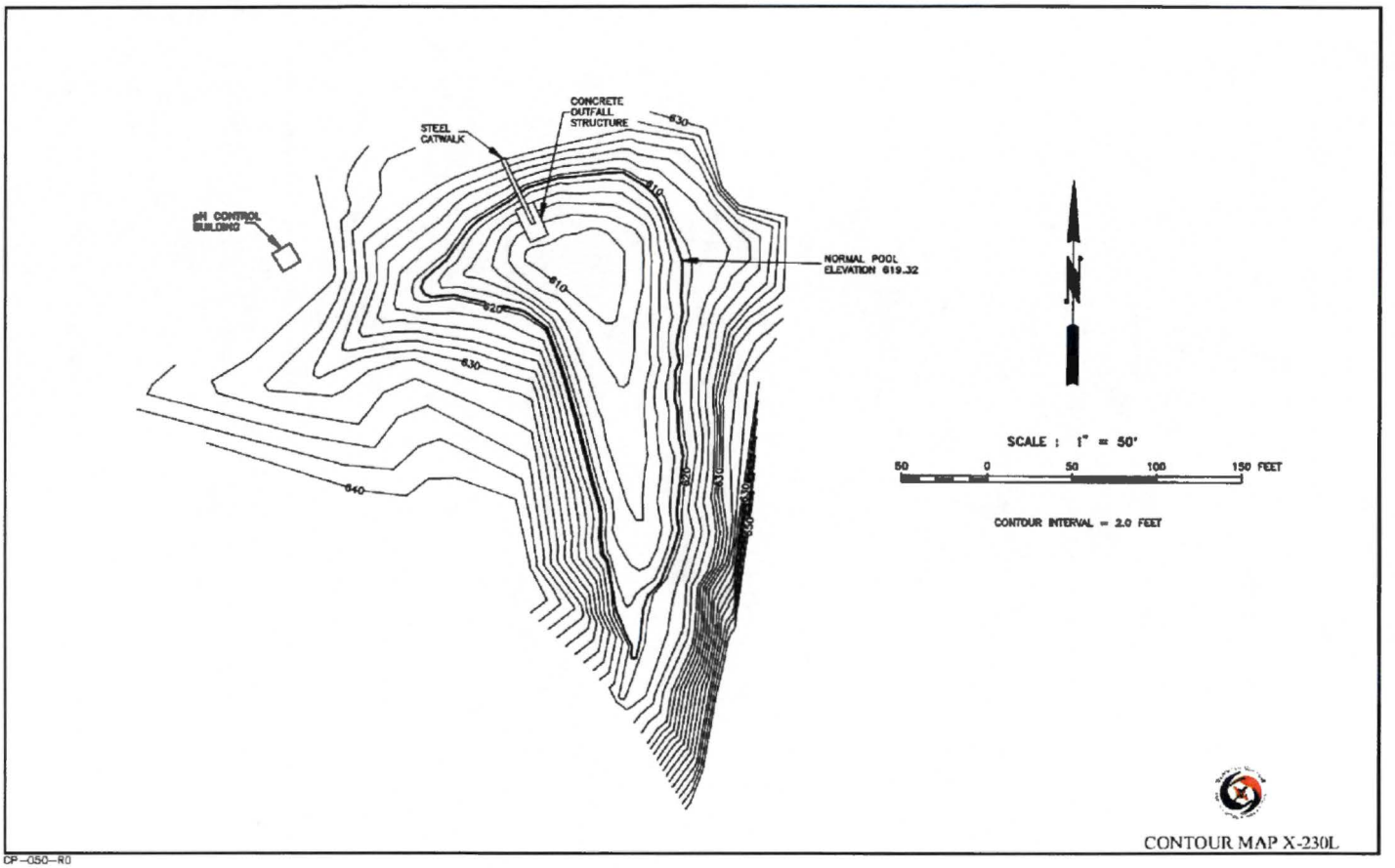


Figure 3.4.2-6 Contour Map of X-230L

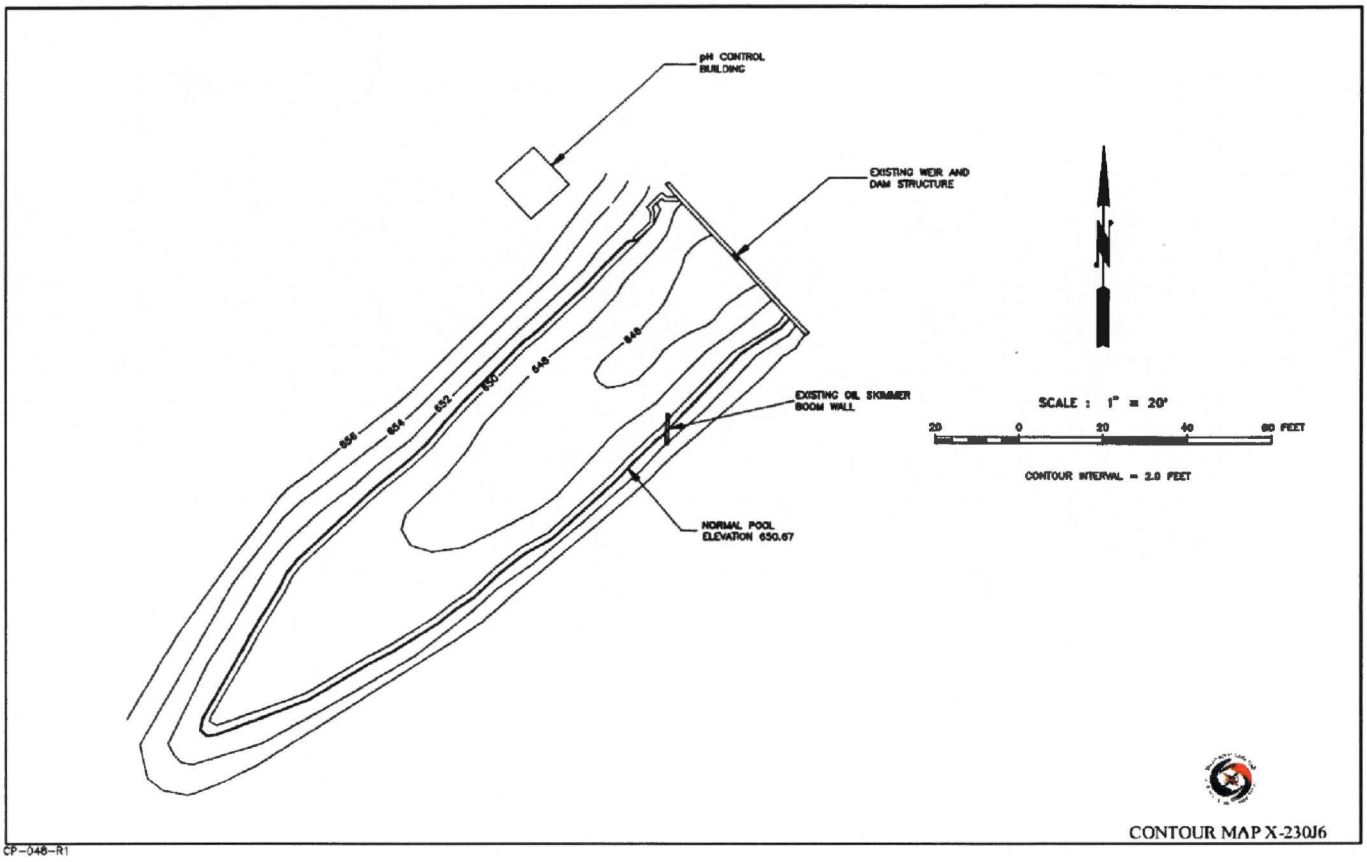


Figure 3.4.2-7 Contour Map of X-230J6

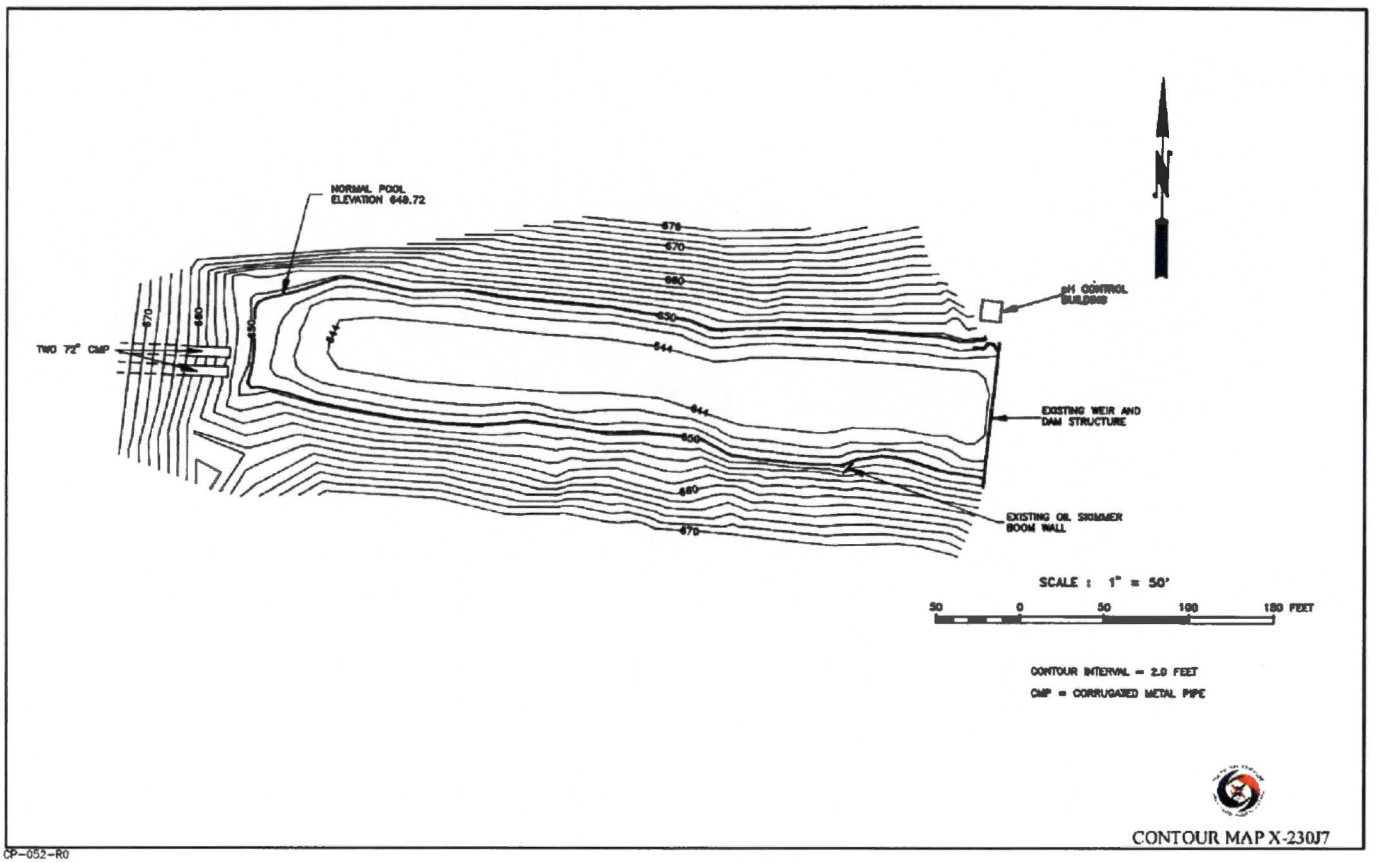


Figure 3.4.2-8 Contour Map of X-230J7

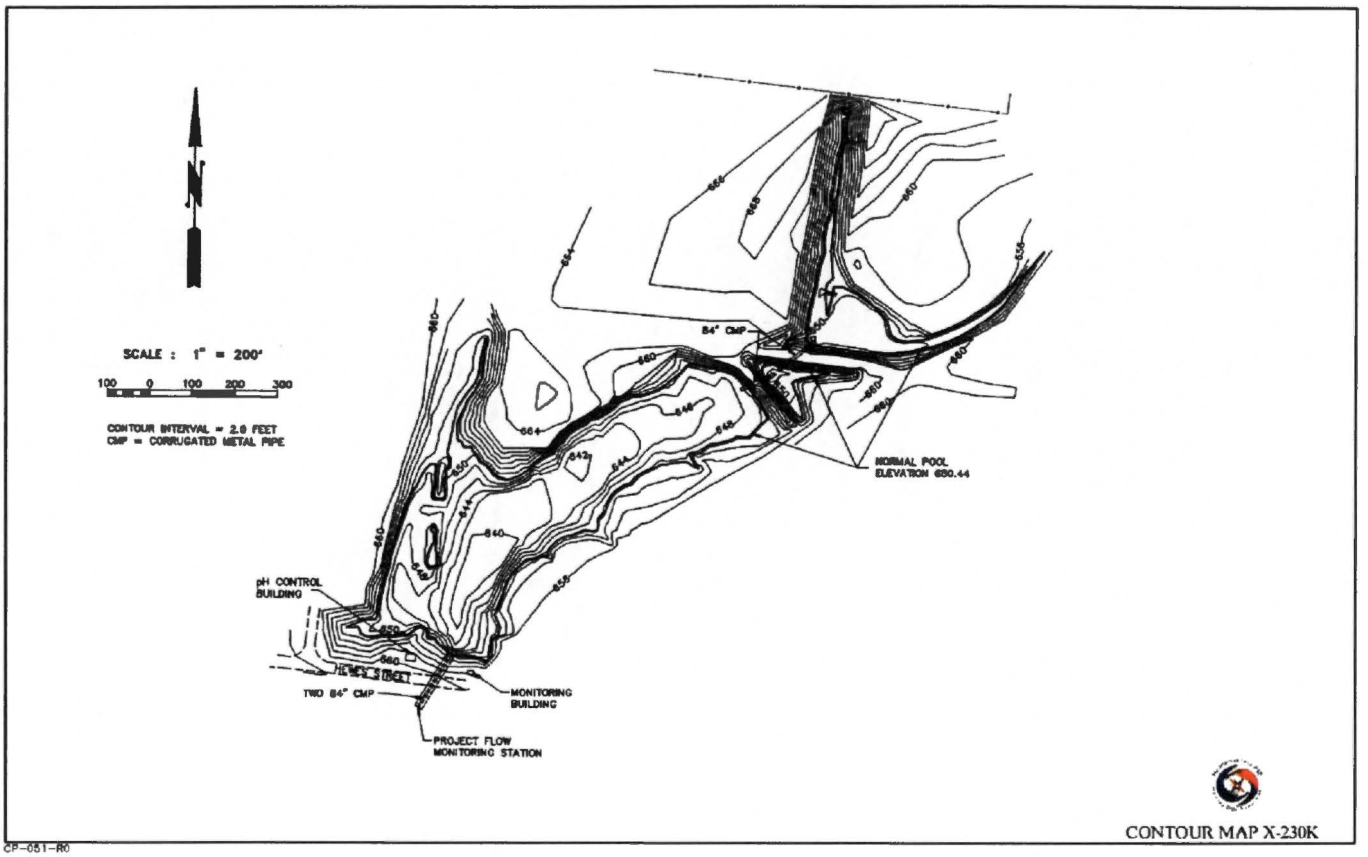


Figure 3.4.2-9 Contour Map of X-230K

Table 3.4.2-1 Surface Water Sampling Monitoring Results

Radionuclide	Maximum activity (pCi/L)	Location	Derived Concentration Standard (DCS)	Percentage of DCS
Technetium-99	9.12	RW-13	44,000	0.02%
Uranium-233/23	4.72	RW-7	680	0.7%
Uranium-235/236	0.214	RW-7	720	0.03%
Uranium-238	1.02	RW-7	750	0.1%

Source: FBP-ER-RCRA-WD-RPT-0288

In 2017, the following maximum levels of uranium and uranium isotopes were detected in surface water at the ~~DUF6~~DOE cylinder storage yards: uranium at 44.5 µg/L, Alpha Activity at 303 pCi/L, and Beta Activity at 232 µCi/L. Results for the ~~MCS~~DUF_6 cylinder storage yards were: uranium at 13 µg/L, Alpha Activity at 7.1 pCi/L, and Beta Activity at 10.5 µCi/L. Surface water from the cylinder storage yards flows to FBP NPDES outfalls prior to discharge from the site; therefore, releases of radionuclides from the cylinder yards are monitored by sampling conducted at the FBP outfalls. Complete details on the most current DOE reservation soil sampling results are detailed in FBP-ER-RCRA-WD-RPT-0288.

~~In 2002, the following levels of uranium and uranium isotopes were detected in surface water at the DOE cylinder storage yards: uranium at 10 µg/L, $^{233/234}$U at 2.0 pCi/L, ^{235}U at 0.16 pCi/L, and ^{238}U at 3.5 pCi/L. The following were not detected in any of the samples collected in 2002: ^{236}U, ^{241}Am, ^{237}Np, ^{238}Pu, and $^{239/240}$Pu. ^{99}Tc was detected in two samples at a maximum concentration of 14 pCi/L (DOE 2002b).~~

~~Similar concentrations of radionuclides were detected at upstream and downstream locations on the Scioto River and Big Beaver Creek. Beta activity, ^{99}Tc, and uranium were detected more frequently and at higher concentrations at the downstream sampling locations on Little Beaver Creek than at the upstream sampling location. Uranium was detected more frequently at one of the downstream sampling locations on Big Run Creek than at the upstream sampling location. Detections of uranium at the downstream sampling locations, while different from concentrations detected upstream, are similar to detections of naturally occurring uranium at the upstream Scioto River sampling location and may be attributable to natural variation (DOE 2003a).~~

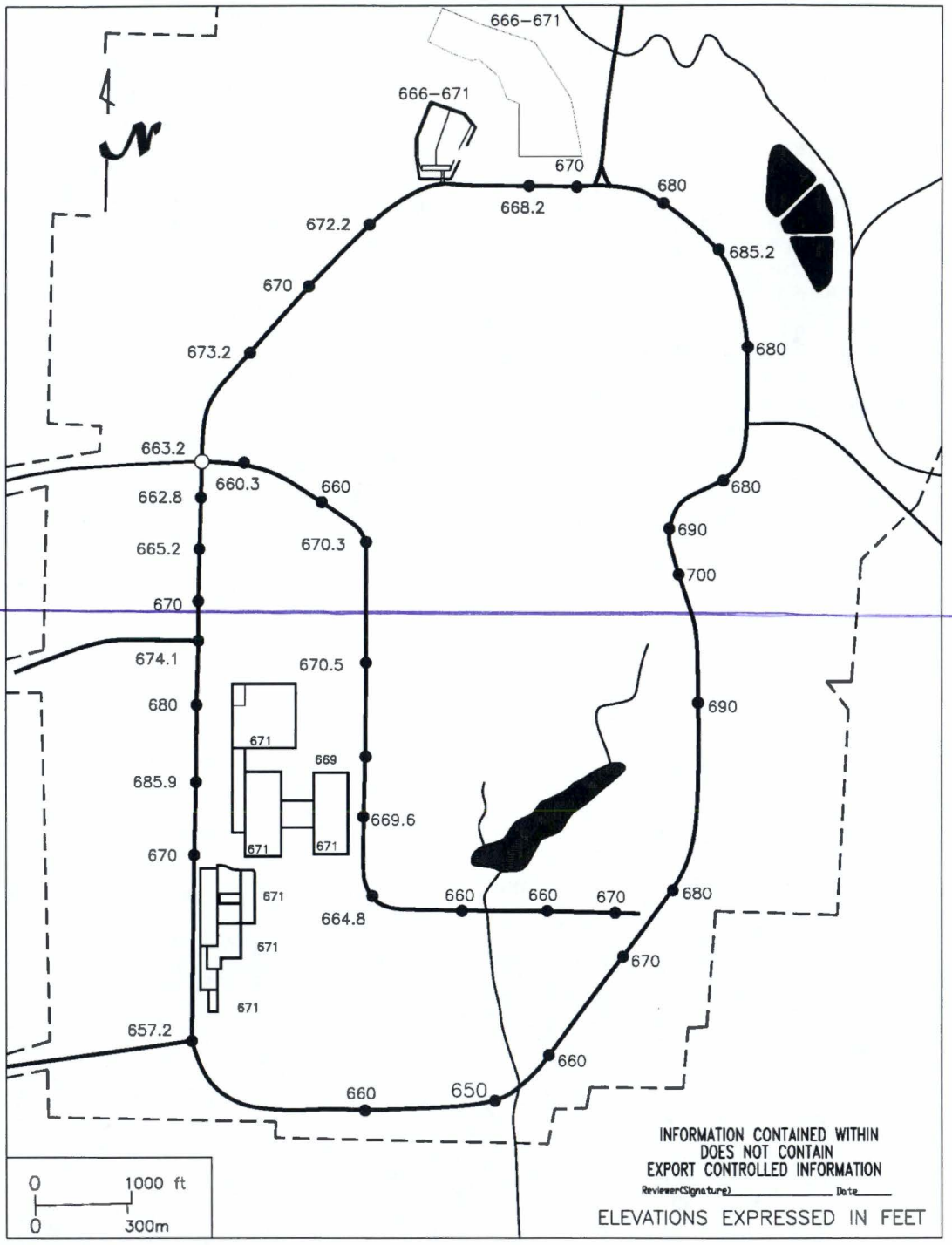
~~Samples collected at the surface-water monitoring points in 2002 were analyzed for total uranium, isotopic uranium ($^{233/234}$U, ^{235}U, ^{236}U, and ^{238}U), ^{99}Tc and selected transuranic radionuclides (^{241}Am, ^{237}Np, ^{238}Pu, and $^{239/240}$Pu). ^{241}Am was detected in only one sample, from Big Beaver Creek, at a concentration of 0.184 pCi/L. ^{99}Tc was detected in two samples from different locations in Little Beaver Creek at a maximum concentration of 22 pCi/L, which is below the DOE-derived concentration guide of 100,000 pCi/L for ^{99}Tc in ingested water. $^{233/234}$U was detected at a maximum concentration of 2.4 pCi/L. ^{235}U was detected at a maximum concentration of 0.095 pCi/L. ^{238}U was detected at a maximum concentration of 0.51 pCi/L. Each of these detections is well below the DOE-derived concentration guide for the respective uranium isotope in drinking water (500 pCi/L for $^{233/234}$U and 600 pCi/L for ^{235}U and ^{238}U). Neither ^{236}U nor any~~

~~of the other transuranics (^{237}Np, ^{238}Pu, $^{239/240}Pu$) were detected in any 2002 surface water samples (DOE 2003a).~~

3.4.3 Floodplains

Floodplains consist of mostly level land along rivers and streams that may be submerged by floodwaters. The Flood Insurance Rate Map provided by the Federal Emergency Management Agency indicates that the 100-year floodplain extends on both sides of Little Beaver Creek upstream from the confluence with Big Beaver Creek to the rail spur located near the X-230J9 North Environmental Sampling Station. The 100-yr floodplain ranges on either side of Little Beaver Creek from 15 to 61 m (50 to 200 ft) roughly following the 175 m (575 ft) amsl topographic contour and is confined to the bed contour of Little Beaver Creek. Flooding is not a problem for the majority of the site. The highest recorded flood level of the Scioto River in the vicinity of the site was 174 m (570 ft) amsl (January 1913), which is approximately 30 m (100 ft) below the level of most site facilities. No portion of the floodplain for Big Beaver Creek is located within the DOE reservation boundary (see Figures 3.4.3-1 and 3.4.3-2).

The average annual discharge at the Higby station for the period of record (1930-2001) is 4,721 cfs, while the maximum discharge of record is 177,000 cfs observed on January 23, 1937. The average annual mean flow has ranged from 4,256 to 8,090 cfs from 2001 to 2018, similar to the historical flow rates (USGS, 2020). The stage of the 1937 flood was 593.7 ft amsl. The historical flood stage of the Scioto River next to the site was estimated to be 556.7 ft amsl by using the estimate that the Scioto River drops approximately 37 ft between the Higby gauging station (river mile [RM] 55.5) and the mouth of Big Beaver Creek (RM 27.5). Elevations for floods (with three recurrence intervals) at the confluence of the Scioto River and Big Beaver Creek (RM 27.5), estimated by the U. S. Army Corps of Engineers, are compared with the site nominal grade elevation in Table 3.4.3-1.


666–671
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ELEVATIONS EXPRESSED IN FEET

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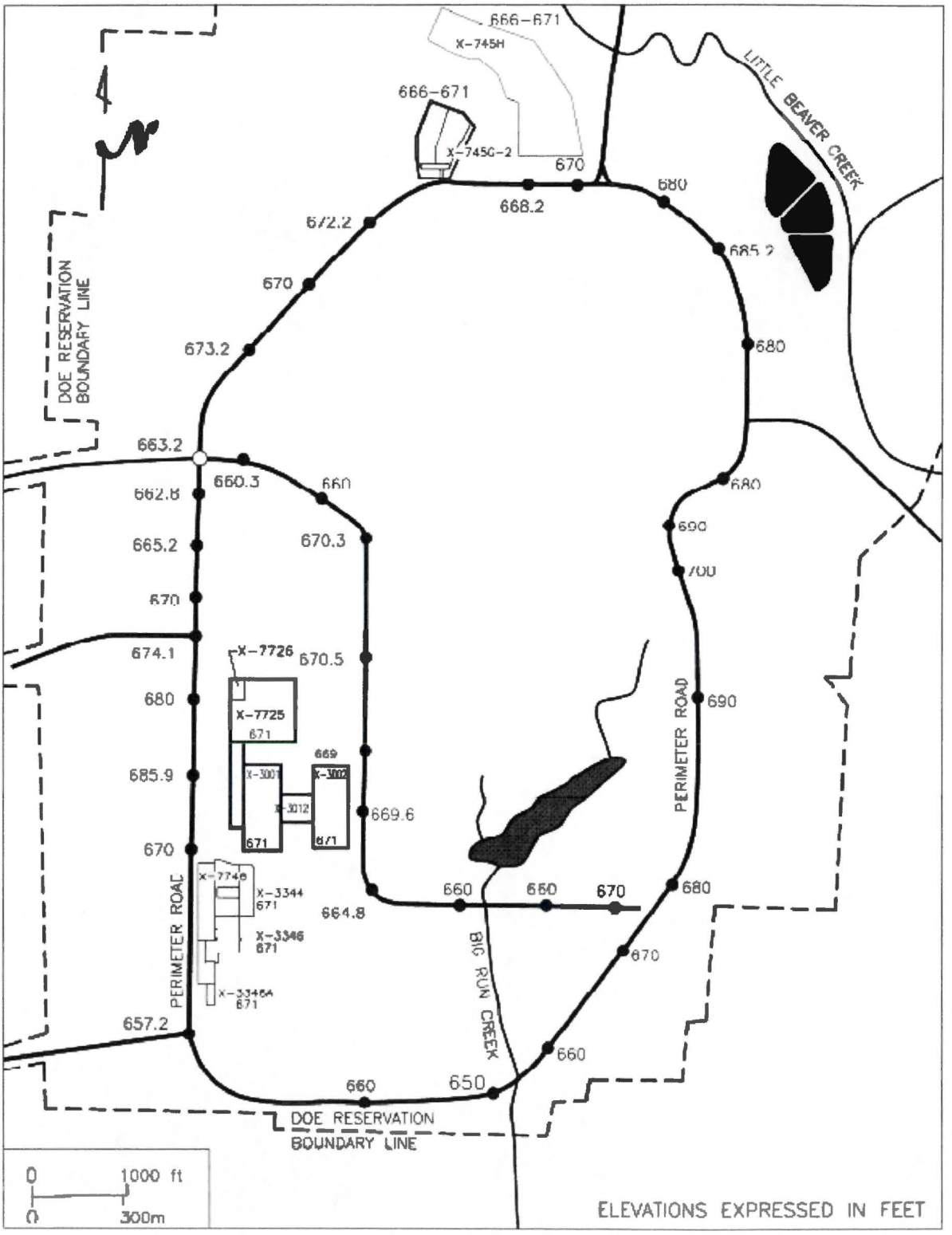


Figure 3.4.3-1 Elevations of Roadways

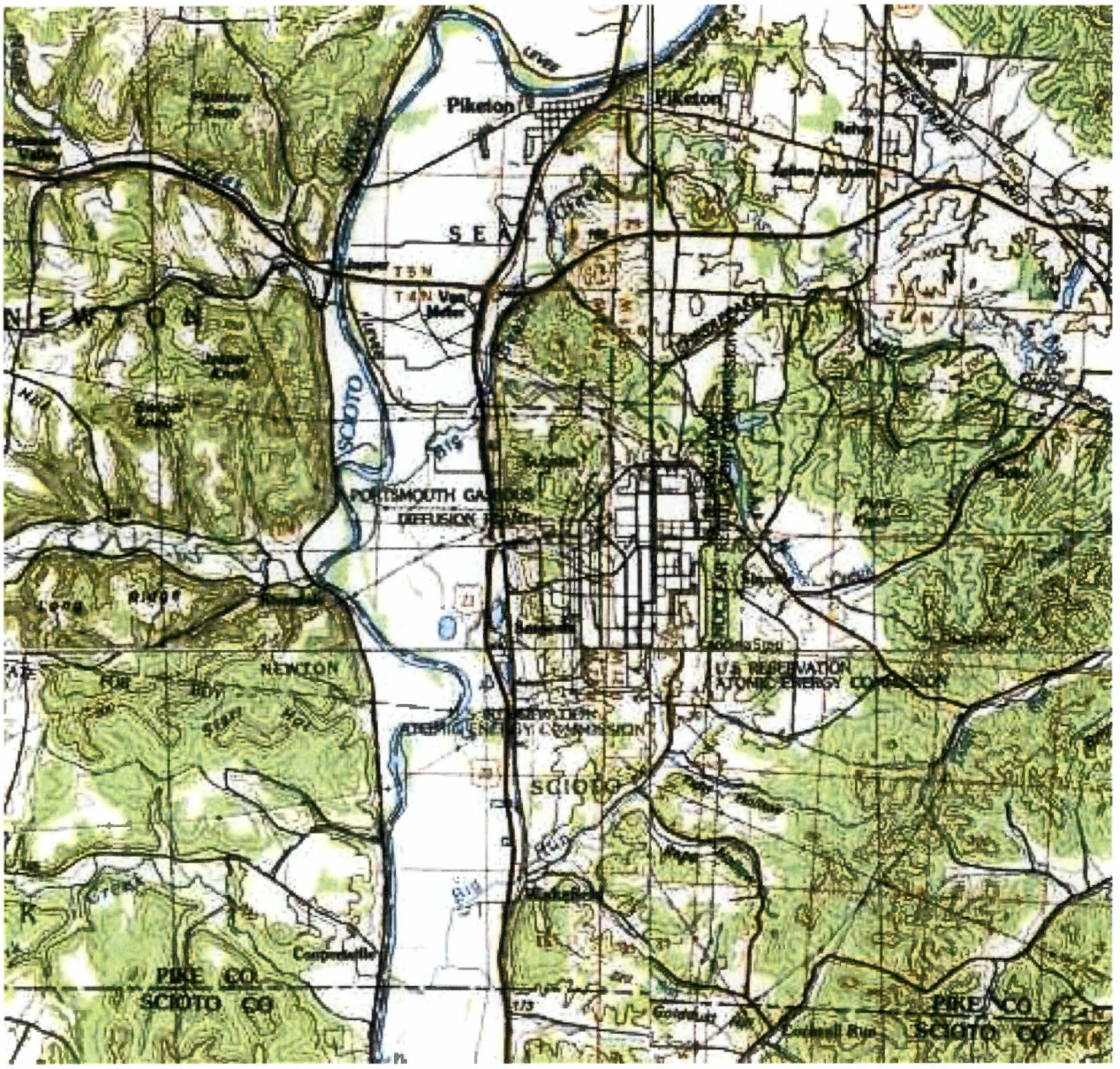


Figure 3.4.3-2 Topographic Map of the U.S. Department of Energy Reservation

Since the site has a nominal elevation of about 670 ft amsl and about 113 ft above the historical flood level for the Scioto River in the area, the site has not been affected by flooding of the Scioto River (see Figure 3.4.3-1).

Table 3.4.3-1 Comparison of Flood Elevations of the Scioto River Near the DOE Reservation With the Nominal Grade Elevation

	Elevation	
Recurrence interval	Meters	Feet
50-year flood [a]	170.1	558.0
100-year flood [a]	170.8	560.3
500-year flood [a]	172.4	565.7
Historical written record [b]	169.7	556.7
Probable Maximum flood [c]	174.0	571.0
Nominal grade	204.2	670.0

[a] Estimates by U.S. Army Corps of Engineers (Reference 5).

[b] Estimated from records at Higby, 181.0 m (593.7 ft) (Reference 5), assuming the flood level at the mouth of Big Beaver Creek is 11.3 m (37 ft) lower.

[c] Probable Maximum Flood calculated flow is greater than that of the estimated 10,000-year flood discharge. ~~(USEC-02).~~

3.4.4 Wetlands

Wetlands are areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil condition. Wetlands generally include swamps, marshes, bogs, and similar areas. The area of the Proposed Action is either inside existing concrete floor buildings, paved, or previously disturbed industrial property, consequently there are no environmentally sensitive areas within the immediate project area.

The DOE reservation contains 41 jurisdictional and four non-jurisdictional wetlands totaling 14 ha (34 acres) (DOE 2003a). The majority of the wetlands are associated with wet fields, areas of previous disturbance, drainage ditches, or wet areas along roads and railway tracks.

3.5 Ecological Resources

This section describes the ecological resources, including terrestrial resources, wetlands, environmentally sensitive areas, and rare, threatened, and endangered species within the DOE reservation. The area selected for the ACP includes existing facilities formerly used for GCEP, and located in a fully developed industrial area. As such, the grounds are maintained as lawns and support various species of grasses and herbaceous divots.

3.5.1 Terrestrial Resources

Vegetation

Much of the DOE reservation and the area in the vicinity of the site has experienced extensive disturbance. There is very little in terms of vegetative communities within the Perimeter Road on the site. The area of the Proposed Action is either inside existing concrete floor buildings, paved, or previously disturbed industrial property. The vegetation of surrounding Pike County consists primarily of hardwood forests. Field crops constitute the other major category of vegetative cover in the surrounding area.

The 10 terrestrial habitat types identified at the site are as follows (DOE 1997):

- 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 over story is dominated by Virginia pine.
- Pine plantation – Nearly pure stands of Virginia pine.
- 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 DOE reservation are managed grassland, oak hickory forest, and upland mixed hardwood forest.

3.5.2 Wildlife

The area of the Proposed Action is either inside existing concrete floor buildings, paved, or previously disturbed industrial property; consequently, there is no animal habitat within the immediate project area. There are 49 mammals that have ranges which include the DOE reservation. The most abundant mammals include the white-footed mouse (*Peromyscus leucopus*), short-tailed shrew (*Blarina brevicauda*), and opossum (*Didelphis virginiania*) (DOE 1996c, DOE 2001b).

There has been 114 bird species, including year-round residents, winter residents, and migratory species, observed on the site (DOE 1996c, DOE 2001b). 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*), non-game birds such as nuthatches (*Sitta* sp.), and wrens (*Troglodytes* sp.).

There has been 11 species of reptiles and six species of amphibians observed on the site. The most common reptiles include the eastern box turtle (*Terrapene carolina*), black rat snake (*Elaphe obsolete*), and northern black racer (*Coluber constrictor constrictor*). The most common species of amphibians are the American toad (*Bufo americanus*) and northern dusky salamander (*Desmognathus fuscus*) (DOE 1996c, DOE 2001b).

Common insects include cicadases, aphids, bees, wasps, ants, flies, beetles, and grasshoppers (DOE 1996c, DOE 2001b).

3.5.3 Environmentally Sensitive Areas

The area of the Proposed Action is either inside existing concrete floor buildings, paved, or previously disturbed industrial areas; consequently, there are no environmentally sensitive areas within the immediate project area. However, there are several environmentally sensitive areas within the DOE reservation. These include areas where Ohio endangered or threatened species have been observed, and wetland areas and the floodplain of the Little Beaver Creek. There are no exceptional water streams within the plant. Discussions of these areas were presented in previous NEPA documents (DOE 2001, 2001c, 2002b).

Northwest Tributary. This area is a stream corridor considered a sensitive area because it represents the best habitat for Indiana bats (M*yotis sodalis*) at the DOE reservation.

X-611A Former Lime Sludge Lagoons. The area near the sludge lagoons is sensitive because of the presence of Virginia meadow-beauty (*Rhexia virginica*) adjacent to the base of the dike. Wetlands also are present in this area.

X-611B Sludge Lagoon. The area near the sludge lagoon should be considered a sensitive area due to the possible presence of Carolina yellow-eyed grass (*Xyris difformis)*, which was observed at the site in 1994 (DOE 1996b). Confirmation of this species is necessary, however, as the original identification occurred while the plant was not flowering.

There are no state or national parks, conservation areas, wild and scenic rivers, or other areas of recreational, ecological, scenic, or aesthetic importance within the immediate vicinity of the DOE reservation (DOE 2001b).

3.5.4 Rare, Threatened, and Endangered Species

The potential occurrence of Federal and State rare, threatened, and endangered species in the project vicinity was determined by consulting with the Ohio Department of Natural Resources (ODNR), Division of Natural Areas and Preserves, and previously prepared environmental assessments. A comprehensive evaluation of the site for the presence of Federal and State listed rare, threatened, and endangered species was conducted in 1996 (DOE 1997). ~~USEC~~ The Licensee consulted with the U.S. Fish and Wildlife Service (USFWS) in order to comply with Section 7 of the *Endangered Species Act*, in preparation of the Lead Cascade ER (USEC 2004b). In their letter dated August 30, 2002, the USFWS indicated that the Indiana bat (*Myotis sodalis*) is the only Federally listed endangered animal species whose home range includes the DOE reservation. ~~USEC~~ The Licensee also consulted the ODNR. The ODNR's letter, dated December 1, 2003, indicated that there are no records of rare or endangered species in the project area, including a one-mile radius at the DOE reservation in Piketon, Ohio (USEC 2003a). The timber rattlesnake (*Crotalus horridus*) has been identified as present by the USFWS 20-25 mi from the DOE reservation (USEC 2003a) and should not be affected by the Proposed Action.

Surveys were conducted for the presence of the Indiana bat in 1994 and 1996. As part of the 1996 survey, potential summer habitat for the Indiana bat was identified in the Northwest Tributary stream corridor, the Little Beaver Creek stream corridor, and along a logging road in a wooded area ~~to~~ on the east ~~of the X-100 building~~side of reservation (see Figure 3.5.4-1). Mist netting was conducted in those areas in June and again in August. Although 14 bats representing four common species were captured during the August survey, no Indiana bats were collected. The survey also indicated that most of the site has poor summer habitat for Indiana bats. The few woodlands that occur on the property are small, isolated, and not of sufficient maturity to provide good habitat. The exception is an area of deciduous sugar maple forest along the Northwest Tributary stream corridor, where several of the bats were collected (DOE 1997). The Northwest Tributary begins just southwest of the Don Marquis substation and flows approximately 3,200 ft before leaving the DOE property prior to its confluence with Little Beaver Creek. Historically, isolated sightings and observations of threatened, endangered, or special interest species have occurred at the plant. An Ohio endangered raptor, the sharp-shinned hawk *(Accipiter striatus)*, has been observed at the site in the past. One Ohio endangered plant species, Carolina yellow-eyed grass *(Xyris difformis)*, and a potentially threatened species, Virginia meadow beauty *(Rhexia virginica)*, have been found at the site (DOE 1996c). The rough green snake *(Opheodrys aestivus)*, listed as an Ohio special interest species, has been observed at the site (DOE 1996c).

The OEPA determined that two State endangered fish species and four State threatened fish species near the site are restricted to the Scioto River. In support of this determination, the *Biological and Water Quality Study of Little Beaver Creek and Big Beaver Creek-1997*, an OEPA study, indicated that Little Beaver Creek and Big Beaver Creek do not provide sufficient habitat to support threatened or endangered species. Little Beaver Creek runs through the eastern end of the site and is a tributary to Big Beaver Creek, which flows into the Scioto River (OEPA 1998).

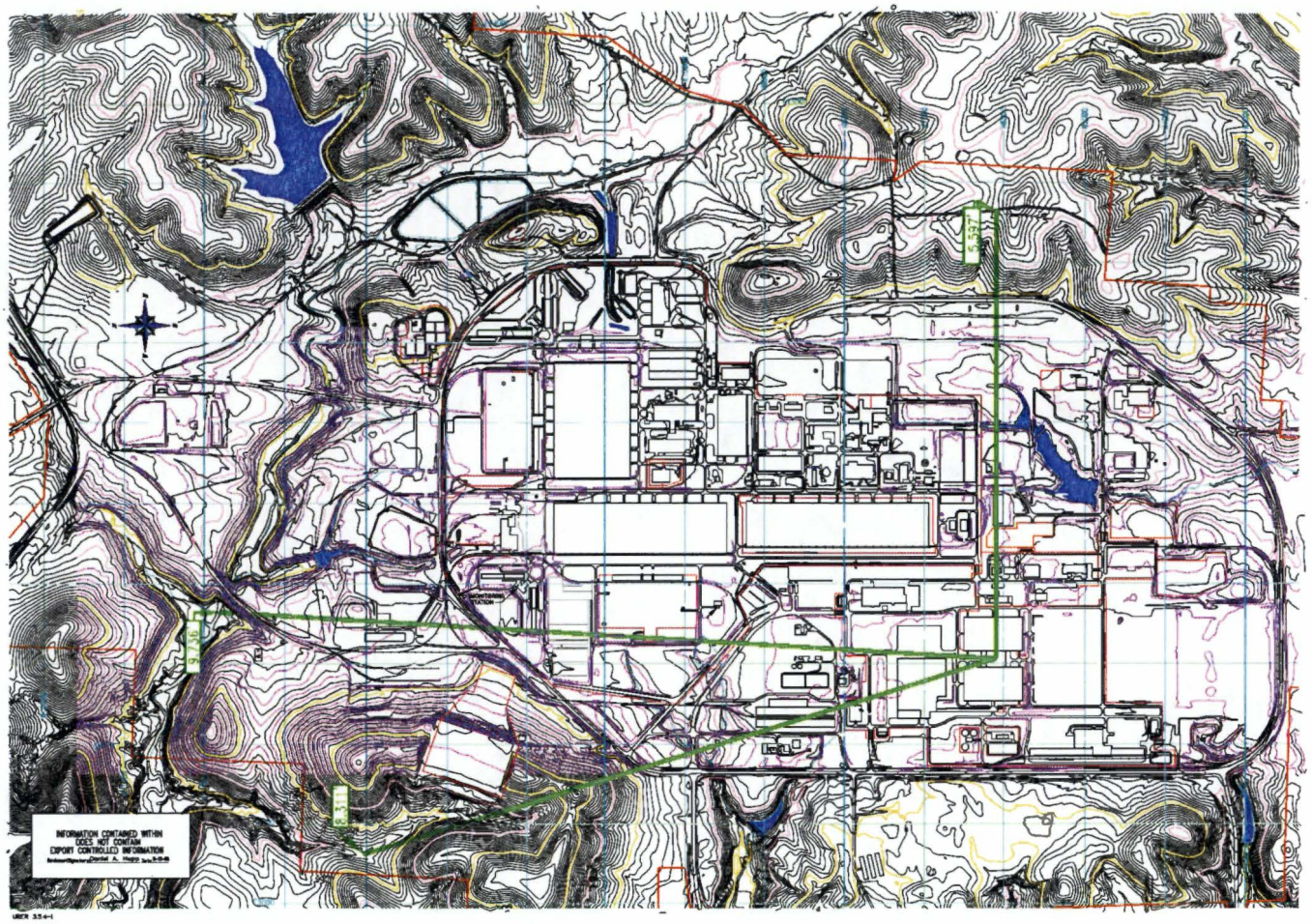


Figure 3.5.4-1 Suitable Indiana Bat Habitats on the U.S. Department of Energy Reservation

3.5.5 Background Radiological and Chemical Characteristics (Environmental Media)

This section describes the naturally occurring sources of radiation and the levels of exposure that may be found at the Piketon DOE reservation.

3.5.5.1 Average Population Dose

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

Manmade sources also contribute to the average amount of dose a member of the U.S. population receives. These sources include x-rays for medical purposes (39 mrem/yr), nuclear medicine (14 mrem/yr), and consumer products (5 to 13 mrem/yr) (e.g., smoke detectors). A

person living in the United States receives a current average dose of about 360 mrem/yr (NRC 2002).

3.5.5.2 Site-Specific Background Chemical and Radiological Characteristics

The environmental radiological monitoring program at the DOE reservation collects samples of air, surface water, groundwater, soil, sediment, and biota in order to detect releases of radionuclides and calculate the estimated maximum radiation dose. Information on the most recent environmental radiological program monitoring results can be found in the Annual Site Environmental Report (FBP-ER-RCRA-WD-RPT-0288).

Air Concentrations

Table 3.5.2-1 summarizes the 2002 background air concentrations based on an air-sampling station specifically located to collect background data. This air-sampling location is located approximately 20.9 km (13 mi) southwest of the DOE reservation.

Table 3.5.2-1 Background Air Concentrations

Parameter [a]	Number of Samples [b] (Measurements) [b]	Minimum [c]	Maximum [c]	Average [c]
^{241}Am	12 (12)	0	3.3×10^{-05}	
Fluoride	52 (7)	2.4×10^{-02}	1.1×10^{-01}	5.1×10^{-02}
^{237}Np	12 (12)	0	1.3×10^{-05}	
^{238}Pu	12 (12)	0	1.4×10^{-05}	
$^{239/240}$Pu	12 (12)	0	3.8×10^{-06}	
^{99}Tc	12 (12)	0	4.1×10^{-03}	
Uranium	12 (0)	4.0×10^{-04}	8.2×10^{-04}	6.3×10^{-04}
$^{233/234}$U	12 (0)	1.2×10^{-04}	1.2×10^{-03}	3.1×10^{-04}
^{235}U	12 (8)	9.5×10^{-09}	6.6×10^{-05}	
^{236}U	12 (10)	0	1.2×10^{-05}	
^{238}U	12 (0)	1.3×10^{-04}	2.8×10^{-04}	2.1×10^{-04}

[a] All parameters are measured in pCi/m^3 with the exception of uranium and fluoride, which are measured in µg/m^3.
[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] 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 2003a.

Sediment Concentrations

Table 3.5.2-2 summarizes the 2002 background sediment concentrations. Sampling points are approximately 16 km (10 mi) from the DOE reservation.

Table 3.5.2-2 Background Concentrations of Radionuclides and Chemicals in Sediment[a]

Parameter	Unit	RM-10N[b]	RM-10E[b]	RM-10S[b]	RM-10W[b]
Alpha Activity	pCi/g	8.1	3.9	7.3	9.8
^{241}Am	pCi/g	0.0288U	0.0639U	0.0567U	0.0363U
Beta Activity	pCi/g	7.8	6.8U	6.6U	7.1
Cadmium	mg/kg	1.03B	0.489B	3.41U	3.47U
Chromium	mg/kg	6.51	6.10	24.6	13.1
Lead	mg/kg	17.4B	8.83U	29.7B	14.5B
^{237}Np	pCi/g	-0.0467U	0.0204U	0.0309U	0.00652U
Nickel	mg/kg	19.0	5.1B	14.8	27.8
PCB, Total	µg/g	5U	5U	5U	5U
^{238}Pu	pCi/g	0.0332U	0.0254U	0.0376U	0.0367U
$^{239/240}$Pu	pCi/g	0U	0.00847U	0.0188U	-0.00646U
^{99}Tc	pCi/g	0.0496U	0.0160U	0.0568U	0.144
Uranium	µg/g	1.83	2.10	2.64	4.31
$^{233/234}$U	pCi/g	0.0557	0.569	2.60	1.46
^{235}U	pCi/g	0.0377U	0.0930	0.0400U	0.0485U
^{236}U	pCi/g	0.0126U	0.000009U	-0.00717U	0.0580U
^{238}U	pCi/g	0.608	0.698	0.881	1.44

[a] Abbreviations and data qualifiers are as follows: B = result is less than the practical quantification limit but greater than or equal to the instrument detection limit; U = undetected.

[b] Maximum value taken from biannual measurements.

Source: DOE 2003a, USEC 2004d.

Soil Concentrations

Soil-sampling locations approximately 16 km (10 mi) from the DOE reservation are used to determine background concentrations in soils. Table 3.5.2-3 summarizes the 2002 soil monitoring results.

Table 3.5.2-3 Background Soil Concentration for Selected Radioactive Elements

Location	Alpha activity (pCi/g)[b]	Beta activity (pCi/g)[a,b]	99Tc (pCi/g)[a,b]	Uranium (µg/g)[b]
RS-10N	7.0	7.4U	0.2U	1.7
RS-10S	7.6	7.0U	0.2U	2.0
RS-10E	6.2	6.7U	0.2U	1.7
RS-10W	7.0	9.4	0.2U	3.8

[a] U – undetected.
[b] Maximum value taken from biannual measurements.
Source: USEC 2003e

Vegetation

The United States Enrichment Corporation monitors background concentrations of fluoride, ^{99}Tc, and uranium in plants located approximately 16 km (10 mi) away from the DOE reservation. Table 3.5.2-4 presents the background data obtained in 2002 for vegetation.

Table 3.5.2-4 Vegetation Monitoring Program Background Levels

Location	Fluoride (µg/g)[b]	99Tc (pCi/g)[a,b]	Uranium (µg/g)[a,b]
RV-10N	6.2	0.2U	0.06
RV-10S	6.8	0.2U	0.04U
RV-10E	1.3	0.2U	0.04U
RV-10W	2.2	0.2U	0.04U

[a] U – undetected.
[b] Maximum value taken from biannual measurements.
Source: USEC 2004d.

Surface Water Concentrations

Background concentrations of radionuclides are provided for streams that are not considered impacted by DOE reservation operations. Streams used for background data are located approximately 16 km (10 mi) away from the site. Chemicals that are routinely monitored

in surface water include total phosphate, fluoride, and 29 metals. Table 3.5.2-5 summarizes the background data collected in 2002 for surface water.

Table 3.5.2-5 Surface-Water Monitoring Background Results[a]

Location	Parameter	Number of Samples[b]	Units	Minimum[c]	Maximum[c]
RW-10N	Alpha Activity	12 (12)	pCi/L	4U	6U
	^{241}Am	2 (2)	pCi/L	0.0758U	0.0902U
	Beta Activity	12 (9)	pCi/L	8U	14
	^{237}Np	2 (2)	pCi/L	-0.0845U	0U
	^{238}Pu	2 (2)	pCi/L	0.00170U	0.158U
	$^{239/240}$Pu	2 (2)	pCi/L	0U	0.000568U
	^{99}Tc	12 (11)	pCi/L	8U	114
	Uranium	12 (10)	µg/L	0.2U	1.9
	$^{233/234}$U	2 (2)	pCi/L	-0.0654U	0.275U
	^{235}U	2 (2)	pCi/L	0U	0.000002U
	^{236}U	2 (2)	pCi/L	0U	0.0145U
	^{238}U	2 (1)	pCi/L	0.0653U	0.201
RW-10S	Alpha Activity	12 (12)	pCi/L	2U	6U
	^{241}Am	2 (2)	pCi/L	0.0241U	0.0692U
	Beta Activity	12 (10)	pCi/L	7U	14
	^{237}Np	2 (2)	pCi/L	-0.162U	-0.0822U
	^{238}Pu	2 (2)	pCi/L	0.00117U	0.0615U
	$^{239/240}$Pu	2 (2)	pCi/L	0.0205U	0.0245U
	^{99}Tc	12 (12)	pCi/L	8U	12U
	Uranium	12 (10)	µg/L	0.1U	1.6
	$^{233/234}$U	2 (2)	pCi/L	-0.435U	0.168U
	^{235}U	2 (2)	pCi/L	0U	0.0208U
	^{236}U	2 (2)	pCi/L	-0.0219U	0.0187U
	^{238}U	2 (2)	pCi/L	-0.0986U	-0.0182U
RW-10E	Alpha Activity	12 (12)	pCi/L	4U	6U
	^{241}Am	2 (2)	pCi/L	0.0391U	0.0788U
	Beta Activity	12 (11)	pCi/L	7U	13
	^{237}Np	2 (2)	µi/L	0U	0.0129U
	^{238}Pu	2 (2)	pCi/L	0U	0.0271U

Table 3.5.2-5 Surface-Water Monitoring Background Results[a]

Location	Parameter	Number of Samples[b]	Units	Minimum[c]	Maximum[c]
	$^{239/240}$Pu	2 (2)	pCi/L	-0.0462U	0.0696U
	^{99}Tc	12 (12)	pCi/L	8U	12U
	Uranium	12 (10)	µg/L	0.1U	1.0
	$^{233/234}$U	2 (2)	pCi/L	0.136U	0.149U
	^{235}U	2 (2)	pCi/L	-0.0153U	0.0240U
	^{236}U	2 (2)	pCi/L	-0.0275U	0U
	^{238}U	2 (1)	pCi/L	0.0372U	0.161
RW-10W	Alpha Activity	12 (11)	pCi/L	4U	6
	^{241}Am	2 (2)	pCi/L	0.0689U	0.0835U
	Beta Activity	12 (10)	pCi/L	7U	13
	^{237}Np	2 (2)	pCi/L	-0.0701U	-0.0311U
	^{238}Pu	2 (2)	pCi/L	0.000621U	0.0310U
	$^{239/240}$Pu	2 (2)	pCi/L	-0.0245U	0.124U
	^{99}Tc	12 (12)	pCi/L	8U	12U
	Uranium	12 (11)	µg/L	0.1U	1.7
	$^{233/234}$U	2 (2)	pCi/L	-0.146U	0.104U
	^{235}U	2 (2)	pCi/L	-0.0213U	0.0000007U
	^{236}U	2 (2)	pCi/L	-0.0607U	0.0383U
	^{238}U	2 (2)	pCi/L	0.000003U	0.0704U

[a] Based on 2001 monitoring data. The derived concentration guide (DCG) for each radionuclide is as follows: ^{241}Am, 30 pCi/L; ^{237}Np, 30 pCi/L; ^{238}Pu, 40 pCi/L; $^{239/240}$Pu, 30 pCi/L; ^{99}Tc, 100,000 pCi/L; $^{233/234}$U, 500 pCi/L; ^{235}U, 600 pCi/L; ^{236}U, 500 pCi/L; ^{238}U, 600 pCi/L. All results are well below these DOE standards. DCGs are not available for the other radiological parameters (alpha activity, beta activity, and total uranium).

[b] The number in parentheses is the number of samples that were below the detection limit.

[c] U – undetected

Source: DOE 2003a, USEC 2004d.

External Gamma Radiation Monitoring

Table 9.2-8 of the License Application summarizes external gamma radiation levels from 1998-2002.

Ground-Water Concentrations

Groundwater monitoring at DOE PORTS is required by a combination of state and federal regulations, legal agreements with Ohio EPA and U.S. EPA, and DOE Orders. More than 400 monitoring well are used to track the flow of groundwater and to identify and measure

~~groundwater contaminants. Groundwater programs also include on-site surface water monitoring and water supp~~

3.6 Meteorology, Climatology, and Air Quality

3.6.1 Meteorology

A 60-m (197 ft) tower is ~~in use by the United States Enrichment Corporation~~used on the DOE reservation. It is equipped with instrument packages at the 10-, 30-, and 60-m (33-, 98-, and 197-ft) levels. In addition, ground-level instrumentation measures solar radiation, barometric pressure, precipitation, and soil temperatures at 1- and 2-ft depths.

Hourly temperatures at the 10- and 30-m (33- and 98-ft) levels above the ground were recorded at the site meteorological tower ~~from~~ since at least 1995 ~~to 2002~~. Data from the 1995 to 2002 period show that ~~At~~ at the 33-ft, 69,734 of the possible 70,080 data points ~~ar~~were available. At the 33-ft level the average annual hourly temperature was 10°C (50.6°F), the minimum average hourly temperature was 19°C (-1.4°F), the maximum average hourly temperature was 35°C (94.1°F).

Of the 70,080 possible hourly wind speed and wind direction data for 1995 through 2002, approximately 70,000 data points are available for wind speed and direction. The average wind speeds were 4.0, 6.2, and 7.5 mph at 10-, 30-, and 60-m (33-, 98-, and 197-ft) levels, respectively. The average wind direction is from South 11° West (1σ = 33°) and the most frequent wind direction is from the south.

Wind roses at 10-, 30-, and 60-m (33-, 98-, and 197-ft) at the site constructed from the 1998 through 2002 data are compared in Figures 3.6.1-1, 3.6.1-2, and 3.6.1-3, respectively.

Additional data from calendar year 2016 was also obtained for this report. The average wind speeds were 3.6, 5.0, and 6.5 mph at the 10-, 30- and 60-meter levels, respectively (Brust, 2020). At the 10-meter level, the minimum average hourly temperature was 4.0 °F, and the maximum average hourly temperature was 96.4 °F. This data is similar to the historical (1995–2002) results.

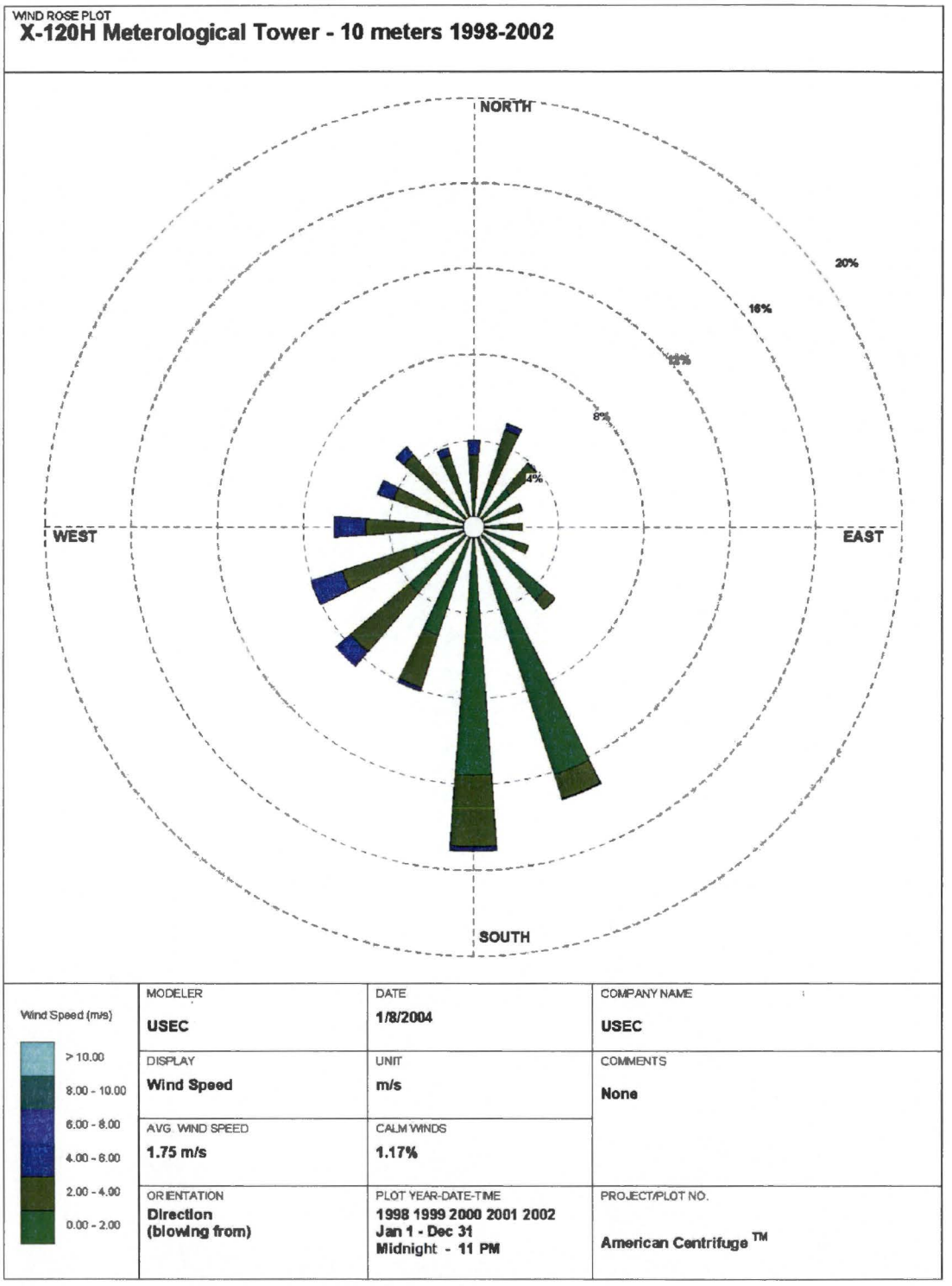


Figure 3.6.1-1 Wind Roses at 10-Meters

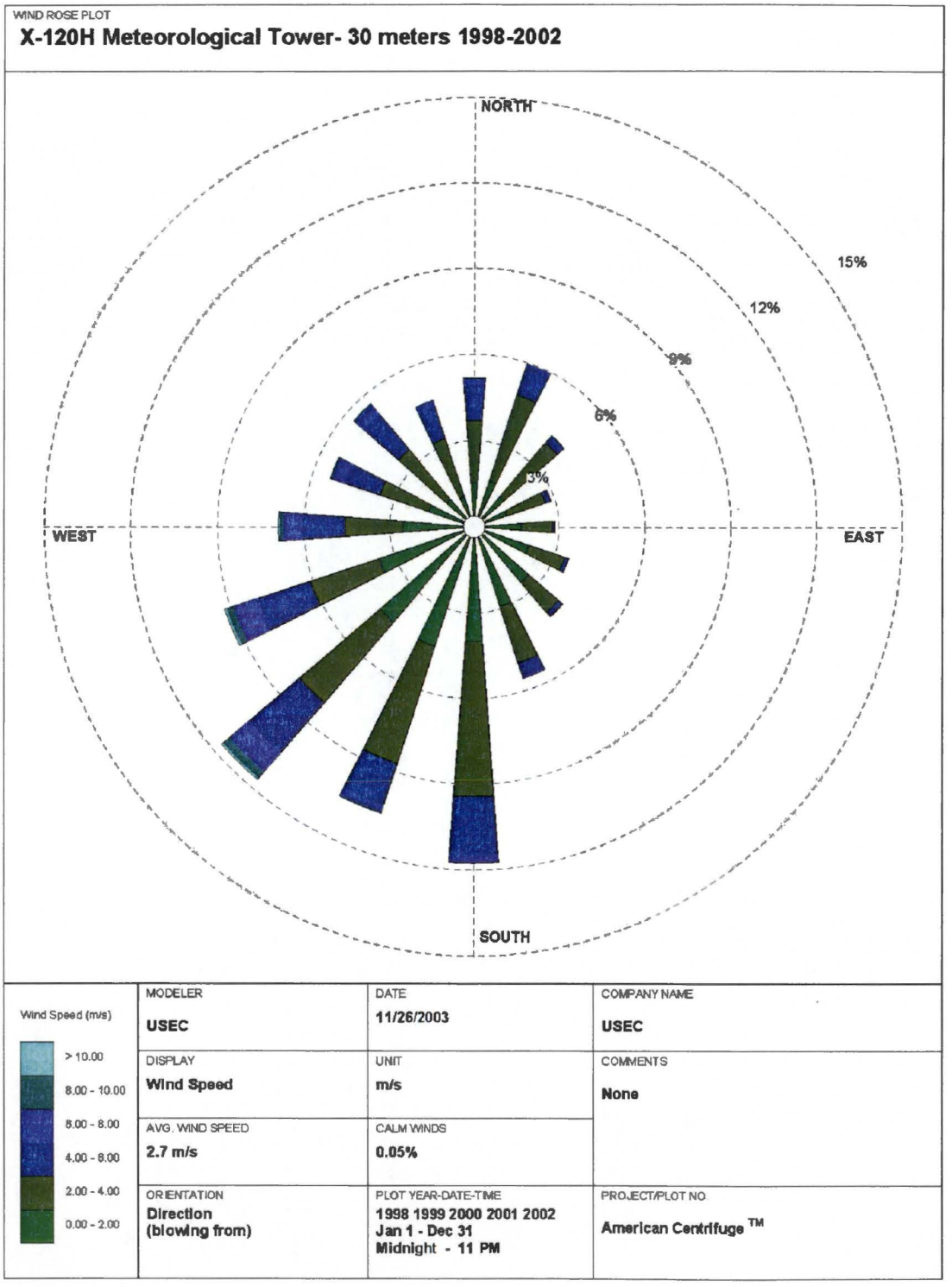


Figure 3.6.1-2 Wind Roses at 30-Meters

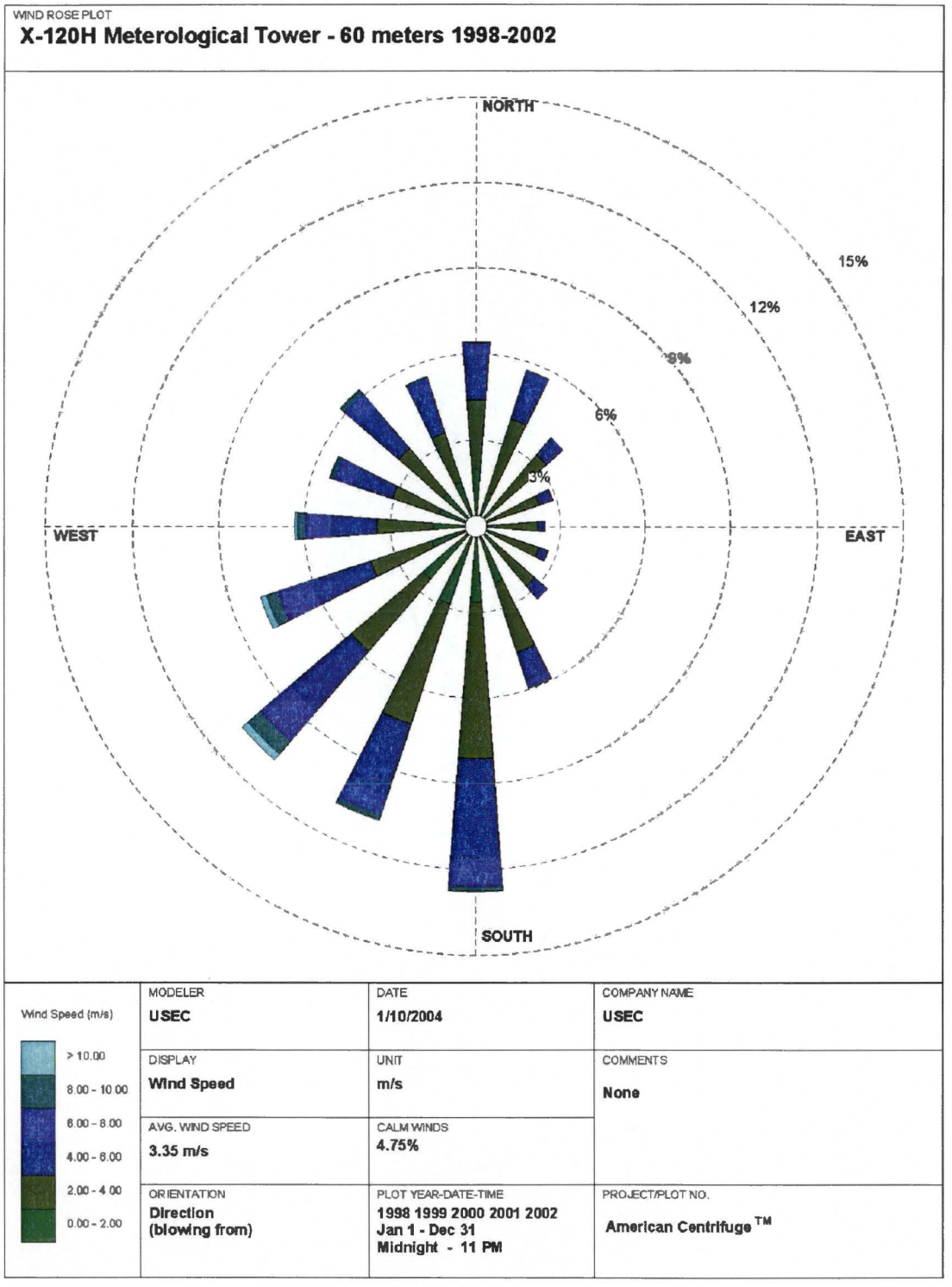


Figure 3.6.1-3 Wind Roses at 60-Meters

3.6.2 Climate

Located west of the Appalachian Mountains, the region around the site has a climate essentially continental in nature, characterized by moderate extremes of heat and cold and wetness and dryness. July is the hottest month, with an average monthly temperature of ~~23 °C (~~745.20°F~~)~~, and January is the coldest month with an average temperature of ~~-1 °C (30~~29.9°F~~)~~. The highest and lowest daily temperatures from 1951 to 20~~0~~192 were ~~39 and -35 °C (~~103 and -31°F~~)~~ on July 14, 1954, and January 19, 1994, respectively (NOAA, 2019a and b~~NOAA 2003a, NOAA 2003b~~).

Moisture in the area is predominantly supplied by air moving northward from the Gulf of Mexico. Precipitation is abundant from March through August and sparse in October and February. The average annual precipitation at Waverly, Ohio, for the period from 1951 to 20~~02~~19 was ~~102 centimeter (cm)~~ 40 in. The greatest daily rainfall during this period was ~~12 cm (~~4.9 in.~~)~~, occurring on March 2, 1997. Snowfall occurrence varies from year to year, but is common from November through March. The average annual snowfall for the area is about ~~54 cm (~~21.1 in.~~)~~, based on 1951-20~~02~~19 data. During that time period, the maximum monthly snowfall was ~~65 cm (~~25.4 in.~~)~~, occurring in January 1978 (NOAA, 2019 and Menne, 2019~~NOAA 2003a~~).

Occasionally, heavy amounts of rain associated with thunderstorms or low-pressure systems ~~will~~ falls in a short period of time. The Midwestern Climate Center, Climate Analysis Center, the National Weather Service, the National Oceanic and Atmospheric Administration, and the Illinois State Water Survey Division of the Illinois Department of Energy and Natural Resources has published values of the total precipitation for durations from 30 minutes to 24 hours and return periods from 1 to 100 years (NOAA 2003c). The results for the geographic locale including the site are summarized in Table 3.6.2-1. A local drainage analysis for extreme storms at the site has been performed (see Table 4.4.3-1).

Table 3.6.2-1 Precipitation as a Function of Recurrence Interval and Storm Duration for the DOE Reservation

Recurrence Interval (yrs[b])	Storm duration (hrs)						
	0.5	1	2	3	6	12	24
	Precipitation (in[a])						
1	0.85	1.08	1.33	1.47	1.72	1.99	2.29
2	1.03	1.31	1.62	1.79	2.09	2.43	2.79
5	1.27	1.61	1.98	2.19	2.57	2.98	3.42
10	1.48	1.88	2.33	2.57	3.01	3.49	4.01
25	1.8	2.29	2.82	3.12	3.65	4.24	4.87
50	2.09	2.66	3.28	3.62	4.24	4.92	5.66
100	2.4	3.06	3.77	4.16	4.88	5.66	6.5
10,000	3.85	4.91	6.05	6.67	7.83	9.09	10.44

[a] NOAAa
[b] NOAAc

Tornadoes do occur in Southern Ohio; however, specific analyses of the frequency of tornadoes in the region show that they are rare. On the average, from 1991 to 2010, 19 tornadoes per year were reported in Ohio, but the total varies widely from year to year (e.g., 63 in 1992 and 4 in 2005). Pike County has experienced eleven tornados since 1950. When considering the surrounding counties, (Adams, Jackson, Highland, Ross and Scioto) the total number of tornadoes experienced is 54 since 1950. Twelve of those tornadoes were rated F2 or greater on the Fujita Tornado Scale. The DOE reservation had an average of three days per year between 1990 and 2019 with severe storms with winds exceeding 58 mph, defined as severe thunderstorm winds (NOAA, 2020). ~~Tornadoes do occur in Southern Ohio; however, specific analyses of the frequency of tornadoes in the region show that they are rare. On the average, from 1950 to 2002, 18 tornadoes per year were reported in Ohio, but the total varies widely from year to year (e.g., 63 in 1992 and 0 in 1988). Pike County has experienced three tornados since 1950. When considering the surrounding counties (Adams, Jackson, Highland, Ross and Scioto), the total number of tornadoes experienced is 46 since 1950. Fifteen of those tornadoes were rated F2 or greater on the Fujita Tornado Scale (NOAA 2003d). The site had an average of 3 days per year between 1950 and 2002 with severe storms with winds exceeding 58 mph (NOAA 2003d).~~ Because the DOE reservation is not a coastal location, the effects of hurricanes are not considered other than increased rainfalls as remnants of the storm affected weather patterns in the upper Ohio River Valley.

Severe storms can and are likely to produce lightning strikes, which can interrupt and cause a partial power failure. However, the buildings are heavily grounded and some have installed lightning protection. The DOE reservation had an average of three days per year between 1990 and 2019 with severe storms with winds exceeding 58 mph, defined as severe thunderstorm winds (NOAA, 2020)~~The DOE reservation is in an area that had an average of 36 thunderstorms between the years 1989 and 1998~~. The DOE reservation is at a "moderate" risk value of loss due to lightning strikes. Lightning has not been a problem for these structures, since initial construction in the mid-1980s.

3.6.3 Air Quality

Non-radiological emissions are regulated under NAAQS and the standards adopted by the State of Ohio. The EPA under National Emission Standard regulates radioactive emissions for Hazardous Air Pollutants (NESHAP) regulations (40 CFR Part 61, Subpart H). This emission standard limits emissions of radionuclides to the ambient air from the DOE reservation not to exceed amounts that would cause any member of the public to receive an EDE of 10 mrem/yr.

3.6.3.1 Non-Radiological Air Quality

As directed by the *Clean Air Act* of 1970 (42 U.S.C. §7401), the EPA has set the NAAQS for several criteria pollutants to protect human health and welfare (40 CFR Part 50). These pollutants include particulate matter less than 10 microns in diameter (PM_{10}), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), lead (Pb), and ozone (O_3).

Non-radiological air quality can be characterized by the concentration of various pollutants in the atmosphere expressed in units of parts per million (ppm) or in micrograms per cubic meter

($\mu g/m^3$). The standards and limits set by State and Federal regulations are provided in concentrations averaged over incremental time limits (e.g., 30 minutes, 1 hour, 3 hours). The averaging times shown in the tables of this section correspond to the regulatory averaging times for the individual pollutants.

An area is designated by the EPA as being in attainment for a pollutant if ambient concentrations of that pollutant are below the NAAQS or in non-attainment if violations of the NAAQS occur. In areas where insufficient data are available to determine attainment status, designations are listed as unclassified. Unclassified areas are treated as attainment areas for regulatory purposes.

The Piketon region is classified as an attainment area for the pollutants listed in the NAAQS (OEPA, 2020~~DOE 2001b~~). These standards are shown in Table 3.6.3.1-1. Primary standards protect against adverse health effects, while secondary standards protect against welfare effects such as damage to crops, vegetation, and buildings. The State of Ohio has adopted the NAAQS and regulations to guide the evaluation of hazardous air pollutants and toxins to specify permissible short-and long-term concentrations. Existing air quality on the site is in attainment with NAAQS for the criteria pollutants.

Table 3.6.3.1-1 National Ambient Air Quality Standards and Allowable Prevention of Significant Deterioration Increments

Pollutant	Averaging Time	NAAQS Standard ($\mu g/m^3$)		Allowable PSD Increment ($\mu g/m^3$)	
		Primary	Secondary	Class I	Class II
Sulfur dioxide	3 h[a]	—	1,300	25	512
	24 h[a]	365	—	5	91
	Annual	80	—	2	20
Nitrogen dioxide	Annual	100	100	2.5	25
Ozone	1 h[b]	235	235	—	—
	8 h	157	157	—	—
Carbon monoxide	1 h[a]	10,000	—	—	—
	8 h[a]	40,000	—	—	—
PM-10[d]	24 h[b]	150	150	8	30
	Annual	50	50	4	17
PM-2.5[c,e]	24 h	65	65	—	—
	Annual	15	15	—	—
Lead	3 months [e]	1.5	1.5	—	—

a Not to be exceeded more than once per year
b Not to be exceeded more than one day per year on average over three years
c Particulate matter less than 10 μm in diameter
d Particulate matter less than 25 μm in diameter
e Calendar quarter

The DOE reservation is located in a Class II prevention of significant deterioration (PSD) area. PSD regulations were established to prevent significant deterioration of air quality in areas that already meet the NAAQS. Specific details of PSD are found in 40 CFR 51.166. Among other provisions, cumulative increases in SO_2, NO_2, and PM_{10} levels after specified baseline dates must not exceed specified maximum allowable amounts. These allowable increases, also known as increments, are especially stringent in areas designated as Class I areas (e.g., national parks and wilderness areas) where the preservation of clean air is particularly important. Areas not designated as Class I currently are designated as Class II. The nearest Class I PSD area is the Dolly Sods Wilderness Area, which is approximately 280 km (174 mi) east of the DOE reservation in West Virginia.

OEPA issued a Title V permit to the Licensee ~~with an effective date of August 21~~on July 27, 2017 with the following sources listed:

- Pump down cart No. 2
- Analyzer cart No.1
- X-6002 Boilers 1 and 2
- Unit group – feed carts, sample carts, dump carts (19 sources)
- Unit group – gulpers (5 sources)
- Unit group – vacuums (11 sources)
- De Minimis sources - 11 emergency generators, 2 emergency pumps, and a refrigerant recovery system

Most of these sources (except for the boilers) were part of the former Lead Cascade project and have been dismantled. The Title V permit will be modified as needed to reflect the new planned equipment for the HALEU project.

In addition, OEPA issued a permit to FBP in 2014 for the following sources:

- Plant roadways and parking areas
- Unit group – misc. (9 sources)
- Unit group – significant tanks (2 sources)
- Unit group – X-300 series buildings (15 sources)
- Unit group – X-700 building (6 sources)
- Unit group – X-705 building (28 sources)
- De Minimis sources - 6 emergency generators, 2 emergency compressors, 5 emergency pumps, the X-623 Groundwater Treatment Facility, the X-749 Soil Venting System, a mobile pump, the X-670A cooling tower, and a gasoline dispensing facility

~~, 2003. Under the Title V regulations, the United States Enrichment Corporation has 66 non-insignificant sources and 151 insignificant sources. The X-3001 purge vacuum and evacuation vacuum system is included in the Title V permit. DOE reservation operations are minor emission sources that do not require a Title V permit.~~

~~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 3.6.3.1-2. The boilers are permitted by OEPA with opacity, particulate, and SO_2 limits. Electrostatic precipitators~~

~~on each of the boilers control opacity and particulate emissions. In addition, the boilers emit NO_2 and CO. 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.~~

~~DOE applied for and received air emission permits for two boilers and two aboveground storage tanks (AST) associated with the X-6002 Recirculating Hot Water Plant in 2001. The plant was built to provide hot water to heat DOE buildings that were formerly heated by hot water produced from the heat given off by the gaseous diffusion process. Because the gaseous diffusion process is no longer operating in Piketon, Ohio, an alternative source of heat for the recirculating hot water system was needed. In 2002, DOE submitted a modification to the permit-to-install for the Hot Water Plant to allow the plant to burn either fuel oil or natural gas to produce heat. OEPA approved the modification in October 2002.~~

~~In addition to the air permits associated with the Hot Water Plant, DOE/ PORTS had four permitted and nine registered air emission sources at the end of 2002 (DOE 2003a).~~

~~Table 3.6.3.1-2 United States Enrichment Corporation Non-Radiological Airborne Emissions~~

~~Total Particulate Matter~~	~~Air Permit Limit~~	~~Stack Test Results~~ [a]
~~Boiler Number 1~~	~~0.19 lb/million british thermal unit (mmbtu)~~	~~0.04 lb/mmbtu~~
~~Boiler Number 2~~	~~0.19 lb/mmbtu~~	~~0.05 lb/mmbtu~~
~~Boiler Number 3~~	~~0.19 lb/mmbtu~~	~~0.05 lb/mmbtu~~

~~Sulfur Dioxide~~	~~Air Permit Limit~~	~~Analytical Results~~ [b]
~~Boiler Number 1~~	~~6.16 lb/mmbtu~~	~~4.72 lb/mmbtu~~
~~Boiler Number 2~~	~~6.16 lb/mmbtu~~	
~~Boiler Number 3~~	~~6.16 lb/mmbtu~~	

~~[a] Boilers 1 and 2 tested in April 2003. Boiler 2 tested in November 2003.~~
~~[b] Steam plant total for 2002.~~

3.6.3.2 Radiological Air Quality

Atmospheric emissions of radionuclides from the DOE reservation are regulated under EPA regulations found under NESHAP, 40 CFR Part 61, Subpart H. The EPA Effective Dose Equivalent (EDE) ~~EDE~~ limit of 10 mrem/yr to members of the public for the atmospheric pathway is also incorporated in DOE Order 5400.5, Radiation Protection of the Public and the Environment. The pertinent NRC regulations related to the radiation dose limits TEDE to individual members to the public are also listed in 10 CFR Part 20. Additional EPA dose limits are listed at 40 CFR Part 190.

At the DOE reservation, unrestricted areas are not exposed to any significant direct

radiation sources, and the public dose is dominated by gaseous effluents. Consequently, the public TEDE is equal to the public EDE calculated under the NESHAP regulations. The NRC has recognized this and accepted demonstrations of NESHAP compliance as demonstrating compliance with the TEDE limit as well (~~USEC-02~~).

The environmental radiological monitoring program at the DOE reservation collects samples of air and conducts air modeling in order to detect releases of radionuclides and calculate the estimated maximum radiation dose. Information on the most recent environmental radiological program monitoring results can be found in the Annual Site Environmental Report (FBP-ER-RCRA-WD-RPT-0288).

~~DOE and the United States Enrichment Corporation annually calculate MEI and collective doses and a percentage of dose contribution from each radionuclide emitted using the CAP88 computer code. Since the United States Enrichment Corporation is responsible for the principal site process and support operations and DOE is responsible for operations such as the X-326 L-Cage and its Glovebox, the X-345 High Assay Sampling Area, the X-744 Glovebox, and site remediation activities, separate annual NESHAP reports are submitted due to the separation of responsibilities. Results of the DOE reservation compliance modeling are discussed below. Details of the annual compliance modeling are also reported in the NESHAP 2002 Annual Report for the Department of Energy Portsmouth Gaseous Diffusion Plant (NESHAP 2003a) and the NESHAP Radionuclide Emissions Report For 2002, United States Enrichment Corporation (NESHAP 2003b).~~

~~Description of Dose Model~~

~~CAP88-PC, a computer program approved by the EPA for compliance with 40 CFR Subpart H, was used to calculate the dose due to radionuclide emissions to air from DOE operations, and CAP88-PC mainframe model was used to calculate the dose due to radionuclide emissions to air from site operations. The programs are identical except for the operating system and use a modified Gaussian plume equation to estimate the dispersion of radionuclides released from up to six sources. The program computes radionuclide concentrations in air, rates of deposition on ground surfaces, concentrations in food, and intake rates to people from ingestion of food produced in the assessment area.~~

~~Summary of Input Parameters~~

~~Input parameters for the CAP88 model include physical parameters for each radionuclide emission source, radionuclide emissions, meteorological data, and agricultural data. DOE has four unmonitored minor emission sources regulated by the EPA. United States Enrichment Corporation has thirteen monitored and several unmonitored sources at the DOE reservation regulated by the EPA. The radionuclide emissions for each source are presented in the NESHAP reports (NESHAP 2003a, NESHAP 2003b). For modeling purposes, the physical emission sources are grouped into three emission release points for DOE and ten emission release points for the United States Enrichment Corporation as shown in Tables 3.6.3.2-1 and 3.6.3.2-2. Default values were used for the size and class of each radioisotope. Tables 3.6.3.2-1 and 3.6.3.2-2 provide the physical parameters for each source modeled from DOE and the United States Enrichment Corporation's operations, respectively.~~

~~Table 3.6.3.2-1 Physical Parameters for DOE Air Emissions Sources~~

~~Source~~	~~Stack height (m)~~	~~Stack diameter (m)~~	~~Exit velocity~~

			(m/s)
X-326 L-Cage Glovebox	22	0.36	6.35
X-623 Groundwater Treatment Facility	7.6	0.2	15.5
X-624 Groundwater Treatment Facility	6.1	0.2	20.6

Source: NESHAP 2003a

Table 3.6.3.2-2 Physical Parameters for United States Enrichment Corporation Air Emission Sources

Source	Stack height (m)	Stack diameter (m)	Exit velocity (m/s)
X-326 (Purge Cascade)	50	0.25	18
X-326 (other vents)	20	0.97	24
X-330	20	0.2	61
X-333	20	0.62	29
X-344A	20	0.36	0.3
X-700	16	0.3	14
X-705	14	1.5	12.3
X-710	9	1	10.2
X-720	18	1.19	9
XT-847	11	0.406	5.5
X-343	33	0.076	9.3
X-344	15	0.35	0.4

Source: NESHAP 2003b

Site-specific meteorological data is collected at the 30 m (98 ft) height from the on-site meteorological tower. Data collected for between 1998 and 2002 indicate:

- Annual precipitation: 101.6 cm/yr (40 in./yr)
- Average air temperature: 10.3 °C (50.6°F)
- Average mixing layer height: 1,000 m (3,280 ft)

The wind file used in the CAP88-PC model is also generated from data collected at the on-site meteorological tower.

Note that the default values provided with the CAP88-PC model can be very conservative. The rural food array used to estimate the DOE dose assumes that the public obtains foodstuffs within 80 km (50 mi) of the plant (see Table 3.6.3.2-3). In reality, the majority of the foodstuffs consumed are purchased at supermarkets that receive foodstuffs from all over the world.

Table 3.6.3.2-3 Agricultural Data: Rural Default Food Array Values

~~Fraction of foodstuffs from~~	~~Local area~~	~~Within 50 miles~~	~~Beyond 50 miles~~
~~Vegetables and Produce~~	~~0.700~~	~~0.300~~	~~0~~
~~Meat~~	~~0.442~~	~~0.558~~	~~0~~
~~Milk~~	~~0.399~~	~~0.601~~	~~0~~

~~*Source:* CAP88-PC Version 2 User's Guide, 2000~~

Results

The effect of radionuclides released to the atmosphere was characterized by calculating EDEs to the MEI (a hypothetical individual who is assumed to reside at the most exposed point on the plant boundary). In 200217, the maximum EDE rate from ~~United States Enrichment~~all sources at the DOE reservation ~~Corporation sources~~ was 0.0269 mrem/yr. This anticipated dose is much lower than the EPA limit of 10 mrem/yr and the NRC Total EDE limit of 100 mrem/yr. Details on calculations of this dose can be found in the Annual Site Environmental Report (FBP-ER-RCRA-WD-RPT-0288).

~~DOE operations contributed an additional 0.0042 mrem/yr to the individual's EDE resulting in a combined EDE of 0.031 mrem/yr. The United States Enrichment Corporation's MEI is located 2,530 m south-southwest of United States Enrichment Corporation's predominant emission sources X-700, X-705 and X-720 building vent. These are modeled as a single source in the middle of building X-705 (NESHAP 2003b).~~

~~The CAP88 model calculated the 2002 maximum EDE for the MEI near the DOE reservation based on emissions from DOE operation sources to be 0.0046 mrem/yr. The DOE MEI is located 1,114 m south of DOE's predominant emission source, the X-622 Groundwater Treatment Facility. United States Enrichment Corporation operations contributed an additional 0.021 mrem/yr to this individual's EDE for a total of 0.025 mrem/yr from total plant operations.~~

~~In accordance with 40 CFR 61.92, EDEs to individuals based on site emissions should be combined with the DOE EDEs. The maximum EDE for the entire DOE reservation is calculated by adding the DOE and USEC EDEs for each individual. When the two EDEs are combined, the EDE to the MEI in 2003 is 0.031 mrem/yr, the United States Enrichment Corporation's MEI discussed above. This EDE is substantially below the 10-mrem/yr NESHAP limit applicable to the DOE reservation and the approximately 300-mrem/yr dose that the average individual in the U.S. receives from natural sources of radiation.~~ During Lead Cascade operations, radionuclide releases to the air were measured by a continuous vent or estimated in accordance with guidance in 40 CFR Part 61, Appendices D and E. Atmospheric dispersion of the releases was modeled and the consequent public radiation dose was estimated using EPA approved computer models in accordance with EPA guidance. The table below provides the Collective EDE (i.e., population doses) in person-rem/yr. due to the Licensee's operations since the beginning of Lead Cascade operations. The Collective EDEs are provided for the 50-mile radius population and the village of Piketon; the individual EDEs for the MEI due to the Licensee's operations are provided for comparison. Because of the change in the Licensee's responsibilities, Table 3.6.3.2-1 lists the public doses due to combined Lead Cascade and GDP emissions through 2010, and the

corresponding public doses from the Lead Cascade alone from 2007 through 2016 (DP-2605-0001).

Table 3.6.3.2-1 Annual Dose Due to Licensee Airborne Emissions, 2006-2016

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	EPA Std
50-mile Collective EDE[2,4]	0.014	0.077	0.10	0.14	0.81							NA
	LC only	$5.9x10^{-5}$	$6.5x10^{-5}$	$7.1x10^{-5}$	$3.9x10^{-5}$	$3.8x10^{-5}$	$5.3x10^{-5}$	$4.6x10^{-5}$	$6.8x10^{-5}$	$7.4x10^{-5}$	$2.97x10^{-5}$	
Piketon Collective EDE[3,4]	0.0037	0.0024	0.0051	0.0046	0.028							NA
	LC only	$2.3x10^{-6}$	$2.7x10^{-6}$	$2.5x10^{-6}$	$1.7x10^{-6}$	$2.1x10^{-6}$	$2.1x10^{-6}$	$2.1x10^{-6}$	$3.6x10^{-6}$	$3.2x10^{-6}$	$1.39x10^{-6}$	
MEI EDE[5] (mrem/yr)	0.0045	0.0034	0.0053	0.0069	0.051							10
	LC only	$3.4x10^{-6}$	$3.4x10^{-6}$	$2.8x10^{-6}$	$2.3x10^{-6}$	$2.6x10^{-6}$	$2.7x10^{-6}$	$3.7x10^{-6}$	$5.3x10^{-6}$	$6.7x10^{-6}$	$2.10x10^{-6}$	

Notes:
1. All dose figures in this table are for Licensee operations only. Prior to 2011 this included both GDP and ACP operations. From 2011 onward, Licensee operations are limited to ACP operations.
2. Collective EDE in person-rem/year for 50-mile radius. This is a summation of the dose to each individual living within a 50-mile radius.
3. Collective EDE in person-rem/year for the Village of Piketon. This is a summation of the dose to each individual living within the village.
4. Population distributions for calendar year 2009 and earlier are based on 2000 census data.
5. Population distributions for calendar year 2010 and later are based on 2010 census data.

Source: (DP-2605-0001).

The calculated public airborne radiation doses are all lower than the anticipated maximum, the EPA standard, and the NRC limit.

~~The collective EDE to the entire population within 80 km (50 mi) of the DOE reservation in 2002 was 0.095 person-rem/yr.~~

~~DOE collected data from a monitoring network of 15 air samplers in 2002 (DOE 2003a). Data were collected both on-site and in the area surrounding the DOE reservation. The monitoring network is intended to assess whether air emission from the DOE reservation affects air quality in the surrounding area. A background ambient air-monitoring station is located approximately 21 km (13 mi) southwest of the site. The analytical results from air-sampling stations closer to the plant are compared to background measurements (DOE 2003a).~~

~~Uranium-233/234 ($^{233/234}$U) and uranium-238 (^{238}U) were routinely detected at the stations and in most of the samples collected from each station. ^{235}U was detected in slightly less than half of the samples collected in 2002. Uranium-236 (^{236}U) was detected in one or two samples at 8 of the 15 stations. Americium-241 (^{241}Am), neptunium-237 (^{237}Np), and plutonium-238 (^{238}Pu) were detected once each at stations A28, A36, and A24, respectively. Technetium-99 (^{99}Tc) was detected once at three sampling stations in 2002. Detections of the transuranic radionuclides, ^{99}Tc, and ^{236}U were usually near the detection limit for the analytical method (DOE 2003a).~~

3.7 Noise

Noise on the DOE reservation is intermittent and intensity levels vary. Noise levels associated with refurbishment, construction and processing activities, and local traffic are

comparable to those of any other industrial site. No sensitive receptor sites, such as picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, or hotels, are in the immediate vicinity of the site (DOE 2001b).

Because actual noise estimates are not available, measured noise levels around an automobile assembly plant were used to estimate, and conservatively bound, any potential noise impacts. These noise levels are 55 to 60 decibel A-weighted (dBA) at about 60 m (200 ft) from the plant property (Cantor 1996). These noise levels would be inaudible 500 m (1,640 ft) from the site, even with low background noise levels. EPA has identified 55 dBA as a yearly average outdoor noise level that, if not exceeded, would prevent activity interferences and annoyance (EPA 1978).

Various standards that regulate the noise levels are given below:

- The NIOSH recommended exposure limit (REL) for occupational noise exposure is 85 dBA as an 8-hr Time-Weighted Average (TWA) (NIOSH 1998). Exposures at or above these levels are considered hazardous.
- The *Noise Control Act* of 1972 (23 CFR Part 722) regulates maximum per truck noise levels of 80-83 dBA depending on the truck type measured 15 m from traffic centerline.
- *Federal-Aid Highway Act* of 1970 has set the noise abatement criteria (NAC) by land use type and human activities (23 CFR Part 722). The following NAC are the unacceptable levels, which are used to determine impacts.
  - NAC for the outdoors range from 57 dBA to 75 dBA
  - NAC for parks (most similar to National Resources and Environmental Research Program [NRERP]) is 67 dBA
  - NAC for developed areas is 72 dBA

Typical noise levels of familiar noise sources are provided in Figure 3.7-1.

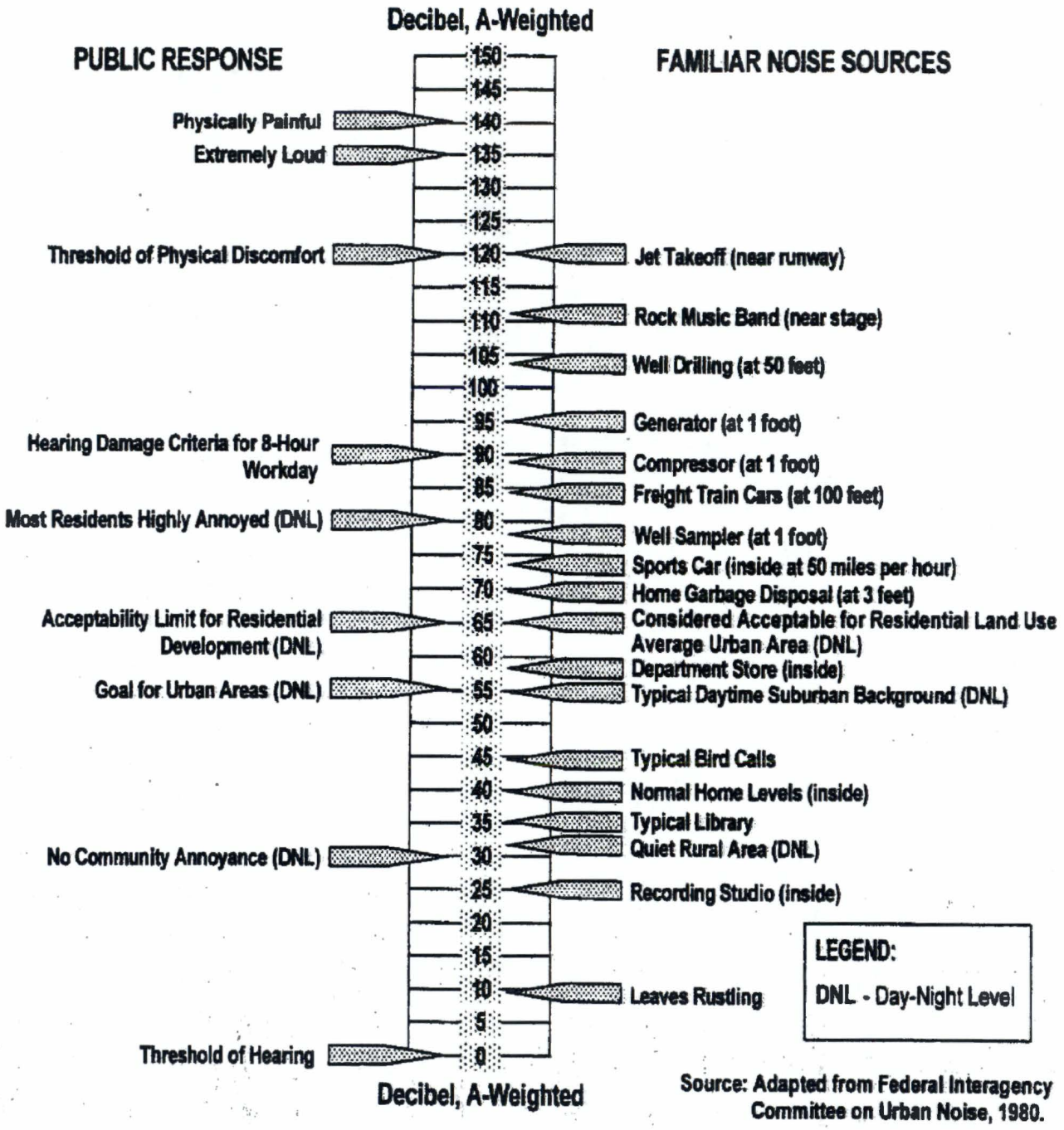


Figure 3.7-1 Typical Noise Levels of Familiar Noise Sources and Public Responses

3.8 Historic and Cultural Resources

3.8.1 Cultural Resources

Cultural resources are defined as any prehistoric or historic district, site, building, structure, or object considered important to a culture, subculture, or community for scientific, traditional, religious, or any other reason. When these resources meet any one of the National Register Criteria for Evaluation (NRCE) (36 CFR 60.4), they may be termed historic properties and thereby are potentially eligible for inclusion on the National Register of Historic Places (NRHP).

The plant is located within a region where Adena and Hopewell Indian mounds have existed. Additionally, several historic Native American Indian tribes are known to have had villages nearby.

Two preliminary Phase I archaeological surveys have been completed on the DOE reservation and were used in the preparation of the *Environmental Assessment Reindustrialization Program at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio* (DOE 2001b). The combined surveys covered 836 ha (2,066 acres) in Quadrants I through IV (Figure 3.4.1-1). There are few prehistoric archaeological resources at the site. Whether this is indicative of the local prehistoric upland settlement pattern or is a consequence of the extensive land disturbance associated with development of the site is not known. In contrast, historic archaeological resources at the site are relatively abundant, conspicuous, and undisturbed due to the nature and development of the plant.

Dobson-Brown et al. (1996) developed a predictive model of archaeological resource locations at the site based on variations in modern plant communities, topography, and soils, and on the location of previously identified archaeological resources in a 6.5 km (4 mi) literature review study area radius around the plant (DOE 2001b).

Survey methods in Quadrants I and II included visual inspection, surface collection, and hand excavation of shallow, less than 13 cm (less than 5 in.), shovel test pits. Similar shovel test pits inside the Perimeter Road area did not identify archaeological resources and indicated that this area has been highly disturbed.

Survey methods in Quadrants III and IV consisted of visual inspection, surface collection, hand-excavated shovel tests to 30 cm (12 in.) in depth in high-probability areas lacking significant disturbance and less than 15 percent slope. Additionally, hand-excavated deep shovel tests (greater than 30 cm or 12 in.) were accompanied by 2 cm (0.75-in.)-diameter hand-coring in three areas in Quadrant IV along Little Beaver Creek. Portions of Quadrants I and II that were not investigated during the preliminary Phase I archaeological survey were also investigated by shallow shovel tests.

The combined Phase I archaeological surveys identified 38 archaeological resources. Nine of the resources contain prehistoric components. Five are identified as prehistoric isolated finds. Two are identified as prehistoric lithic scatters. Two contain prehistoric and historic components: a prehistoric isolated find in an historic cemetery and a prehistoric lithic scatter and historic farmstead. These sites are located in Quadrants I, II, and IV. No archaeological resources have

been identified in Quadrant III. Thirty of the archaeological resources are associated with historic-era properties located within the site. Fifteen are remnants of historic farmsteads. Seven are scatters of historic artifacts or open refuse dumps. Two are isolated finds of historic artifacts. Four are remnants of the DOE reservation structures. Two are historic cemeteries. One of the historic cemeteries has an associated chapel and remnant of an observation tower.

The draft cultural resource report (Schweikart et al. 1997) determined that 22 of the archaeological resources do not meet the NRCE. Insufficient data were collected at the remaining 14 archaeological components and two historic-era cemeteries, one of which (33 Pk 189; PIK-206-9) includes an associated historic archaeological component, to determine whether they meet the NRCE (DOE 2001b).

An archaeological survey of an area in the southwest corner of the PORTS reservation was begun in June 2003. No sensitive archaeological deposits were identified on DOE property. The State Historical Preservation Office reviewed the report (Phase II Architectural Testing at Site 33PK210, Scioto Township, Pike County, Ohio) (DuVall 2003) and agreed that no further investigations are needed (DOE 2005a). Site 33PK210 is not within the proposed areas of construction or operation of the ER.

3.8.2 Architectural Historic Resources

Two architectural historic surveys have also been completed at the site (Dobson-Brown et al. 1996; Coleman et al. 1997). The combined surveys covered an approximate 1,497 ha (3,700 acre) area and identified several structures that may have historical significance (DOE 2001b).

A draft historic context for the DOE reservation has also been prepared. This historic context is broken into four development periods for the site: Development Period 1 (1900–51), Development Period 2 (1952–56), Development Period 3 (1957–78), and Development Period 4 (1979–85). In the draft architectural survey report (Coleman et. al. 1997), recommendations were made concerning which buildings and structures were considered contributing and noncontributing resources to the historic property. DOE will evaluate these recommendations in conjunction with the SHPO to determine which buildings and structures are considered historic properties under the NHPA and whether any of the properties are eligible for inclusion in the NRHP (DOE 2001b). Cultural resource reviews are conducted on a case-by-case basis, and consultations with the Ohio State Historical Preservation Office are made as required by Section 106 of the Act (DOE 2005a).

3.9 Visual/Scenic Resources

The dominant view shed in the vicinity of the DOE reservation consists of support facilities, transmission lines, open and forested buffer areas, marginal farmland, limited residential areas, and densely forested hills.

The DOE reservation consists mainly of a 1,497 ha (3,700 acre) fully developed industrial area. The majority of the industrial area is centrally located within a fenced 223 ha (550 acre) Controlled Access Area. Within this area are approximately 190 facilities as well as utility structures, water towers, and auxiliary facilities that support site activities. A second, large

developed and fenced area covering about 81 ha (200 acres) contains the facilities built in the early 1980s for the GCEP. The grounds are maintained as lawns, and support various species of grasses and herbaceous dicots. These facilities are generally not visible off the DOE reservation because views are limited by rolling terrain and heavy forests and vegetation. Photographs of the GCEP facilities that will be utilized for the ACP are shown in Figures 3.9-1 through 3.9-6.

The developed areas and utility corridors (i.e. transmission lines and support facilities) of the DOE reservation are consistent with a Visual Resources Management (VRM) Class IV designation. The remainder of the DOE reservation is consistent with VRM Class III or IV.

There are no existing state nature preserves or scenic rivers in the area.

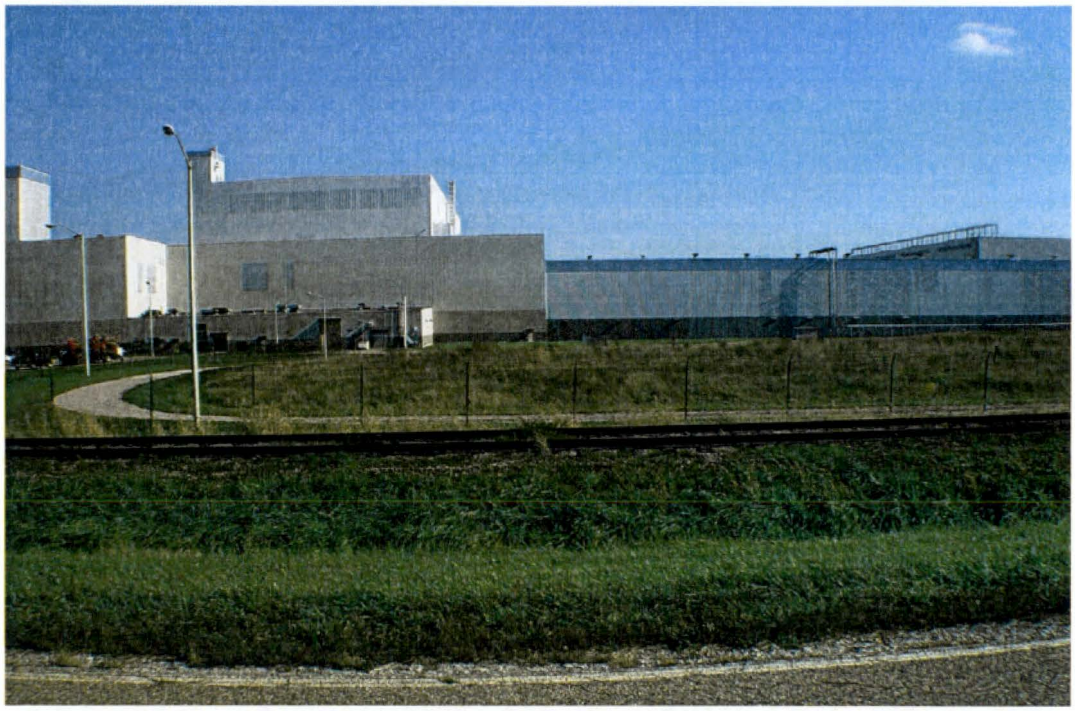


Figure 3.9-1 View of the X-7725 Building and X-7727H Facilityies [Looking East]

Figure 3.9-2 View of the X-7725 ~~Facility~~Building [Looking Southwest]

Figure 3.9-3 View of the X-3001 and X-3002 Process Buildings [Looking Northeast]

Figure 3.9-4 View of the X-3346 Building and X-7745S Area for the X-3003 and X-3004 Process Buildings [Looking West]

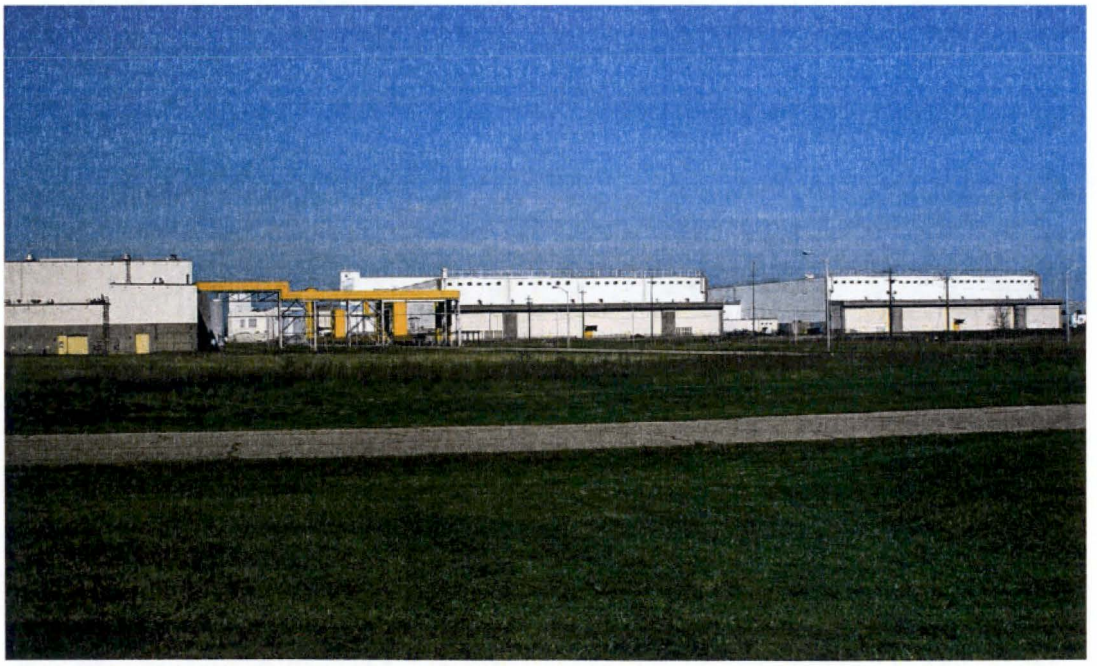


Figure 3.9-5 View of the X-3346, X-3001, X-3012, and X-3002 Buildings [Looking Northeast]

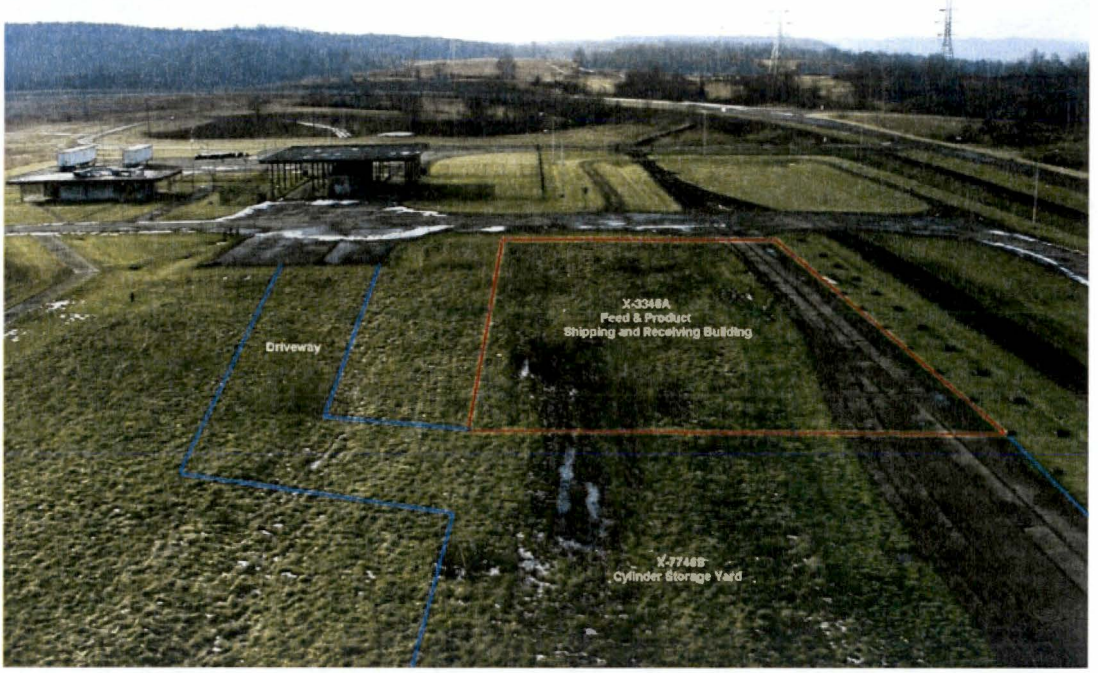


Figure 3.9-6 Site of X-3346A Feed and Product Shipping and Receiving Building [Looking South]

3.10 Socioeconomic

This section describes current socioeconomic conditions within a ROI where ~~approximately 92~~almost 95 percent of the DOE reservation workforce currently resides. The region of influence (ROI) is a four-county area in Southern Ohio comprised of Jackson, Pike, Ross, and Scioto Counties.

Employment and Income

Employment by sector over the last decade has changed slightly, as shown in Table 3.10-1. The service sector provides the highest percentage of the employment in the ROI, almost 40 percent, followed by the government, wholesale and retail trade, and manufacturing sectors, with 17.9 percent, 15.1 percent, and 12.1 percent, respectively. The past decade has continued an employment shift from the government, construction, and manufacturing sectors towards the service sectors within the ROI.

Table 3.10-1 Employment by Sector (Ppercent)

Sector	Jackson		Pike		Ross		Scioto		ROI	
	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010
Services	18.9	32.5	16.0	33.0	25.0	38.3	31.1	45.8	23.4	39.4
Wholesale and Retail Trade	21.5	13.6	16.0	24.5	22.1	14.8	24.0	12.4	21.4	15.1
Government and government enterprises	10.7	12.1	12.3	12.9	19.0	20.5	18.6	19.6	18.6	17.9
Manufacturing	27.0	23.1	38.2	2.3	14.4	10.2	8.3	5.3	17.8	12.1
Construction	0.0	5.1	5.9	6.4	5.1	4.7	5.8	4.9	5.2	5.0
Finance, insurance and real estate	5.1	5.0	5.9	5.0	3.9	4.9	4.2	5.2	3.9	5.0
Transportation and public utilities	3.8	D	3.4	D	5.7	3.0	4.5	3.9	4.3	D
Farm employment	4.8	3.4	3.6		3.6	3.0	2.5	2.2	4.3	2.9
Mining, oil and gas extraction	2.4	1.7	0.0	D	0.0	0.1	0.1	0.1	0.3	D
Other sectors	0.0	0.1	0.0	D	0.0	0.4	0.9	0.4	0.6	D

D – Not shown (confidential information)
Source: BEA, 2020a

The ROI experienced negative growth over the last 10 years. The labor force decreased from 96,333 in 2008 to 84,186 in 2018, for a growth rate of -12.6 percent for that period. Employment decreased less than the labor force, decreasing from 85,465 in 2008 to 82,108 in 2018, for a growth rate of -3.9 percent for that period. The ROI unemployment rate, which was 8.1 percent in 2008, decreased to 6.0 percent as of 2018, as shown in Table 3.10-2. The average unemployment rate for the State of Ohio was 4.6 percent in 2018, down from 6.4 percent in 2008 (FRED, 2020). The unemployment rate in the ROI is higher than for the state.

Per capita income in the ROI was $28,604 in 2010, a 41 percent increase from the 2000 level of $20,272. Per capita income in 2010 in the ROI ranged from a low of $27,233 in Pike County to a high of $28,896 in Ross County. The per capita income in Ohio was $36,683 in 2010 (Ohio, 2020).

Table 3.10-2 Region of Influence Unemployment Rates (Ppercent)

Administrative Unit	2008	2018
Jackson County	8.5	6.6
Pike County	10.2	6.5
Ross County	7.9	4.6
Scioto County	8.3	6.8
ROI Total	8.1	6.0
Ohio	6.4	4.6

Sources: BLS, 2020a; FRED, 2020~~Employment by sector over the last decade has changed slightly, as shown in Table 3.10-1. The service sector provides the highest percentage of the employment in the ROI, 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. 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 ROI.~~

Table 3.10-1 Employment By Sector (Percent)

	Jackson		Pike		Ross		Scioto		ROI	
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
Services	21.6	18.9	16.7	16.0	21.8	25.0	28.3	31.1	23.4	24.7
Wholesale and Retail Trade	21.5	21.5	14.9	16.0	21.0	22.1	24.2	24.0	21.4	21.7
Government and government enterprises	12.7	10.7	15.6	12.3	21.2	19.0	19.4	18.6	18.6	16.6
Manufacturing	23.1	27.0	35.5	38.2	18.8	14.4	8.3	8.3	17.8	17.9
Construction	4.9	0.0	4.8	5.9	4.9	5.1	5.9	5.8	5.2	4.7
Finance, insurance, and real estate	4.1	5.1	2.4	3.9	3.5	3.9	4.8	4.2	3.9	4.2
Transportation and public utilities	4.4	3.8	3.6	3.4	3.7	5.7	5.2	4.5	4.3	4.6
Farm employment	6.1	4.8	5.5	3.6	4.3	3.6	3.1	2.5	4.3	3.4
Mining	1.3	2.4	0.3	0.0	0.1	0.0	0.2	0.1	0.3	0.4
Other Sectors	0.4	0.0	0.5	0.0	0.6	0.0	0.7	0.9	0.6	0.3

Source: BEA 2002b

The ROI experienced stable growth over the last 10 years. The labor force grew from 86,670 in 1992 to 95,030 in 2001, for a growth rate of 9.6 percent for that period. Employment growth outpaced labor force growth, increasing from 77,721 in 1992 to 88,980 in 2001, for a growth rate of 14.5 percent for that period. The ROI unemployment rate, which was 10.3 percent in 1992, is 6.4 percent as of 2001, as shown in Table 3.10-2. The average unemployment rate for the State of Ohio was 4.3 percent in 2001, down from 7.3 percent in 1992 (BLS 2003). The unemployment rate in the ROI is higher than for the state.

Per capita income in the ROI was $20,272 in 2000, a 54 percent increase from the 1990 level of $13,142. Per capita income in 2000 in the ROI ranged from a low of $19,158 in Pike County to a high of $21,849 in Ross County. The per capita income in Ohio was $27,977 in 2000 (BEA 2002a).

Table 3.10-2 Region of Influence Unemployment Rates (Percent)

Administrative Unit	1992	2002
Jackson County	9.2	7.9
Pike County	11.7	8.9
Ross County	9.2	6.2
Scioto County	11.5	7.8

~~ROI Total~~	~~10.3~~	~~7.7~~
~~Ohio~~	~~7.3~~	~~5.7~~

~~*Source:* BLS 2003~~

Current Licensee Employment

At the time of this document ~~T~~the Licensee ~~presently~~ employs 67 workers on the program, which is approximately 0.07 percent of the total individuals working within Pike County. Of the total number employed on the program, 53, or 79.1 percent live within the ROI. Table 3.10-3 lists the number of Licensee workers by their county of residence within Ohio.

Table 3.10-3 Licensee Workers by County of Residence

County	Number of Workers	Percent of Total Employment
Jackson	8	11.9%
Pike	10	14.9%
Ross	13	19.4%
Scioto	22	32.8%
Outside of ROI	14	20.9%
Total	67	100%

Source: Conley, 2020.

~~**Reservation Employment**~~

~~In January 2004, the United States Enrichment Corporation and USEC employment was 1,223 workers at the site, which is approximately 11.0 percent of the total individuals working within Pike County. Of the total number employed at the site, 1,192, or 97.5 percent are residents of Ohio. Table 3.10-3 lists the number of United States Enrichment Corporation and USEC workers by their county of residence within Ohio. In addition, the DOE Bechtel Jacobs Company, LLC, Subcontractors, and the Ohio Army National Guard employ an additional 374 workers at the DOE reservation.~~

~~**Table 3.10-3 United States Enrichment Corporation and USEC Workers by County of Residence**~~

~~County~~	~~Numbers of Workers~~	~~Percentage of Total Employment~~
~~Jackson~~	~~118~~	~~9.7~~
~~Pike County~~	~~272~~	~~22.2~~
~~Ross County~~	~~145~~	~~11.3~~
~~Scioto County~~	~~588~~	~~48.7~~
~~Outside ROI~~	~~100~~	~~8.05~~

~~*Source* USEC 2004a~~

Tax Structure

The average property tax rates for Ohio cities are divided into two separate classifications: Class I Real (residential and agricultural) and Class II Real (commercial, industrial, mineral, and public utility). For Waverly, in Pike County, the rate is $0.0896 per $1,000 for Class I and $0.1265 for Class II; for Portsmouth, in Scioto County, the rate is $0.0913 per $1,000 for Class I and $0.1036 for Class II; for Jackson, in Jackson County, the rate is $0.101 per $1,000 for Class I and

$0.1038 For Class II; and in Chillicothe, in Ross County, the Class I rate is $0.296, and the Class II rate is $0.3361 per $1,000 (ODT, 2020a).

The State of Ohio has a graduated personal income tax. For example, the tax rate for incomes ranging from $21,750 to $43,450 is $310.47 plus 2.85 percent of excess over $21,750, for incomes ranging from $43,450 to $86,900 it is $928.92 plus 3.326 percent of excess over $43,450, and for incomes ranging from 86,900 to 108,700 it is $2,374.07 plus 3.802 percent of excess over $86,900. Ohio also has a 5.75 percent sales tax rate. In addition to the state sales tax, each county in Ohio has a county sales tax. Jackson, Pike, Ross, and Scioto Counties have a county sales tax rate of 1.5 percent (ODT, 2020b).

~~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 (ODT 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 is $1,337.20 plus 5.2 percent of excess over $40,000, and for incomes ranging from 80,000 to 100,000 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 (ODT 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 (ODT 2003a).~~

Area Residential Population

The nearest residential center and the closest town to the DOE reservation is Piketon, located in Pike County about four miles north of the DOE reservation on U.S. Route 23 with a population of 2,181 in 2010. The largest town in Pike County is Waverly, about eight miles north of the DOE reservation, with a population of 4,408 in 2010. Chillicothe, in Ross County about 27 miles north, is the largest population center in the ROI with a population of 21,698 in 2010. Other population centers include Portsmouth, about 27 miles south in Scioto County, and Jackson, about 26 miles east in Jackson County, with populations of 20,340 and 6,242 in 2010, respectively (Census, 2020). The total population within the five-mile radius of the DOE reservation is 5,805 in 2010 (Missouri, 2020). Over the last 20 years, population within the ROI has grown at a slightly lower rate compared to the State of Ohio. ROI population is projected to slightly decrease, decreasing 4.2 percent between 2010 and 2020, compared to the state rate of an increase of 0.3 percent. Table 3.10-4 presents historic and projected population in the ROI and the state.

~~The nearest residential center and the closest town to the DOE reservation is Piketon, located in Pike County about four miles north of the DOE reservation on U.S. Route 23 with a population of 1,907 in 2000. The largest town in Pike County is Waverly, about eight miles north~~

~~of the DOE reservation, with a population of 4,433 in 2000. Chillicothe, in Ross County about 27 miles north, is the largest population center in the ROI with a population of 21,796 in 2000. Other population centers include Portsmouth, about 27 miles south in Scioto County, and Jackson, about 26 miles east in Jackson County, with populations of 20,909 and 6,184 in 2000, respectively. Table 3.10-4 presents historic and projected population in the ROI and the state (CBP 2000). The total population within the five-mile radius of the DOE reservation is 5,836.~~

Table 3.10-4 Historic and Projected Population

Administrative Unit	1980	1990	2000	2010	2020
Jackson County	30,592	30,230	32,641	33,225	31,600
Pike County	22,802	24,249	27,695	28,709	29,000
Ross County	65,004	69,330	73,345	78,064	76,000
Scioto County	84,545	80,327	79,195	79,499	73,730
ROI Total	202,943	204,136	212,876	219,497	210,330
Ohio	10,797,630	10,847,115	11,353,140	11,536,504	11,574,870

	~~1980~~	~~1990~~	~~2000~~	~~2010~~
~~Jackson County~~	~~30,592~~	~~30,230~~	~~32,641~~	~~34,724~~
~~Pike County~~	~~22,802~~	~~24,249~~	~~27,695~~	~~29,981~~
~~Ross County~~	~~65,004~~	~~69,330~~	~~73,345~~	~~80,111~~
~~Scioto County~~	~~84,545~~	~~80,327~~	~~79,195~~	~~81,307~~
~~ROI~~	~~202,943~~	~~204,136~~	~~212,876~~	~~226,123~~
~~Ohio~~	~~10,797,630~~	~~10,847,115~~	~~11,353,140~~	~~11,805,877~~

~~Source: CBP 2000; OOSR 2001~~
~~Year 2010 projections based on established rates applied to 2000 census counts.~~
Sources: Census, 2020; OOSR, 2020. Year 2020 projections based on established rates applied to 2010 census counts.

Housing characteristics for the ROI are presented in Table 3.10-5. Owner-occupied housing units account for 70.7 percent of the total housing units while renter-occupied units accounted for 29.3 percent. The vacancy rate in the ROI was 4.2 percent in 2010, indicating that over 3,400 units are available for occupancy (Census, 2020).

~~Housing characteristics for the ROI are presented in Table 3.10-5. Owner-occupied housing units account for 71.8 percent of the total occupied housing units while renter-occupied units accounted for 28.2 percent. The vacancy rate in the ROI was 3.6 percent in 2000, indicating that over 3,200 units are available for occupancy (CBP 2000).~~

Table 3.10-5 Region of Influence Housing Characteristics

Administrative Unit	Housing Units	Owner-Occupied Units	Owner-Occupied Vacancy Rate	Rental Units	Rental Vacancy Rate (Percent)

			(Percent)		
Jackson County	14,587	9,193	2.6	3,817	8.7
Pike County	12,481	7,541	1.5	3,471	11.2
Ross County	32,148	20,404	2.6	8,515	8.8
Scioto County	23,142	21,126	1.7	9,744	7.8
ROI Total	82,358	58,264	2.1	25,547	8.7
	~~Housing Units~~	~~Owner-Occupied Units~~	~~Owner-Occupied Vacancy Rate (Percent)~~	~~Rental Units~~	~~Rental Vacancy Rate (Percent)~~
~~Jackson County~~	~~13,909~~	~~9,328~~	~~1.7~~	~~3,291~~	~~8.6~~
~~Pike County~~	~~11,602~~	~~7,314~~	~~2.0~~	~~3,130~~	~~8.5~~
~~Ross County~~	~~29,461~~	~~19,958~~	~~1.8~~	~~7,178~~	~~7.5~~
~~Scioto County~~	~~34,054~~	~~21,646~~	~~1.9~~	~~9,225~~	~~9.5~~
~~ROI~~	~~89,026~~	~~58,246~~	~~1.8~~	~~22,824~~	~~8.6~~

~~*Source:* CBP 2000~~

Seasonal Populations

In season recreational activities include boating and swimming at Lake White and Pike Lake State Parks, golfing on championship courses, and great hunting and fishing areas.

Schools

There are a number of educational institutions inside a five-mile radius of the DOE reservation. All of the Scioto Valley Local School District's (SVLSD) schools are within the five-mile radius. As of January 2020, these schools are the Piketon High School and Junior High School, located in the same building with 492 students and 27 teachers; Zahn's Corner Middle School with 303 students and 18 teachers (relocated to Piketon High School and Jasper Elementary for the 2019-2020 school year); and Jasper Elementary School with 385 students and 18 teachers (NCES, 2020). In addition to the SVLSD there is the Pike County Career Technology Center with 400 vocational high school students and adult education students, and 70 staff. There are also two public preschools with daycare: Early Childhood Family Center with 35 students and 32 staff, and the Pike County Community Action Committee with 267 students and 63 staff. In addition, there is a private pre and elementary school, Miracle City Academy, with 32 students and 5 staff (Kaylor, 2020). The proximity of these schools to the DOE reservation is shown in Figure 3.10-1.

~~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 five miles of the DOE reservation: one private school that includes preschool through grade 8; two elementary schools, both of which include a preschool program; one junior high school; and one high school. The combined enrollment of these schools for the school year 2003-2004 is approximately 2,437 (USEC-2004-SP). The total school population within five miles, including faculty and staff, is approximately 2,718. The proximity of these schools to the DOE reservation and their enrollments are shown in Figure 3.10-1.~~

~~Four facilities within five miles of the DOE reservation provide day care 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 remaining three facilities are consolidated in the numbers provided in the above paragraph (USEC-2004-SP). The locations of these facilities are shown in Figure 3.10-1.~~

Hospitals and Nursing Homes

Adena Pike Medical Center is the hospital closest to the site, located approximately 7.5 miles north of the facility off State Route 104 south of Waverly. The hospital facility has 25 licensed beds, approximately 147 total staff, and operates at full capacity. Adena Health Center operates an urgent care facility located in Waverly approximately 1 mile north of the hospital. The Southern Ohio Medical Center Family Health Center also operates an urgent care center in Waverly. The Valley View Health Center is located next to the Adena Pike Medical Center. The Adena Family Medicine – Piketon and another Valley View Health Center are both located in Piketon.

There are two licensed nursing homes in the Piketon area: Piketon Nursing Center and Pavilion at Piketon. As of January 2020, the Piketon Nursing Center had 46 patients and 46 staff, and the Pavilion at Piketon had 193 patients and 220 staff. Additionally, a home for people with

intellectual and developmental disabilities is located in Wakefield, Scioto Trails Group Home, with 32 beds and 100 staff (Kaylor, 2020).

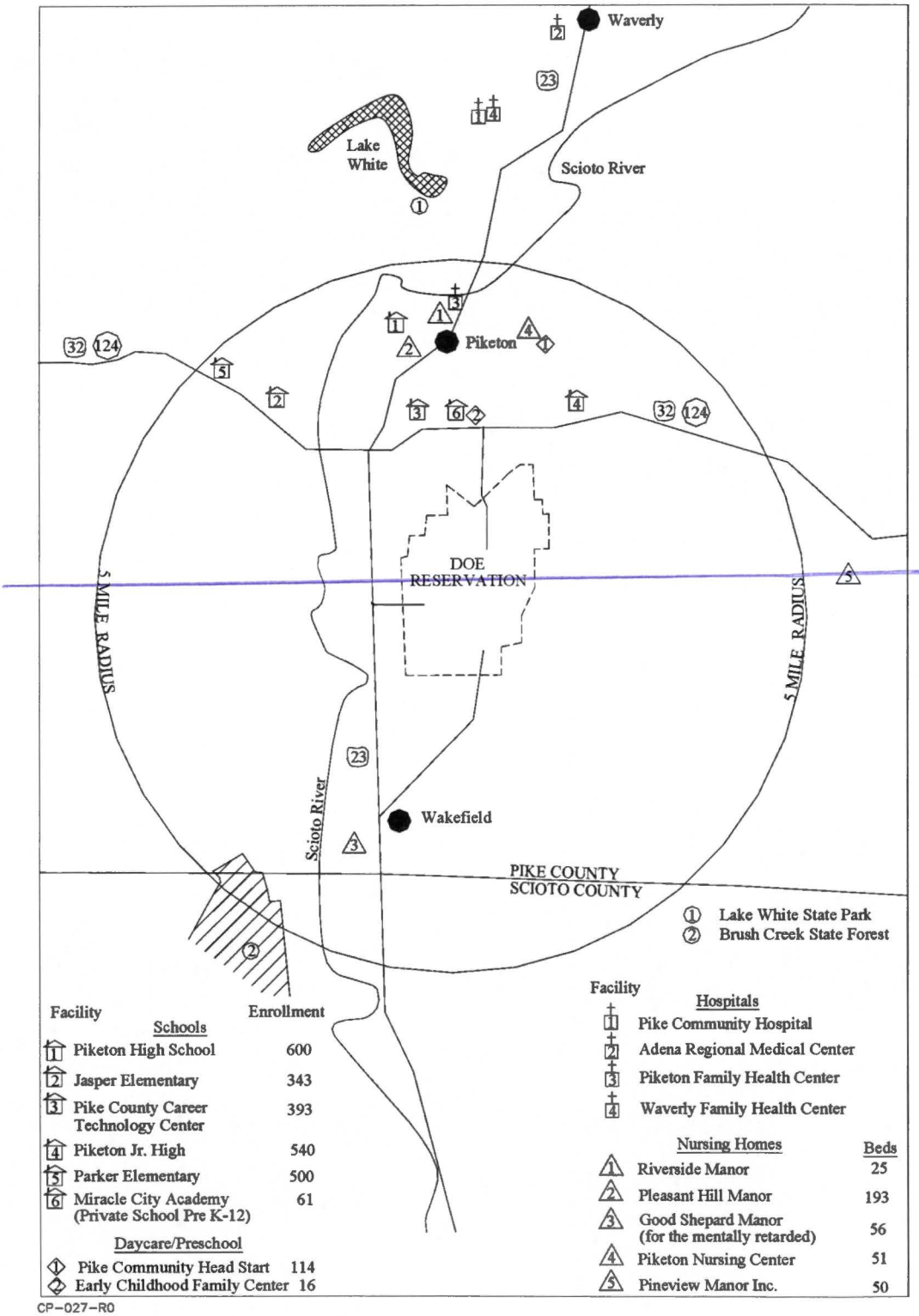
~~Pike Community Hospital is the hospital closest to the DOE reservation, located approximately 7.5 miles north of the DOE reservation on State Route 104 south of Waverly. The facility has 70 licensed beds. No other acute care facilities are located in Pike County. Adena Health Center operates as an urgent care facility, located approximately 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 3.10-1.

Law Enforcement

Several state, county, and local police departments provide law enforcement in the ROI. Pike County, which is where the DOE reservation is located, has 15 officers and will provide law enforcement services to the DOE reservation. Other counties in the ROI have a total of 109 full-time officers, 20 in Jackson, 54 in Ross, and 35 in Scioto (FBI, 2020).~~The on-site 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.~~

~~Three licensed nursing homes are located near Piketon, one in Wakefield, and one in Beaver. Four of these nursing homes are located within five 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 3.10-1 depicts these facilities and shows the number of beds per facility.~~

~~Several state, county, and local police departments provide law enforcement in the ROI. 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 ROI have a total of 101 full-time officers, 16 in Jackson, 32 in Ross, and 53 in Scioto (FBI 2000).~~


Waverly
Lake White
Scioto River
Piketon
DOE RESERVATION
5 MILE RADIUS
5 MILE RADIUS
Wakefield
Scioto River
PIKE COUNTY
SCIOTO COUNTY
① Lake White State Park
② Brush Creek State Forest
Facility
Schools
Enrollment
1 Piketon High School 600
2 Jasper Elementary 343
3 Pike County Career Technology Center 393
4 Piketon Jr. High 540
5 Parker Elementary 500
6 Miracle City Academy (Private School Pre K-12) 61
Daycare/Preschool
1 Pike Community Head Start 114
2 Early Childhood Family Center 16
Facility
Hospitals
1 Pike Community Hospital
2 Adena Regional Medical Center
3 Piketon Family Health Center
4 Waverly Family Health Center
Nursing Homes
Beds
1 Riverside Manor 25
2 Pleasant Hill Manor 193
3 Good Shepard Manor (for the mentally retarded) 56
4 Piketon Nursing Center 51
5 Pineview Manor Inc. 50

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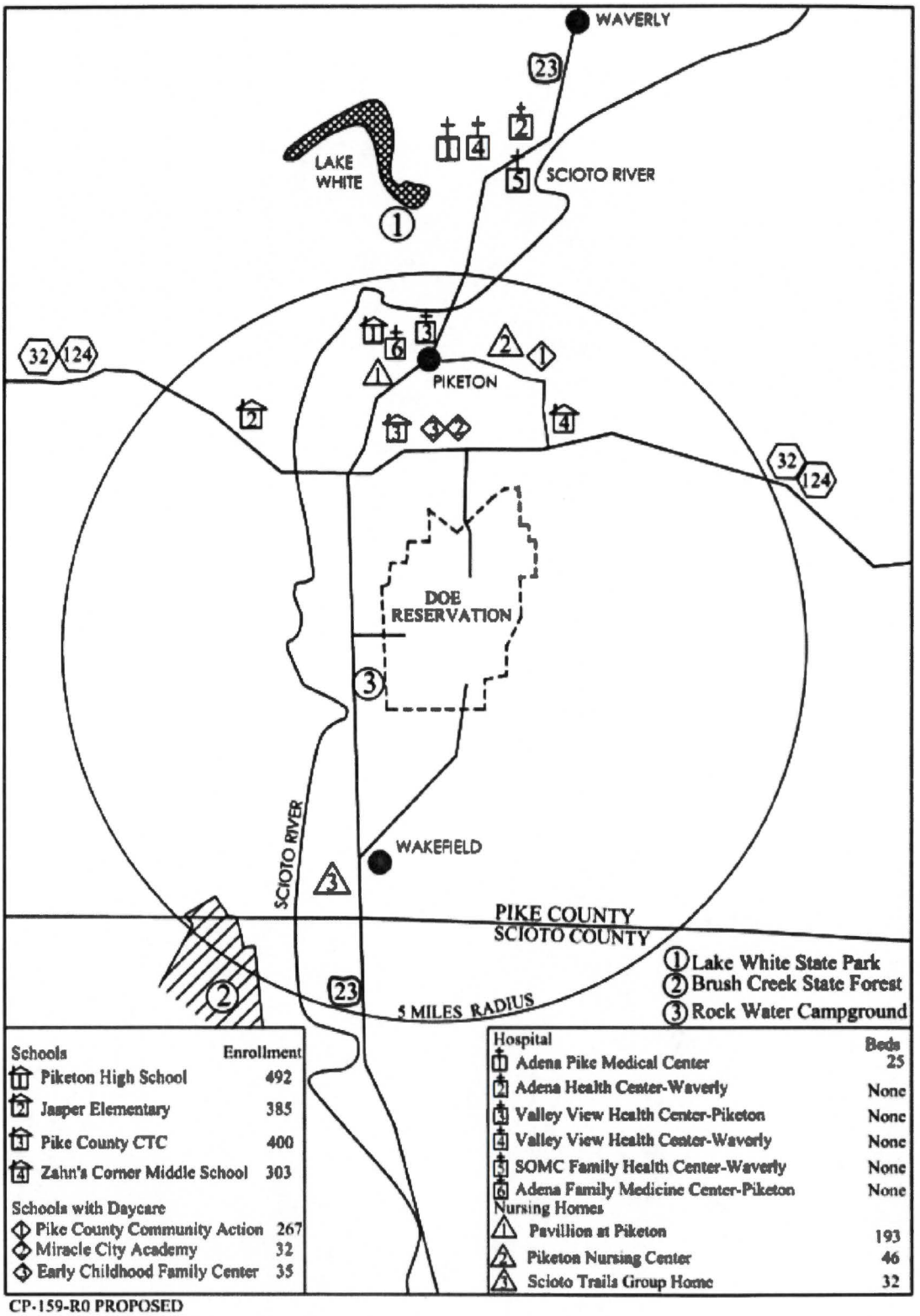


Figure 3.10-1 Special Population Centers within Five Miles of the U.S. Department of Energy Reservation

Minority and Low-Income Population

This section details the racial composition and income status of the county where the DOE reservation is located. Data is provided on the county and census tract level using Census 2010 data (Census, 2020).

The DOE reservation is located in central Pike County just south of the Village of Piketon. The site lies near the eastern edge of Census Tract 9522, near the border with Census Tracts 9523 and 9527. Tables 3.10-6 and 3.10-7 present the individuals of each category of race within the local areas by number and percent respectively. The state levels are presented for comparison. Low-income populations are identified using statistical poverty thresholds from the Bureau of Census (defined in 2010 as income of less than $22,314 for a family of four). Poverty status data from the 2010 Census is not available for individual census tracts, but an estimate of 2017 data was available, and is included. The estimated number of persons below the poverty level and the rates for each of the geographical areas are presented in Table 3.10-8.

~~U.S. census data from the 2000 census was used to determine the minority and low-income status of the areas within a four mile radius of the DOE reservation. The 2000 U.S. census was also used to determine what Census Block Groups (CBG) are wholly or in part within a four mile radius of the DOE reservation. See Figures 3.10-2 and 3.10-3 for the 2000 U.S. Census maps of the DOE reservation; Table 3.10-6 for the raw data on minority population; Table 3.10-7 for the minority population percentages; and Table 3.10-8 for low-income information. This data was used in the environmental justice evaluation contained in Section 4.11.~~

Table 3.10-6 Minority Population (Raw Data)

~~Geography~~	~~Total Population~~	~~White~~	~~African American~~	~~American Indian~~	~~Asian~~	~~Pacific Islander~~	~~Other~~	~~Two or more races~~	~~Hispanic or Latino~~
~~Ohio~~	~~11,353,140~~	~~9,640,523~~	~~1,288,359~~	~~26,999~~	~~132,131~~	~~2,641~~	~~89,149~~	~~173,338~~	~~213,889~~
~~Pike County, Ohio~~	~~27,695~~	~~26,675~~	~~222~~	~~285~~	~~97~~	~~14~~	~~51~~	~~351~~	~~146~~
~~Scioto County, Ohio~~	~~79,195~~	~~75,025~~	~~2,026~~	~~434~~	~~300~~	~~62~~	~~125~~	~~1,223~~	~~476~~
~~Tract 9522, CBG 3, Pike County, Ohio~~	~~1571~~	~~1517~~	~~3~~	~~0~~	~~0~~	~~0~~	~~9~~	~~42~~	~~14~~
~~Tract 9522, CBG 4, Pike County, Ohio~~	~~1,534~~	~~1,525~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~9~~	~~0~~
~~Tract 9523, CBG 1, Pike County, Ohio~~	~~2,493~~	~~2,391~~	~~32~~	~~15~~	~~2~~	~~0~~	~~2~~	~~51~~	~~14~~
~~Tract 9527, CBG 1, Pike County, Ohio~~	~~1,350~~	~~1,305~~	~~0~~	~~6~~	~~11~~	~~0~~	~~14~~	~~14~~	~~14~~
~~Tract 9922, CBG 2, Scioto County, Ohio~~	~~793~~	~~786~~	~~0~~	~~7~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~

	Racial Composition								Ethnicity	
		One Race						Two or More races		
	Total Population	White	African American	American Indian	Asian	Pacific Islander	Other		Hispanic	Non-Hispanic
Census Tract 9522	5,757	5,490	94	30	2	1	10	130	52	5,705
Census Tract 9523	5,497	5,319	47	15	12	1	3	100	37	5,460
Census Tract 9527	4,463	4,361	15	29	1	0	1	56	19	4,444
Pike County	28,709	27,729	258	150	55	4	44	469	207	28,502
Scioto County	79,506	74,729	2,202	372	99	0	730	1,374	880	78,626
Ohio	11,536,504	9,539,437	1,407,681	25,292	192,233	4,066	130,030	237,765	354,674	11,181,830

Note: Persons of Hispanic ethnicity may be of any race.
Source: Census, 2020.

Table 3.10-7 Minority Population (Percentages)

~~Geography~~	~~White~~	~~African American~~	~~American Indian~~	~~Asian~~	~~Pacific Islander~~	~~Other~~	~~Two or more races~~	~~Hispanic or Latino~~
~~Ohio~~	~~84.9%~~	~~11.3%~~	~~0.2%~~	~~1.2%~~	~~0.0%~~	~~0.8%~~	~~1.5%~~	~~1.9%~~
~~Pike County, Ohio~~	~~96.3%~~	~~0.8%~~	~~1.0%~~	~~0.4%~~	~~0.1%~~	~~0.2%~~	~~1.3%~~	~~0.5%~~
~~Scioto County, Ohio~~	~~94.7%~~	~~2.6%~~	~~0.5%~~	~~0.4%~~	~~0.1%~~	~~0.2%~~	~~1.5%~~	~~0.6%~~
~~Tract 9522, CBG 3, Pike County, Ohio~~	~~96.6%~~	~~0.2%~~	~~0.0%~~	~~0.0%~~	~~0.0%~~	~~0.6%~~	~~2.7%~~	~~0.9%~~
~~Tract 9522, CBG 4, Pike County, Ohio~~	~~99.4%~~	~~0.0%~~	~~0.0%~~	~~0.0%~~	~~0.0%~~	~~0.0%~~	~~0.6%~~	~~0.0%~~
~~Tract 9523, CBG 1, Pike County, Ohio~~	~~95.9%~~	~~1.3%~~	~~0.6%~~	~~0.1%~~	~~0.0%~~	~~0.1%~~	~~2.0%~~	~~0.6%~~
~~Tract 9527, CBG 1, Pike County, Ohio~~	~~96.7%~~	~~0.0%~~	~~0.4%~~	~~0.8%~~	~~0.0%~~	~~1.0%~~	~~1.0%~~	~~1.0%~~
~~Tract 9922, CBG 2, Scioto County, Ohio~~	~~99.1%~~	~~0.0%~~	~~0.9%~~	~~0.0%~~	~~0.0%~~	~~0.0%~~	~~0.0%~~	~~0.0%~~

	Racial Compositions (percent)								
		One Race						**Two or More races**	**Ethnicity**	
	Total Population	**White**	**African American**	**American Indian**	**Asian**	**Pacific Islander**	**Other**		**Hispanic**	**Non-Hispanic**
Census Tract 9522	5,757	97.6	1.6	0.5	0.0	0.0	0.2	2.3	0.9	99.1
Census Tract 9523	5,497	96.8	0.9	0.3	0.2	0.0	0.1	1.8	0.7	99.3
Census Tract 9527	4,463	97.7	0.3	0.6	0.0	0.0	0.0	1.3	0.4	99.6
Pike County	26,709	96.6	0.9	0.5	0.2	0.0	0.2	1.8	0.7	99.3
Scioto County	79,506	94.0	2.8	0.5	0.1	0	0.9	1.7	1.1	98.9
Ohio	11,536,504	82.7	12.2	0.2	1.7	0.0	1.1	2.1	3.1	96.9

Note: Persons of Hispanic ethnicity may be of any race.
Source: Census, 2020.

~~*Source:* Census 2000~~

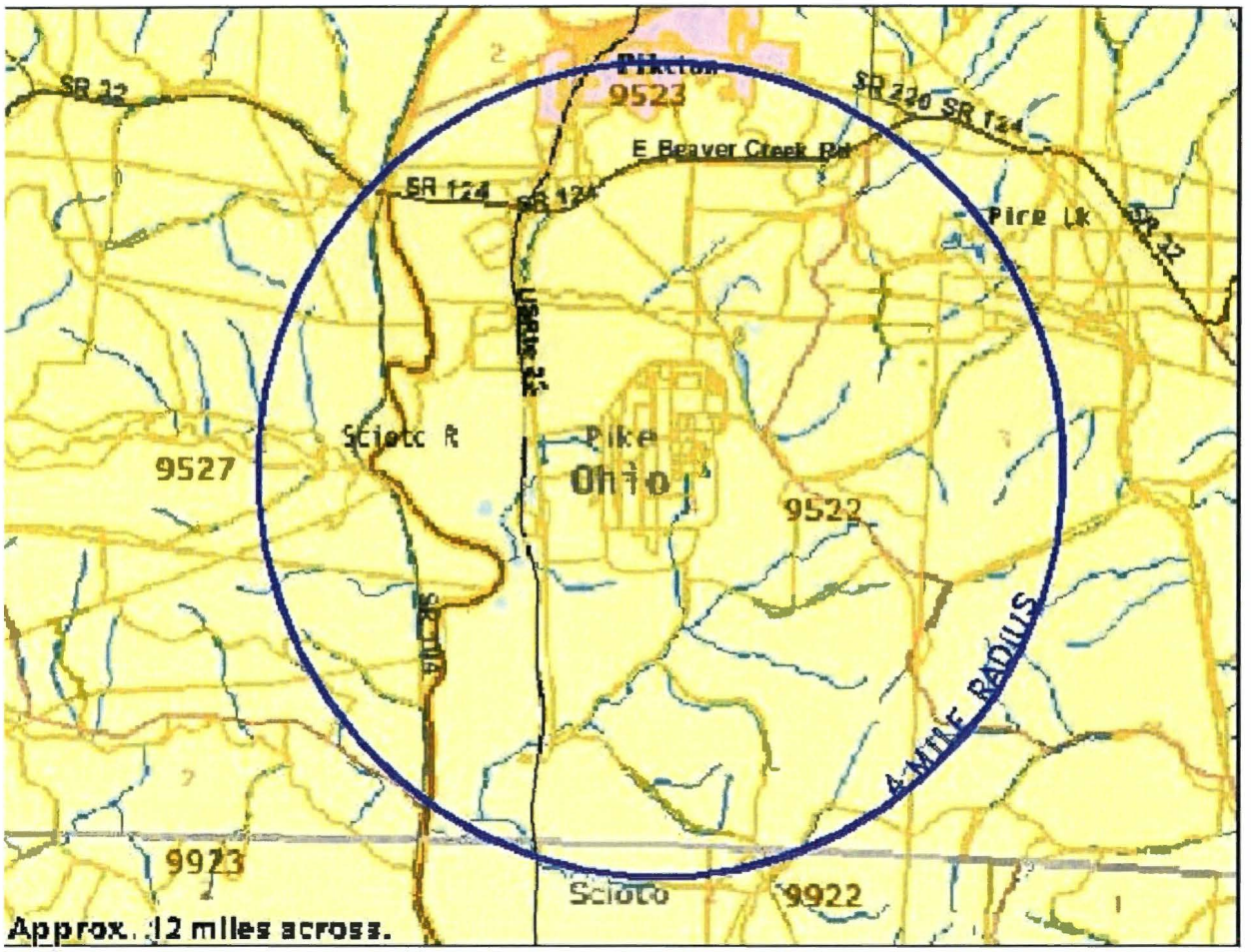
Table 3.10-8 Low-Income Population

Geography	Total	Low-Income (Below Poverty Line)	Percent
Ohio	11,046,987	1,170,698	10.6%
Pike County, Ohio	27,226	5,061	18.6%
Scioto County, Ohio	75,683	14,600	19.3%
Tract 9522, CBG 3, Pike County, Ohio	1530	161	10.5%
Tract 9522, CBG 4, Pike County, Ohio	1,449	249	17.2%
Tract 9523, CBG 1, Pike County, Ohio	2,329	499	21.4%
Tract 9527, CBG 1, Pike County, Ohio	1,350	339	25.1%
Tract 9922, CBG 2, Scioto County, Ohio	786	114	14.5%

Source: Census 2000

Low Income Populations (2017 data)				
Region	**Population**	**Population for Determination of Poverty Status**	**Population Below Poverty Level**	**Percent**
Census Tract 9522	5,757	6,073	1,662	27.4
Census Tract 9523	5,497	4,603	982	21.3
Census Tract 9527	4,463	4,610	962	20.9
Pike County	28,291	27,763	5,565	20.0
Scioto County	79,506	72,072	16,538	22.9
Ohio	11,609,756	11,269,161	1,683,890	14.9

Source: Census, 2020.



Source: ~~2000~~ Census, 2020

Figure 3.10-2 Census Block Group Map

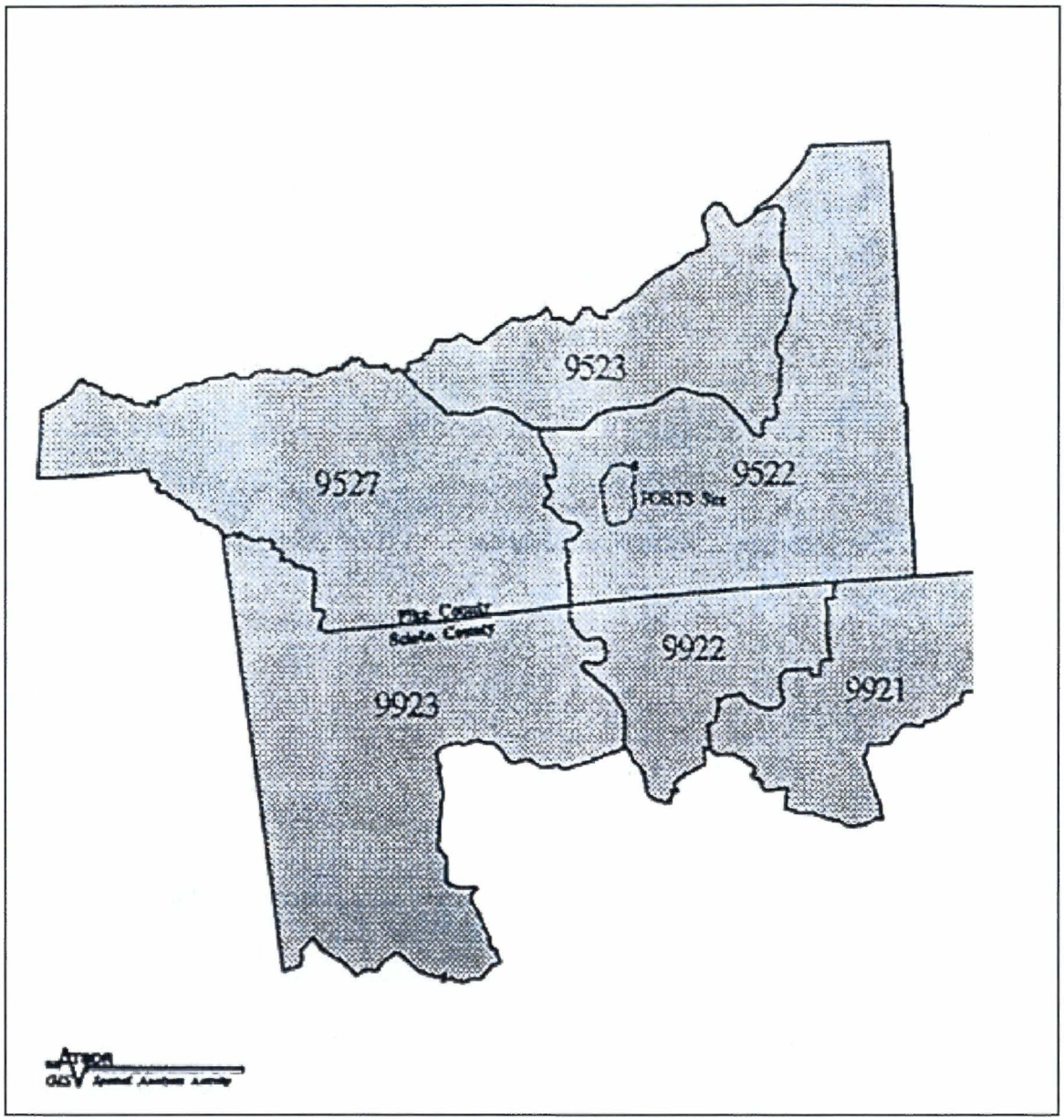


Figure 3.10-3 Census Tract Map

3.11 Public and Occupational Health

Air releases of radionuclides from the operations at the site result in radiation exposures to people in the vicinity well within regulatory limits. Based on the year 20~~02~~17 total radionuclide releases from ~~United States Enrichment Corporation~~DOE reservation operations, the radiation dose calculated to the MEI is 0.~~026~~ 9 mrem/yr. ~~The collective dose to population within 80 km (50 mi) of the site is 0.10 person-rem (NESHAP 2002b).~~ This calculated MEI dose of 0.~~026~~ 9 mrem/yr is much lower than the EPA standard of 10 mrem/yr and the NRC TEDE limit of 100 mrem/yr.

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 GDP. It has been estimated that only about 1,200 of a total of 28,000 personnel (including subcontractors) who have worked at PORTS have received a medical test to determine beryllium sensitivity.

The Department of Energy authorized Bechtel Jacobs Company (BJC) LLC to initiate characterization of potential beryllium contamination at the Portsmouth Gaseous Diffusion Plant. In December 2003, under contract to BJC, 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~~were found in aluminum parts machined and used in several PORTS facilities and these levels are significant based on initial surface characterization results in comparison with DOE 850 contamination limits. 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 NIOSH conducted an epidemiologic study 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 NIOSH 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 final report, Mortality Patterns Among Uranium Enrichment Workers at the Portsmouth Gaseous Diffusion Plant, was published in July 2001. The Announcement of Findings by NIOSH, published October 2001 states: "Overall cohort mortality was significantly less than expected, when compared to the United States population, as was mortality from all cancers. 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. 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 NIOSH study of PORTS" (NIOSH 2002).

The U.S. Department of Labor, Bureau of Labor Statistics (BLS), compiles annual injury and illness data including the incidence rates by industry. ~~United States Enrichment Corporation~~The Licensee's NAICS designation 32518, *Other Basic Inorganic Chemical*

Manufacturing. ~~standard industrial classification (SIC) is 2819, "Industrial Inorganic Chemicals, not elsewhere classified."~~ Calendar year ~~2003~~ 2019 BLS average incidence rate of nonfatal occupational injuries and illnesses are not currently published. The BLS average incidence rate of nonfatal occupational injuries and illnesses for ~~SIC 2819~~NAICS 32518 for calendar year 20~~02~~18 is 0.5 ~~3.4~~ (20~~03~~19 data are not currently available).

The ~~United States Enrichment Corporation~~Licensee maintains a log and summary of recordable occupational injuries and illnesses under the guidance of OSHA 29 CFR Part 1910, Part 1904, *Recording & Reporting Occupational Injuries & Illnesses*. A compilation of Recordable Injury / Illness Rates (RIIs) including the Days Away Restricted: Transferred (DART) rates for the Licensee operations at the DOE reservation are shown in Table 3.11-1.

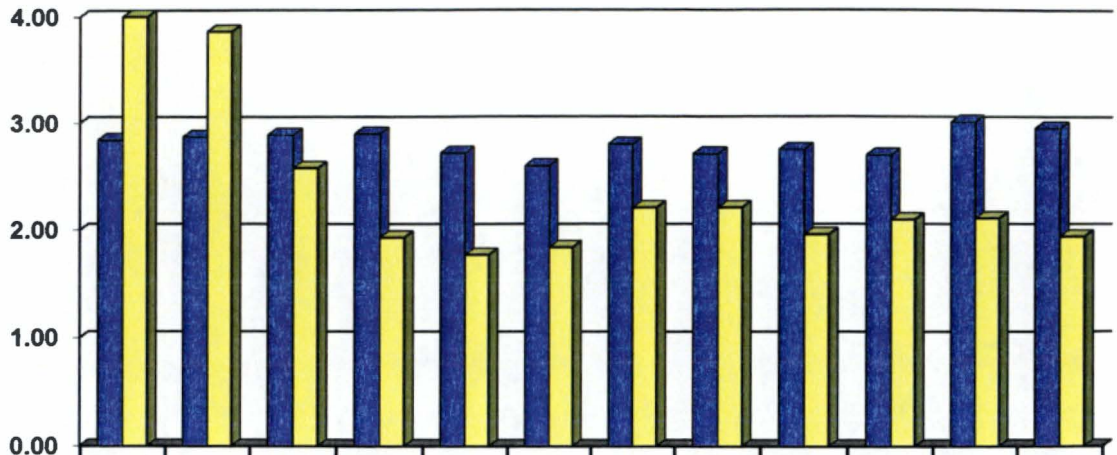
Table 3.11-1 Recordable Injury/Illness Rates (RIIs) for Fiscal Years 20092-201903

Year	Licensee RII	BLS National Average	DART	BLS National Average
2009	0.33	2.0	0.0	0.9
2010	0.0	2.1	0.0	1.1
2011	0.46	3.4	0.0	2.0
2012	1.42	1.9	0.0	1.0
2013	0.77	1.7	0.0	0.9
2014	0.88	2.3	0.0	1.3
2015	0.89	2.0	0.45	0.9
2016	0.00	1.1	0.0	0.6
2017	2.99	2.3	2.24	0.7
2018	5.37	1.3	5.37	0.5
2019	1.90	Not Available	1.90	Not Available

Source: Bennet, 2020.

~~Table 3.11-1 summarizes a comparison of year-to-date monthly Recordable Injury/Illness rates (RIIs) for fiscal years 2002 and 2003.~~

~~**Table 3.11-1 Recordable Injury/Illness Rates (RIIs) for Fiscal Years 2002 and 2003**~~



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CY-2002	2.84	2.87	2.89	2.90	2.72	2.60	2.80	2.71	2.75	2.70	3.01	2.95
CY-2003	4.40	3.86	2.58	1.93	1.77	1.84	2.21	2.21	1.96	2.10	2.11	1.94

~~*Source:* Waste Management, Environmental Compliance, Industrial Safety~~
~~Note: The rates are calculated based on the number of injuries and illnesses divided by the Number of hours worked by employees times 200,000 hours.~~

~~Calendar year 2002 and 2003 Recordable Injury/Illness rates are 2.95 and 1.94, respectively which are well below the national average of 3.4 for SIC 2819 published for 2002.~~ Over the years, the major sources of significant chemical exposures at the Gaseous Diffusion Plant have been to the following agents:

- Acids (Hydrochloric, Hydrofluoric, Nitric, Sulfuric) - Nitric acid levels ranged up to 8.14 milligrams per cubic meter (mg/m^3)
- Arsenic - Levels ranged up to 2.1 mg/m^3
- Asbestos - Levels ranged up to 1.4 fibers/cubic centimeter (cc)
- Chlorine, Chlorine Trifluoride - Chlorine levels ranged up to 1.8 mg/m^3
- Chlorinated Solvents (TCE, Methyl chloroform, etc.) - TCE levels ranged up to 145 mg/m^3
- Chromium (Total) - Levels ranged up to 1.6 mg/m^3
- Fluoride, Fluorine, and HF – HF levels ranged up to 4.2 mg/m^3
- Lead, Copper (weapons qualification) - Lead levels ranged up to 19.5 mg/m^3
- Mercury - Levels ranged up to 0.19 mg/m^3

- Nickel - Levels ranged up to 0.45 mg/m^3

Exposures to the above chemical agents are controlled by administrative and engineering methods and/or personal protective equipment. Exposure results are reported as an 8-hour TWA as specified in 29 CFR 1910.1000, Table Z-1.

The following Extremely Hazardous Substances are stored and used on the DOE reservation site as identified by *Ohio Revised Code* Section 3750.02(B)(1)(a), *Superfund Amendment and Reauthorization Act* of 1986, Title III, Community Right-To-Know:

- ~~Chlorine~~
- Fluorine
- HF
- Nitric Acid
- ~~SO_2~~
- Sulfuric Acid

There have been no industrial fatalities on the DOE reservation.

3.12 Waste Management

~~The DOE and United States Enrichment Corporation's Waste Management Programs direct the safe storage, treatment, and disposal of waste generated by past and present operations and from current environmental restoration projects. DOE also stores United States Enrichment Corporation generated mixed waste in the RCRA Part B permitted storage areas in agreement with the OEPA Director's Final Findings and Orders, issued to the United States Enrichment Corporation on October 5, 1995.~~

Waste management requirements are varied and are sometimes complex because of the variety of waste streams generated by the ~~United States Enrichment Corporation~~Licensee and DOE activities. DOE Orders and NRC, EPA, OEPA, and Ohio Department of Health (ODH) regulations must be satisfied to demonstrate compliance for waste management activities. Additional policies have been implemented for management of radioactive, hazardous, and mixed wastes. ~~The United States Enrichment Corporation is currently operating in accordance with an NRC Certificate of Compliance in accordance with 10 CFR Part 76.~~

3.12.1 Waste Handling Operations

Waste is managed safely, effectively, and in full compliance with federal and state regulations, while protecting the environment from present and future degradation.

~~Waste is typically transferred to the XT-847 facility. At the XT-847 facility, the waste may be further sampled/measured to assist in determining the proper waste characterization and proper disposal/treatment.~~

After ensuring proper containerization, characterization, labeling/marking, etc., the waste is scheduled for off-reservation disposal/treatment at a Treatment, Storage, Disposal, Recycling Facility (TSDRF) in accordance with applicable state and federal regulations.

~~Waste Operations in the XT-847 facility also includes United States Enrichment Corporation generated waste and waste generated from United States Enrichment Corporation Project/Contract work. These wastes may process through the XT-847 facility for preparation for off-reservation shipment (this includes sampling, batching/blending, packaging, labeling, etc.).~~

With the beginning of D&D at the DOE reservation, DOE is placing increased emphasis on the evaluation of materials generated by D&D for reuse or recycling. An agreement between DOE and the Southern Ohio Diversification Initiative (SODI) allows DOE to transfer excess equipment, clean scrap materials, and other assets to SODI. SODI first attempts to reuse the excess equipment and property within the local community. Pursuant to the agreement, if SODI is unable to place the property for reuse in the local community, SODI may sell the property. When SODI sells the property, the proceeds are used to support economic development in the southern Ohio region. Between 2012 and 2017, SODI received over 4,600 tons of materials from the former Portsmouth GDP, including recyclable materials (metals, paper and plastic), recyclable oil, excess office furniture; and over 200 passenger vehicles (FBP-ER-RCRA-WD-RPT-0288).

DOE obtained approval from the OEPA in June 2015 to construct an OSWDF in the northeast portion of the DOE reservation. The record of decision for site-wide waste disposition was concurred with by Ohio EPA in June 2015. Approval of Phase I and Phase II of the remedial design/remedial action work plan for the OSWDF was obtained in September and October 2015, respectively, which allowed initial site construction activities such as tree clearing, fencing, utility installation, and installation of erosion and sediment controls, retention ponds for surface water runoff, and installation of office trailers. These activities began after approval of the work plan and are continuing (FBP-ER-RCRA-WD-RPT-0288).

The latest information for the former Portsmouth GDP waste generation rates can be found in the Annual Site Environmental Report (FBP-ER-RCRA-WD-RPT-0288).

Waste Streams

Various waste streams are generated and are designated as one or more of the following, as applicable: low-level radioactive waste (LLRW), RCRA hazardous waste, LLMW, non-regulated/recyclable waste, classified/sensitive waste, and sanitary/industrial waste.

Low-Level Radioactive Waste

LLRW is radioactively contaminated waste that is not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or by-product materials as defined in section 11e(2) of the *Atomic Energy Act*.

Some examples of LLRW include dry active waste (DAW), radioactively contaminated metal, trap material, and used oil.

LLRW including mixed waste exhibit radionuclide activities that will typically range from the minimum detectable activity of 0.2 to 0.5 ug/g for total uranium and 1.0 pCi/g technetium up to 0.5mg/g for total uranium and 30 pCi/g for technetium. Higher concentrations do occasionally occur.

Trap material consists of alumina, magnesium and sodium fluoride pellets. Activities will typically range from the minimum detectable activity of 0.2 to 0.5 ug/g for total uranium and 1.0 pCi/g technetium up to 10.0 mg/g for total uranium and 100,000 pCi/g for technetium.

Magnesium trapping material from the feed stock decontamination project has had levels of up to 4.78 μCi/g.

Resource Conservation and Recovery Act - Hazardous Waste

RCRA waste is a hazardous waste that is listed in 40 CFR Part 261, Subpart D or exhibits any hazardous waste characteristics reported in 40 CFR Part 261 Subpart C or in equivalent state regulations.

Some examples of RCRA hazardous waste include mercury batteries, nickel-cadmium batteries, lithium batteries, aerosol cans, solvents, and laboratory waste.

Low-Level Mixed Waste

LLMW is a waste that contains both low-level radioactive waste and RCRA hazardous waste, as defined in OAC 3745-266-210.

Some examples of LLMW include laboratory waste, decontamination solutions, and solvents.

Non-Regulated/Recyclable Waste

Non-regulated/recyclable waste includes waste that is:

- Not radioactively contaminated,
- Not RCRA-hazardous,
- Not *Toxic Substance Control Act* (TSCA)-regulated,
- Not classified/sensitive, and
- Is not acceptable for disposal at a sanitary landfill.

Some examples of non-regulated/recyclable waste include used oil, fluorescent bulbs, incandescent bulbs, High Intensity Discharge bulbs, circuit boards, scrap metal, and lead-acid batteries.

Classified/Sensitive Waste

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.

Sanitary/Industrial Waste

Sanitary/industrial waste includes non-hazardous solid waste generated by industrial process and manufacturing and conventional waste material that is no longer usable for plant operations.

Some examples of sanitary/industrial waste include sludge from wastewater treatment, alkaline batteries, trash, paper, wood, metal, glass, and cafeteria/office refuse.

Waste Stream Characterization/Classification

Waste are classified based upon various factors, which includes, but is not limited to, laboratory analysis, radiological assessment, process knowledge, Material Safety Data Sheets (MSDS), and Non-Destructive Analysis (NDA).

Waste Segregation and Collection

Generated wastes are collected and packaged, where feasible, by the waste generator. Wastes known to be suitable for release to unrestricted areas based on the point and process of generation are segregated at the source, when possible, from wastes not suitable for release to unrestricted areas. Until characterized, wastes from areas controlled for loose radioactive contamination are considered to be potentially contaminated, these wastes are segregated until completion of such characterization.

Waste collection and segregation activities are completed in accordance with applicable state and federal rules and regulations and site procedures. Waste are collected and packaged, where feasible, by the waste generator. Waste are segregated into the various waste streams and handled accordingly to minimize the generation of hazardous, LLMW, and LLRW.~~**Waste Operations Within the XT-847 Facility**~~

~~For long-term storage and preparation of waste for off-reservation shipment to TSDRF, several operations are performed within the XT-847 facility by the United States Enrichment Corporation. These operations include, but are not limited to: sampling, batching, blending, glove box operations, non-destructive assay measurements, DAW and contaminated metal sorting, repackaging, and overpacking. Sampling, batching, and repackaging may also be performed elsewhere on-site, as necessary (e.g., X-710 building).~~

~~Sampling and batching of some solid waste, with air-borne potential, may be performed within the glove box enclosure. Sampling and batching of some liquid waste may be performed by utilizing a blending unit (a liquid waste collection and sampling system). Additional sampling and batching of both liquid and solid waste is performed within the XT-847 facility outside of glove box and blending unit operations.~~

~~The non-destructive assay equipment located within the XT-847 facility includes, but is not limited to (portable NDA equipment may be utilized within the XT-847 facility), a Low Density Waste Assay Monitor (LDWAM) and box monitor. This equipment is utilized to measure the activity of waste in a variety of containers including small diameter containers, drums, and B-25 boxes.~~

~~DAW and contaminated metal is typically collected in 55-gallon containers, but in some instances may be placed directly into B-25 boxes. The contents of the filled 55-gallon containers is sorted and transferred into B-25 boxes within the XT-847 facility in preparation for off-reservation shipment to a TSDRF.~~

~~Waste is also repackaged and/or overpacked within the XT-847 facility. Prior to off-reservation shipment or upon discovery, leaking and/or damaged containers are either repackaged into a similar container or overpacked. 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 Packaging and Labeling

Waste is containerized and labeled in accordance with applicable U.S. Department of Transportation (DOT) regulations and site procedures. Some general types of waste packaging include, but are not limited to:

- 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/DAW — B-25 boxes or other similar boxes; various drums

In addition, 85- and 110-gallon overpacks may be used for appropriate wastes and leaking/damaged containers.

Waste Storage

Waste is typically removed from the generating facilities and transferred to a waste storage facility ~~(typically the XT-847)~~ prior to final disposal; however, in some instances, waste may be shipped directly from other on-site areas. RCRA hazardous waste is stored on-site for up to 90 days prior to off-reservation shipment to a TSDRF. Non-regulated/recyclable waste, LLMW, and LLRW are stored on-site until off-reservation shipment to a TSDRF can be scheduled.

The LLMW waste is exempted from the storage requirements of RCRA hazardous waste as defined in OAC 3745-51-03. LLMW is eligible for this conditional exemption as it is a RCRA hazardous waste and is generated and managed as described in 40 CFR Part 266, Subpart N and OAC-3745-266.

Contaminated scrap metal, DAW, and other boxed waste may be stored outside. ~~Typically, these B-25 boxes are 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 B-25 boxes, radioactive wastes with removable contamination are packaged in containers, wrapped or covered to prevent the release of radioactivity.

Off-reservation Waste Shipments

Waste shipments are packaged, labeled, and manifested in accordance with applicable state, federal, DOT, NRC, EPA requirements, and plant procedures. Packages are inspected prior to shipment, as appropriate, to verify compliance with applicable packaging and transportation requirements.

Off-reservation shipments of waste are made only to approved TSDRFs. Prior to off-reservation shipment, it is confirmed that the waste meets the waste acceptance criteria (WAC) of the TSDRF.

During 20~~02~~17, over 4 million lb of waste from the DOE Portsmouth were recycled, treated, or disposed (Table 3.12.1-1). ~~Future DOE waste management projects include the shipment for disposal of LLRW and mixed waste, and the treatment of mixed and polychlorinated biphenyl (PCB) mixed waste at DOE approved off-reservation facilities~~These figures include waste from FBP only, and do not include waste from the Licensee (FBP-ER-RCRA-WD-RPT-0288).

Waste Tracking and Documentation

All LLRW, LLMW, RCRA hazardous waste, and non-regulated/recyclable waste are tracked through a Request for Disposal (RFD) system. Each waste container is given a unique identification number. The identification numbers are entered and maintained in a database. The database is updated to reflect location, characterization, and waste disposal information.

Table 3.12.1-1 U.S. Department of Energy Waste Management Program Treatment, Disposal, and Recycling Accomplishments for 201702

Waste Type	Waste Stream	Quantity (lbs)	Treatment, disposal, or recycling facility
RCRA	PCB contaminated soft combustible debrisAerosol cans and other liquids classified as hazardous waste	12,999 drums/ 262,0201,396 lbs	EnvirocareEnvironmental Quality Co.
RCRA	Battery acid and air filters contaminated with metals	1,559	Michigan Disposal Waste Treatment Plant
LLW	Used oils	81,392	Diversified Scientific Solutions
LLW	Sludges, contaminated liquids, scrap metal, and other debrisLow-level radioactive waste	2546 containers/ 2,937,518 lbs69,315	EnvirocareEnergy Solutions Clive, UT
LLW	Contaminated paperSoil contaminated with trichloroethene	2,295927 containers/ 639,469 lbs	Materials & Energy CorporationEnergy Solutions Bear Creek, TN
LLW	RCRA debrisAsh and other solids	676422 containers/ 59,529 lbs	Materials & Energy Corp.TSCA Incinerator
LLW	D&D waste, uranium materials, scrap metal, and other soilds, Silver Solutions	1,747,657 30 containers/ 1616 lbs	Nevada National Security SiteSafety-Kleen
LLW/BSFR	Assorted solids (wood, metal, plastic, etc.)Lamps	192,3706,360 lbs	Omega Waste LogisticsOnyx
RCRA/LLW	Lab wastes, gas cylinders, and other liquids Batteries	3,55639,906 lbs	Diversified Scientific SolutionsOnyx
RCRA/LLW	D&D waste, soil, lab wastes, and other materials Aluminum cans	70,3472,112 lbs	Energy Solutions Clive, UT Star, Inc.
RCRA/LLW	Metal turnings, carbon filters, and other materials Cardboard	124,21211,430 lbs	Materials & Energy Corp.Star, Inc.
RCRA/LLW	Solids contaminated with RCRA metals	5,61335,760 lbs	Perma-Fix FloridaRumpke
LLW/PCB	Oil/water mixture contaminated with PCBs	11,675	Diversified Scientific Solutions
LLW/PCB	PCB ballasts, wire, and other D&D waste	51,803	Nevada National Security Site
RCRA/LLW/ PCB	Used PCB oil	353	Diversified Scientific Solutions
PCB	PCB Transformer	427	Environmental Protection Services
Solid Waste	D&D waste, concrete, asphalt, metal, office waste, and other solid materials	562,600	Rumpke/ Pike Sanitation Landfill
Solid Waste	Non-hazardous liquids (antifreeze, refrigerant)	21,011	Environmental Quality Co.
-	Recyclable aluminum cans, batteries, electronic materials, plastic, batteries, light bulbs, etc.	294,750	Various (not including SODI)
-	Recyclable materials transferred to SODI	1,192,021	-

Source: FBP-ER-RCRA-WD-RPT-0288DOE 2003a

On March 2, 2016, the Licensee notified NRC of their decision to permanently cease operation at the Lead Cascade and to terminate the NRC Materials License (SNM-7003) following decontamination and decommissioning activities. The packaging and shipping activities associated with the classified and/or contaminated waste were completed over a 10-month period which began in March 2017 and the final shipment was completed in December 2017. Waste categories handled during the Lead Cascade decommissioning efforts, were as follows: 1) solid radioactive waste, 2) liquid radioactive waste, and 3) solid Low-Level Mixed Waste (DP-2605-0001). Unclassified, low-level contaminated liquid waste was handled as an on-site transfer for processing to the DOE's Prime Contractor for the D&D activities at the former Portsmouth GDP, FBP in Piketon, Ohio (DP-2605-0001).

~~During calendar year 2003, the United States Enrichment Corporation disposed of 5,465 cubic feet (ft3) of LLRW and 524 ft3 of mixed wastes. The United States Enrichment Corporation was able to recycle 2,700 ft3 of batteries, bulbs, and used oil (Table 3.12.1-2). The generation rates for LLRW and mixed wastes are expected to remain constant for the next few years. The projected annual United States Enrichment Corporation generation rates for waste is 13,000 ft3 for LLRW and 500 ft3 of mixed wastes.~~

~~**Table 3.12.1-2 United States Enrichment Corporation Waste Generation and Shipment Rates - Calendar Year 2003**~~

Waste Category	Generated (ft^3)	Shipped (ft^3)	Treatment/Disposal Facility
Mixed/Hazardous:			
-Aerosol Cans			
-Lithium Batteries			
-Ni-cad Batteries			
-Metal Bearing Solids			
-Solvent Laden Solids	317		LWD
-Solvent Laden Paint	217 Mixed	524	DSSI
-Laboratory & Off Spec Chemicals	100 RCRA		**Perma-Fix**
-Misc. Lab Solutions			
-Alumina			
-Sludge			
Low-Level Radioactive:			
-Dry-Activated Waste			
-Scrap Metal			Envirocare
-Oily 3M Cloth	10,016	5,465	DSSI
-Used Oil			**GTS Duratek**
-Alumina			
-Sludge			
Recyclables:			
Fluorescent Bulbs Incandescent Bulbs Circuit Boards	1,033	820	**AERC**
Lead-Acid Batteries	622	1430	**DOE Run**
Used Oil	148	451	**Safety-Kleen**
Sanitary/Industrial	300 ton	300 ton	**Pike Sanitary Landfill**

NOTE: Wastes shipped include shipping those in backlog.

Source: United States Enrichment Corporation Waste Management/Environmental Compliance/Industrial Safety.