U.S. DEPARTMENT OF ENERGY PORTSMOUTH ANNUAL SITE ENVIRONMENTAL REPORT (ASER) FOR 2010

Student Summary

Message from the Department of Energy

The U.S. Department of Energy (DOE) conducts environmental monitoring at the former Portsmouth (PORTS) Gaseous Diffusion Plant site on an ongoing basis. Each year, the information collected is presented in a data volume, and a comprehensive publication entitled the Annual Site Environmental Report. This year, a class at Waverly High School developed this summary report. Each of these reports is important as it allows DOE to clearly and concisely explain our environmental monitoring programs to our many stakeholders. The information presented in this summary shows that the PORTS site near Piketon, Ohio is safe due in part to the Department's focus on safety. The work at DOE's facilities is highly detailed and technically complex, but it is our commitment to perform each of these activities safely. No matter what we do, our first priority is to protect the well-being of our workers, the surrounding communities, and the environment. We would like to offer our sincerest appreciation to the students and faculty leader at Waverly High School who worked on this summary document. On behalf of the entire Department of Energy, we congratulate each of you for your effort, enthusiasm, and willingness to support DOE with this project. We hope that you enjoy reading the *PORTS 2009 Annual Site Environmental Report Summary.*

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Dear Reader,

We, a select group of Waverly High School students from the classes of 2013 and 2014, hope that this summary helps to explain what happens at the U.S. Department of Energy's (DOE) Portsmouth Gaseous Diffusion Plant (PORTS). We are thankful to have been chosen to work on this Summary of the 2010 Annual Site Environmental Report (ASER). During the school year, the class met with many professionals in various fields of expertise, and went on field trips to understand the report better.

Certain aspects of the project were especially enjoyable. We learned the history of the plant and its impact on the development of Pike, Scioto, Ross and Jackson counties. We learned how the plant enriched uranium. The current decontamination and decommissioning (D & D) of several areas of the facility is especially pertinent to understanding the ASER. We learned how the community has involvement in future plans for the site once work is done.

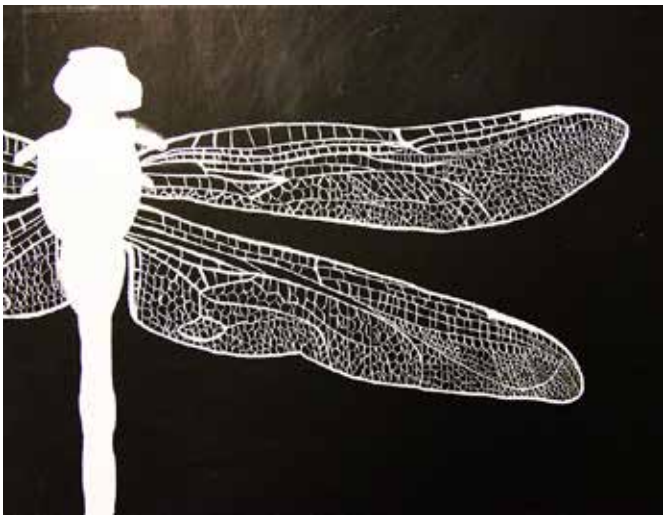
Throughout the project, the many steps that the DOE takes to protect the environment became evident. Work is being done to correct any environmental damage that was done in the past. As detailed in the ASER, the DOE monitors air, water, vegetation, fish, and wildlife on-site and in the surrounding areas to make sure that no harm comes to the surrounding communities (both people and the environment). This student summary is written for you, the general public, so that you may better understand what steps the DOE is taking to protect the environment and how well these steps are succeeding in doing so as of 2010.

Introduction

The Portsmouth Gaseous Diffusion Plant (PORTS) is located on a 5.9 square-mile site in rural Pike County, Ohio. PORTS is located east of the Scioto River and is approximately 120 feet in elevation above the river. It is near the Southern Ohio communities of Beaver, Piketon, Chillicothe, Jackson, Portsmouth and Waverly.

The United States Enrichment Corporation (USEC) operated the PORTS facilities until 2001. USEC, Inc. (the parent company of USEC) leases the facilities at PORTS to develop and plan operations of the gaseous centrifuge uranium enrichment facility. USEC, Inc. is a privately owned company and so their operations are not subject to U.S. Department of Energy (DOE) Orders. Although USEC, Inc. and USEC Government Services are not covered fully in this summary, some data is included to give a more complete picture of the activities at PORTS. The site and uranium production facilities were leased by DOE to USEC Government Services in 1993. The PORTS site enriched uranium via the gaseous diffusion process from 1954 through 2001. USEC Government Services, which became a publically held company in 1998, enriched uranium at the PORTS plant via gaseous diffusion until May 2001, when production at PORTS ceased.

DOE is responsible for the Decontamination and Decommissioning (D&D) of the gaseous diffusion facilities, process buildings, all associated facilities, environmental restoration, waste management, uranium operations, and management of facilities that are not leased to USEC, Inc. or USEC Government Services. In 2009, DOE received $118 million in funding under the American Recovery and Reinvestment Act (ARRA) for five projects at PORTS that involved environmental remediation, D&D of inactive facilities, and materials disposition.

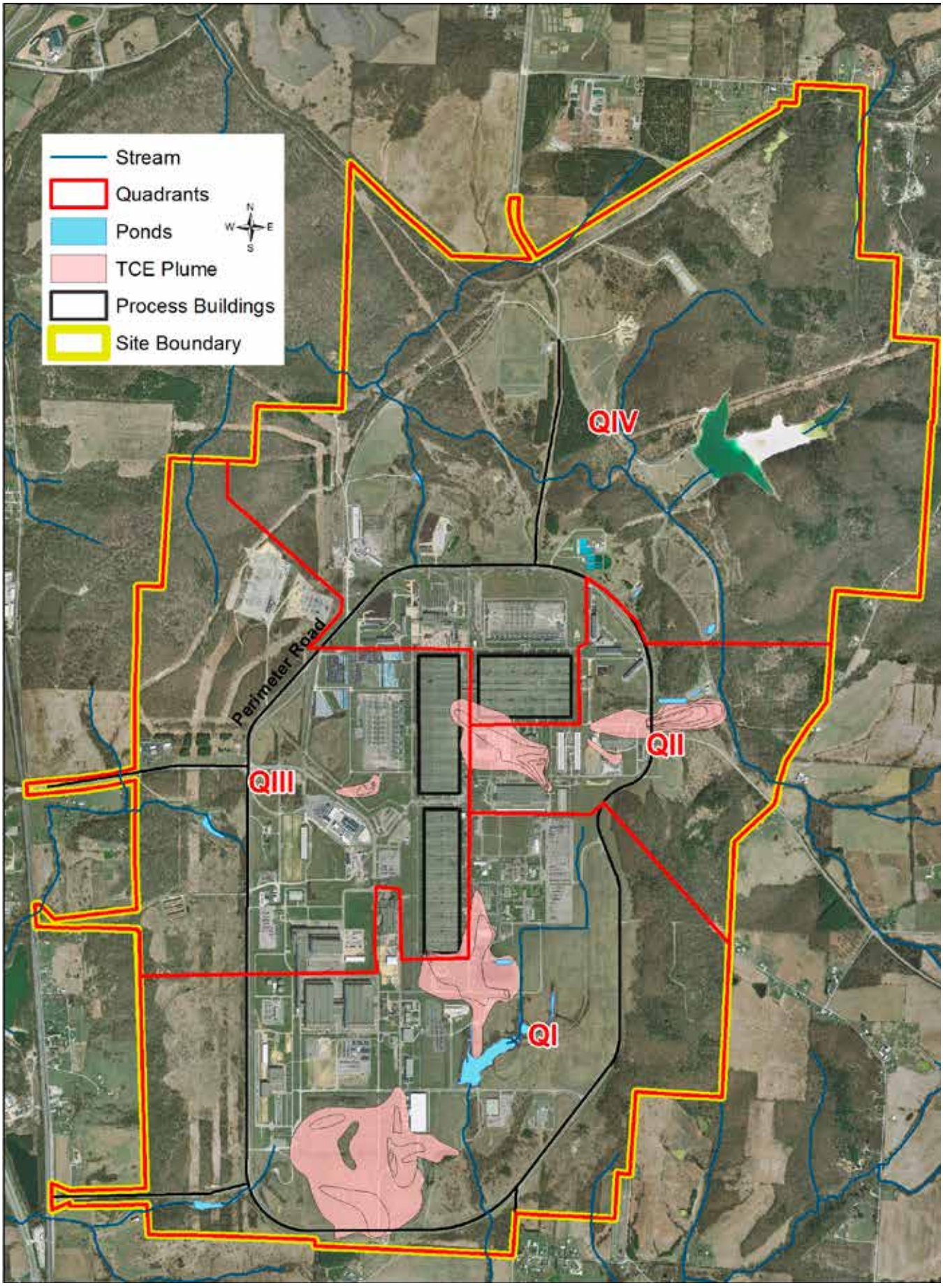


Artwork by Jamie Welch

On August 17, 2010, DOE announced that Fluor B&W Portsmouth (FBP) had been awarded a contract for D&D of PORTS. The contract includes the D&D of the three gaseous diffusion process buildings and over 100 other associated facilities. In addition, the contract includes environmental remediation, compliance and other activities. FBP assumed the responsibility of site operations included in the D&D contract in 2011.

In 2010, the gaseous diffusion production facilities at PORTS were leased by USEC Government Services under the cold shutdown program. Cold shutdown activities include removing lube oils and oils contaminated with polychlorinated biphenyls (PCBs) from equipment and removing uranium hexafluoride (UF6) deposits with the gaseous diffusion process equipment to prepare the site for D&D.

USEC Inc. has been in the process of developing a gaseous centrifuge uranium enrichment plant at PORTS. The gaseous centrifuge enrichment process requires far less electricity than the gaseous diffusion process. Gas centrifuge


Stream
Quadrants
Ponds
TCE Plume
Process Buildings
Site Boundary
N
W
E
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QIV
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QIII
QI
Perimeter Road

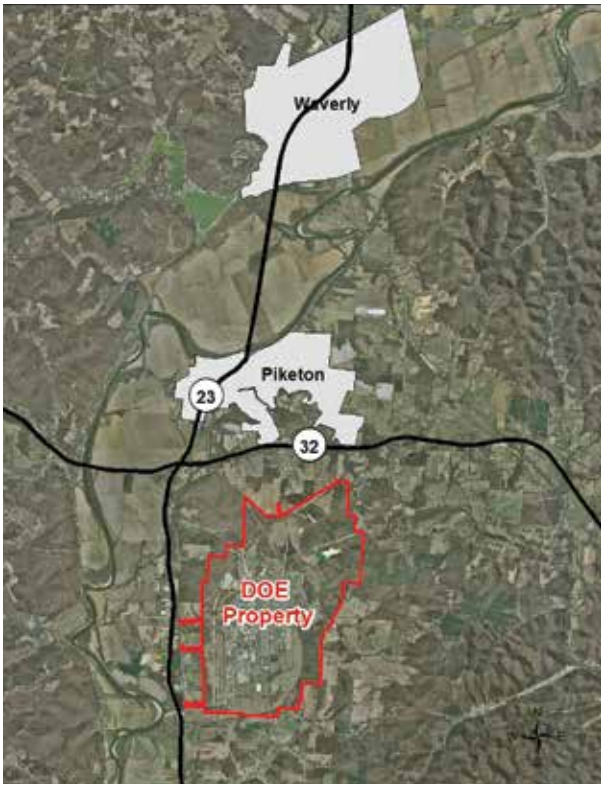
uranium enrichment uses a high speed rotor that is located within a casing to separate the uranium.

The USEC, Inc. Lead Cascade is a small-scale demonstration centrifuge for uranium enrichment, and it has been operating since 2006. The commercial scale American Centrifuge Plant (ACP) is under development but was on hold at the end of 2010 pending receipt of additional funding from federal sources.

The PORTS site includes management and disposition of all waste from DOE activities at PORTS, wastes generated by D&D, environmental restoration, the Depleted Uranium Hexafluoride (DUF6) Conversion Facility, and other DOE site operations. DOE is also responsible for uranium management which includes the DUF6 program and warehousing of other uranium materials such as uranium hexafluoride, uranium oxides, and uranium metal.

Map: Matt Trainer, Voinovich School of Leadership and Public Affairs

Steps are being taken for environmental restoration in accordance with the Resource Conservation and Recovery Act (RCRA) corrective action process. The three main steps in the restoration process aim to identify, control, and remediate environmental contamination at PORTS. All activities are subject to regulations by the U.S. Environmental Protection Agency (U.S. EPA) and the Ohio Environmental Protection Agency (Ohio EPA). These agencies issue permits, review compliance reports, conduct joint monitoring programs, inspect facilities and operations, and oversee compliance with applicable regulations.



Map: Matt Trainer, Voinovich School of Leadership and Public Affairs

Compliance Summary

DOE is responsible for the D&D Program, Environmental Restoration Program, Waste Management Program, uranium operations, and maintenance of all facilities not leased to USEC, Inc. and USEC Government Services. USEC, Inc. and USEC Government Services are responsible for compliance activities directly associated with their operations. DOE and/or the responsible DOE contractor during 2010 held National Pollutant Discharge Elimination System (NPDES) permits for discharge of water to surface streams, several air emission permits, and a Resource Conservation and Recovery Act (RCRA) permit for the storage of hazardous wastes. DOE activities at PORTS are inspected regularly by the state and local agencies responsible for enforcing environmental regulations at PORTS. Primary regulatory agencies include the U.S. Environmental Protection Agency (U.S. EPA) and the Ohio Environmental Protection Agency (Ohio EPA). DOE and DOE contractors at PORTS did not receive any Notices of Violation for inspections conducted during the 2010 calendar year. However, DOE received a Notice of Violation in April 2010 from an inspection conducted by the U.S. EPA and Ohio EPA in June 2009.

Compliance Status

The Emergency Planning and Community Right-to-Know Act was passed in 1986 and is known as the Superfund Amendments and Reauthorization Act Title III. It requires facilities such as PORTS to submit information on chemicals that are on site if above specified quantities. The report includes identity, location, storage information, and hazards of the chemicals. This information is sent annually to U.S. EPA , Ohio EPA and local authorities.

Artwork by Trinity Curtis

RCRA regulates transportation, storage, accumulation, and disposal of solid and hazardous wastes. Hazardous wastes are a subset of solid wastes and are designated as hazardous by the U.S. EPA because of various chemical properties, including ignitability, corrosivity, reactivity, and toxicity. During 2010, DOE and LATA-Parallax Portsmouth (LPP) held a permit to store hazardous waste within seven designated areas of the X-326 building. The permit requires inspections of all areas within this building. RCRA also requires groundwater monitoring at hazardous waste management units.

The Federal Facility Compliance Act enacted in 1992, allows mixed and low-level radioactive waste to be stored for over one year because treatment is not readily available; it also requires facilities to submit site treatment plans for treatment of mixed wastes.

The Toxic Substances Control Act (TSCA) regulates the use, storage, and disposal of PCBs. Through this, many PCB transformers and capacitors present at PORTS were removed or stored by the end of 2010, including 111 transformers and 11,099 large capacitors. As expected, an annual document log is prepared to meet TSCA regulatory requirements. The report includes the PCB use in systems that are not totally enclosed.

DOE Order 5400.5 provides guidance and establishes radiation protection standards and control practices to protect the public and environment from radiation and radioactive waste. This requires that off-site radiation

does not exceed 100 millirem (mrem)/year. DOE Order 435.1 ensures that radioactive waste is managed in a manner that is protective of worker and public health and safety, and the environment.

Artwork by Zach Smith

The Clean Air Act requires the DOE to comply with U.S. EPA and Ohio EPA regulations pertaining to air emissions (both radionuclides and non-radiological pollutants) and stratospheric ozone protection. In 2010, DOE and LPP were responsible for three permitted air emission sources, two registered air emission sources, and one de minimis source subject. DOE and Uranium Disposition Services, LLC (UDS) were responsible for four additional sources associated with the DUF6 Conversion Facility that began operating in 2010. Monitoring results of these sources indicate that DOE air emission sources are not a major source of air pollutants; however, they have released approximately 6,600 pounds of the ozone-depleting substance dichlorotetrafluoroethane into the air in 2010. The National Emission Standards for Hazardous Air Pollutants require DOE to submit an annual report for radiological emissions from DOE air emission sources. Radiological air emissions from the DOE sources in 2010 were 0.12 curie.

DOE must also comply with U.S. EPA and Ohio EPA regulations pertaining to water quality and protection. Water from the three internal LPP Outfalls is treated in the X-6619 Sewage Treatment Plant. UDS NPDES permit allows the discharge of process wastewaters from the conversion facility. Although one outfall is monitored under the permit, in 2010, discharges from the UDS NPDES Outfall only consisted of precipitation runoff. No process wastewater was discharged through the UDS NPDES outfall during 2010. Overall, the LPP NPDES compliance rate for 2010 was 100%. UDS had four exceedences of NPDES permit effluent limitations in 2010; therefore the overall UDS NPDES compliance rate for 2010 was 93%.

The Endangered Species Act of 1973, as amended, provides for the designation and protection of endangered and threatened wildlife and plants, and the habitat on which such species depend. A site-wide threatened and endangered species habitat survey and an Indiana bat (Myotis sodalis) survey were completed in August 1996. No Indiana bats were found at PORTS.

The Archaeological and Historic Preservation Act of 1996 and the Archaeological Resources Protection Act of 1979 require the Secretary of the Department of Interior to report to Congress on several federal archaeological activities. The Archaeological Resources Protection Act requires federal land managers to provide archaeology program information to the Secretary of the Interior for this report.

No unplanned releases from DOE activities at PORTS were reported in 2010. There were more than 12 inspections of DOE activities at PORTS conducted by federal, state, or local agencies in 2010. There were no violations submitted as a result of these inspections. DOE received a Notice of Violation in April 2010 from an inspection conducted by U.S. EPA and Ohio EPA in June 2009. The Notice of Violation was for failing to have the word "waste" on a tank that holds trichloroethene recovered from the vapor phase carbon unit in one of the groundwater treatment facilities. The violation was abated by adding the word "waste" to the tank on the same day. No further action was required.

Environmental Program Information

Decontamination and Decommissioning Program

The Ohio EPA issued D&D Orders on April 13, 2010, which is an enforceable agreement between Ohio EPA and DOE that governs the process for D&D of the gaseous diffusion process buildings and associated facilities that are no longer in use at PORTS. D&D uses the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) for determining appropriate removal and remedial actions. The PORTS Site Specific Advisory Board (SSAB) provides recommendations to DOE based on the concerns of the communities surrounding PORTS. There are three primary components of the D&D Orders: 1) engineering evaluation/cost analysis and action memoranda for less complex facilities, 2) a remedial investigation/feasibility study (RI/FS) and record of decision for process buildings and complex facilities, and 3) an RI/FS and record of decision for evaluation and selection of alternatives for site-wide waste disposition.

Artwork by Kaitlin Curtis

The smaller and less complex buildings at PORTS undergo D&D under the process for non-time critical removal actions. An engineering evaluation/cost analysis is then prepared that includes the site characterization information obtained during the preliminary assessment.

D&D of seven buildings at PORTS will follow the RI/FS process. These buildings are the most complex structures to be removed under the D&D Orders and include the three gaseous diffusion process buildings (X-326, X-330, and X-333). The D&D process begins with a pre-investigation evaluation report, which includes site history, a summary of existing data, and identification of problems to be addressed in the RI/FS work plan. This is followed by a RI/FS report that that will summarize the nature and extent of contamination and screen possible remedial actions. A proposed plan that identifies the proposed remedial action is then prepared and made available for public comment. The record of decision then finalizes the remedial action to be undertaken and then implementation begins.

D&D also includes evaluating off-site and on-site waste disposal alternatives for waste generated by D&D. The on-site disposal alternative to be evaluated involves construction of an on-site waste disposal facility.

In 2010, DOE submitted the engineering evaluation/cost analyses for two groups of buildings: X-103 Auxiliary Office Building, X-334 Transformer Cleaning and Storage Building, and X-344B Maintenance Storage Building; and X-626 and X-630 Recirculating Cooling Water Complexes. DOE submitted the engineering evaluation/cost analysis for each group of buildings to Ohio EPA, and together they discussed a strategy to develop a single engineering evaluation/cost analysis. In 2010, DOE began development of the pre- investigation evaluation report

and RI/FS work plan for D&D of the process buildings and complex facilities. DOE also submitted the pre-investigation evaluation report for site-wide waste disposition to Ohio EPA. The Ohio EPA and DOE also agreed to the removal of four small buildings: X-230J9 North Environment Sampling Building, X-605H Booster Pump House, X-605I Chlorinator Building, and X-605J Diesel Generator Building.

Demolition of the X-100 Building

Environmental Restoration Program

DOE established the Environmental Restoration Program in 1989 to identify, control, and remediate environmental contamination at PORTS. The program includes assessing to identify releases of contaminants, determining the need for further investigation, and identifying and evaluating remedial alternatives to address environmental contamination. This includes addressing groundwater plumes.

The assessment and investigation of areas of PORTS that were not leased to USEC were completed in the 1990s. Because PORTS is a large facility, it was divided into quadrants (Quadrant I, II, III, and IV) to facilitate the cleanup process (see map on page 6). Remedial actions have been implemented in each of the PORTS quadrants.

2010 Activities by Quadrant:

Quadrant I ~The remedial actions identified for the X-749/X-120 groundwater plume included phytoremediation (a process that uses plants to remove, degrade, or contain contaminants in the soil and/or groundwater). The remedial actions identified also included installation of a barrier wall around the eastern and southern portions of the X-749 Landfill as well as continued operation of the groundwater collection trenches installed at the Peter

Kiewit (PK) Landfill and X-749 Landfill. Three additional extraction wells were installed within the X-749/X-120 groundwater plume in 2010 to provide additional control and remediation of the plume. The wells began operating in September 2010.

In 2010, monitoring data collected from wells in the X-749/X-120 groundwater plume indicated that the extraction wells installed in the X-749 South Barrier Wall area and the groundwater collection trench on the southwest side of the X-749 Landfill were reducing concentrations of trichloroethene within the groundwater plume and causing the plume perimeter to shrink.

In 2010, contaminated soil was removed from the site of the former X-770 Building.

Quadrant II ~The X-633 Recirculating Cooling Water Complex was demolished in 2010 using funding provided by ARRA. A work plan for the RCRA investigation of soil and groundwater in the area was approved by Ohio EPA in 2010.

Quadrant III ~ In 2010, Ohio EPA approved a pilot study of enhanced anaerobic bioremediation for the X-740 area. Field activities for this project began in December 2010 and continued throughout 2011.

Quadrant IV ~ D&D of the X-533 Switchyard Complex took place throughout 2010 and was completed in 2011 using funding provided by ARRA. Contaminated soil was removed from the X-533 Switchyard in 2010. A work plan for the RCRA investigation of soil and groundwater at the X-630 Cooling Water Complex in Quadrant IV was approved by Ohio EPA in November 2010.

Waste Management Program

The DOE Waste Management Program directs the safe storage, treatment, and disposal of waste generated by past and present operations and from current D&D and Environmental Restoration projects at PORTS.
There are seven basic categories of waste material:

- Low-level radioactive waste- radioactive waste not classified as high level or transuranic waste.
- Hazardous (RCRA) waste- waste that exhibits one or more of the four RCRA hazardous characteristics.
- PCB waste- waste containing PCBs.
- RCRA/low-level radioactive mixed waste- waste containing both hazardous and radioactive components.
- PCB/low-level radioactive mixed waste- waste containing both PCB and radioactive components.
- PCB/RCRA/low-level radioactive mixed waste- waste containing PCB and radioactive components that is also a RCRA hazardous waste.
- Solid waste- Waste that includes construction and demolition debris, industrial waste, and sanitary waste, as defined by Ohio regulations.

In 2010, over 30,000 tons of waste from DOE activities at PORTS were recycled, treated, or disposed at off-site facilities.

Environmental Sustainability Program

DOE is committed to the reduction of the following through the integration of environmental sustainability principles: environmental risks, costs, wastes, and future liability. The DOE Environmental Sustainability Program is a balanced, holistic approach linking and improving PORTS overall environmental performance in regards to planning, budgeting, and measuring. In order to achieve the objectives and targets of the Environmental Sustainability Program, DOE has developed and implemented an integrated strategy for setting, updating and achieving objectives, both quantitative and qualitative, in line with the Environmental Management System (EMS) and in conjunction with DOE pollution prevent goals.

Artwork by Gary Cooper

DOE's environmental sustainability program includes the following objectives:

- eliminating, minimizing, or recycling wastes that would otherwise require storage, treatment, disposal, and long-term monitoring and surveillance
- eliminating or minimizing use of toxic chemicals and associated environmental releases that would otherwise require control, treatment, monitoring, and reporting
- maximizing the use (procurement) of recycled-content materials and environmentally preferable products and services, thereby minimizing the economic and environmental impacts of managing by-products and wastes generated in the conduct of mission-related activities; and
- reducing the life-cycle cost of managing personal property at PORTS.

Highlights of fiscal year 2010 include the following accomplishments:

- treated soils contaminated with trichloroethene in place at the X-701B Holding Pond, thereby avoiding the generation of approximately 6,500 cubic yards of soil and other materials regulated as low-level radioactive waste and RCRA hazardous waste; and
- recycled approximately 270,000 gallons of transformer oil, 44,423 pounds of office and mixed paper, 14,340 pounds of cardboard, 500 pounds of aluminum cans, 715 pounds of toner cartridges, and 1,380 pounds of plastic.

In addition, the DOE accomplished the following energy reduction efforts at PORTS in fiscal year 2010:

- installation of a central dry air facility resulting in an estimated annual savings of approximately 6,470 megawatt-hours (MWH); and
- development of innovative computer management strategies to reduce cooling demand, lower energy consumption, and reduce operating costs.

Inactive Facilities Removal

In 2009, DOE received funding under ARRA for D&D of three inactive, surplus facilities (X-533 Switchyard Complex, X-633 Cooling Towers Complex, and X-760 Chemical Engineering Building). The D&D process began in 2010. D&D of the X-633 Cooling Towers Complex and the X-760 Chemical Engineering Building was completed in June 2010. D&D of the X-533 Switchyard Complex began in February 2010 and was expected to be finished in early 2011.

Environmental Training Program & Public Awareness Program

DOE contractors at PORTS provide both an environmental training program and public awareness program. The environmental training program increases employee awareness of environmental activities and enhances the knowledge and qualifications of personnel performing tasks associated with environmental assessment, planning, and restoration. A public awareness program is in place at PORTS to foster a spirit of openness and credibility between PORTS officials and local citizens, elected officials, business, media, and various segments of the public. The PORTS Site Specific Advisory Board, comprised of up to 20 citizens from the local area, provides public input and recommendations to DOE on D&D, environmental remediation, waste management, and related issues at PORTS. In 2010, the board provided recommendations to DOE on waste disposition alternatives for materials to be generated during D&D, development of future uses for PORTS, and development of informational materials about past, present, and future operations at PORTS. Additional information about the board can be obtained at www.ports-ssab.org or by calling 740-289-5249.

Environmental Radiological Program Information

Environmental monitoring at PORTS measures both radiological and chemical parameters in air, water, soil, sediment, and biota (e.g.,animals, vegetation, and crops). Environmental monitoring programs are required by state and federal regulations, permits, and DOE Orders. They may also be developed to address public concerns about the PORTS Plant. Data collected through these programs are used to assess potential impacts to human health and the environment from radionuclides released by current and historical PORTS operations.

Monitoring programs are designed to detect the effects of operations on human health and the environment due to radionuclides released by current and historical PORTS operations. The results of these programs are used to gauge the environmental impacts of PORTS operations and to set priorities for environmental improvements. Specific radionuclides monitored at PORTS are selected based on the materials handled at PORTS and on historical monitoring data. Environmental monitoring data are collected by DOE contractors, USEC, Inc., and USEC Government Services. Data from airborne discharges, ambient air, radiation, discharges to the surface water, sediment, soil, vegetation, and biota are included in this chapter. Dose is a measure of potential biological damage that could be caused by exposure to and subsequent absorption of radiation to the body. Releases of radionuclides from PORTS activities can result in a dose to a member of the public in addition to the dose received from natural sources of radiation. U.S. EPA sets a 10 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 exposure pathways.

Radiological Emissions and Doses

Exposure to radioactive materials can occur from releases to the atmosphere, surface water, or groundwater and from exposure to direct external radiation emanating from buildings or other objects. Analytical data from the environmental monitoring programs are assessed to determine whether radionuclides were detected at locations accessible to the public, in which case a dose assessment is completed. In 2010, doses are estimated for exposure to radionuclides detected by the monitoring programs for sediment, soil, vegetation, crops, and fish. The table below is a summary of potential doses to the public from PORTS in 2010. DOE Order 5400.5 sets an absorbed dose rate limit of one rad (a rad is the total amount of energy absorbed per unit mass as a result of exposure to radiation) per day to native aquatic organisms. DOE staff, DOE contractors, and visitors to DOE areas who may be exposed to radiation are also monitored.

Summary of potential doses to the public from PORTS in 2010:

Source of dose	*Dose (mrem/year)*
Airborne radionuclides	0.17
Radionuclides released to the Scioto River	0.022
Direct radiation from DUF6 cylinder storage yards	0.81
Radionuclides detected by environmental monitoring programs (sediment, soil, vegetation, crops, and fish)	0.39
Total	**1.4**

Artwork by Sierra Arnold

Radiation from radionuclides outside the body (in or on environmental media or objects) is called external exposure. Radiation from radionuclides deposited inside the body (by inhalation, ingestion, and, in a few cases, absorption through the skin) is called internal exposure. This distinction is important, because external exposure occurs only as a person is near the external radionuclide; simply leaving the area of the source will stop the exposure, while internal exposure continues as long as the radionuclide remains inside the body. The three natural uranium isotopes (uranium-234, uranium-235, and uranium-238) and technetium-99 are the most commonly detected radionuclides in environmental media samples collected around PORTS. A number of specialized measurement units have been defined for characterizing exposures:

- *Absorbed dose*- the quantity of ionizing radiation energy absorbed by an organ divided by the organ's mass.
- *Dose*- the product of the absorbed dose in tissue and a quality factor.
- *Effective dose*- the sum of the doses received by all organs or tissues of the body after each one has been multiplied by an appropriate weighting factor.
- *Collective dose*- the sum of the doses or effective dose of all individuals in an exposed population.

Airborne discharges of radionuclides from PORTS are regulated by U.S. EPA under the Clean Air Act and the National Emission Standards for Hazardous Air Pollutants (NESHAP). In 2010, DOE and LPP were responsible for five radiological emission sources: one L-cage Glove Box and four Groundwater Treatment Facilities. Emissions from the groundwater treatment facilities were calculated based on quarterly influent and effluent sampling at each facility and quarterly throughout. Emissions from the L-cage Glove Box were based on the mass of the materials transferred within the glove box, analytical data available for each material, and emission factors provided by U.S. EPA.

Artwork by Tegan Pierce

Dose calculations were made using a computer program called CAP88-PC Version 3.0. The program uses models to calculate levels of radionuclides in the air, on the ground, and in food as well as utilizing meteorological data collected at PORTS. The calculations assumed that each person remained unprotected, resided at home the entire year and obtained food according to the rural pattern defined in the NESHAP background documents. DOE collects samples from 15 ambient

air monitoring stations and analyzes them for the radionuclides that could be present in ambient air due to PORTS activities. The following assumptions were made to calculate the dose at each station:

1. The highest level of each radionuclide detected in 2010 was assumed to be present for the entire year.

2. If a radionuclide was not detected, the radionuclide was assumed to be present for the entire year at half the highest undetected result.

The dose associated with each radionuclide at each ambient air monitoring station was added to obtain the gross dose for each station. The highest net dose measured at the ambient air monitoring stations was 5% of the dose calculated from the combined DOE and USEC Government Services point source emissions.

DOE contractors and USEC Government Services are responsible for NPDES outfalls at PORTS. In 2010, LPP held an NPDES permit for four outfalls through which water is discharged from the site . Of the four LPP outfalls, one outfall discharges directly to Little Beaver Creek and the remaining three outfalls discharge to the Sewage Treatment Plant. The LPP NPDES outfalls are monitored for radiological discharges by collecting water samples and analyzing the samples for total uranium, uranium isotopes, technetium-99, and transuranic radionuclides. Discharges of radionuclides were significantly less than the 100 mrem/year limit for all radiological releases from a facility. No transuranics were detected in samples collected either.

Artwork by Sheridan McLean

In 2010, USEC Government Services was responsible for 14 NPDES outfalls through which water is discharged from the site. Ten outfalls discharge directly to surface water, and four discharge to another USEC NPDES outfall before leaving the site. Water from these external outfalls is either directly discharged to the Scioto River or eventually flows into the Scioto River from Little Beaver Creek, Big Run Creek, or unnamed tributaries to these water bodies. Transuranic radionuclides were not detected in any of the samples collected from USEC Government Services NPDES outfalls in 2010. The dose from radionuclides released to the Scioto River in 2010 was significantly less than the 100 mrem/year DOE limit for all radiological releases from a facility.

Radiation is emitted from cylinders stored on site at PORTS in the cylinder storage yards. Due to increased security at PORTS, the general public no longer has uncontrolled access to this portion of Perimeter Road near the cylinder yards. However, certain members of the public (e.g., delivery people) are allowed on this portion of the road. Therefore, data from direct radiation monitoring at the cylinder yards are used to assess potential exposure to the members of the public that drive on Perimeter Road. Environmental radiation was measured at five locations along Perimeter Road near the boundaries of the cylinder storage yards. The potential estimated dose from the cylinder yards to a member of the public was significantly less than the 100 mrem/year DOE limit.

DOE workers are responsible for monitoring direct radiation levels in active DOE facilities at PORTS on a continual basis. This assists in determining the radiation levels that workers are exposed to and in identifying changes in radiation levels. They use a Radiation Exposure Information Reporting System which is an electronic file created annually to comply with DOE Order 231.1A. This report contains exposure results for all monitored DOE employees, contractors, and visitors. The 2010 Radiation Exposure Information Reporting System report indicated that no visitors received a measurable dose (defined as 10 mrem or more). Over 1,500 DOE employees and DOE contractors were monitored during 2010. Only 63 DOE contractors, primarily DUF6 cylinder yard workers, received a measurable dose (defined as 10 mrem or more). These 63 workers received a measurable dose that averaged 47 mrem. No administrative guidelines or regulatory dose limits were exceeded in 2010.

Artwork by Sarah Dresbach

Environmental monitoring at PORTS includes collecting samples at off-site locations and analyzing the samples for radionuclides that could be present due to PORTS operations. To ensure that potential doses to the public don't exceed 100 mrem/year, dose calculations are completed for detections of radionuclides in environmental media and biota at off-site sampling locations. In 2010, potential doses to the public from radionuclides detected by the PORTS environmental monitoring program were significantly less than the DOE limit.

Protection of Biota

DOE sets an absorbed dose rate of 1 rad/day to native aquatic organisms. Analytical data for radionuclides detected in sediment and surface water collected at approximately the same location are used to assess compliance with this limit. Assessments indicate that the levels of radionuclides detected in water, sediment, and soil at these locations do not result in a dose of more than 1 rad/day to aquatic organisms or terrestrial animals.

Environmental Radiological Monitoring

Ambient Air monitoring

The ambient air monitoring stations measure radionuclides released from DOE, USEC, Inc., and USEC Government Services point sources; fugitive air emissions; and background levels of radionuclides. In 2010, samples were collected from 15 ambient air monitoring stations located within and around PORTS. No transuranic radionuclides were detected in these samples, while technetium-99 was detected at 13 of 15 ambient air stations, and uranium isotopes were detected in all of the air monitoring station samples collected. However, the highest net dose calculation was well below the 10 mrem/year limit.

Environmental Radiation

Radiation was measured continuously by DOE at 19 locations that include most of the ambient air monitoring locations and other on-site locations. Measuring devices are placed at the monitoring locations at the beginning of each quarter and removed at the end for laboratory processing. Of these, three locations detected elevated levels of radiation in 2010. In addition, radiation was measured at five locations around the northwest corner of PORTS and no dose limits were exceeded.

Artwork by Reba Clark

Ohio EPA requires monthly collection of surface water samples from four locations at the cylinder storage yards. Samples collected during 2010 were analyzed for alpha activity, beta activity, and total uranium. Results indicate that the dose from radionuclides released to surface water in 2010 was significantly less than the 100 mrem/year DOE limit.

Local Surface Water

In 2010, local surface water samples were collected semiannually from 14 locations upstream and downstream from PORTS. As background measurements, samples were also collected from local streams approximately 10 miles north, south, east, and west of PORTS. No transuranic radionuclides were detected in any of the surface water samples collected in 2010. Technetium-99 was detected at levels well below the concentration guide for drinking water. Detections of uranium and uranium isotopes also remained well below the DOE derived concentration guide.

Sediment

Artwork by Olyvia Frisby

Sediment samples are collected from the same locations upstream and downstream from PORTS where local surface water samples are collected and at the NPDES outfalls on the east and west sides of PORTS. Uranium and uranium isotopes that were detected in the 2010 samples have been detected at similar levels in previous sampling events from 2002 through 2009. Transuranic radionuclides were detected at very low activities in one sediment sampling location upstream from PORTS and two locations at PORTS. These detections of technetium-99 were consistent with or lower than data from previous sampling events. The potential dose to a member of the public resulting from sediment exposure was 0.017 mrem/year, which was well below the DOE standard of 100 mrem/year.

Settleable Solids

DOE collects semiannual water samples from three NPDES effluent locations to determine the concentration of radioactive material that is present in the sediment suspended in the water sample. Two samples are collected from each of the three monitoring locations. The first sample was analyzed for total suspended solids, total alpha activity, and total beta activity. The second sample was analyzed for non-settleable solids, total alpha activity, and total beta activity. In 2010, DOE standards (5 pCi/g for alpha activity and 50 pCi/g for beta activity) were not exceeded at any location.

Soil

Soil samples are collected annually from ambient air monitoring locations. The transuranics Plutonium 239/240 and Americium-241 were detected at much less than the U.S. EPA preliminary remediation goal for each radionuclide in residential soil. Technetium-99 was not detected in the soil samples collected during 2010. Total uranium and uranium isotopes were detected at similar levels at all the soil sampling locations, including the background locations. The potential dose to a member of the public resulting from PORTS operations was well below the DOE standard of 100 mrem/year.

Vegetation

To assess the uptake of radionuclides into plant material, vegetation samples are collected annually in the same areas where soil samples are collected at the ambient air monitoring stations. No transuranics or technetium-99 were detected in vegetation samples in 2010. Uranium and uranium isotopes were detected occasionally, and have been detected at similar levels in previous sampling. The potential dose to a member of the public resulting from PORTS operations was well below the DOE standard of 100 mrem/year.

Biological Monitoring

The DOE requires biological monitoring to assess the uptake of radionuclides into local biota (deer, fish, crops, milk, and eggs):

Deer

Samples of liver, kidney, and muscle from a deer killed on site in a motor vehicle collision were collected in May of 2010. The samples were analyzed and no radionuclides were detected.

Fish

In 2010, samples from fish caught upstream and downstream on the Scioto River were analyzed for radionuclides. Only uranium-233/234 was detected. A dose assessment to a member of the public based on consumption of fish was 0.0015 mrem/yr which is below the 100 mrem/yr DOE standard.

Crops

In 2010, 16 crop samples, including peppers, corn, tomatoes, cucumbers, melon, and squash were collected from five off-site locations near PORTS. No transuranics or technetium-99 were detected in any of the samples. Uranium, uranium-233/234, and uranium-238 were detected in nine samples. The potential dose to a member of the public from crop consumption was calculated at 0.00077 mrem/year, which was well below the DOE standard.

Artwork by Nick Bradley

Milk and Eggs

Samples of milk and eggs were collected in 2010 at a dairy in Waverly and a farm near Lucasville. The samples were tested and no radionuclides were detected.

Environmental Non-Radiological Program Information

Non-radiological (i.e., chemical) environmental monitoring at PORTS includes air, surface water, sediment, and biota (fish). Both radiological and non-radiological components are monitored that could be released to the environment as a result of PORTS activities. Monitoring of these parameters is not only required by state and federal regulations and/or permits, but it is also performed to reduce public concerns about plant operations.

Air

Permitted air emission sources at PORTS emit non-radiological air pollutants. The DOE is responsible for several sources of air pollutants such as organic compounds and particulate matter. DOE also monitor the release of asbestos by D&D activities and the release of fluoride, which is difficult to measure as it occurs naturally in the environment. Ambient fluoride concentrations at background locations were not appreciably different from concentrations near PORTS.

Water

Surface and groundwater are also monitored at PORTS. This non-radiological surface water monitoring primarily consists of sampling water discharges at outfalls. PCBs are also monitored in surface water downstream from the DUF6 cylinder storage yards.

Artwork by Alex Thompson

In 2010, DOE contractors and USEC Government Services were responsible for NPDES outfalls at PORTS. Ohio EPA selects the chemical parameters that must be monitored at each outfall based on the chemical characteristics of the water that flows into the outfall and sets discharge limitations for some of these parameters.

In 2010, UDS held the NPDES permit for the discharge of process wastewaters from the DUF6 Conversion Facility to the west ditch, which flows to the X-230J5 Northwest Holding Pond and then to the Scioto River. The monitoring data are submitted to Ohio EPA in a monthly operating report. Beginning in November 2008, any UDS process effluents were taken to USEC Government Services for treatment as necessary prior to discharge through a USEC Government Services NPDES outfall.

The USEC Government Services NPDES Permit also identifies additional monitoring points that are not discharge points. USEC NPDES station number 902 is a monitoring location on Little Beaver Creek downstream from USEC NPDES outfall 001. USEC NPDES station number 903 is a monitoring location on Big Run Creek

downstream from USEC NPDES outfall 002. Water temperature is the only parameter measured at these monitoring points. Surface water samples are collected quarterly from four locations in the drainage basins downstream from the DUF6 cylinder storage yards. PCB's were not detected in any of the surface water samples. See Section 6 of the full report for a discussion on chemical groundwater plumes.

Sediment

In 2010, sediment monitoring at PORTS included streams of the Scioto River upstream and downstream from PORTS and drainage basins downstream from the DUF6 cylinder storage yards. In 2010, samples were analyzed for 20 metals, PCBs, and radiological parameters. The results of metals sampling indicated that no appreciable differences were evident in the metal concentrations present in sediment samples taken upstream and downstream from PORTS and at background sampling locations. The metals detected in the samples most likely did not result from PORTS activities, since metals occur naturally in the environment. PCBs, primarily PCB-1260 and PCB-1254, were detected in the sediment samples as well as upstream and downstream of the Scioto River sampling locations. The detection of PCBs in sediments around PORTS, however, was less than the risk-based concentration of PCBs for protection of human health.

Sediment samples are collected from four locations in the drainage basins downstream from the DUF6 cylinder storage yards and analyzed for PCBs. In 2010, total PCBs were detected in at least one of the sediment samples collected from each location; however, the concentrations were below the reference value of 220 ug/kg used by the Ohio EPA.

Biological Monitoring- Fish

In 2010, fish were collected from upstream locations on Big Beaver Creek and the Scioto River as well as downstream sampling locations on Little Beaver Creek, Big Beaver Creek, and the Scioto River as part of the routine fish monitoring program at PORTS. Fish samples were analyzed for PCBs, in addition to the radiological parameters. Fish samples collected for this program included only the portion of the fish a person would eat. Fish samples collected from the Scioto River were fresh water drum. The samples collected from Big Beaver Creek were a mixture of rock bass and blue gill. The sample collected from Little Beaver Creek was a mixture of rock bass and largemouth bass. PCBs were not detected in the fish samples at concentrations higher than the detection limits for the samples (approximately 300 µg/kg). The PCB limits are set for the following consumption rates: unrestricted, 1/week, 1/month, 6/year and do not eat. The detection limits are above the 1/week maximum limit (220 µg/kg) and below the 1/month maximum limit (1000 µg/kg).

Groundwater Programs

Groundwater monitoring is required by a combination of state and federal regulations. More than 400 monitoring wells are used at PORTS. Concentrations of trichloroethene continued to decrease in the X-749/X-120-/PK Landfill area during 2010. The following report provides an overview of the PORTS groundwater monitoring program and its history.

Overview of Groundwater Monitoring at PORTS

Groundwater monitoring at PORTS was initiated in the 1980's. An Integrated Groundwater Monitoring Plan was developed in 1998, reviewed by Ohio EPA, and implemented at PORTS starting April 1, 1999. There are two water-bearing zones present beneath PORTS: the Gallia and the Berea formations. The Gallia is the uppermost water bearing zone and contains most of the groundwater contamination. The Berea is deeper and usually separated from the Gallia by Sunbury Shale. The groundwater beneath PORTS is not used for domestic, municipal, or industrial water supply. The contaminants in the groundwater do not affect the quality of the water in the Scioto River Valley buried aquifer. PORTS is the largest industrial user of water in the vicinity and uses three water supply well fields south of Piketon in the Scioto River Valley. Samples of groundwater beneath PORTS are collected and analyzed from monitoring wells. Levels of water, or groundwater elevation, are recorded and used to estimate the rate and direction of groundwater flow.

Artwork by Catalina Stanlin

Groundwater Monitoring Areas

The Integrated Groundwater Monitoring Plan requires groundwater monitoring of 12 areas within the quadrants of the site. This plan also contains requirements for 1) surface water monitoring in creeks and drainage ditches that receive groundwater discharge, and 2) water supply monitoring. All samples are tested for metals, volatile organic compounds, and radionuclides. A constituent detected in the groundwater is compared to standards called preliminary remediation goals. Five areas of groundwater contamination have been identified at PORTS. The areas that contain groundwater plumes are X-749/X-120/PK Landfill, Quadrant I Groundwater Investigative Area/X-749A Classified Materials Disposal Facility, Quadrant II Groundwater Investigative Area, X-701B Holding Pond, and X-740 Waste Oil Handling Facility.

X-749 Contaminated Materials Disposal Facility/X-120 Old Training Facility/PK Landfill

Artwork by Emily Rosen

In the southernmost portion of PORTS in Quadrant I, groundwater concerns focus on three contaminant sources: X-749 Contaminated Materials Disposal Facility, X-120 Old Training Facility, and PK Landfill.

The X-749 Contaminated Materials Disposal Facility contains contaminants such as industrial solvents, waste oils, hazardous sludges, and low-level radioactive material. Initial closure included installation of a multimedia cap, barrier wall (north side and northwest corner), and subsurface groundwater drains. In 1994 a subsurface south barrier wall was completed and in 2002 an additional barrier wall was completed on the south and east sides. In 2002 and 2003, hybrid poplar trees were planted to experiment with phytoremediation. In 2007, four groundwater extraction wells were installed in the X-749 South Barrier wall area, and in 2008, two extraction wells were installed in the groundwater collection system. Eighty wells and one sump were sampled during 2010.

Groundwater in the former X-120 Old Training Facility is contaminated with volatile organic compounds, primarily trichloroethene. A groundwater extraction well was installed in 2010 west of the old training facility to remediate the higher concentrations of trichloroethene.

A contaminated groundwater plume is associated with the X-749/X-120/PK Landfill groundwater monitoring area. In 2010, concentrations of trichloroethene decreased in numerous wells. Concentrations of trichloroethene in the South Barrier wall also decreased. In 2010, trichloroethene was detected at one off-site monitoring well, below 1 ug/L.

X-749A Classified Materials Disposal Facility

In the northern portion of Quadrant I, groundwater concerns are focused on two areas: the Quadrant I Groundwater Investigative Area and the X-749A Classified Materials Disposal Facility.

The Quadrant I Groundwater Investigative Area consists of a groundwater plume resulting from a number of different sources: Oil Biodegrading Plots, Coal-Fired Steam Plant, Coal Pile Yard, Coal Pile Runoff Treatment Facility, Technical Services Building, Classified Materials Disposal Facility, Pilot Investigation Building, and Mechanical Testing Facility; the sources themselves are being monitored. Eleven additional extraction wells were added in the years 2001-2002. Twenty-nine wells were sampled in 2010 as a part of the Quadrant I groundwater investigation.

A contaminated groundwater plume consisting of mostly trichloroethene is associated with the Quadrant I Groundwater Investigative Area. Generally the concentrations of trichloroethene are decreasing in the plumes

around this area, however, a new area of higher concentrations of trichloroethene on the south side of X231A was identified in 2010 based on samples collected to further delineate the southeastern perimeter of the plume. Concentrations of trichloroethene also increased in two wells (X326-09G and X626-07G) in the western portion of the plume due to the operation of extraction well (X622-EW12G), which is intended to draw contaminated groundwater from beneath the X326 Building.

Quadrant II Groundwater Investigative Area

The X-701C Neutralization Pit was an open topped-pit located within a plume centered on the X-700 and X-705 buildings. This open pit received process effluents and basement sump wastewater treatments such as acid and alkali solutions and rinse water contaminated with trichloroethene. This pit was removed in 2001. The natural groundwater flow direction in this area is to the east toward Little Beaver Creek. This pattern has been changed by the use of sump pumps in the basements of these buildings. As a result, these pumps keep the water from reaching Little Beaver Creek. The sump pumps collect the water for treatment at the X-627 Groundwater Treatment Facility. This facility discharges through LPP NPDES Outfall 661, which flows to the X-6619 Sewage Treatment Plant. A groundwater plume consisting of mainly trichloroethene is associating itself with the Quadrant II Groundwater Investigative Area. No substantial changes were noticed in the volatile organic compound concentrations.

X-701B Holding Pond

In the eastern part of Quadrant II the groundwater concerns are focused on three areas: the X-701B Holding Pond, the X-230J7 Holding Pond, and the X-744Y Waste Storage Yard.

The X-701B Holding Pond was used from 1954 until 1988. It was designed for neutralization and settlement of acid waste from different sources. Sludge retention basins were located west of the holding pond. To the south of the holding pond is a 15 acre storage yard. RCRA hazardous waste was managed in this area. There is a contaminated plume that extends from the holding pond towards Little Beaver Creek. Three extraction wells were installed in the bottom of the pond as part of the RCRA closure of the unit. These wells and sumps were designed to try and intercept the contaminated water as it was coming out of the holding pond before it could reach the existing groundwater plume. The equipment was removed between 2009 and 2011 with the implementation of the X-701B interim remedial measure (IRM). Two French drains are used currently to intercept as much of the trichloroethene as possible in the eastern portion of the monitoring area. The extracted groundwater is treated in the X-624 Groundwater Treatment Facility and discharges through the LPP NPDES Outfall 015. Contaminated soil from the X-701B IRM area was mixed with an oxidant, with additional oxidants mixed into the soils remaining at the bottom of the excavation site. Twenty-seven wells were sampled in 2010 as part of the monitoring for the area.

The plume perimeter did not change significantly from 2009-2010. Concentrations of the trichloroethene in the plume in the X-701B monitoring area decreased in 2010 due to the increased groundwater pumping in the X-701B IRM area. Five samples were collected from wells in or around X-744G Storage Building and X-744Y Storage Yard analyzed for cadmium and nickel and were recorded above preliminary goals in three of the five wells. These results are typical of the X-744 area wells.

X-633 Pumphouse/Cooling Towers Area

The X-633 Pumphouse/Cooling Towers Area in Quadrant II consisted of a recirculating water pumphouse and four cooling towers with associated basins. The system used a chromium-based corrosion inhibitor until the early 90's when they switched to phosphate-based inhibitors. This area was defined as an area of concern for potential metals contamination in 1996. Two wells are sampled semiannually for chromium as part of the monitoring program for this area.

Chromium was detected in the X-633 wells in 2010. Samples from well X633-07G contained chromium concentrations higher than the preliminary remediation goal, while samples from the other well had concentrations well below the remediation goal. The concentrations were consistent with historical results for the wells sampled.

X-616 Chromium Sludge Surface Impoundments

A corrosion inhibitor containing chromium was used in the cooling systems in the X-616 Chromium Sludge Surface Impoundments building in Quadrant III. Chromium-containing sludge was produced by the system and stored in impoundments. These impoundments were certified closed in 1993. Seven wells are sampled annually and nine of them are sampled biannually to keep up with the monitoring program.

In 2010, chromium was detected in a single well sample at 74 μg/L. The detected chromium concentration was below the preliminary remediation goal for chromium (100 μg/L). In 2010, volatile organic compounds were detected at low levels with samples being selected from six wells. These are routinely detected in the area and generally located west or south of the impoundments.

X-740 Waste Oil Handling Facility

Artwork by Hillary Kittaka

The former X-740 Waste Oil Handling Facility, which operated from 1983-1991 and was demolished in 2006, was located more on the western half of PORTS south of the X-530A Switchyard. A sump within the X-740 Waste Oil Handling Facility was used to clean up waste oil and waste solvents from drums crushed in the hydraulic crusher. Both the facility and the sump underwent closure in 1998. A pilot study of enhanced anaerobic bioremediation in 2010 was approved to fully reduce volatile organics in the groundwater. Though results indicate that the perimeter of the X-740 groundwater plume did not change significantly in 2010, the pilot study did provide additional information about tricholoethene concentrations within the plume.

X-611A Former Lime Sludge Lagoons

The X-611A Former Lime Sludge Lagoons were comprised of three adjacent unlined sludge retention lagoons constructed in 1954 and used for disposal of lime sludge waste from the site water treatment plan from 1954 to 1960. The lagoons were about 18 acres in a low lying area including Little Beaver Creek. A prairie habitat has

been developed in this area by placing a soil cover over the north, middle, and south lagoons. A soil berm was constructed outside the northern boundary of the north lagoon. Monitoring results of six wells at X-611A indicate that concentrations of both beryllium and chromium are below the preliminary remediation goals. Chromium was detected in five of the six wells in this area, while Beryllium was detected in three of the six wells.

X-735 Landfills

Several distinct waste management units are contained within the X-735 Landfills area in Quadrant IV, including the X-735 RCRA Landfill and the X-735 Industrial Solid Waste Landfill. The solid waste landfill consists of solid waste cells, asbestos disposal cells, and chromium sludge monocells A and B. Initially a total of 17.9 acres was approved by Ohio EPA and the landfill began operating in 1981. Waste disposal in the northern area ended in December 1991 after contaminated wipe rags were discovered in that area which required closure as a RCRA hazardous waste landfill. A buffer zone was left unexcavated to provide space for groundwater monitoring wells and a space between the RCRA landfill unit and the remaining southern portion.

Artwork by Travis Welch

The industrial solid waste portion of the landfills included a solid waste section and an asbestos waste section. Monitoring results of 18 wells in 2010 indicate that the concentrations of cobalt, mercury, and nickel did not exceed the concentration limits. Three volatile organics were detected in three monitoring wells; however, these detections were well below the applicable preliminary remediation goal.

X-734 Landfills

The X-734 Landfills in Quadrant IV consisted of three landfill units that were used until 1985. Wastes known to be disposed at the landfills included trash bags, construction spoils, wood and other waste from clearing and grubbing, empty drums and possibly waste contaminated with metals, empty paint cans, and uranium-contaminated soil from the X-342 area. The landfills were closed in accordance with regulations in effect at that time, and no groundwater monitoring of the area was required. The landfills were capped in 1999-2000. Semiannual monitoring results of 15 wells indicated that volatile organic compound concentrations were detected below or just above the preliminary remediation goals. The only volatile organic compound to be detected at concentrations exceeding preliminary remediation goals was trichloroethene in the second quarter of 2010.

X-533 Switchyard Area

The X-533 Switchyard Area in Quadrant IV consisted of electrical transformers and circuit breakers, associated support buildings, and a transformer cleaning pad. Groundwater area of concern was located north of the switchyard. The switchyard was identified as an area of concern for potential metals contamination in 1996. Cadmium, cobalt, and nickel were detected in samplings taken in 1998 and 1999, and the wells are sampled semiannually for these metals. In 2010, monitoring results of three wells in the X-533 Switchyard Area indicate that each sample contained cadmium, cobalt, and nickel above the preliminary remediation goals.

Former X-344C Hydrogen Fluoride Storage Building

The former Hydrogen Fluoride Storage Building and associated hydrogen fluoride storage tanks were demolished and removed in May 2006. In 2009, an investigation of soils and groundwater determined that the groundwater in one monitoring well south of the former building contained two volatile compounds, but the concentrations were well below preliminary remediation goals. This area was added to the PORTS groundwater monitoring program in 2010. Monitoring results of the well indicate that concentrations of both compounds remained well below the preliminary remediation goals.

Artwork by Sheridan McLean

Surface Water Monitoring

Surface water monitoring is conducted in conjunction with the groundwater assessment monitoring to find out if there are contaminants from groundwater in the surface water. Samples were taken from Little Beaver Creek, Big Run Creak, the Southwestern Drainage Ditch, North Holding Pond, and both the West and East Drainage Ditches. In 2010, concentrations of various volatile organic compounds, such as trihalomethanes and trichloroethene, were found in the samples but in very low concentrations below Ohio EPA water quality criteria. No transuranics were detected in the surface water samples. Technitium-99 detected was well below the Ohio EPA drinking water standard. Uranium was routinely detected in 2010 surface water at low concentrations, which were also well below the DOE derived concentration guide.

Water Supply Monitoring

Routine monitoring of six private residential drinking water sources is completed at PORTS to determine whether these water sources have been adversely affected by plant operations. Trichloroethene was detected at levels less than the drinking water standard. Chloroform, chloromethane, and bromomethane were detected as well. No other volatile organic compounds or transuranics were detected. Low levels of uranium and uranium isotopes detected were consistent with naturally-occurring concentrations found in groundwater in the area.

DOE Order Monitoring Programs

Monitoring of exit pathways from the PORTS facility showed low levels of trichloroethene, which has continued to decrease in three on-site exit pathway groundwater monitoring wells (X749-44G, X749-45G and X749-97G). In 2010, no transuranics or technetium-99 were detected in exit pathway monitoring wells or in the surface water sampling locations that are part of the exit pathway monitoring program.

Groundwater Treatment Facilities

In 2010, a combined total of almost 36 million gallons of water were treated at four Groundwater Treatment Facilities. Approximately 197 gallons of trichloroethene were removed from the water.

Conclusion

The DOE PORTS facility must comply with numerous Federal regulations initiated by Environmental Legislation (Such as the Clean Air Act) and Statutes and the facility is regularly inspected, including 12 inspections in 2010. The 12 inspections resulted in no violations.

Extensive environmental monitoring takes place at PORTS to satisfy federal regulations, permits, and DOE Orders, but also to address any public concerns about the Plant. Environmental monitoring at PORTS measures both radiological and chemical parameters in air, water, soil, sediment, and biota. The results are used to gauge the environmental impacts of PORTS operations and to set priorities for environmental improvements. Samples for monitoring are taken from numerous sources, including 15 ambient air monitoring stations, local surface water and sediment samples from 14 locations, local biota including deer, fish, crops and eggs, and more than 400 monitoring wells are used. Additionally, over 1,500 DOE employees and DOE contractors were monitored during 2010. Key points from the environmental monitoring results include:

- Radiological exposure is well below the set limit of 100 millirems and therefore poses very little threat to the public.
- Using numerous approaches, DOE or DOE contractors are making progress on cleaning up potentially harmful substances such as trichlorethene.

Environmental monitoring also includes collecting samples at off-site locations and analyzing the samples for radionuclides that could be present due to PORTS operations. Routine monitoring of six private residential drinking water sources is completed at PORTS to determine whether these water sources have been adversely affected by plant operations.

DOE is focused on decommissioning and decontaminating the PORTS property. In 2009, DOE received $118 million in funding under the American Recovery and Reinvestment Act (ARRA) for five projects at PORTS that involved environmental remediation, D&D of inactive facilities, and materials disposition. Several buildings on the property were demolished in 2010.

DOE is also committed sustainable practices. Toward this, in 2010, over 30,000 tons of waste from DOE activities at PORTS were recycled, treated, or disposed at off-site facilities.

Definitions

Ambient air – the atmosphere around people, plants, and structures. Ambient air usually means outdoor air (as opposed to indoor air).

Biota – animal and plant life characterizing a given region.

Centrifuge – piece of equipment that rotates around a fixed axis to separate isotopes in nuclear power and nuclear weapon programs (U.S. Centrifuge Systems, 2012).

Dose – the energy imparted to matter by ionizing radiation. The unit of absorbed dose is the rad, equal to 0.01 joule per kilogram in any medium.

Absorbed dose – the quantity of ionizing radiation energy absorbed by an organ divided by the organ's mass. Absorbed dose is expressed in units of rad (or gray) (1 rad = 0.01 gray).

Dose – the product of the absorbed dose (rad) in tissue and a quality factor. Dose is expressed in units of rem (or sievert) (1 rem = 0.01 sievert).

Effective dose – the sum of the doses received by all organs or tissues of the body after each one has been multiplied by the appropriate weighting factor.

Collective dose/collective effective dose – the sums of the doses of all individuals in an exposed population expressed in units of person-rem (or person-sievert). The collective effective dose is also frequently called the "population dose."

Effluent – a liquid or gaseous waste discharge to the environment.

Gaseous diffusion – technology used to produce enriched uranium by forcing gases through a porous barrier (United States Nuclear Regulatory Commission, 2011).

Ionizing radiation – radiation that has enough energy to remove electrons from substances that it passes through, forming ions (U.S. DOE, 2004).

Isotope – form of an element having the same number of protons but differing numbers of neutrons in their nuclei.

Radionuclide – radioactive nuclide capable of spontaneous transformation into other nuclides by changing its nuclear configuration or energy level. This transformation is accomplished by the emission of photons or particles.

Rem – unit of radiation dose that reflects the ability of different types of radiation to damage human tissues and the susceptibility of different tissues to the damage (U.S. DOE, 2004).

Remediate – correction or cleanup of a site contaminated with waste.

Stewardship – responsibility of planning and management of resources shared by all those whose actions affect the environment (U.S. Environmental Protection Agency, 2011).

Stratospheric Ozone – the "good" ozone layer that extends upward from about 6 to 30 miles and protects life on Earth from the sun's harmful ultraviolet (UV) rays. This natural shield has been gradually depleted by man-made chemicals, allowing more UV radiation to reach the ground and leading to more health and environmental problems (U.S. EPA, 2010).

Switchyard complex – enclosed area used as the distribution center where power is supplied to the plant from the outside, and power is sent from the plant (Peak Power Engineering, 2012).

Transuranics – elements such as americium, plutonium, and neptunium that have atomic numbers (the number of protons in the nucleus) greater than 92. All transuranics are radioactive.

Uranium cylinders – containment vessel with a flat bottom and a domed top that is used to store uranium (U.S. Department of Energy, 2004).

Acronyms And Abbreviations

ACP	American Centrifuge Plant
ARRA	American Recovery and Reinvestment Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
D&D	decontamination and decommissioning
D&D	Orders 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, including the September 12, 2011 Modification thereto
DOE	U.S. Department of Energy
DUF6	depleted uranium hexafluoride
EMS	Environmental Management System
FBP	Fluor-B&W Portsmouth LLC
LLW	low-level radioactive waste
LPP	LATA/Parallax Portsmouth, LLC
µg/kg	microgram per kilogram (equivalent to part per billion)
µg/L	microgram per liter (equivalent to part per billion)
mrem	millirem
MWH	megawatt-hour
NPDES	National Pollutant Discharge Elimination System
Ohio EPA	Ohio Environmental Protection Agency
PCB	polychlorinated biphenyl
pCi/g	picocurie per gram
PK	Peter Kiewit
PORTS	Portsmouth Gaseous Diffusion Plant
RCRA	Resource Conservation and Recovery Act
RI/FS	remedial investigation/feasibility study
TSCA	Toxic Substances Control Act
UDS	Uranium Disposition Services, LLC
U.S. EPA	U.S. Environmental Protection Agency
USEC	United States Enrichment Corporation

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