

3. ENVIRONMENTAL PROGRAM INFORMATION

3.1 SUMMARY

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

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

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

In 2011, approximately 16,000 tons of materials from D&D and other DOE activities at PORTS were recycled, treated, or disposed at off-site facilities. Activities undertaken by the Environmental Sustainability, Training, and Public Awareness programs are also discussed in this chapter.

Chapter 2, Section 2.3.6, provides information on implementation of the DOE EMS at PORTS.

3.2 D&D PROGRAM

On April 13, 2010, Ohio EPA issued the DFF&O, 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. The DFF&O was revised in 2011 and 2012 to add structures that were inadvertently omitted from the original orders and to allow these structures to be addressed under one of two processes (see Sections 3.2.1 and 3.2.2 below) with the agreement of DOE and Ohio EPA. The DFF&O, which applies to the D&D of buildings down to and including the building slab and disposal of wastes generated by D&D, use the CERCLA framework for determining appropriate removal and remedial actions. Documents are submitted to Ohio EPA for either concurrence or approval. Chapter 2, Section 2.3.1.1, provides additional information about the DFF&O.

Community involvement is an important part of the CERCLA process and the DFF&O. Opportunities for public comment are built into the D&D process as described in Sections 3.2.1, 3.2.2, and 3.2.3. The PORTS Community Relations Plan identifies opportunities to provide information to the public and obtain public input. Additionally, the PORTS Site Specific Advisory Board provides recommendations to DOE based on the concerns of the communities surrounding PORTS. Section 3.7 provides additional information on the PORTS Public Awareness Program.

The primary components of the DFF&O are 1) engineering evaluations/cost analyses and action memoranda for less complex facilities (non-time critical removal actions), 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. The following sections discuss each component of the DFF&O and the activities completed during 2011 for each component of the DFF&O.

3.2.1 Non-time critical removal actions

The smaller and less complex buildings at PORTS undergo D&D using the process for non-time critical removal actions. This process begins with a removal site evaluation. The removal site evaluation includes a preliminary assessment of the facility, including anticipated wastes and volumes, and an evaluation of the likelihood of releases of hazardous substances. Existing analytical data is compiled, potential hazards to human health, safety and the environment are evaluated, and data needs (if any) are identified. If necessary, a sampling and analysis plan is prepared to collect data to characterize wastes that will be generated during D&D and identify areas of contamination. If required, a preliminary assessment report, removal site investigation work plan, and removal site investigation report are prepared, or can be included in the engineering evaluation/cost analysis with Ohio EPA concurrence. If a preliminary assessment report, removal site investigation work plan, and/or removal site investigation report are prepared, Ohio EPA must review and concur with the documents.

An engineering evaluation/cost analysis is then prepared that includes the site characterization information obtained during the preliminary assessment, the technological options for removal of the facility/area, the recommended option for removal of the facility/area, and a schedule for completion of the work.

After Ohio EPA concurs with the engineering evaluation/cost analysis, a public comment period will commence. At the conclusion of the public comment period, DOE prepares an action memorandum to summarize and address public comments (if any). A removal action work plan is then prepared that details the activities necessary to remove the building. Upon completion of the building removal, a removal action completion report is submitted to Ohio EPA for review and concurrence.

3.2.1.1 Non-time critical removal action activities in 2011

In 2011, DOE continued the process begun in 2010 for evaluation and removal of 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.

Removal of the X-103 Auxiliary Office Building, X-334 Transformer Cleaning and Storage Building, and X-344B Maintenance Storage Building were completed in June (X-103 and X-334) and August 2011 (X-344B). Removal action completion reports for the X-103 and X-334 were submitted to Ohio EPA in November 2011, and Ohio EPA provided concurrence in December 2011. The removal action completion report for the X-344B was submitted to Ohio EPA in 2012, and Ohio EPA provided concurrence in 2012.

RCRA investigations to identify possible soil contamination associated with the former X-103 Auxiliary Office Building, X-334 Transformer Cleaning and Storage Building, and X-344B Maintenance Storage Building were also completed during 2011. Sections 3.3.1.4 (X-103), 3.3.4.3 (X-334), and 3.3.4.4 (X-344B) summarize the results of these investigations.

Removal of the X-630 Recirculating Cooling Water Complex was completed in August 2011. However, removal of the X-626 Recirculating Cooling Water Complex was placed on hold at the end of 2011 because it was determined that the facility was still needed to support site operations. The removal action

completion report for the X-630 was submitted to Ohio EPA in 2012 and Ohio EPA provided concurrence in 2012.

The RCRA investigation of soil and groundwater near the former X-630 Recirculating Cooling Water Complex was initiated in 2011. Section 3.3.4.6 provides more information about this investigation.

In 2011, DOE and Ohio EPA developed a single engineering evaluation/cost analysis for 46 of the buildings to be removed as non-time critical removal actions. The *Engineering Evaluation/Cost Analysis for the Plant Support Buildings and Structures* was initially submitted to Ohio EPA in April 2011. DOE and Ohio EPA worked together to finalize the document from April into October. Ohio EPA concurred with the *Engineering Evaluation/Cost Analysis for the Plant Support Buildings and Structures* in October 2011.

Several activities were undertaken to provide the public information about and the means to comment upon the proposed demolition of the buildings included in the *Engineering Evaluation/Cost Analysis for the Plant Support Buildings and Structures*. DOE provided information to the Site Specific Advisory Board in May and June of 2011 about the proposed demolition of the facilities. The Site Specific Advisory Board supported demolition of the buildings as they could not foresee any reuse of the facilities. The public comment period for the *Engineering Evaluation/Cost Analysis for the Plant Support Buildings and Structures* was held from October 24, 2011, through November 23, 2011. A public availability session was held on November 10, 2011. The Action Memorandum was completed in 2012.

Sampling plans for the following buildings included in the *Engineering Evaluation/Cost Analysis for the Plant Support Buildings and Structures* were submitted to Ohio EPA in the fourth quarter of 2011: X-100 Administration Building, X-100B Air Conditioner Equipment Building, X-101 Dispensary, X-109C Monitoring Station, X-744S Warehouse, and X-624-1 Decontamination Pad. The sampling plans were finalized in 2012.

3.2.2 Process buildings and complex facilities

D&D of seven buildings at PORTS will follow the RI/FS process. Under the revised DFF&O, other facilities may also be included in the RI/FS process or may be addressed as non-time critical removal actions with the agreement of DOE and Ohio EPA. The seven buildings that must be addressed by the RI/FS process are the most complex of the buildings to be removed under the DFF&O and include the three gaseous diffusion process buildings.

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. The RI/FS work plan details the tasks to be completed to characterize site conditions, determine the nature of wastes to be generated, assess the risk to human health and the environment, and evaluate potential remedial alternatives. Specific activities can include identifying contaminants within the buildings (PCBs, radionuclides, and other chemicals), determining the quantity of wastes to be generated by D&D of the buildings, and identifying alternatives for handling and disposing of wastes (reusing various materials, landfill disposal, etc.). The RI/FS report provides the results of the RI/FS work plan. Ohio EPA reviews and provides concurrence for each report: the pre-investigation evaluation report, RI/FS work plan, and RI/FS report.

A proposed plan that identifies the proposed remedial action is then prepared and made available for public comment. The record of decision finalizes the remedial action selected by DOE with concurrence from Ohio EPA (with public input) and implementation of the remedial actions begins.

3.2.2.1 Process buildings and complex facilities RI/FS activities in 2011

DOE submitted the pre-investigation evaluation report and RI/FS work plan for D&D of the process buildings and complex facilities to Ohio EPA in April 2011. Ohio EPA provided comments on the report and work plan, with comments on the pre-investigation evaluation report addressed in the RI/FS work plan. DOE and Ohio EPA met throughout 2011 to discuss revisions to the RI/FS work plan. Several revisions were submitted to Ohio EPA, with the final *Remedial Investigation and Feasibility Study Work Plan for the Process Buildings and Complex Facilities Decontamination and Decommissioning Project* submitted in December 2011. Ohio EPA provided concurrence on the RI/FS work plan in December 2011.

3.2.3 Site-wide waste disposition

This portion of D&D evaluates 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. The waste disposition project follows a similar process as described for D&D of the process buildings and complex facilities, including the pre-investigation evaluation report, RI/FS work plan, RI/FS report, proposed plan, and record of decision. Development of waste acceptance criteria for an on-site waste disposal facility (if this alternative is selected) is also included as part of the RI/FS work plan.

3.2.3.1 Site-wide waste disposition activities in 2011

DOE submitted the pre-investigation evaluation report for site-wide waste disposition to Ohio EPA in 2010. Ohio EPA provided comments on the report, which were addressed in the site-wide waste disposition RI/FS work plan submitted to Ohio EPA in June 2011. Ohio EPA provided comments on the RI/FS work plan, and DOE and Ohio EPA met to discuss the comments, related technical issues, and the list of regulatory compliance requirements that are applicable or relevant and appropriate requirements (ARARs) under CERCLA. DOE and Ohio EPA agreed to maintain the list of ARARs in draft form until all items were agreed upon by both parties and both agreed that Ohio EPA could provide concurrence on the remainder of the RI/FS work plan. A revised RI/FS work plan was submitted to Ohio EPA in December 2011.

In 2011, DOE also developed the *Phase I Sampling and Analysis Plan for Process Equipment Characterization in Support of the Site-wide Waste Disposition Project*. This sampling and analysis plan summarized the approach to characterize the waste generated by removal of the process gas systems in the former gaseous diffusion process buildings. Ohio EPA provided conditional concurrence on the document in June 2011 so that sampling activities could begin in the process buildings (final concurrence was provided in July 2011). Sampling continued through the end of 2011.

The *Geotechnical Sampling and Analysis Plan for the Site-wide Waste Disposition Evaluation Project* was also developed in 2011. This plan was developed to gather data to evaluate potential on-site disposal locations for some of the waste generated by D&D, if the alternative is selected. Data collection began in May 2011, and Ohio EPA provided conditional concurrence with the plan in September 2011 (final concurrence was provided in December 2011). Data collected included water level measurements, soil/rock characterization, and measurement of naturally-occurring metals and other parameters in groundwater.

DOE submitted the *Test Plan for Batch Leaching of Contaminated Equipment and Debris from Building X-326* to Ohio EPA in October 2011. The Test Plan was developed to conduct laboratory measurements and theoretical evaluations of the leachability of radionuclides (uranium and technetium-99) from process building debris in case the debris is placed in an on-site disposal facility, if the alternative is selected. At the end of 2011, DOE and Ohio EPA were working together to finalize the plan.

In December 2011, Ohio EPA also concurred with the *Work Plan for Modeling Analysis in Support of Regulatory Decisions*, which identifies the models that are proposed for use as part of the waste disposition RI/FS.

3.2.4 Pre-D&D activities

In 2011, four small buildings, X-230J9 North Environmental Sampling Building, X-605H Booster Pump House, X-605I Chlorinator Building, and X-605J Diesel Generator Building, were removed as pre-D&D actions under the DFF&O due to the very small size and simplicity of the buildings. A RCRA investigation to identify possible soil contamination associated with the former buildings was also completed in during 2011. Section 3.3.4.5 summarizes the results of this investigation.

3.3 ENVIRONMENTAL RESTORATION PROGRAM

DOE established the Environmental Restoration Program in 1989 to identify, control, and remediate environmental contamination at PORTS. Environmental restoration is conducted in accordance with the RCRA corrective action process, under U.S. EPA Administrative Consent Order, issued on September 29, 1989 (amended in 1994 and 1997), and Consent Decree with the State of Ohio, issued on August 29, 1989. With implementation of D&D, removal of facilities and structures down to and including the building slab is controlled by the D&D process (see Section 3.2). Investigation and remediation of environmental contamination is completed under the RCRA corrective action process and in accordance with U.S. EPA Administrative Consent Order and Consent Decree with the State of Ohio.

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

- 1) an assessment to identify releases of contaminants and determine the need for further investigation (the RCRA facility assessment),
- 2) an investigation to determine the nature and extent of any contamination (the RCRA facility investigation), and
- 3) a study to identify and evaluate remedial alternatives to address contamination (the cleanup alternatives study/corrective measures study).

Following the approval of the final cleanup alternative study/corrective measure study, Ohio EPA selects the remedial alternatives that will undergo further review to determine the final remedial actions (the preferred plan). Upon concurrence from U.S. EPA and completion of the public review and comment period, U.S. EPA and Ohio EPA select the final remedial actions. Ohio EPA issues a decision document to select the final remedial actions and the remedial actions are implemented by DOE. Final remedial actions are reviewed by Ohio EPA 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 protective of 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. Remedial actions have been implemented in each of the PORTS quadrants.

With the beginning of D&D, investigation of areas known as “deferred units” is beginning to occur. Deferred units are areas that were in or adjacent to the gaseous diffusion production and operational areas such that remedial activities would interrupt operations, or were areas that could become recontaminated from ongoing operations. Ohio EPA deferred investigation/remedial action of soil and groundwater

associated with these units until D&D of PORTS (or until the area no longer met the requirements for deferred unit status).

The following sections describe the remedial actions underway in each quadrant as well as investigations of any formerly deferred units that occurred during 2011. Table 3.1 lists remedial activities for the groundwater monitoring areas at PORTS, which include remedial actions required by decision documents and other actions.

3.3.1 Quadrant I

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

Remedial actions required for the X-749B Peter Kiewit Landfill (PK Landfill) were provided in separate Decision Documents issued by Ohio EPA in 1996 and U.S. EPA in 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 Area, as well as any RCRA investigations of environmental media associated with deferred units and other former buildings located in Quadrant I (see Section 3.3.1.2).

3.3.1.1 X-749/X-120 groundwater plume

The remedial actions identified for X-749/X-120 groundwater plume 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. In addition, groundwater extraction wells were installed in 2007, 2008, and 2010 to control migration of the plume and remediate areas of higher trichloroethene (TCE) concentrations within the plume.

Phytoremediation is a process that uses plants to remove, degrade, or contain contaminants in soil and/or groundwater. Phytoremediation at the X-749/X-120 groundwater plume was installed in two phases during 2002 and 2003. The *Preliminary Evaluation Report for the X-749/X-120 Phytoremediation System*, completed in January 2008, provided a preliminary evaluation of the phytoremediation system. The trees selected for the phytoremediation system had just begun to develop sufficient leaf area (approximately equal to root volume) so that groundwater was transpired through the trees; therefore, a complete system evaluation could not be completed. Continued operation of the phytoremediation system was recommended in order for the trees to grow and develop a more extensive root system.

The *First Five-Year Review for the X-749/X-120 Groundwater Plume*, submitted to Ohio EPA in January 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 migration of contaminants from the X-749 Landfill and controlling migration of the X-749/X-120 groundwater plume. However, Ohio EPA and DOE agreed that the phytoremediation system was not as successful as anticipated in reducing concentrations of TCE in groundwater. The extraction wells that began operating in 2007-2008 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 (completed in 2002), appeared to be primarily responsible for the reductions in TCE concentrations within the X-749/X-120 groundwater plume.

Chapter 6, Section 6.4.1.4, provides additional information about the 2011 groundwater monitoring results for the X-749/X-120 groundwater plume.

Table 3.1. Remedial actions at PORTS in groundwater monitoring areas

Quadrant/monitoring area	Remedial action/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 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 Area (Five-Unit Groundwater Investigative 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
Quadrant II Quadrant II Groundwater Investigative Area (Seven-Unit Groundwater Investigative 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 – ongoing
Quadrant II X-701B 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

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

Quadrant/monitoring area	Remedial action/year completed
Quadrant III X-740 Waste Oil Handling Facility	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 Switchyard	Contaminated soil removal – 2010

3.3.1.2 PK Landfill

The remedial actions required by the PK Landfill Decision Documents consisted of the 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. 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 second five-year review for the PK Landfill was completed in 2008. This report, *the Second Five-Year Review for the X-749B Peter Kiewit Landfill*, found that the remedial actions implemented at the PK Landfill (the groundwater collection systems and landfill cap) were achieving remedial action objectives by eliminating exposure pathways and reducing the potential for contaminant transport. Concentrations of many of the contaminants detected in the PK Landfill wells, sumps, and manholes had decreased significantly from 1999 to 2007. Contaminants detected in the PK Landfill wells, sumps, and manholes were not detected in surface water samples collected from Big Run Creek adjacent to or downstream from PK Landfill. Based on these data, construction of a barrier wall on the upgradient sides of the PK Landfill did not appear to be necessary. The next review of the remedial actions implemented at the PK Landfill will be submitted to Ohio EPA in 2013.

Chapter 6, Section 6.4.1.4, provides 2011 groundwater monitoring results for the PK Landfill area.

3.3.1.3 Quadrant I Groundwater Investigative Area

Remedial actions identified for the Quadrant I Groundwater Investigative Area (also called the Five-Unit Groundwater Investigative Area) are: 1) installation of multimedia caps over the X-231A and X-231B Oil Biodegradation Plots; and 2) installation of 11 additional groundwater extraction wells to extract contaminated groundwater for treatment in the X-622 Groundwater Treatment Facility. The caps were constructed in 2000 and operation of the groundwater extraction wells began 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 TCE beneath the building. Table 3.1 lists the remedial actions completed for the Quadrant I Groundwater Investigative Area.

A five-year review of both the groundwater extraction system for the Quadrant I Groundwater Investigative Area and the multi-layered caps for the X-231A and X-231B Oil Biodegradation Plots was completed in 2008. This report, the *First Five-Year Review for the Five-Unit Groundwater Investigative Area and X-231A/X-231B Oil Biodegradation Plots*, found that the remedial actions had eliminated potential exposure pathways to contaminants and reduced concentrations of TCE in the groundwater, although more slowly than expected. The next review of the remedial actions implemented at the Quadrant I Groundwater Investigative Area and X-231A/B Oil Biodegradation Plots will be submitted to Ohio EPA in 2013.

RCRA investigations of soil were completed in 2010 near two buildings in the northern portion of the monitoring area that have been removed: the X-760 Chemical Engineering Building and the X-770 Mechanical Testing Facility. These former buildings were removed in 2010 and 2007, respectively. Soil contaminated with TCE and other volatile organics was removed from the south and east sides of the former X-770 building. Contaminated soil was also identified on the north and west sides of the former X-760 building; however, the decision was made to leave this soil in place until cleanup determinations are made for all of Quadrant I.

Chapter 6, Section 6.4.2.3, provides information on the groundwater monitoring completed in the Quadrant I Groundwater Investigative Area during 2011.

3.3.1.4 X-103 Auxiliary Office Building investigation

The X-103 Auxiliary Office Building, which was located in Quadrant I immediately north of the Quadrant I Groundwater Investigative Area, was removed during 2011 as part of D&D (see Section 3.2.1.1). Soil samples were collected around the former building during March 2011 and analyzed for volatile organic compounds, semivolatile organic compounds, metals, PCBs, and radionuclides. If detected, none of these constituents were present at levels above PORTS preliminary remediation goals. DOE and Ohio EPA agreed that no additional sampling or remediation was necessary at this time.

3.3.2 Quadrant II

The *Quadrant II Cleanup Alternative Study/Corrective Measures Study* was approved by Ohio EPA in 2001. After approval of 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.

Chapter 6 provides 2011 groundwater monitoring results for the following areas in Quadrant II that require groundwater monitoring: Quadrant II Groundwater Investigative Area (Section 6.4.3.1), X-701B Holding Pond (Section 6.4.4.1), and X-633 Pumphouse/Cooling Towers Area (a deferred unit) (Section 6.4.5.1).

3.3.2.1 Quadrant II Groundwater Investigative Area

A number of deferred units are in the groundwater plume in the Quadrant II Groundwater Investigative Area (also known as the Seven-Unit Area). A special investigation conducted in 2009, which sampled soil and groundwater, identified areas of higher TCE concentrations that appeared to be associated with continuing sources of groundwater contamination in the southeastern portion of the plume. In 2010, Ohio EPA approved an interim remedial measure (IRM) for this area called enhanced anaerobic bioremediation. Enhanced anaerobic bioremediation utilizes injections of fermentable carbon compounds such as sodium lactate (a common ingredient in soaps and face creams) to provide additional food for naturally-occurring microorganisms in soil that degrade TCE to harmless substances. The project began in 2010 and continued throughout 2011.

Monitoring data collected in 2011 indicated that favorable conditions for enhanced anaerobic bioremediation were being established within the treatment areas, and TCE degradation was beginning to occur in some of the wells within the treatment areas. This project continued in 2012.

3.3.2.2 X-701B Holding Pond

Remedial actions required by the Decision Document for X-701B include groundwater remediation by injection of a chemical oxidant. The Decision Document also requires removal of contaminated soil in the western portion of the area and consolidation of the soil under two landfill caps to be constructed over the X-701B Holding Pond/East Retention Basin and the West Retention Basin.

The oxidant injections required by the Decision Document took place between 2006 and 2008. Following the end of the injections in 2008, an independent review of the X-701B project was completed by DOE Headquarters to evaluate remediation results to date and provide recommendations for a path forward.

The review of the X-701B oxidant injections determined that the method used to inject oxidant into the contaminated area was not able to address contaminants in the deepest portion of the contaminated soil. If contaminants remained in this portion of the soil, they would continue to be released into the groundwater plume. Therefore, DOE proposed an IRM to excavate soil in the western portion of the X-701B plume area and directly mix oxidant into the contaminated soil. With Ohio EPA approval, excavation and soil mixing began in December 2009 and was completed in January 2011. This remediation of contaminated soils in the X-701B area was one of the projects funded by ARRA. Sampling data collected as part of the X-701B IRM indicate that while TCE concentrations decreased in soil samples collected during the IRM, groundwater monitoring data collected during 2011 for wells that monitor the IRM area indicate a rebound in groundwater TCE concentrations.

A RCRA investigation of the X-747K Contaminated Scrap Metal Storage Yard (in the southeastern portion of the X-701B monitoring area directly south of the X-623 Groundwater Treatment Facility) took place during 2010. Areas of soil potentially contaminated with metals were identified, but the higher concentrations of metals may have been present in these areas (15 to 20 ft below ground surface) due to naturally-occurring variations in the geology of the area.

In 2011, DOE recommended and Ohio EPA agreed to additional investigation of the concentrations of naturally-occurring metals in soil and groundwater within the varying geologic formations at PORTS. DOE and Ohio EPA worked together throughout 2011 to develop the approach for this investigation, called a background study, and a work plan for a comprehensive background study was submitted to Ohio EPA in 2012.

3.3.2.3 X-633 Pumphouse/Cooling Towers Area investigation

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 and implemented in 2011.

Areas of soil potentially contaminated with metals were identified, but the higher concentrations of metals may have been present in these areas (15 to 20 ft below ground surface) due to naturally-occurring variations in the geology of the area. A background study was under development at the end of 2011 to provide additional information about the concentrations of naturally-occurring metals in soil and groundwater within the varying geologic formations at PORTS (see Section 3.3.2.2).

Chromium and TCE were detected in groundwater at concentrations above the preliminary remediation goals. DOE agreed to sample eight wells around the area semiannually through 2012 to continue evaluation of chromium and TCE in groundwater at this area.

3.3.3 Quadrant III

The *Quadrant III Cleanup Alternative Study/Corrective Measures Study* was approved by Ohio EPA in 1998. The Decision Document for Quadrant III required phytoremediation of the groundwater plume near the X-740 Waste Oil Handling Facility.

Over 700 hybrid poplar trees were planted on a 2.6-acre area above the X-740 groundwater plume in 1999. In 2003, a five-year review was completed for the X-740 groundwater plume to evaluate the effectiveness of the phytoremediation system. The report, entitled *Five-Year Evaluation Report for the X-740 Phytoremediation Project*, indicated that the trees in the phytoremediation system did not noticeably affect the overall groundwater flow in the Gallia at this area, although the trees did appear to influence water levels in individual wells. Concentrations of TCE in the X-740 groundwater plume had not decreased appreciably.

Upon review of the 2003 Five-Year Evaluation Report, Ohio EPA required another evaluation of this area in three years to determine if the phytoremediation system was effective in remediating the groundwater plume. Additional data collected for this evaluation included soil moisture at specified depths below ground surface, wind speed/direction, rainfall, air/soil temperature, tree growth rates, and sap flow measurements. The *Supplemental Evaluation to the Five-Year Evaluation Report for the X-740 Phytoremediation System*, submitted to Ohio EPA in 2007, found that the phytoremediation system had not performed as expected to remove TCE from groundwater in this area.

In response to Ohio EPA comments on the above mentioned report, DOE developed a work plan for additional remedial activities for the X-740 area. Three rounds of oxidant injections were completed in 2008 to remove TCE from the groundwater. Although the oxidant briefly reduced TCE concentrations detected in some of the wells, TCE concentrations in groundwater returned to typical levels in 2009. In 2010, Ohio EPA approved a pilot study of enhanced anaerobic bioremediation for the X-740 area. Section 3.3.2.1 provides additional information about enhanced anaerobic bioremediation. Emulsified oil, a slow-acting fermentable carbon compound, was injected into the selected portions of the X-740 groundwater plume during December 2010 and January 2011. Collection of groundwater samples to monitor the pilot study took place throughout 2011.

Chapter 6 provides 2011 groundwater monitoring results for the following areas in Quadrant III that require groundwater monitoring: X-616 Chromium Sludge Surface Impoundments (Section 6.4.6.1) and X-740 Waste Oil Handling Facility (Section 6.4.7.1).

3.3.4 Quadrant IV

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

Chapter 6 provides 2011 groundwater monitoring results for the following areas in Quadrant IV that require groundwater monitoring: X-611A Former Lime Sludge Lagoons (Section 6.4.8.1), X-735 Landfills (Section 6.4.9.1), X-734 Landfills (Section 6.4.10.1), X-533 Switchyard Area (a deferred unit) (Section 6.4.11.1), and former X-344C Hydrogen Fluoride Storage Building (Section 6.4.12.1).

3.3.4.1 X-611A Former Lime Sludge Lagoons

Ohio EPA and U.S. EPA issued a Decision Document for the X-611A area in 1996, which required a soil cover over the former lagoons and establishment of a prairie habitat. The soil cover and planting of the prairie were completed in 1997. The *Second Five-Year Review for the X-611A Prairie* was submitted to Ohio EPA in 2008. The report found that the soil cover and prairie habitat were continuing to meet the

remedial action objectives for this unit by eliminating exposure pathways to the contaminants in the sludge at this area. The next review of the remedial actions implemented at the X-611A area will be submitted to Ohio EPA in 2013.

3.3.4.2 X-734 Landfills

Ohio EPA issued a Decision Document for the X-734 Landfills in 1999. Remedial actions required by the Decision Document included construction of a multimedia cap over the northern portion of the landfills and a soil cap over the southern portion of the area. These caps were installed in 1999 and 2000.

The *First Five-Year Review for the X-734 Landfill Area* was submitted to Ohio EPA in 2008. The report found that construction of the caps on the landfills had achieved remedial action objectives by isolating contaminants in soil and sediment from potential receptors. The caps were preventing contaminants in soil and sediment from migrating to groundwater and surface water. The next review of the remedial actions implemented at the X-734 Landfills will be submitted to Ohio EPA in 2013.

3.3.4.3 X-334 Transformer Cleaning and Storage Building investigation

The X-334 Transformer Cleaning and Storage Building, located in Quadrant IV west of the former X-533 Switchyard Complex, was removed during 2011 as part of D&D (see Section 3.2.1.1). Soil samples were collected around the former building during June 2011 and analyzed for volatile organic compounds, semivolatile organic compounds, metals, PCBs, and radionuclides. If detected, none of these constituents were present at levels above PORTS preliminary remediation goals. DOE and Ohio EPA agreed that no further actions were necessary at this time.

3.3.4.4 X-344B Maintenance Storage Building investigation

The X-344B Maintenance Storage Building, located in Quadrant IV west of the former X-533 Switchyard Complex, was removed during 2011 as part of D&D (see Section 3.2.1.1). Soil samples were collected around the former building during August 2011 and analyzed for volatile organic compounds, metals, and radionuclides. Uranium was detected in one sample at a concentration just above the PORTS preliminary remediation goal. None of the other constituents were detected at levels above preliminary remediation goals.

3.3.4.5 X-605H, I, and J; X-230J9 Building investigation

The X-605H Booster Pump House, X-605I Chlorinator Building, X-605J Diesel Generator Building, and X-230J9 North Environmental Sampling Building, located in Quadrant IV west or north of the X-734 Landfills, were removed during 2011 (see Section 3.2.4). Soil samples were collected around the former buildings during March 2011 and analyzed for volatile organic compounds, semivolatile organic compounds, metals, PCBs, and radionuclides. If detected, none of these constituents were present at levels above PORTS preliminary remediation goals.

3.3.4.6 X-630 Recirculating Cooling Water Complex investigation

The X-630 Recirculating Cooling Water Complex, located in Quadrant IV within Perimeter Road and west of the X-533 Switchyard Complex, was removed during 2011 as part of D&D (see Section 3.2.1.1). A work plan for the RCRA investigation of soil and groundwater at the X-630 Cooling Water Complex was implemented in 2011.

Areas of soil potentially contaminated with metals were identified, but the higher concentrations of metals may have been present in these areas (15 to 20 ft below ground surface) due to naturally-occurring variations in the geology of the area. A background study was under development at the end of 2011 to provide additional information about the concentrations of naturally-occurring metals in soil and groundwater within the varying geologic formations at PORTS (see Section 3.3.2.2).

Chromium and TCE were detected in groundwater at concentrations above the preliminary remediation goals. DOE agreed to sample four wells around the area semiannually through 2012 to continue evaluation of chromium and TCE in groundwater at this area.

3.4 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. Waste managed under the program is divided into the following seven categories, which are defined below:

- *Low-level radioactive waste* – radioactive waste not classified as high level or transuranic waste.
- *Hazardous (RCRA) waste* – waste listed under RCRA or waste that exhibits one or more of the four RCRA hazardous characteristics: ignitability, corrosivity, reactivity, and toxicity. Universal waste, which includes common items such as batteries and light bulbs, is a subset of RCRA waste that is subject to reduced requirements for storage, transportation, and disposal or recycling.
- *PCB wastes* – waste containing PCBs, a class of synthetic organic chemicals. Disposal of PCB-contaminated materials is regulated under TSCA.
- *RCRA/low-level radioactive mixed waste* – waste containing both hazardous and radioactive components. The waste is subject to RCRA, which governs the hazardous components, and to the Atomic Energy Act that governs the radioactive components.
- *PCB/low-level radioactive mixed waste* – waste containing both PCB and radioactive components. The waste is subject to TSCA regulations that govern PCB components, and to the Atomic Energy Act that governs radioactive components.
- *PCB/RCRA/low-level radioactive mixed waste* – waste containing PCB and radioactive components that is also a RCRA hazardous waste. The waste is subject to RCRA regulations, TSCA regulations that govern PCBs, and to the Atomic Energy Act that governs radioactive components.
- *Solid waste* – Waste that includes construction and demolition debris, industrial waste, and sanitary waste, as defined by Ohio regulations. These wastes can include waste from construction or demolition activity and office waste. Waste contaminated with asbestos may also be included in this category if it is not included in any of the categories listed above (PCB, RCRA, and/or low-level radioactive waste).

In 2011, approximately 16,000 tons of waste from DOE activities at PORTS were recycled, treated, or disposed at off-site facilities (see Table 3.2).

Waste management requirements are varied and are sometimes complex because of the variety of waste streams generated by DOE activities at PORTS. DOE Orders, Ohio EPA regulations, and U.S. EPA regulations must be satisfied to demonstrate compliance with waste management activities. Additional

Table 3.2. Waste Management Program off-site treatment, disposal, and recycling accomplishments for 2011

Waste type	Waste stream	Quantity (pounds)	Treatment, disposal, or recycling facility
RCRA	Aerosol cans, spent solvents, and ignitable liquids	811	Environmental Quality Co.
LLW ^a	Scrap metal, demolition debris, soil, and other solids	3,266,229	EnergySolutions
LLW	Uranium materials, scrap metal, and other solids	827,977	Nevada National Security Site
LLW	Assorted excess solid materials (PVC, metals, and other debris)	292,820	Impact Services Inc.
PCB	Used transformer oil from X-533 Switchyard	1112	Veolia
PCB	Miscellaneous solids and soil from X-605 D&D	203,620	Environmental Quality Co./Wayne Disposal
PCB	Electrical equipment (bushings), and other equipment contaminated with PCBs	46,468	Environmental Protection Services
PCB/LLW	D&D waste, concrete, asphalt, and other solids contaminated with PCBs from X-334 D&D	808,381	EnergySolutions
PCB/LLW	Solid materials contaminated with PCBs from X-326	7609	Nevada National Security Site
RCRA/LLW	D&D waste, contaminated soil, electronic debris, and other solids contaminated with metals or solvents	1,100,489	EnergySolutions
RCRA/LLW	Spent solvents, waste potassium hydroxide solutions	2205	EnergySolutions
RCRA/LLW/ PCB	Gaskets contaminated with PCBs and chromium from X-533 D&D	622	EnergySolutions
Solid waste	D&D waste, concrete, asphalt, metal, and other materials	11,308,290	Pike County Landfill
PCB	Light ballasts contaminated with PCBs (recyclable)	896	USA Lamp & Ballast Recycling
Universal waste	Light bulbs (fluorescent, mercury vapor, incandescent, and compact fluorescent), batteries (ni-cad, lead acid, and gel cell), thermostats, and circuit boards	10,756	USA Lamp & Ballast Recycling
Used oils	Waste oil (recyclable)	37,035	Glockner Oil
Used oils	Waste oil (recyclable)	14,926	Environmental Quality Co.
-	Recyclable metals	10,025,330	JH Erectors
-	Recyclable metals	3,379,840	JVC Metals Co.
-	Recyclable lead materials	3666	Environmental Recycling

^aLow-level radioactive waste.

policies have been implemented for management of radioactive, hazardous, and mixed wastes. These policies include the following:

- minimizing waste generation;
- characterizing and certifying wastes before they are stored, processed, treated, or disposed;
- pursuing volume reduction (such as blending and bulking) as well as on-site storage in preparation for safe and compliant final treatment and/or disposal; and
- recycling.

With the beginning of D&D at PORTS, DOE is placing increased emphasis on the evaluation of materials generated by D&D for reuse or recycling. An agreement between DOE and the Southern Ohio Diversification Initiative (SODI) allows DOE to transfer excess equipment, clean scrap materials and other assets to SODI. When SODI sells the materials, the proceeds are divided by SODI and DOE. In 2010-2011, SODI received approximately 13 million pounds of scrap metal and 270,000 gallons of transformer oil from D&D activities at PORTS, primarily D&D of the X-533 Switchyard Complex. Approximately 4.2 million dollars was generated from sales of these materials. SODI used the proceeds to support economic development in the southern Ohio region. Projects that received funding from SODI in 2011 included construction of a steel processing plant in New Boston, Ohio, and a sewer line extension project in Pike County.

3.5 ENVIRONMENTAL SUSTAINABILITY PROGRAM

DOE is committed to reducing environmental risks, costs, wastes, and future liability by effectively integrating environmental sustainability principles into 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 *Environmental Sustainability Plan* describes the Environmental Sustainability Program and integrates the tenets of an EMS. The Environmental Sustainability Program includes elements of pollution prevention, waste minimization, affirmative procurement, sustainable design, and energy and water efficiency.

DOE is committed to minimizing and/or eliminating the amounts and types of wastes generated and to achieving reduced life cycle costs for managing and dispositioning property and wastes during all of DOE projects and activities at PORTS.

Effective environmental sustainability management begins with an integrated strategy. In order 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 EMS and in conjunction with DOE pollution prevention goals. The broad objectives are core elements of the Environmental Sustainability Program. These objectives, presented below, are both qualitative and quantitative and 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 (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.

The Environmental Sustainability Program recycled approximately 55,500 pounds of office and mixed paper, 11,300 pounds of cardboard, 340 pounds of aluminum cans, and 820 pounds of plastic in 2011. Other materials including scrap metal and waste oil were also recycled (see Section 3.4 and Table 3.2).

DOE continued energy reduction programs at PORTS that focused on accomplishing the goals of Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, which replaced Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*. Executive Order 13514 introduced management requirements for greenhouse gas emissions and expanded previous energy reduction and other environmental sustainability goals. *The U.S. Department of Energy Fiscal Year 2012 Site Sustainability Plan for the Portsmouth Gaseous Diffusion Plant* provides goals and progress through fiscal year 2011 for reductions in greenhouse gas emissions, water consumption, recycling/waste diversion, electronic stewardship, and other areas. The following accomplishments were listed for fiscal year 2011:

- a decrease of 4.6% in greenhouse gas emissions (primarily associated for electricity consumption) versus the fiscal year 2008 baseline emissions.
- 8.4% of electricity consumption from renewable energy sources, which exceeds the goal of 7.5%
- an increase in the number of alternative fuel consumption vehicles to 69.6% of all vehicles. All newly acquired vehicles are either flex-fuel or hybrid vehicles.
- set duplex printing as the default for copiers and printers with duplex printing capability to decrease paper usage.
- implemented power management features on all eligible computers, printers, copiers, and monitors to decrease energy usage.

3.6 ENVIRONMENTAL TRAINING PROGRAM

DOE contractors at PORTS provide environmental training to increase employee awareness of environmental activities and to enhance the knowledge and qualifications of personnel performing tasks associated with environmental assessment, planning, and restoration. The program includes on- and off-site classroom instruction, on-the-job training, seminars, and specialized workshops and courses. Environmental training conducted or prepared by DOE contractors at PORTS includes hazardous waste training required by RCRA and numerous Occupational Safety and Health Administration training requirements.

3.7 PUBLIC AWARENESS PROGRAM

A comprehensive community relations and public participation program is in place at PORTS. The purpose of the program is 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 program also provides the public with opportunities to become involved in the decisions affecting environmental issues at PORTS.

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 2011, the board provided recommendations to DOE on waste disposition alternatives for materials to be generated during D&D and construction of an off-site, multi-purpose facility to provide adequate meeting space and other areas for DOE and community needs. Additional information about the board can be obtained at www.ports-ssab.org or by calling 740-289-5249.

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

DOE also maintains a public Environmental Information Center to provide public access to documents used to make decisions on remedial actions being taken at PORTS. The Information Center is located just north of PORTS at the Ohio State University Endeavor Center (Room 207), 1862 Shyville Road, Piketon, Ohio 45661. The email address is portseic@wems-llc.com. Hours for the Information Center are 9 a.m. to noon Monday and Tuesday, noon to 4 p.m. Wednesday and Thursday, or by appointment (call 740-289-8898). Other information, including this Annual Site Environmental Report, can also be obtained from the DOE Portsmouth/Paducah Project Office web site at www.pppo.energy.gov or the FBP web site at www.fbportsmouth.com.

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

Points of contact have been established for the public to obtain information or direct questions regarding the Environmental Management Program. The DOE Site Office may be contacted at 740-897-5010. The Office of Public Affairs (740-897-3486) also provides information on the program.