EXECUTIVE SUMMARY

PURPOSE

This Annual Site Environmental Report is prepared to summarize environmental activities, primarily environmental monitoring, at the U.S. Department of Energy (DOE) Portsmouth Gaseous Diffusion Plant (PORTS) for calendar year 2011. The report fulfills a requirement of DOE Order 231.1B, *Environment, Safety and Health Reporting*, for preparation of an annual summary of environmental data to characterize environmental management performance. The Annual Site Environmental Report also provides the means by which DOE demonstrates compliance with the radiation protection requirements of DOE Orders 458.1, *Radiation Protection of the Public and the Environment*, which replaced DOE Order 5400.5 during 2011.

SITE AND OPERATIONS OVERVIEW

PORTS, which produced enriched uranium via the gaseous diffusion process from 1954 to 2001, is one of three uranium enrichment facilities originally built in the United States; the other two were constructed in Oak Ridge, Tennessee and Paducah, Kentucky, respectively. PORTS is located on 5.9 square miles in Pike County, Ohio. The county has approximately 28,700 residents.

DOE is responsible for decontamination and decommissioning (D&D) of the gaseous diffusion process buildings and associated facilities, environmental restoration, waste management, depleted uranium hexafluoride (DUF_6) conversion, and management of other non-leased facilities at PORTS. DOE contractors LATA/Parallax Portsmouth, LLC (LPP), Fluor-B&W Portsmouth LLC (FBP), Wastren-EnergX Mission Support, LLC (WEMS), Uranium Disposition Services, LLC (UDS), and B&W Conversion Services, LLC (BWCS) managed DOE programs at PORTS in 2011.

LPP was responsible for the following activities from January 1, 2011 until March 29, 2011: 1) environmental restoration of contaminated areas; 2) monitoring and reporting on environmental compliance; 3) disposition of legacy radioactive waste; 4) D&D of inactive facilities; 5) disposition of highly enriched uranium; and 6) operation of the site's waste storage facilities. On March 29, 2011, FBP assumed responsibility for these activities, as well as D&D of PORTS.

WEMS provided facility support services including the following: 1) maintenance of facilities, grounds, and roadways; 2) janitorial services; 3) security access for DOE facilities; 4) training; 5) records and fleet management; and 6) information technology/network support for DOE operations.

UDS was responsible for operations associated with the DUF_6 Conversion Facility from January 1, 2011 until March 29, 2011. BWCS assumed responsibility for the DUF_6 Conversion Facility on March 29,2011, including surveillance and maintenance of DUF_6 cylinders, and environmental compliance and monitoring activities associated with operation of the DUF_6 Conversion Facility. DUF_6, which is a product of the uranium enrichment process, is stored in cylinders on site. The DUF_6 Conversion Facility converts DUF_6 into uranium oxide and hydrogen fluoride. The uranium oxide is made available for beneficial reuse, storage, or disposal, and the hydrogen fluoride is sold for reuse.

In 1993, DOE leased the uranium enrichment production and operations facilities at PORTS to the United States Enrichment Corporation (USEC), a company that was government-owned until it was privatized in 1998. USEC Government Services, a subsidiary of USEC that leased the gaseous diffusion production facilities from DOE, began the process of returning the gaseous diffusion process buildings to DOE in 2010. This process was completed on September 30, 2011. Environmental monitoring data collected by USEC Government Services prior to September 30, 2011, are reported by FBP (the DOE contractor that became responsible for this monitoring).

USEC, Inc. (the parent company of USEC) is developing a gaseous centrifuge uranium enrichment plant at PORTS. USEC, Inc. leases buildings from DOE, but the gaseous centrifuge uranium enrichment plant is a commercial enterprise of USEC, Inc. and is not pursuant to a DOE contract. The USEC, Inc. Lead Cascade, which is a small-scale demonstration centrifuge for uranium enrichment, has been operating since 2006. The commercial scale American Centrifuge Plant (ACP) is under development. Both of these facilities (the Lead Cascade and the ACP) are housed in existing buildings at PORTS.

With the exception of Chapter 2, Compliance Summary; Chapter 4, Environmental Radiological Program Information; and Chapter 5, Environmental Non-Radiological Program Information, this report does not cover USEC, Inc. operations at PORTS because their operations are not subject to DOE Orders. USEC, Inc. data are included in these chapters to provide a more complete picture of the operations in place at PORTS to detect and assess potential impacts to human health and the environment resulting from PORTS activities.

ENVIRONMENTAL COMPLIANCE

DOE and/or the responsible DOE contractor have been issued permits for discharge of water to surface streams, air emission permits, and a permit for the storage of hazardous waste. The National Pollutant Discharge Elimination System (NPDES) outfalls and numerous air emission permits that were associated with the gaseous diffusion plant were also transferred from USEC Government Services to FBP during 2011.

DOE contractors are responsible for preparing a number of reports for compliance with environmental regulations. These reports include: an annual groundwater monitoring report; an annual hazardous waste report; an annual polychlorinated biphenyl (PCB) document log; an annual summary of radionuclide air emissions and the associated dose to the public from these emissions; a biennial report of specified non-radiological air emissions; a monthly report of NPDES monitoring data; a quarterly radiological discharge monitoring report for NPDES outfalls; an annual hazardous chemical inventory; and an annual toxic chemical release inventory.

USEC, Inc. is responsible for compliance activities directly associated with the ACP and Lead Cascade including air emission permits associated with the gaseous centrifuge uranium enrichment operations (the proposed ACP and Lead Cascade), NPDES outfalls, and management of wastes generated by their current operations.

DOE and/or DOE contractors received three Notices of Violation in 2011. On April 6, 2011, Ohio EPA observed a release of used oil at the X-630 D&D project that was a violation of used oil storage regulations. In response to the release, FBP removed and disposed of absorbent materials saturated with oil and stained gravel in the area of the release. Absorbent material and straw was placed in or around the affected on-site drainage ditch and storm drain to catch any residual oil. Documentation of the cleanup was provided to Ohio EPA. In response, Ohio EPA stated that DOE and FBP had abated the violation in a letter dated April 15, 2011.

DOE received a Notice of Violation/Return to Compliance from the inspection conducted by U.S. Environmental Protection Agency (U.S. EPA) and Ohio Environmental Protection Agency (Ohio EPA) on June 27, 2011. The Notice of Violation was for failing to label containers of used oil and used fluorescent lamps with the words “used oil” or “used lamps”, respectively. The violation was immediately abated by labeling the containers. U.S. EPA stated in the Notice of Violation that DOE and FBP had resolved the violation. No further action was required.

LPP received a Notice of Violation dated August 2, 2011 from the Utah Radiation Control Board for a shipment of radioactive waste received on February 7, 2011 by the EnergySolutions facility in Clive,

Utah. The shipment, which consisted of three 85-gallon drums of radioactive waste, exceeded the facility's waste acceptance criteria for depleted uranium and uranium-235, based on samples of the waste that were collected and analyzed by EnergySolutions. A civil penalty of $10,000 was assessed by the Utah Radiation Control Board and paid by LPP. The waste was subsequently shipped to and disposed at a facility that was allowed to accept radioactive waste with the levels of depleted uranium and uranium-235 that were present in the waste.

ENVIRONMENTAL PROGRAMS

D&D, Environmental Restoration, Waste Management, and Public Awareness Programs are conducted at PORTS to protect and inform the local population, improve the quality of the environment, and comply with federal and state regulations.

D&D Program

In 2010, D&D of the PORTS gaseous diffusion process buildings and associated facilities began with the signing of 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 Ohio EPA and DOE that governs the process for D&D of the buildings/structures that are no longer in use at PORTS.

In 2011, the planning and investigations necessary for D&D of the gaseous diffusion process buildings and associated facilities included development of the process for characterization and removal of 46 of the less complex facilities at PORTS, development of the work plan to characterize the process buildings and other complex facilities, and sampling and evaluation necessary to determine alternatives for disposition of the waste generated by D&D.

D&D of eight facilities (X-103, X-334, X-344B, X-630, X-230J9, X-605H, X-605I, and X-605J) was completed during 2011. Three projects funded by the American Recovery and Reinvestment Act (ARRA) were also completed in 2011: environmental remediation (source removal) at the X-701B Holding Pond, D&D of the X-533 Switchyard Complex, and repackaging and disposition of excess uranium materials.

Environmental Restoration Program

The Environmental Restoration Program was established by DOE in 1989 to identify, control, and remediate environmental contamination at PORTS. The 1989 Ohio Consent Decree and the 1989 U.S. EPA Administrative Consent Order (as amended in 1994 and 1997) require investigation and cleanup of environmental media at PORTS in accordance with the Resource Conservation and Recovery Act (RCRA) Corrective Action Program. The site was divided into quadrants to facilitate the investigation and cleanup. Corrective actions, also called remedial actions, are underway in each quadrant.

In 2011, the Environmental Restoration Program was responsible for investigations of soil and/or groundwater associated with several facilities removed as part of D&D, two projects to remediate soil and/or groundwater contamination in the Quadrant II Groundwater Investigative Area and X-740 Waste Oil Handling Facility, and the continued remediation of the western portion of the X-701B area, which was funded by ARRA and began in 2009.

The Environmental Restoration Program also monitors and maintains five closed landfills at PORTS in accordance with Ohio EPA regulations. Samples are collected periodically (most often semiannually) from groundwater monitoring wells around the landfills. The samples are analyzed for chemicals and radionuclides that could be released from the materials that were disposed in the landfills.

Four groundwater treatment facilities are operated by the Environmental Restoration Program to treat contaminated groundwater from the on-site groundwater plumes that are contaminated with industrial solvents, including trichloroethene (TCE). These facilities are part of the systems at PORTS that collect contaminated groundwater. The groundwater treatment facilities remove TCE from the water so it can be safely discharged to Little Beaver Creek or the Scioto River in accordance with NPDES permits issued by Ohio EPA.

Waste Management Program

The DOE Waste Management Program at PORTS directs the safe storage, treatment, and disposal of waste generated from D&D of facilities that are no longer in use, past plant operations, ongoing plant maintenance, and ongoing environmental restoration projects. In 2011, approximately 16,000 tons of waste from DOE activities at PORTS were recycled, treated, or disposed at off-site facilities.

Waste management activities are conducted in compliance with applicable DOE Orders, Ohio EPA regulations, and U.S. EPA regulations. Waste management requirements are varied and often complex because of the variety of wastes generated by DOE activities at PORTS. The types of waste managed by DOE at PORTS include:

- *Low-level radioactive waste* – radioactive waste not classified as high level or transuranic waste.
- *Hazardous (RCRA) waste* – waste listed under RCRA or waste that exhibits one or more of the four RCRA hazardous characteristics: ignitability, corrosivity, reactivity, and toxicity.
- *PCB wastes* – waste containing PCBs, a class of synthetic organic chemicals. Disposal of PCB-contaminated materials is regulated under the Toxic Substances Control Act.
- *Solid wastes* – Waste that includes construction and demolition debris, industrial waste, and sanitary waste, as defined by Ohio regulations.

Many of the wastes generated by DOE activities at PORTS are a combination of the first three waste types listed above; for example, some wastes are both RCRA hazardous waste and low-level radioactive waste (called mixed waste).

In addition to complying with DOE Orders and Ohio EPA/U.S. EPA regulations, DOE has also implemented supplemental policies for management of DOE waste at PORTS including: minimizing waste generation; characterizing and certifying wastes before they are stored, processed, treated, or disposed; pursuing volume reduction (such as blending and bulking); on-site storage in preparation for safe and compliant final treatment and/or disposal; and recycling.

With the beginning of D&D at PORTS, 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. When SODI sells the materials, the proceeds are divided by SODI and DOE. In 2010-2011, SODI received approximately 13 million pounds of scrap metal and 270,000 gallons of transformer oil from D&D activities at PORTS, primarily D&D of the X-533 Switchyard Complex. Approximately 4.2 million dollars was generated from sales of these materials. SODI used the proceeds to support economic development in the southern Ohio region. Projects that received funding from SODI in 2011 included construction of a steel processing plant in New Boston, Ohio, and a sewer line extension project in Pike County.

Public Awareness Program

DOE provides a public Environmental Information Center to allow access to all documents used to make decisions on remedial actions being taken at PORTS. The information center is located just north of PORTS at the Ohio State University Endeavor Center (Room 207), 1862 Shyville Road, Piketon, Ohio 45661. The Information Center is open 9 a.m. to noon Monday and Tuesday, noon to 4 p.m. Wednesday and Thursday, or by appointment (call 740-289-8898). The email address is portseic@wems-llc.com. Additional information is provided by the DOE Site Office (740-897-5010) and the Office of Public Affairs (740-897-3486). This Annual Site Environmental Report and other information can also be obtained from the DOE web site for PORTS at www.pppo.energy.gov or the FBP web site at www.fbportsmouth.com.

The PORTS Site Specific Advisory Board, comprised of up to 20 citizens from the local area, provides public input and recommendations to DOE on environmental remediation, waste management, and related issues at PORTS. Additional information about the board can be obtained at www.ports-ssab.org or by calling 740-289-5249.

In 2011, DOE and FBP began the PORTS Envoy Program. The Envoy Program matches employee volunteers with community stakeholders such as families living next to DOE property, community groups, and local government organizations. The envoys communicate information about PORTS D&D and other site issues to the stakeholders and are available to answer stakeholder questions about PORTS.

Public update meetings and public workshops on specific topics are also held to keep the public informed and to receive their comments and questions. Periodically, fact sheets about major projects are written for the public. Additionally, notices of document availability and public comment periods, as well as other communications on the program, are regularly distributed to the local newspaper and those on the community relations mailing list, neighbors within 2 miles of the plant, and plant employees.

ENVIRONMENTAL MONITORING

Extensive environmental monitoring is completed at PORTS to comply with environmental regulations, permit requirements, and DOE Orders, and to address public concerns about plant operations. The *Environmental Monitoring Plan for the Portsmouth Gaseous Diffusion Plant* describes the DOE environmental monitoring programs at PORTS, with the exception of groundwater monitoring. Groundwater monitoring, which also includes related surface water monitoring and residential water supply monitoring, is described in the *Integrated Groundwater Monitoring Plan for the Portsmouth Gaseous Diffusion Plant.* This monitoring is discussed in Chapter 6, Groundwater Programs.

Environmental monitoring includes the collection of samples of air, water, soil, vegetation, and biota (animals and crops) on a regular basis that ranges from weekly (ambient air) to annually (sediment, soil, vegetation, and biota). In 2011, environmental monitoring information was collected for the following programs:

- ambient air
- direct radiation
- discharges to surface water
- local surface water
- sediment
- soil
- vegetation
- biota (crops, deer, fish, milk, and eggs).

Samples are analyzed for radionuclides, metals, and/or other chemicals that could be present in the environment due to PORTS activities, although many of these analytes also occur naturally or can be present due to human activities not related to PORTS. Over 1000 samples from these programs are collected on an annual basis.

Data collected for these programs in 2011 are consistent with data collected in previous years and indicate that radionuclides, metals, and other chemicals released by PORTS operations have a minimal effect on human health and the environment. The next section, Dose, provides more information about the potential impacts to human health from radionuclides released by PORTS.

DOSE

Potential impacts on human health from radionuclides released by PORTS operations are calculated based on environmental monitoring data. This impact, commonly called a dose, can be caused by radionuclides released into the air and/or water, or radiation emanating directly from buildings or other objects at PORTS. U.S. EPA sets a 10 millirem (mrem)/year limit for the dose from radionuclides released to the air, and DOE sets a 100 mrem/year limit for the dose from radionuclides from all potential pathways (air, water, and direct radiation). A person living in the United States receives an average dose of approximately 311 mrem/year from natural sources of radiation (National Council on Radiation Protection [NCRP] 2009). Figure 1 provides a comparison of the doses from various common radiation sources.

This Annual Site Environmental Report includes radiological dose calculations for the dose to the public from radionuclides released to the environment based on environmental monitoring data collected by DOE contractors and USEC, Inc. The maximum dose that a member of the public could receive from radiation released by PORTS in 2011 is 1.3 mrem, based on a maximum dose of 0.032 mrem from airborne radionuclides, 0.012 mrem from radionuclides released to the Scioto River, 0.81 mrem from direct radiation from the cylinder storage yards, and 0.42 mrem based on exposure to radionuclides detected at off-site monitoring locations in 2011. This dose calculation uses a worst-case approach; that is, the calculation assumes that the same individual is exposed to the most extreme conditions from each pathway. This dose (1.3 mrem) is significantly less than the 100 mrem/year limit set by DOE for the dose to a member of the public from radionuclides from all potential pathways. The dose to a member of the public from airborne radionuclides released by PORTS (0.032 mrem) is also significantly less than the 10 mrem/year standard set by U.S. EPA.

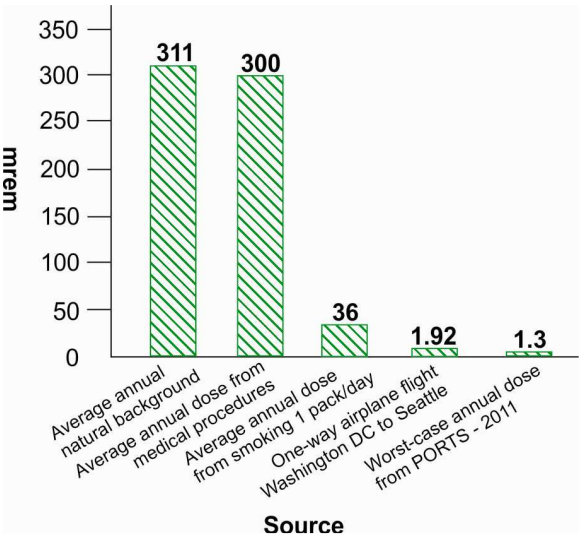

Figure 1. Comparison of dose from various common radiation sources

GROUNDWATER PROGRAMS

Groundwater monitoring at PORTS is performed at RCRA hazardous waste units, solid waste disposal units, and RCRA Corrective Action Program units. The *Integrated Groundwater Monitoring Plan* describes the groundwater monitoring program for PORTS, which has been reviewed and approved by Ohio EPA. In general, samples are collected from wells at 12 groundwater monitoring areas and

14 surface water locations that are part of the groundwater monitoring program. Samples are analyzed for metals, volatile organic compounds, and/or radiological constituents. Constituents detected in the groundwater are then evaluated to assess the potential for each constituent to affect human health and the environment.

Some groundwater monitoring is conducted in order to meet DOE Order requirements. Exit pathway monitoring assesses the effect of PORTS on regional groundwater quality and quantity.

Five groundwater contamination plumes have been identified on site at PORTS in the following areas: X-749/X-120/Peter Kiewit (PK) Landfill (Quadrant I), Quadrant I Groundwater Investigative Area, Quadrant II Groundwater Investigative Area, X-701B Holding Pond (Quadrant II), and X-740 Waste Oil Handling Facility (Quadrant III). The primary groundwater contaminant is TCE. Other monitoring areas may have groundwater contaminated with metals or may be monitored to comply with regulatory requirements for closed landfills. Remediation of groundwater is being conducted primarily under Ohio EPA's RCRA Corrective Action Program.

In 2011, concentrations of TCE continued to decrease in the X-749/X-120/PK Landfill area due to the groundwater extraction wells installed in this area in 2007-2008. TCE was detected at an estimated concentration of 0.25 microgram per liter (µg/L – or parts per billion) in the first quarter sample collected from off-site monitoring well WP-03G. No TCE or other volatile organic compounds were detected in any of the seven off-site monitoring wells sampled in the second, third, and/or fourth quarters of 2011. TCE has not been detected in groundwater beyond the DOE property boundary at concentrations that exceed the Ohio EPA drinking water standard of 5 µg/L. In general, the other contaminated groundwater plumes present at PORTS did not change significantly in 2011.

The *Integrated Groundwater Monitoring Plan* also addresses monitoring of residential water supplies near PORTS to verify that site contaminants have not migrated into off-site drinking water wells. Results of this program indicate that PORTS has not affected drinking water wells outside the site boundaries.

QUALITY ASSURANCE AND QUALITY CONTROL

Data reliability is of the utmost importance for monitoring releases and measuring radiation in the environment. To demonstrate that the monitoring and measurement results are accurate, DOE contractors have implemented a quality assurance and quality control program based on guidelines from U.S. EPA, the American Society for Testing and Materials, and other federal and state agencies. DOE and DOE contractors administer numerous quality control activities to verify reliability of the data on a day-to-day basis. DOE and DOE contractors also participate actively in quality control programs administered by agencies outside the site such as U.S. EPA.