

3. ENVIRONMENTAL PROGRAM INFORMATION

3.1 SUMMARY

In 2010, D&D of the PORTS gaseous diffusion process buildings and associated facilities began with the award of the D&D contract to FBP and signing of the D&D Orders, a legal agreement between DOE and Ohio EPA. D&D of several small facilities was underway at the end of 2010. The planning and investigation process has begun for D&D of the process buildings and for site-wide waste disposition.

In 2010, five projects funded by the American Recovery and Reinvestment Act (ARRA) that involve D&D of inactive facilities, environmental remediation, or materials disposition were completed or near completion. These projects are environmental remediation (source removal) at the X-701B Holding Pond; D&D of the X-533 Switchyard Complex, X-633 Cooling Towers Complex, and X-760 Chemical Engineering Building; and repackaging and disposition of excess uranium materials.

In 2010, the Environmental Restoration Program was responsible for installation of three additional groundwater extraction wells in the X-749/X-120 groundwater plume, investigations of soil and/or groundwater associated with several inactive facilities, initiation of 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 2010, over 30,000 tons of waste from DOE activities at PORTS were recycled, treated, or disposed at off-site facilities. Activities undertaken by the Environmental Sustainability, Training, Inactive Facilities Removal, and Public Awareness programs are also discussed in this chapter.

Chapter 2, Section 2.3.6, provides information on DOE Order 450.1A and implementation of the DOE EMS at PORTS.

3.2 D&D PROGRAM

On April 13, 2010, Ohio EPA issued the D&D Orders, which are 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. This agreement, which applies to the D&D of buildings down to and including the building slab and disposal of wastes generated by D&D, uses the CERCLA framework for determining appropriate removal and remedial actions. Documents are submitted to Ohio EPA for concurrence. Chapter 2, Section 2.3.1.1, provides additional information about the D&D Orders.

Community involvement is an important part of the CERCLA process and the D&D Orders. Opportunities for public comment are built into the D&D process as described in Section 3.2.1. In addition, the D&D Orders require a Community Relations Plan to identify opportunities to provide information to the public and obtain public input. Ohio EPA concurred with the Community Relations Plan for PORTS in 2010. Additionally, the PORTS Site Specific Advisory Board provides recommendations to DOE based on the concerns of the communities surrounding PORTS. Section 3.8 provides additional information on the PORTS Public Awareness Program.

3.2.1 D&D Program Process

The primary components of the D&D Orders 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 D&D Orders.

3.2.1.1 Non-time critical removal actions

The smaller and less complex buildings at PORTS undergo D&D under 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 threats 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, although the information provided in these documents 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 reviews and concurs 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 commences. 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. Section 3.2.2.1 summarizes the non-time critical removal actions underway in 2010.

Although D&D of the X-533 Switchyard, X-633 Recirculating Cooling Water Complex, and X-760 Chemical Engineering Building followed the process for non-time critical removal actions, D&D of these facilities began before the D&D Orders were effective. Therefore, D&D information for these facilities is provided in Section 3.6, Inactive Facilities Removal.

3.2.1.2 Process buildings and complex facilities

D&D of seven buildings at PORTS will follow the RI/FS process. These buildings are the most complex of the buildings to be removed under the D&D Orders and include the three gaseous diffusion process buildings. Section 3.2.2.2 summarizes the activities underway for D&D of the process buildings and complex facilities in 2010.

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 (reuse of 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.

3.2.1.3 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 is also included as part of the RI/FS work plan. Section 3.2.2.3 summarizes the activities underway for site-wide waste disposition in 2010.

3.2.2 D&D Program Activities in 2010

The following activities were completed in 2010 for the non-time critical removal actions, process buildings and complex facilities, and site-wide waste disposition.

3.2.2.1 Non-time critical removal actions

In 2010, DOE submitted the engineering evaluation/cost analyses for two groups of buildings:

- X-103 Auxiliary Office Building, X-334 Transformer Cleaning and Storage Building, and X-344B Maintenance Storage Building, and
- X-626 and X-630 Recirculating Cooling Water Complexes.

DOE submitted the engineering evaluation/cost analyses for each group of buildings to Ohio EPA on October 7, 2010. Ohio EPA provided comments, and revised engineering evaluation/cost analyses were submitted on November 10, 2010. The public comment period began on November 17 and ended on December 17. No comments were received. By the end of 2010, DOE had submitted an action memoranda for each group to Ohio EPA. Removal of the buildings was completed in 2011.

In addition, DOE and Ohio EPA discussed a strategy to develop a single engineering evaluation/cost analysis to include approximately 40 of the buildings to be removed as non-time critical removal actions. Development of this engineering evaluation/cost analysis was underway at the end of 2010.

3.2.2.2 Process buildings and complex facilities

In 2010, DOE began development of the pre-investigation evaluation report and RI/FS work plan for D&D of the process buildings and complex facilities. The pre-investigation evaluation report and RI/FS work plan were due to Ohio EPA in 2011.

3.2.2.3 Site-wide waste disposition

DOE submitted the pre-investigation evaluation report for site-wide waste disposition to Ohio EPA on October 7, 2010. Ohio EPA provided comments on the report, which were being addressed in the site-wide waste disposition RI/FS work plan (under development at the end of 2010).

3.2.2.4 Pre-D&D activities

In 2010, Ohio EPA and DOE agreed to remove four small buildings, X-230J9 North Environmental Sampling Building, X-605H Booster Pump House, X-605I Chlorinator Building, and X-605J Diesel Generator Building as pre-D&D actions under the D&D Orders due to the very small size and simplicity of the buildings. Therefore, an engineering evaluation/cost analysis was not completed for these facilities. The facilities were removed in early 2011.

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 assessment and investigation of areas of PORTS that were not leased to USEC were completed in the 1990s. Because PORTS is a large facility, it was divided into quadrants (Quadrant I, II, III, and IV) to facilitate the cleanup process. 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 2010. Table 3.1 lists completed 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).

Table 3.1. Remedial actions completed 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)
Quadrant II X-701B Holding Pond	X-237 Groundwater Collection System – 1991 X-624 Groundwater Treatment Facility – 1991 (upgraded 2006) Extraction wells (3) – 1993 X-623 Groundwater Treatment Facility – 1993 X-701B sump – 1995 Groundwater remediation by oxidant injection Phase I oxidant injections – 2005 Phase IIa oxidant injections – 2006 Phase IIb and IIc oxidant injections – 2007 Phase IId, IIe, and IIf oxidant injections – 2008 Groundwater and soil remediation by oxidant mixing – 2010

Table 3.1. Remedial actions completed 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
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

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.

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. Water level data and tree core sampling results indicated that contaminated groundwater was being transpired by the trees; however, the volume of contaminated groundwater uptake by the trees was uncertain. Continued operation of the phytoremediation system was recommended in order for the trees to grow and develop a more extensive root system. The next review of the remedial actions implemented at the X-749/X-120 groundwater plume was submitted to Ohio EPA in 2011.

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

In 2010, monitoring data collected from wells in the X-749/X-120 groundwater plume indicated that the extraction wells installed in the X-749 South Barrier Wall area and the groundwater collection trench on the southwest side of the X-749 Landfill were reducing concentrations of trichloroethene within the groundwater plume and causing the plume perimeter to shrink. Chapter 6, Section 6.4.1.4, provides

additional information about the 2010 groundwater monitoring results for the X-749/X-120 groundwater plume.

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 2010 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 trichloroethene 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 trichloroethene 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.

In 2010, RCRA investigations of soil were completed 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 (see Section 3.6). Soil contaminated with trichloroethene 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 2010.

3.3.2 Quadrant II

The *Quadrant II Cleanup Alternative Study/Corrective Measures Study* was approved by Ohio EPA on March 26, 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 January 2003, Ohio EPA informed DOE that a separate Preferred Plan and Decision Document would be prepared for the X-701B area. Ohio EPA issued the X-701B Preferred Plan in September 2003 and the X-701B Decision Document in December 2003.

Chapter 6 provides 2010 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 trichloroethene 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 action 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 trichloroethene to harmless substances. Field work for this project began in November 2010 and continued in 2011.

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 October 2006 and October 2008. Following the October 2008 injections, 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 to excavate soil in the western portion of the X-701B area and directly mix oxidant into the contaminated soil. With Ohio EPA approval, excavation and soil mixing began in December 2009 and continued throughout 2010, with completion of the project in 2011. This remediation of the X-701B groundwater plume is one of the projects funded by ARRA.

In addition, 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. DOE and Ohio EPA have agreed

to additional investigation of the concentrations of naturally-occurring metals in the geologic formations at PORTS, and a work plan for a comprehensive background study is being developed.

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 (see Section 3.6). A work plan for the RCRA investigation of soil and groundwater in the area was approved by Ohio EPA in December 2010. Field activities were underway at the end of 2010 and completed in 2011.

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 trichloroethene 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 January 2007, found that the phytoremediation system had not performed as expected to remove trichloroethene from groundwater in this area.

In response to Ohio EPA comments on this report, DOE developed a work plan for additional remedial activities for the X-740 area. Three rounds of oxidant injections were completed in May, June/July, and September of 2008 to remove trichloroethene from the groundwater. Although the oxidant briefly reduced trichloroethene concentrations detected in some of the wells, trichloroethene 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. Field activities for this project began in December 2010 and continued throughout 2011.

Chapter 6 provides 2010 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 2010 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-533 Switchyard Area

D&D of the X-533 Switchyard Complex took place throughout 2010 and was completed in 2011 using funding provided by ARRA (see Section 3.6). A work plan for the RCRA investigation of soil in the area was approved by Ohio EPA in March 2010. Three areas of soil contaminated with PCBs or metals were removed in November 2010.

3.3.4.4 X-630 Recirculating Cooling Water Complex

A work plan for the RCRA investigation of soil and groundwater at the X-630 Cooling Water Complex in Quadrant IV (within Perimeter Road and west of the X-533 Switchyard Complex) was approved by Ohio EPA in November 2010. Field activities were underway at the end of 2010 and completed in 2011.

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. DOE also stores waste generated by USEC Government Services in the RCRA Part B permitted storage areas. 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 2010, over 30,000 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 for waste management activities. Additional 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.

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.

Table 3.2. Waste Management Program off-site treatment, disposal, and recycling accomplishments for 2010

Waste type	Waste stream	Quantity (pounds)	Treatment, disposal, or recycling facility
RCRA	Spent carbon contaminated with solvents from the X-624 Groundwater Treatment Facility	7901	Calgon Carbon
RCRA	Sulfur hexafluoride gas from X-533 Switchyard	17,000	Veolia
LLW ^a	Scrap metal, demolition debris, soil, and other solids	6,029,312	EnergySolutions
LLW	Uranium materials, scrap metal, and other solids	4,269,372	Nevada Test Site
PCB	Used transformer oil from X-533 Switchyard	49,103	Clean Harbors
PCB	Miscellaneous solids and soil from X-533 Switchyard	5,374,380	Environmental Quality Co./Wayne Disposal
PCB	Electrical equipment (bushings) contaminated with oil from X-533 Switchyard	275,558	Environmental Protection Services
PCB	Light ballasts	2048	USA Lamp & Ballast Recycling
PCB/LLW	D&D waste, concrete, asphalt, and other solids contaminated with PCBs	7,567,410	EnergySolutions
RCRA/LLW	D&D waste, contaminated soil, electronic debris, and other solids contaminated with metals or solvents	3,475,646	EnergySolutions
RCRA/LLW/ PCB	D&D waste from X-760 contaminated with solvents or metals	244,209	EnergySolutions
Solid waste	D&D waste, concrete, asphalt, metal, and other materials	30,676,725	Pike County Landfill
Universal waste	Light bulbs (fluorescent, mercury vapor, incandescent, and compact fluorescent), batteries (ni-cad, lead acid, and gel cell), thermostats, and circuit boards	10,757	USA Lamp & Ballast Recycling
Used oils	Waste oil (recyclable)	11,696	Glockner Oil
Used oils	Recyclable transformer oil	2,130,912	Hydrodec

^aLow-level radioactive waste.

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.

Highlights of the Environmental Sustainability Program in fiscal year 2010 include the following accomplishments:

- treated soils contaminated with trichloroethene in place at the X-701B Holding Pond (see Section 3.3.2.2), thereby avoiding the generation of approximately 6500 cubic yards of soil and other materials regulated as low-level radioactive waste and RCRA hazardous waste;
- transferred approximately 270,000 gallons of transformer oil from D&D of the X-533 Switchyard Complex and X-633 Recirculating Cooling Water Complex (see Table 3.2) to the Southern Ohio Diversification Initiative, which recycled the oil; and
- recycled approximately 44,423 pounds of office and mixed paper, 14,340 pounds of cardboard, 500 pounds of aluminum cans, 715 pounds of toner cartridges, and 1380 pounds of plastic.

In addition, DOE continued energy reduction programs at PORTS that focused on accomplishing the goals of Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, and DOE Order 430.2B, *Departmental Energy, Renewable Energy, and Transportation Management*. DOE accomplished the following energy reduction efforts at PORTS in fiscal year 2010:

- installation of a central dry air facility to replace the X-630 Recirculating Cooling Water Complex resulting in an estimated annual savings of approximately 6470 megawatt-hours (MWH); and
- development of innovative computer management strategies including implementing a virtual server environment that replaces physical servers with virtual servers, thereby reducing cooling demand, lowering energy consumption, and reducing operating costs; increasing use of thin client (or virtual desktop) computers, which use approximately 40% of the power typically used by a desktop computer; and implementing a power management policy that automatically places all computers and monitors in a sleep mode after one hour of inactivity.

3.6 INACTIVE FACILITIES REMOVAL

In 2009, DOE received funding under ARRA for D&D of three inactive, surplus facilities: X-533 Switchyard Complex, X-633 Cooling Towers Complex, and X-760 Chemical Engineering Building. Removal of these facilities was completed as non-time critical removal actions under the process described in Section 3.2.1.1. D&D of the facilities began in 2010.

X-633 Cooling Towers Complex was a 21-acre area consisting of four cooling towers and a pumphouse in Quadrant II. The complex removed heat from water used for cooling in the enrichment process. D&D of the facility was completed in June 2010. Section 3.3.2.3 provides additional information about the investigation of contaminated soil and groundwater around this former area.

The X-760 Chemical Engineering Building, an 8,000 square foot building in Quadrant I, was formerly used for pilot and bench scale studies of uranium materials and chemicals and also contained a laboratory used for sample preparation. D&D of the facility was completed in June 2010. Section 3.3.1.3 provides additional information about the investigation of contaminated soil around this former building.

X-533 Switchyard Complex was an 18-acre area consisting of 192 towers, 18 transformers, and numerous other structures that provided the power for the gaseous diffusion process buildings. D&D of the complex began in February 2010 and continued throughout 2010, with completion expected in early 2011. Section 3.3.4.3 provides additional information about the investigation of contaminated soil and groundwater around this former area.

DOE completed D&D of 19 inactive, surplus PORTS facilities between 2006 and 2010 (see Table 3.3).

Table 3.3 Inactive facilities removed from PORTS 2006 – 2010

Facility	Year removed	Location (Quadrant)
X-633 Recirculating Cooling Water Complex	2010	II
X-760 Chemical Engineering Building	2010	I
X-746 Shipping and Receiving Building	2009	I
X-744T Lithium Storage Warehouse	2008	I
X-744U Lithium Storage Warehouse	2008	I
X-770 Mechanical Testing Facility	2007	I
X-230J8 Environmental Storage Building	2006	I
X-230J1 Environmental Monitoring Station	2006	II
X-701D Water Deionization Building	2006	II
X-720A Maintenance & Stores Gas Manifold Shed	2006	II
X-105 Electronic Maintenance Building	2006	II
X-740 Waste Oil Storage Facility	2006	III
X-106B Old Fire Training Building	2006	III
X-616 Liquid Effluent Control Facility	2006	III
X-615 Old Sewage Treatment Plant	2006	III
X-344C Hydrogen Fluoride Storage Building	2006	IV
X-344E Gas Ventilation Stack	2006	IV
X-344F Safety Building	2006	IV
X-342C Waste Hydrogen Fluoride Neutralization Pit	2006	IV

3.7 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.

3.8 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 2010, the board provided recommendations to DOE on waste disposition alternatives for materials to be generated during D&D, development of future uses for PORTS, and development of informational materials about past, present, and future operations at PORTS. Additional information about the board can be obtained at www.ports-ssab.org or by calling 740-289-5249.

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 eic@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.