

3. Environmental Programs and Activities

This chapter summarizes the environmental programs and activities at PORTS including environmental management, site sustainability, decontamination and decommissioning, environmental restoration and remediation, and public awareness.

3.1 Environmental Management System

DOE Order 436.1, *Departmental Sustainability*, requires PORTS to develop and implement an Environmental Management System to protect air, water, land, and other natural or cultural resources that may be impacted by DOE operations.

Fluor-BWXT Portsmouth LLC coordinates the implementation of the Environmental Management System among the DOE site contractors (Fluor-BWXT Portsmouth, Portsmouth Mission Alliance, and Mid-America Conversion Services). A report on progress in achieving Environmental Management System goals is submitted annually to DOE Headquarters. These Environmental Management System goals include objectives related to the following:

- Reducing greenhouse gas emissions
- Reducing energy consumption and intensity in site buildings
- Increasing the use of clean or renewable energy
- Enhancing water use efficiency and management
- Managing fleets to reduce petroleum use and increase alternative fuel and vehicle use
- Promoting sustainable acquisition
- Preventing pollution and reducing waste

The 2021 Environmental Management System environmental stewardship scorecard prepared for PORTS was green, which indicates that standards for Environmental Management System implementation have been met and at least 80 percent of the goal areas for fiscal year 2021 were addressed in the Environmental Management System. Some of the Environmental Management System goal areas do not apply to PORTS because the facility is not operating and is implementing and preparing for decontamination and decommissioning.

Green and sustainable remediation is the abatement, cleanup, or use of methods to contain, remove, or destroy contaminants while seeking to minimize the environmental, economic, and social costs of the remediation. DOE is incorporating green and sustainable remediation in the decontamination and decommissioning activities discussed in this chapter. Actions underway to support green remediation include efficient movement of materials to reduce fuel usage, efforts to minimize water usage and control runoff, and recycling and reuse of materials.

3.2 Site Sustainability Program

In accordance with DOE Order 436.1 and Executive Order 14057, this report provides information on the requirements and responsibilities of managing sustainability at PORTS. DOE is committed to reducing potential environmental risks, costs, wastes, and future liability by effectively integrating environmental sustainability principles in DOE activities at PORTS in a cost-effective and environmentally conscious

manner. The DOE Environmental Sustainability Program is a balanced, holistic approach that links planning, budgeting, measuring, and improving PORTS overall environmental performance to specific goals and outcomes. The *Fiscal Year 2022 Site Sustainability Plan* (DOE 2021c) describes the Environmental Sustainability Program and integrates the tenets of the Environmental Management System. The Environmental Sustainability Program includes elements of pollution prevention, waste minimization, sustainable procurement, sustainable design, and energy and water efficiency.

DOE is committed to minimizing or eliminating the amounts and types of wastes it generates and reducing life-cycle costs for managing and dispositioning property and wastes in all DOE projects and activities at PORTS. Effective environmental sustainability management begins with an integrated strategy. To achieve the objectives and targets of the Environmental Sustainability Program, DOE has developed and implemented a well-defined strategy for setting, updating, and achieving objectives and targets in line with the Environmental Management System and DOE pollution prevention goals. The broad objectives are core elements of the Environmental Sustainability Program. The qualitative and quantitative objectives listed below reduce the life-cycle cost and liability of DOE programs and operations at PORTS.

- 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 and 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 by mission-related activities
- Reducing the life-cycle cost of managing personal property at PORTS

The *Fiscal Year 2022 Site Sustainability Plan for the Portsmouth Gaseous Diffusion Plant* provides goals and progress through fiscal year 2021 for reducing greenhouse gas emissions and water consumption, recycling and diverting wastes, improving electronic stewardship, and other areas (DOE 2021c).

Accomplishments for fiscal year 2021 include the following:

- Greenhouse gas emissions (primarily associated with electricity consumption) have been reduced by 84 percent versus fiscal year 2008 baseline emissions.
- Water use was constant in fiscal year 2021 versus fiscal year 2020. Water use intensity (measured in gallons per gross square footage) has been reduced by 62 percent over the 2007 baseline.
- Approximately 34 percent of nonhazardous waste was recycled and thereby diverted from disposal at an off-site landfill, which is a 22 percent increase from fiscal year 2020.
- Approximately 39 percent of construction and demolition materials were recycled and diverted from off-site disposal, which is a 26 percent increase from fiscal year 2020.

DOE is placing increased emphasis on evaluating materials generated by decontamination and decommissioning for reuse or recycling. An agreement between DOE and the Southern Ohio Diversification Initiative (SODI) allows DOE to transfer excess equipment, clean scrap materials, and other assets to SODI. SODI first attempts to reuse the excess equipment and property in the local community. According to the agreement, if SODI is unable to do so then SODI may sell the property. Proceeds from these sales support economic development in the southern Ohio region. In 2021 SODI received approximately 48 tons of materials from PORTS, primarily recyclable metals and reusable equipment.

Approximately 252 tons of recyclable or reusable materials were sent off site in 2021:

- Aluminum cans: 5,000 pounds
- Aerosol cans: 143 pounds
- Batteries: 172,285 pounds
- Electronic materials such as computer equipment and circuit boards: 56,332 pounds
- Light bulbs: 4385 pounds
- Used oil: 10,073 pounds
- Reusable paint: 2,400 pounds
- Paper and cardboard: 80,000 pounds
- Plastic bottles: 38,500 pounds
- Tires: 31,800 pounds
- Spent toner cartridges: 6,500 pounds
- Recyclable materials to SODI (excess equipment and materials and recyclable metals): 48 tons

The Green Electronics Council recognized PORTS in 2021 with a 5-Star Electronic Product Environmental Assessment Tool Purchasing Award for excellence in sustainable procurement of information technology products. PORTS was recognized as a bronze level recipient of the DOE GreenBuy Award for excellence in sustainable acquisition for fiscal year 2021.

3.3 Environmental Management and Waste Management Activities

Environmental and waste management activities at PORTS include decontamination and decommissioning, and site-wide waste disposition. The following subsections describe these critical efforts.

The Decontamination and Decommissioning Director's Final Findings and Orders (Ohio EPA 2012) is an enforceable agreement between Ohio EPA and DOE that governs the process for decontamination and decommissioning of the gaseous diffusion process buildings and associated facilities that are no longer in use. These Director's Final Findings and Orders, which apply to decontamination and decommissioning of buildings down to and including the building slab and disposal of wastes generated by decontamination and decommissioning, use the CERCLA framework to determine appropriate removal and remedial actions. Documents that describe these proposed activities are submitted to Ohio EPA for either concurrence or approval.

3.3.1 Decontamination and Decommissioning Program: Process Buildings and Other Facilities

Decontamination and decommissioning of the process buildings and other facilities at PORTS is proceeding in accordance with the record of decision for process buildings concurred with by Ohio EPA in 2015 (DOE 2015a). The record of decision includes the following actions:

- Demolition of the buildings or structures
- Characterization and demolition of underground man-made features
- Treatment as needed to meet requirements for either on-site or off-site disposal
- Packaging of generated waste for final disposal, either on-site or off-site

- Transportation and disposal of waste, either on-site or off-site, in accordance with the waste disposition record of decision

The *Remedial Design/Remedial Action Work Plan and Remedial Design for the Process Buildings Deactivation at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio – Deactivation of X-326, X-330, X-333, X-111A, X-111B, X-232C1, X-232C2, X232C3, X-232C4, and X-232C5* (DOE 2016) was developed by DOE and concurred with by Ohio EPA in 2016. The *Comprehensive Deactivation, Demolition, and Disposition Remedial Design/Remedial Action Work Plan for the Process Buildings and Complex Facilities Remedial Action Project and Remedial Design for Deactivation of Complex Facilities at the Portsmouth Gaseous Diffusion Plant* (DOE 2018a) was prepared by DOE and concurred with by Ohio EPA in 2018; it includes deactivation, demolition, and waste disposition activities. These two work plans provide the information to demonstrate that deactivation activities to prepare the three main process buildings, along with their associated support structures and other complex facilities, for demolition meet the requirements of the Decontamination and Decommissioning Director’s Final Finding and Orders, the process buildings and waste disposition records of decision, and other applicable requirements.

Demolition of the X-326 Process Building began in 2021. Removal of the transite panels on the outside of the building began on February 24, 2021 and mechanical demolition of the building began on May 17, 2021. At the end of December 2021, 40 percent of the building had been demolished. Figure 3.1 shows the extent of the X-326 Process Building demolition in December 2021.



Figure 3.1. Extent of demolition of the X-326 Process Building in December 2021 (looking northwest)

Waste generated by demolition of the facility is disposed of at the On-Site Waste Disposal Facility if it meets the criteria established for on-site disposal. Waste that does not meet acceptance criteria for on-site waste disposal is shipped off site for disposal in accordance with applicable regulations.

Activities underway at the X-330 and X-333 Process Buildings in 2021 included disassembling and removing equipment, removing wastes including asbestos, PCBs, and RCRA hazardous waste, and

deactivating utilities and other systems. Materials that meet the waste acceptance criteria are disposed of at the on-site waste treatment facility; other materials are shipped off site for disposal in accordance with applicable regulations.

3.3.2 Site-Wide Waste Disposition

The record of decision for site-wide waste disposition was concurred with by Ohio EPA in 2015 (DOE 2015b). The record of decision selected a combination of on-site and off-site disposal, including construction of an On-Site Waste Disposal Facility.

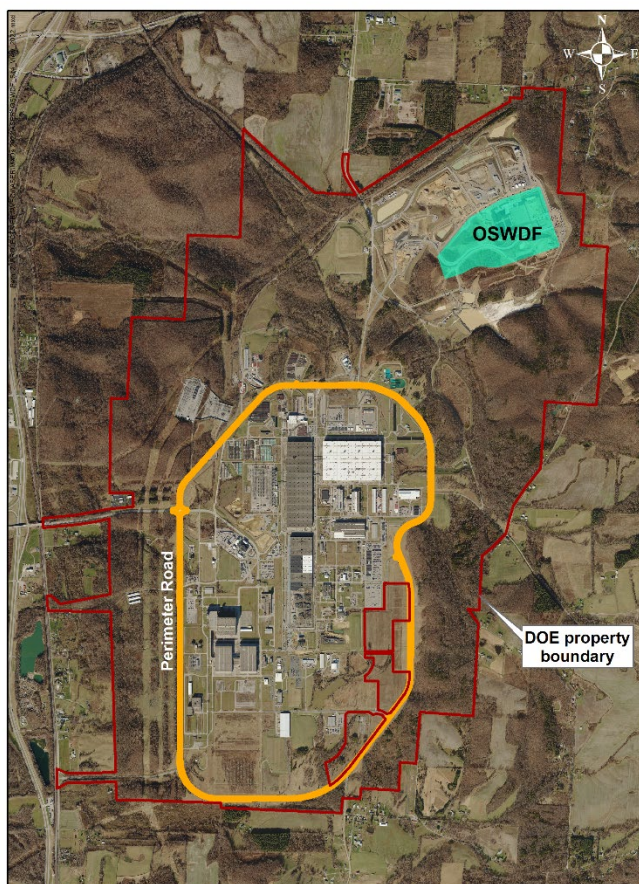


Figure 3.2. Location of the On-Site Waste Disposal Facility (OSWDF) at PORTS

Figure 3.2 shows the location of the On-Site Waste Disposal Facility in the northeast portion of PORTS. Site construction activities began in 2015. The first cell in the On-Site Waste Disposal Facility was completed in 2021 and waste disposal began on May 25, 2021.

Work continued in 2021 on installing the liners and other infrastructure for Cells 4 and 5 in the On-Site Waste Disposal Facility. Installing the leachate transmission piping and valve houses as well as other support areas also continued as planned. Activities were performed in accordance with the On-Site Waste Disposal Facility Final (100%) Design Package and the *Comprehensive On-site Waste Disposal Facility Remedial Design/Remedial Action Work Plan for the Process Buildings and Complex Facilities Remedial Action/Remedial Design Work Plan for the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio, Phase III Balance of the On-site Disposal Remedy* (DOE 2018b).

The *On-site Waste Disposal Facility (OSWDF) Performance Standards Verification Plan* (DOE 2021b) was approved by Ohio EPA as part of the On-site Waste Disposal Facility Final (100%) Design

Package. This plan includes groundwater, surface water, air, and external radiation monitoring to verify that waste disposal protects human health and the environment.

DOE prepares an annual status report for the On-Site Waste Disposal Facility project to summarize annual monitoring. The *2021 On-Site Waste Disposal Facility Annual Project Status Report* (DOE 2022b) and data collected in 2021 are available on the PEGASIS website [here](#).

The DOE Low-level Waste Disposal Facility Review Group oversees the operation and ongoing construction of the On-Site Waste Disposal Facility in compliance with DOE Order 435.1, *Radioactive Waste Management* (see Section 2.2.3). The *Fiscal Year 2021 Annual Summary Report for the On-Site Waste Disposal Facility* (DOE 2022c) documents the operation of the On-Site Waste Disposal Facility

and how the On-Site Waste Disposal Facility meets performance requirements in the Disposal Authorization Statement. This report is provided to the DOE Low-level Waste Disposal Facility Review Group.

3.4 Environmental Restoration and Remediation

DOE established the Environmental Restoration Program in 1989 to identify, control, and remediate environmental contamination at PORTS. Environmental restoration has been conducted in accordance with the RCRA corrective action process under a Consent Decree with the State of Ohio issued on August 29, 1989, and a US EPA Administrative Order by Consent issued on September 29, 1989, which was amended in 1994 and 1997 and terminated on February 13, 2017. Removal of facilities and structures down to and including the building slab is controlled by the decontamination and decommissioning process (see Section 3.3.1). Investigation and remediation of environmental contamination is completed under the RCRA corrective action process and in accordance with the Consent Decree with the State of Ohio.

In general, the RCRA corrective action process consists of the following:

- A RCRA facility assessment to identify releases of hazardous waste and hazardous constituents and determine the need for further investigation
- A RCRA facility investigation to determine the nature and extent of any contamination
- A corrective measures study to identify and evaluate remedial alternatives to address contamination

Following the approval of the final corrective measures study, Ohio EPA selects remedial alternatives for further review to determine the final remedial actions and documents this decision in the statement of basis, formerly called the preferred plan. After a public review and comment period, Ohio EPA selects the final remedial actions. Ohio EPA issues a decision document to select the final remedial actions and DOE implements the remedial actions. Ohio EPA reviews final remedial actions on a schedule agreed upon by Ohio EPA and DOE (approximately every five years) to ensure that the remedial actions are performing as intended by the decision document and are protecting human health and the environment.

The initial assessment and investigation of PORTS under the RCRA corrective action process was 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 Figure 6.1). Remedial actions have been implemented in each quadrant.

Some RCRA corrective action investigations that were deferred to the start of decontamination and decommissioning activities at PORTS are now underway. When the RCRA corrective action process began at PORTS in the 1990s, certain areas in or adjacent to the gaseous diffusion production and operation areas were designated as deferred units. Remedial activities in these areas would have interrupted ongoing operations, or ongoing operations could have recontaminated the areas. Ohio EPA deferred the investigation and remedial action of soil and groundwater associated with these units until decontamination and decommissioning of PORTS began, or until the area no longer met the requirements for deferred unit status. Before the start of decontamination and decommissioning, ongoing environmental monitoring and health and safety programs for on-site workers were used to monitor the contaminants in these areas.

The *Deferred Units Resource Conservation and Recovery Act Facility Investigation/Corrective Measures Study Work Plan* was approved by Ohio EPA in 2015 (DOE 2015c). The soil and groundwater sampling

described in the work plan started in 2015 and was completed in 2016. The initial *Deferred Units Resource Conservation and Recovery Act Facility Investigation/Corrective Measures Study Report* was submitted to Ohio EPA in 2017, and Ohio EPA submitted comments to DOE in December 2018. DOE worked to address these comments, which called for additional sampling and installing additional monitoring wells, throughout 2019 and the beginning of 2020. A revised report was submitted to Ohio EPA in August 2020. In 2021, DOE and Ohio EPA worked to resolve additional comments on the report, and a revised report was submitted on August 31, 2021 (DOE 2021d). Ohio EPA approved the report in 2022.

The following sections describe the remedial actions underway in each quadrant as well as ongoing activities at any formerly deferred units. Table 3.1 lists remedial activities for the groundwater monitoring areas at PORTS, which include remedial actions required by decision documents and other actions.

Table 3.1. Remedial actions at PORTS in groundwater monitoring areas

Quadrant and monitoring area	Remedial action and year completed
Quadrant I X-749/X-120 groundwater plume	X-749 multimedia cap – 1992 X-749 barrier wall (north and northwest sides of landfill) – 1992 X-749 subsurface drains and sumps – 1992 South barrier wall – 1994 X-120 horizontal well – 1996 X-625 Groundwater Treatment Facility – 1996 X-749 barrier wall (east and south sides of landfill) – 2002 Phytoremediation (22 acres) – 2002 & 2003 Injection of hydrogen release compounds – 2004 X-749 South Barrier Wall Area extraction wells – 2007 Two additional extraction wells in the groundwater collection trench on the southwest side of the X-749 Landfill – 2008 X-749/X-120 groundwater plume extraction wells – 2010
Quadrant I Peter Kiewit (PK) Landfill (X-749B)	Relocation of Big Run Creek – 1994 Groundwater collection system – 1994 Groundwater collection system expansion – 1997 PK Landfill Subtitle D cap – 1998
Quadrant I Quadrant I Groundwater Investigative (5-Unit) Area	Groundwater extraction wells (3) – 1991 X-622 Groundwater Treatment Facility – 1991 (upgraded in 2001) Interim soil cover at X-231B – 1995 X-231A/X-231B multimedia caps – 2000 Groundwater extraction wells (11) – 2002 Groundwater extraction well (1) – 2009 Removal of contaminated soil at former X-770 Building – 2010
Quadrant I X-749A Classified Materials Disposal Facility	Cap – 1994

Table 3.1. Remedial actions at PORTS in groundwater monitoring areas (continued)

Quadrant and monitoring area	Remedial action and year completed
Quadrant II Quadrant II Groundwater Investigative (7-Unit) Area	Operation of X-700 and X-705 building sumps – 1989 X-622T Groundwater Treatment Facility – 1992 Removal of X-720 Neutralization Pit – 1998 Removal of X-701C Neutralization Pit – 2001 Removal of contaminated soil near X-720 Neutralization Pit – 2001 X-627 Groundwater Treatment Facility – 2004 (replaced the X-622T facility) Enhanced anaerobic bioremediation – 2011
Quadrant II X-701B Former Holding Pond	X-237 Groundwater Collection System – 1991 X-624 Groundwater Treatment Facility – 1991 (upgraded 2006) Extraction wells (3) – 1993 (removed 2009-2011) X-623 Groundwater Treatment Facility – 1993 X-701B sump – 1995 Groundwater remediation by oxidant injection – 2008 Groundwater and soil remediation by oxidant mixing – 2011
Quadrant III X-740 Former Waste Oil Handling Facility Area	Phytoremediation – 1999 Oxidant injections – 2008 Enhanced anaerobic bioremediation – 2011
Quadrant IV X-611A Former Lime Sludge Lagoons	Soil cover – 1996 Prairie vegetation planted – 1997
Quadrant IV X-735 Landfills	Cap on northern portion – 1994 Cap on southern portion – 1998
Quadrant IV X-734 Landfills	Cap on X-734B Landfill (Phase I) – 1999 Cap on X-734 and X-734A Landfills (Phase II) – 2000
Quadrant IV X-533 Former Switchyard Complex	Contaminated soil removal – 2010

3.4.1 Quadrant I

The *Quadrant I Cleanup Alternative Study/Corrective Measures Study* was approved by Ohio EPA in 2000 (DOE 2000). Ohio EPA issued the Decision Document for Quadrant I in 2001, which outlined the required remedial actions for the X-749/X-120 groundwater plume and the Quadrant I Groundwater Investigative (5-Unit) Area (the Five-Unit Groundwater Investigative Area and X-231A/X-231B Oil Biodegradation Plots) (Ohio EPA 2001).

Remedial actions required for the X-749B Peter Kiewit Landfill (PK Landfill) were provided in separate decision documents issued by Ohio EPA in 1996 (Ohio EPA 1996a) and US EPA in 1997 (US EPA 1997). The following sections discuss the remedial actions required for the X-749/X-120 groundwater plume, PK Landfill, and the Quadrant I Groundwater Investigative (5-Unit) Area. Section 6.3.2.1 includes 2021 groundwater monitoring results for the X-749 Contaminated Materials Disposal Facility/X-120 Former Training Facility, PK Landfill, and Quadrant I Groundwater Investigative (5-Unit) Area.

3.4.1.1 X-749/X-120 Groundwater Plume

The remedial actions identified for the X-749/X-120 groundwater plume (see Figure 6.2) include phytoremediation of the groundwater plume, installation of a barrier wall around the eastern and southern portion of the X-749 Landfill, and continued operation of the groundwater collection trenches installed at the PK Landfill and X-749 Landfill. Groundwater extraction wells were also installed in 2007, 2008, and 2010 to control migration of the plume and remediate areas of higher trichloroethene concentrations within the plume.

Phytoremediation is a process that uses plants to remove, degrade, or contain contaminants in soil and groundwater. Phytoremediation at the X-749/X-120 groundwater plume was installed in two phases during 2002 and 2003. The barrier wall around the eastern and southern portion of the X-749 Landfill was completed in 2002.

The *First Five-Year Review for the X-749/X-120 Groundwater Plume*, submitted to Ohio EPA in 2011, found that the remedial actions implemented for the X-749/X-120 groundwater plume (both the remedial actions required by the Decision Document and the extraction wells installed in 2007 and 2008) were achieving remedial action objectives by preventing the migration of contaminants from the X-749 Landfill and controlling migration of the X-749/X-120 groundwater plume (DOE 2011). However, Ohio EPA and DOE agreed that the phytoremediation system was not as successful as anticipated in reducing concentrations of trichloroethene in groundwater. The extraction wells that began operating in 2007 and 2008 in the groundwater collection trench on the southwest side of the X-749 Landfill and the X-749 South Barrier Wall Area, as well as the barrier wall on the south and east sides of the landfill (which was completed in 2002), appeared to be primarily responsible for reducing trichloroethene concentrations in the X-749/X-120 groundwater plume. Maintenance of the phytoremediation system was discontinued with the approval of Ohio EPA in 2011.

The most recent five-year review for the X-749/X-120 groundwater plume, entitled *Third Five-Year Review for the X-749/X-120 Groundwater Plume* (DOE 2021e), found that the remedial actions were working effectively to meet the remedial action objectives. The next review of the remedial actions for the X-749/X-120 groundwater plume will be submitted to Ohio EPA in 2026.

Section 6.3.2.1 and Figure 6.2 provide additional information on the 2021 groundwater monitoring results for the X-749/X-120 groundwater plume.

3.4.1.2 PK Landfill

The remedial actions required by the PK Landfill decision documents include continued operation of the eastern groundwater collection system installed in 1994 and construction of an engineered cap that meets the RCRA Subtitle D and related requirements (Ohio EPA 1996a and US EPA 1997). In addition, the southeastern groundwater collection system was constructed in 1997 to contain surface seeps, groundwater from the southern slope of the PK Landfill, and the groundwater plume migrating toward Big Run Creek from the X-749 Landfill.

The most recent five-year review for the PK Landfill (the *Fourth Five-Year Review for the X-749B Peter Kiewit Landfill*) found that the corrective actions implemented at the PK Landfill (the groundwater collection systems, landfill cap, and institutional controls) were continuing to achieve corrective action objectives by eliminating exposure pathways and reducing the potential for transporting contaminants (DOE 2018c). Concentrations of many of the contaminants detected in the PK Landfill wells, sumps, and manholes have decreased. The next review of the remedial actions implemented at the PK Landfill will be submitted to Ohio EPA in 2023.

Section 6.3.2.1 and Figure 6.2 provide 2021 groundwater monitoring results for the PK Landfill area.

3.4.1.3 Quadrant I Groundwater Investigative (5-Unit) Area

Remedial actions identified for the Quadrant I Groundwater Investigative (5-Unit) Area (see Figure 6.3) are installing multimedia caps over the X-231A and X-231B Oil Biodegradation Plots and installing 11 additional groundwater extraction wells to extract contaminated groundwater for treatment in the X-622 Groundwater Treatment Facility (Ohio EPA 2001). The caps were constructed in 2000 and the groundwater extraction wells began operating in 2002. In 2009, an additional extraction well was installed south of the X-326 Process Building to control and remediate a newly identified source of trichloroethene beneath the building. Table 3.1 lists the remedial actions completed for the Quadrant I Groundwater Investigative (5-Unit) Area.

The *Third Five-Year Review for the Five-Unit Groundwater Investigative Area and X-231A/X-231B Oil Biodegradation Plots at the Portsmouth Gaseous Diffusion Plant* (DOE 2018d), which is the most recent five-year review of both the groundwater extraction system for the Quadrant I Groundwater Investigative (5-Unit) Area and the multi-layered caps for the X-231A and X-231B Oil Biodegradation Plots, found that the remedial actions implemented for these areas (the multimedia caps and groundwater extraction system) were continuing to eliminate potential exposure pathways to contaminants, control migration of the groundwater plume, and remove volatile organic compounds from groundwater. The next review of the remedial actions implemented at the Quadrant I Groundwater Investigative (5-Unit) Area and X-231A/B Oil Biodegradation Plots will be submitted to Ohio EPA in 2023.

The X-231B Oil Biodegradation Plot is being excavated in accordance with *The July 30, 2018 Director's Final Findings and Orders for CERCLA Actions to Restore Natural Resources* (Ohio EPA 2018). Ohio EPA and DOE entered into these orders to resolve all impacts to natural resources at PORTS that were identified by the State by implementing specific restoration actions, and to enhance ongoing remediation efforts at PORTS in a manner that helps restore the natural resources damaged by historic operations. Additional areas within the Quadrant I Groundwater Investigative (5-Unit) Area are being excavated in accordance with the Waste Disposition Record of Decision.

Section 6.3.2.1 and Figure 6.3 describe the groundwater monitoring completed in the Quadrant I Groundwater Investigative (5-Unit) Area during 2021.

3.4.2 Quadrant II

Ohio EPA approved the *Quadrant II Cleanup Alternative Study/Corrective Measures Study* in 2001 (DOE 2001). After approving the document, however, Ohio EPA requested an amendment to the approved study to address additional remedial alternatives for the X-701B area. Amendments were submitted in 2001 and 2002. In 2003 Ohio EPA informed DOE that a separate decision document would be prepared for the X-701B area, and the X-701B Decision Document was issued in 2003 (Ohio EPA 2003).

Section 6.3.2.2 includes 2021 groundwater monitoring results for the areas in Quadrant II that require groundwater monitoring: the Quadrant II Groundwater Investigative (7-Unit) Area, X-701B Former Holding Pond, and X-633 Former Recirculating Cooling Water.

3.4.2.1 Quadrant II Groundwater Investigative (7-Unit) Area

The groundwater plume in the Quadrant II Groundwater Investigative (7-Unit) Area includes a number of deferred units, as shown in Figure 6.4. A special investigation in 2009, which sampled soil and groundwater, identified areas where concentrations of trichloroethene were higher. The elevated levels were apparently associated with continuing sources of groundwater contamination in the southeastern

portion of the plume. DOE and Ohio EPA agreed that selecting a remedial action for the Quadrant II Groundwater Investigative (7-Unit) Area will be incorporated in the deferred units preferred plan and decision document.

Section 6.3.2.2 and Figure 6.4 describe the groundwater monitoring completed at the Quadrant II Groundwater Investigative (7-Unit) Area in 2021.

3.4.2.2 X-701B Former Holding Pond

Remedial actions required by the Decision Document for X-701B, issued in 2003, include remediating groundwater by injecting a chemical oxidant (Ohio EPA 2003). Oxidant was injected as required by the Decision Document between 2006 and 2008. After injections were completed in 2008, DOE Headquarters conducted an independent review of the X-701B Project to evaluate the remediation results and recommend a path forward. The review found that the method used to inject oxidant into the contaminated area did not address the deepest part of the contaminated soil. Contaminants that remained deep in the soil would continue to be released into the groundwater plume. As an interim remedial measure, DOE proposed to excavate soil in the western part of the X-701B plume area and mix oxidant directly into the contaminated soil. This effort began in December 2009 and was completed in January 2011.

Section 6.3.2.2 and Figure 6.5 describe the groundwater monitoring completed at the X-701B Former Holding Pond in 2021.

3.4.2.3 X-633 Former Recirculating Cooling Water Complex

The X-633 Recirculating Cooling Water Complex was demolished in 2010. In 2011 a RCRA investigation of soil and groundwater in the area identified areas of soil potentially contaminated with metals. However, the higher metal concentrations in these areas, which are 15 to 20 feet below the ground surface, may be due to naturally occurring variations in the area's geology.

Chromium and trichloroethene were detected in groundwater at concentrations above the preliminary remediation goals during the 2011 RCRA investigation for the X-633 area. DOE agreed to sample eight wells around the area each year to continue evaluating chromium and trichloroethene in groundwater. The *2021 Groundwater Monitoring Report for the Portsmouth Gaseous Diffusion Plant* presents the monitoring data for 2021 (DOE 2022a).

3.4.3 Quadrant III

Ohio EPA approved the *Quadrant III Cleanup Alternative Study/Corrective Measures Study* in 1998 (DOE 1998a). The Decision Document for Quadrant III, issued in 1999, required phytoremediation of the groundwater plume near the X-740 Waste Oil Handling Facility (Ohio EPA 1999a). Over 700 hybrid poplar trees were planted on 2.6 acres above the X-740 groundwater plume in 1999 (see Figure 6.8). Evaluation reports for this remedial action in 2003 and 2007 concluded that the phytoremediation had not performed as expected to remove trichloroethene from groundwater in this area (DOE 2003 and DOE 2007).

In response to Ohio EPA concerns about the performance of the phytoremediation system, DOE undertook additional remedial activities for the X-740 area. Three rounds of oxidant injections were completed in 2008. Although this briefly reduced the concentrations of trichloroethene detected in some of the wells, trichloroethene concentrations in groundwater returned to previous levels in 2009.

In 2010 Ohio EPA approved a pilot study of enhanced anaerobic bioremediation for the X-740 area. Emulsified oil, a slow-acting fermentable carbon compound, was injected into parts of the X-740 groundwater plume during December 2010 and January 2011. Trichloroethene decreased in wells in the area of the groundwater plume that was treated during the pilot study. The *Deferred Units RCRA Facility Investigation/ Corrective Measures Study Report* (DOE 2021d) summarizes the results of the pilot study.

In 2021, most of the X-740 groundwater plume was excavated in accordance with *The July 30, 2018 Director's Final Findings and Orders for CERCLA Actions to Restore Natural Resources* (Ohio EPA 2018). All but three of the wells that were part of the X-740 monitoring program were removed to prepare for the excavation. Seven new groundwater monitoring wells were installed in the former plume area in 2022.

Section 6.3.2.3 includes 2021 groundwater monitoring results for the following areas in Quadrant III that require groundwater monitoring: the X-616 Former Chromium Sludge Surface Impoundments and X-740 Former Waste Oil Handling Facility.

3.4.4 Quadrant IV

Ohio EPA approved the *Quadrant IV Cleanup Alternative Study/Corrective Measures Study* in 1998 (DOE 1998b) and DOE received the Decision Document for Quadrant IV in 2000 (Ohio EPA 2000). No new remedial actions were required in Quadrant IV, since earlier remedial actions at the X-344D Hydrogen Fluoride Neutralization Pit, X-735 Landfills, X-611A Former Lime Sludge Lagoons, and X-734 Landfills had been completed.

Section 6.3.2.4 includes 2021 results for the following areas in Quadrant IV that require groundwater monitoring: the X-611A Former Lime Sludge Lagoons, X-735 Landfills, X-734 Landfills, X-533 Former Switchyard Complex, and X-344C Former Hydrogen Fluoride Storage Building.

3.4.4.1 X-611A Former Lime Sludge Lagoons

Ohio EPA and US EPA issued a decision document for the X-611A area in 1996, which required DOE to construct a soil cover over the former lagoons and establish a prairie habitat (Ohio EPA 1996b). The soil cover and prairie planting were completed in 1997. The *Fourth Five-Year Review for the X-611A Prairie* (DOE 2018e), which is the most recent five-year review, found that the soil cover and prairie habitat were meeting the remedial action objectives for this unit by eliminating exposure pathways to the contaminants in the sludge. The next review of the remedial actions implemented at the X-611A area will be submitted to Ohio EPA in 2023.

3.4.4.2 X-734 Landfills

Ohio EPA issued a decision document for the X-734 Landfills in 1999 (Ohio EPA 1999b) that required DOE to construct a multimedia cap over the northern part of the landfills and a soil cap over the southern part. These caps were installed in 1999 and 2000. The *Third Five-Year Review for the X-734 Landfill Area* (DOE 2018f), which is the most recent five-year review, found that the landfill caps have achieved remedial action objectives by isolating contaminants in soil and sediment from people and animals. The caps were also preventing contaminants from migrating from soil to groundwater and from groundwater to surface water. The next review of the remedial actions implemented at the X-734 Landfills will be submitted to Ohio EPA in 2023.

3.4.4.3 X-630 Former Recirculating Cooling Water Complex

The X-630 Recirculating Cooling Water Complex, which was located in Quadrant IV inside Perimeter Road and west of the X-533 Switchyard Complex, was removed in 2011 as part of decontamination and

decommissioning. A RCRA investigation of soil and groundwater at the X-630 Recirculating Cooling Water Complex in 2011 identified areas of soil 15 to 20 feet below the ground surface that were potentially contaminated with metals. However, the higher concentrations of metals may result from naturally occurring variations in the geology of the area.

The 2011 RCRA investigation for the X-630 area also detected chromium and trichloroethene in groundwater at concentrations above the preliminary remediation goals. DOE agreed to sample four wells around the area each year to continue evaluating chromium and trichloroethene in groundwater. The *2021 Groundwater Monitoring Report for the Portsmouth Gaseous Diffusion Plant* includes the data for this monitoring (DOE 2022a).

3.5 Public Awareness Program

PORTS has a comprehensive community relations and public participation program. Its purpose is to foster openness and credibility between PORTS officials and local citizens, elected officials, businesses, the media, and the public. The program also offers opportunities for members of the public to be involved in decisions affecting environmental issues at PORTS. Contact information for the organizations that provide PORTS information to the public is listed below.

PORTS Environmental Information Center:

Phone: 740-289-8898
Hours: 9 a.m.–12 noon, Monday and Tuesday; noon–4 p.m. Wednesday and Thursday
or by appointment
Email: portseic@ports.pppo.gov
Website: energy.gov/pppo/portsmouth-environmental-information-center
Online documents: eic.ports.pppo.gov

DOE Site Office:

Phone: 740-897-5010
Website: energy.gov/pppo

FBP Public Affairs:

Phone: 740-897-2964
Website: fbportsmouth.com

PORTS Environmental Data (PEGASIS): pegasis.ports.pppo.gov

The PORTS version of PEGASIS allows users to access PORTS environmental monitoring data and display it on a local map that shows where the data were collected. Data from 2010 through the current Annual Site Environmental Report are available on the PEGASIS website [here](#).

3.5.1 Community and Educational Outreach

The PORTS Envoy Program matches employee volunteers with community stakeholders such as families living next to DOE property, community groups, and local government organizations. The envoys share information about decontamination and decommissioning and other site issues with stakeholders and are available to answer stakeholder questions.

DOE holds open houses in neighboring communities or virtual public meetings to keep the public informed and to hear their comments and questions, and periodically publishes fact sheets on major projects. DOE distributes notices of document availability and public comment periods, as well as other communications on its programs, to the local newspaper, the community relations mailing list, neighbors within 2 miles of the plant, and plant employees.

Besides sharing information on environmental programs and activities at PORTS and gathering input from the public, DOE aids the community directly by helping to grow a science, technology, engineering, and math (STEM) environment for rural Appalachian schools. One example is The Ohio University Voinovich School's PORTSfuture Program. Through a grant funded by the Portsmouth/Paducah Project Office, PORTSfuture has been able to reach over 13,000 students in the four-county area in Southern Ohio around PORTS. The PORTSfuture Program engages K-12 and college students in STEM activities focused on technology, energy, environment, entrepreneurship, and water quality. Outreach efforts include in-class activities and curriculum, business pitch competitions, science fairs, summer STEM enrichment programs, and after-school clubs.

In one PORTSfuture program, local high school students produce a summary of the Annual Site Environmental Report for distribution to the public. The PORTS Annual Science Alliance event brings more than 1,500 high school juniors to PORTS for an interactive science fair that includes scientific demonstrations and information on careers in STEM fields. DOE and PORTS contractors also support the annual South Central Ohio Regional Science Bowl, an academic competition for middle school and high school students. Student teams answer questions about biology, chemistry, earth sciences, math, and physics, and the regional winners advance to the National Science Bowl in Washington, D.C. More information about the PORTSfuture Program is provided on the PORTSfuture website [here](#).

3.5.2 Site Specific Advisory Board

The PORTS Site Specific Advisory Board, comprised of citizens from the local area, provides public input and recommendations to DOE on decontamination and decommissioning, environmental remediation, waste management, and related issues. The Board holds regularly scheduled meetings with DOE that are open to the public. Find more information about the PORTS Site Specific Advisory Board on the DOE Portsmouth/Paducah Project Office website [here](#) or call 740-289-5249.

3.5.3 Environmental Information Center

The Environmental Information Center provides public access to documents used to make decisions on remedial actions 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.