2.0 Remediation Status and Compliance Summary

This chapter provides a summary of CERCLA remediation activities in 2004 for each project, and summarizes compliance activities with other applicable environmental laws, regulations, and legal agreements. CERCLA, the "Superfund Act," is the primary driver for environmental remediation of the Fernald site.

The EPA and OEPA enforce the environmental laws, regulations, and legal agreements governing work at the Fernald site. The EPA develops, promulgates, and enforces environmental protection regulations and technology-based standards. EPA regional offices and state agencies enforce these regulations and standards by review of data collected at the Fernald site. Region V of the EPA has regulatory oversight of the CERCLA process at the Fernald site, with active participation from OEPA.

For some programs, such as those under the Resource Conservation and Recovery Act (RCRA) as amended, the Clean Air Act as amended (excluding NESHAP compliance), and the Clean Water Act as amended, EPA has authorized the State of Ohio to act as the primary enforcement authority. For these programs, Ohio promulgates state regulations that must be at least as stringent as federal requirements. Several legal agreements between DOE, EPA Region V, and OEPA identify site-specific requirements for compliance with the regulations. As part of complying with these regulations, DOE Headquarters issues directives to its field and area offices, and conducts audits to ensure compliance with all regulations.

2.1 CERCLA Remediation Status

The process for remediating sites under CERCLA consists of three phases: site characterization, remedy selection, and implementation. The FCP has completed the first two phases, as the regulatory agencies have approved remedy selection documents (i.e., records of decision) for all operable units, as well as several amendments to these documents.

The FCP is currently involved in the implementation phase of CERCLA remediation, which includes remedial design, remedial action (construction and implementation of the remedy), certification of soil and groundwater to verify that the remedy was effective, and ultimately site closure. Remediation activities, documents, and schedules are identified in each operable unit's remedial design and remedial action work plan. It should be noted that significant progress was made during 2004 with respect to remediation efforts. This chapter describes that progress.

Each phase of the CERCLA remediation process requires documentation. The documents produced reflect the input of stakeholders who have helped form the remediation strategy at the Fernald site. Many documents that describe specific remediation activities were issued or approved in 2004, as mentioned throughout this report. All cleanup-related CERCLA documentation, including a copy of the Administrative Record, is available to the public at the Public Environmental Information Center located at the Fernald site. A copy of the Administrative Record is also located at EPA's Region V office in Chicago, Illinois. The progress made by each remedial project toward CERCLA cleanup is summarized later in this chapter.

CERCLA also requires a five-year review process of remedial actions implemented under the signed Record of Decision for each operable unit. The purpose of a five-year review is to determine, through evaluation of performance of the selected remedy, whether the remedy at a site remains protective of human health and the environment. The first five-year review report for the Fernald site (DOE 2001b) was approved by the EPA in September 2001.

Cleanup levels at the Fernald site for surface water, sediment, and groundwater were established in the Record of Decision for Remedial Actions at Operable Unit 5 (DOE 1996). These final remediation levels (FRLs) were established for constituents of concern or those constituents at the Fernald site determined, through risk assessment, to present potential risk to human health or the environment. Table 2-1 lists FRLs identified for constituents in groundwater, surface water, and sediment; these constituents are all monitored under the IEMP. FRLs represent the maximum allowable residual levels (the maximum concentrations which may remain in the environment following remediation), and these levels drive excavation and cleanup.

On November 30, 2001, the EPA approved an Explanation of Significant Differences to the Operable Unit 5 Record of Decision. This document formally adopts the EPA's Safe Drinking Water Act Maximum Contaminant Level for uranium of 30 µg/L as both the FRL for groundwater remediation and the monthly average uranium effluent discharge limit to the Great Miami River.

Benchmark Toxicity Values originated from the Operable Unit 5 Sitewide Ecological Risk Assessment. These concentrations for sediment and surface water are used to determine if a constituent may have a detrimental effect on a particular ecological receptor. For surface water and sediment, ecological receptors include fish and animals that inhabit the surface water body or use surface water as a source of drinking water.

Acceptable levels for constituents of ecological concern were established in the Operable Unit 5 Sitewide Ecological Risk Assessment (Appendix B of the Operable Unit 5 Remedial Investigation Report). The Sitewide Ecological Risk Assessment established benchmark toxicity values (BTVs) for protection of ecological receptors. Through the BTV screening process presented in Appendix C of the final Sitewide Excavation Plan (DOE 1998b), three constituents of ecological concern (barium, cadmium, and silver) were selected for evaluation in the surface water pathway to be protective of aquatic receptors. During 2004, EPA and OEPA agreed with the discontinuation of BTV evaluations; however, it is important to note that barium, cadmium, and silver are still monitored in association with surface water for either National Pollutant Discharge Elimination System (NPDES) or FRL evaluations (refer to Chapter 4).

TABLE 2-1
FINAL REMEDIATION LEVELS FOR GROUNDWATER, SURFACE WATER, AND SEDIMENT

	FRL[a]		
Constituent	**Groundwater**	**Surface Water**	**Sediment**
General Chemistry	**(mg/L)**	**(mg/L)**	**(mg/kg)**
Cyanide	NA[b]	0.012	NA
Fluoride	4[c]	2.0	NA
Nitrate[d]	11	2,400	NA
Inorganics	**(mg/L)**	**(mg/L)**	**(mg/kg)**
Antimony	0.0060	0.19	NA
Arsenic	0.050	0.049	94
Barium	2	100	NA
Beryllium	0.0040	0.0012	33
Boron	0.33	NA	NA
Cadmium	0.014	0.0098	71
Chromium VI[d]	0.022	0.010	3,000
Cobalt	0.17	NA	36,000
Copper	1.3	0.012	NA
Lead	0.015[c]	0.010	NA
Manganese	0.900	1.5	410
Mercury	0.0020	0.00020	NA
Molybdenum	0.10	1.5	NA
Nickel	0.10	0.17	NA
Selenium	0.050	0.0050	NA
Silver	0.050	0.0050	NA
Thallium	NA	NA	88
Vanadium	0.038	3.1	NA
Zinc	0.021	0.11	NA
Radionuclides	**(pCi/L)**	**(pCi/L)**	**(pCi/g)**
Cesium-137	NA	10	7.0
Neptunium-237	1.0	210	32
Lead-210	NA	11	390
Plutonium-238	NA	210	1,200
Plutonium-239/240	NA	200	1,100
Radium-226	20	38	2.9
Radium-228	20	47	4.8
Strontium-90	8.0	41	7,100
Technetium-99	94	150	200,000
Thorium-228	4.0	830	3.2
Thorium-230	15	3500	18,000
Thorium-232	1.2	270	1.6
	(µg/L)	**(µg/L)**	**(mg/kg)**
Total Uranium[e]	30[f]	530	210

TABLE 2-1
(Continued)

Constituent	FRL[a] Groundwater	Surface Water	Sediment
Organics	**(µg/L)**	**(µg/L)**	**(µg/kg)**
Alpha-chlordane	2.0	0.31	NA
Aroclor-1254	0.20	0.20	670
Aroclor-1260	NA	0.20	670
Benzene	5.0	280	NA
Benzo(a)anthracene	NA	1.0	190,000
Benzo(a)pyrene	NA	1.0	19,000
Benzo(b)fluoranthene	NA	NA	190,000
Benzo(k)fluoranthene	NA	NA	1,900,000
Bis(2-chloroisopropyl)ether	5.0	280	NA
Bis(2-ethylhexyl)phthalate	6.0	8.4	5,000,000
Bromodichloromethane	100	240	NA
Bromoform	NA	NA	160,000
Bromomethane	2.1	1300	NA
Carbazole	11	NA	63,000
Carbon disulfide	5.5	NA	NA
Chloroethane	1.0	NA	NA
Chloroform	100	79	NA
Chrysene	NA	NA	19,000,000
Dibenzo(a,h)anthracene	NA	1.0	NA
3,3'-Dichlorobenzidene	NA	7.7	NA
1,1-Dichloroethane	280	NA	NA
1,1-Dichloroethene	7.0	15	NA
1,2-Dichloroethane	5.0	NA	NA
Dieldrin	NA	0.020	NA
Di-n-butylphthalate	NA	6,000	NA
Di-n-octylphthalate	NA	5.0	NA
Methylene chloride	5.0	430	NA
4-Methylphenol	29	2,200	NA
4-Methyl-2-pentanone	NA	NA	2,100,000
4-Nitrophenol	320	7,400,000	NA
N-nitrosodiphenylamine	NA	NA	260,000
Octachlorodibenzo-p-dioxin	0.0001	NA	NA
Phenanthrene	NA	NA	3
2,3,7,8-Tetrachlorodibenzo-p-dioxin	0.010	NA	NA
Tetrachloroethene	NA	45	NA
1,1,1-Trichloroethane	NA	1.0	NA
1,1,2-Trichloroethane	NA	230	NA
Trichloroethene	5.0	NA	NA
Vinyl Chloride	2.0	NA	NA

[a]From Record of Decision for Remedial Actions at Operable Unit 5, Tables 9-4 through 9-6, January 1996.
[b]NA = not applicable. No FRL was required for this constituent in this particular environmental media.
[c]The groundwater FRLs for fluoride and lead were changed from 0.89 milligrams per liter (mg/L) and 0.002 mg/L, respectively, to be consistent with the FRL selection process outlined in the Operable Unit 5 Feasibility Study. The changes were documented in the Operable Unit 5 Record of Decision by change pages.
[d]Because of holding time considerations, nitrate/nitrite is analyzed for nitrate and total chromium is analyzed for hexavalent chromium. Total chromium and nitrate/nitrite provide a more conservative result.
[e]Uranium consists of several isotopes (uranium-234, 235, 236 and 238). This report interchangeably uses the terms uranium and total uranium, both defined as the sum of the various isotopic components.
[f]The total uranium groundwater FRL was changed to 30 µg/L in 2001 to reflect the EPA's adopted Safe Drinking Water Act Final Maximum Contamination Level for uranium.

2.1.1 Waste Pits Project

The Waste Pits Project (Operable Unit 1) is responsible for the excavation, drying (as required), loading, and rail transport of the contents of Waste Pits 1 through 6, the burn pit, and the clearwell to an off-site disposal facility. Sampling and analysis of the waste pit material and the off-site disposal of contaminated soil and debris from other remedial projects that exceed the waste acceptance criteria (physical, chemical, and radiological standards) for the on-site disposal facility are part of this scope of work. The project is also responsible for collecting wastewater and storm water associated with the Waste Pits Project activities and, as needed, pre-treating and discharging this remediation water to the advanced wastewater treatment facility. In addition, the project is responsible for implementing dust control measures, and for implementing point source emission controls for dryer operations.

The Waste Pits Project involves the pre-treatment (e.g., crushing, sorting, and shredding) of waste pit materials, drying (as required), and the loadout of railcars with pit material for shipment to Envirocare of Utah, Inc. During 2004, 28 unit trains left the Fernald site carrying approximately 178,800 tons (162,207 metric tons) of material. From April 1999, when the first rail shipment left the Fernald site, through December 2004, the Waste Pits Project shipped 133 unit trains carrying approximately 849,250 tons (770,440 metric tons) of material to Envirocare of Utah, Inc. for disposal. By the end of 2004, all waste and contaminated liners had been removed from Waste Pits 4, 5, and 6, and the clearwell. In addition, all waste had essentially been removed from Waste Pits 1 and 2, and the burn pit. With the remaining contaminated liner and with Waste Pit 3 being over 90 percent complete, the project as a whole was over 90 percent complete at the end of 2004.

Waste Pit 6 after the waste and 6 inches of the liner were removed. Final remediation activities at Waste Pit 6 initiated.

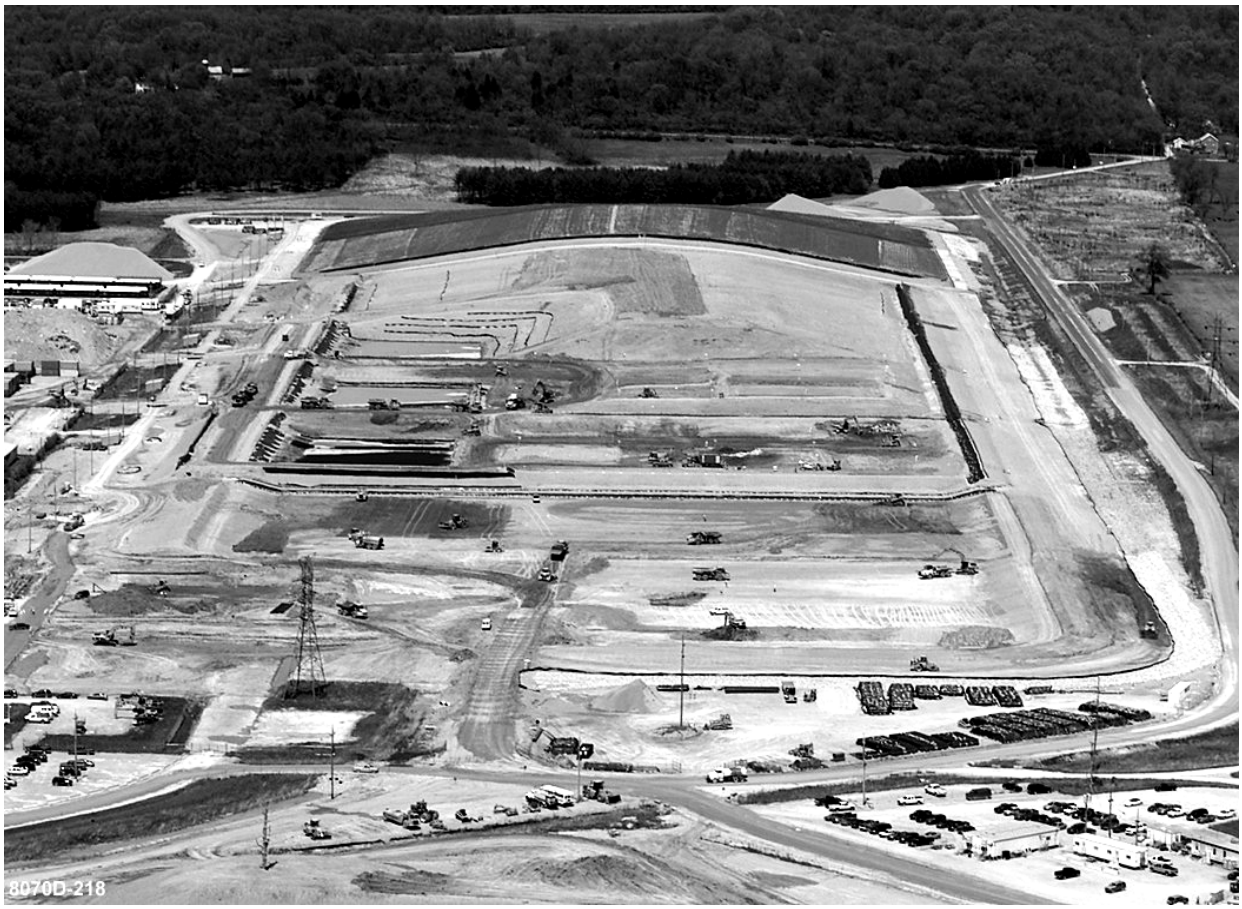
2.1.2 Demolition, Soil, and Disposal Project

The activities associated with this project will be discussed in the following two subsections: Section 2.1.2.1, Soil and Disposal Facility Project, and Section 2.1.2.2, Decontamination and Demolition Project.

2.1.2.1 Soil and Disposal Facility Project

The Soil and Disposal Facility Project, which includes components of both Operable Units 2 and 5, is responsible for characterizing the extent of contamination in the soil, soil sampling, excavation of contaminated soil and at- and below-grade structures, treatment of soil if necessary, certifying that the soil meets the final remediation levels established in the Operable Units 2 and 5 Records of Decision, natural resource restoration, and the construction of on-site disposal facility cells and waste placement into those cells. (The on-site disposal facility's leachate and leak detection monitoring, as well as operation, maintenance, and monitoring of the leachate transmission system, are the responsibility of the Aquifer Restoration/Wastewater Project.)

For purposes of excavating contaminated soil, the Fernald site has been divided into nine separate soil remediation areas based on land use history and known contamination levels (refer to Figure 2-1). Area 9 includes all off-site soil that must be evaluated during remediation and/or certification. In addition, portions of the site's stream corridors (including Paddys Run) along with other potentially contaminated corridors will require remediation and are considered unique areas. Other utility corridors and access roads are not included with the remediation areas. These corridors will be addressed later in site remediation after completion of the aquifer restoration.



By the end of 2004, over 1.85 million yd^3 (1.4 million m^3) of soil and debris had been placed into the on-site disposal facility.

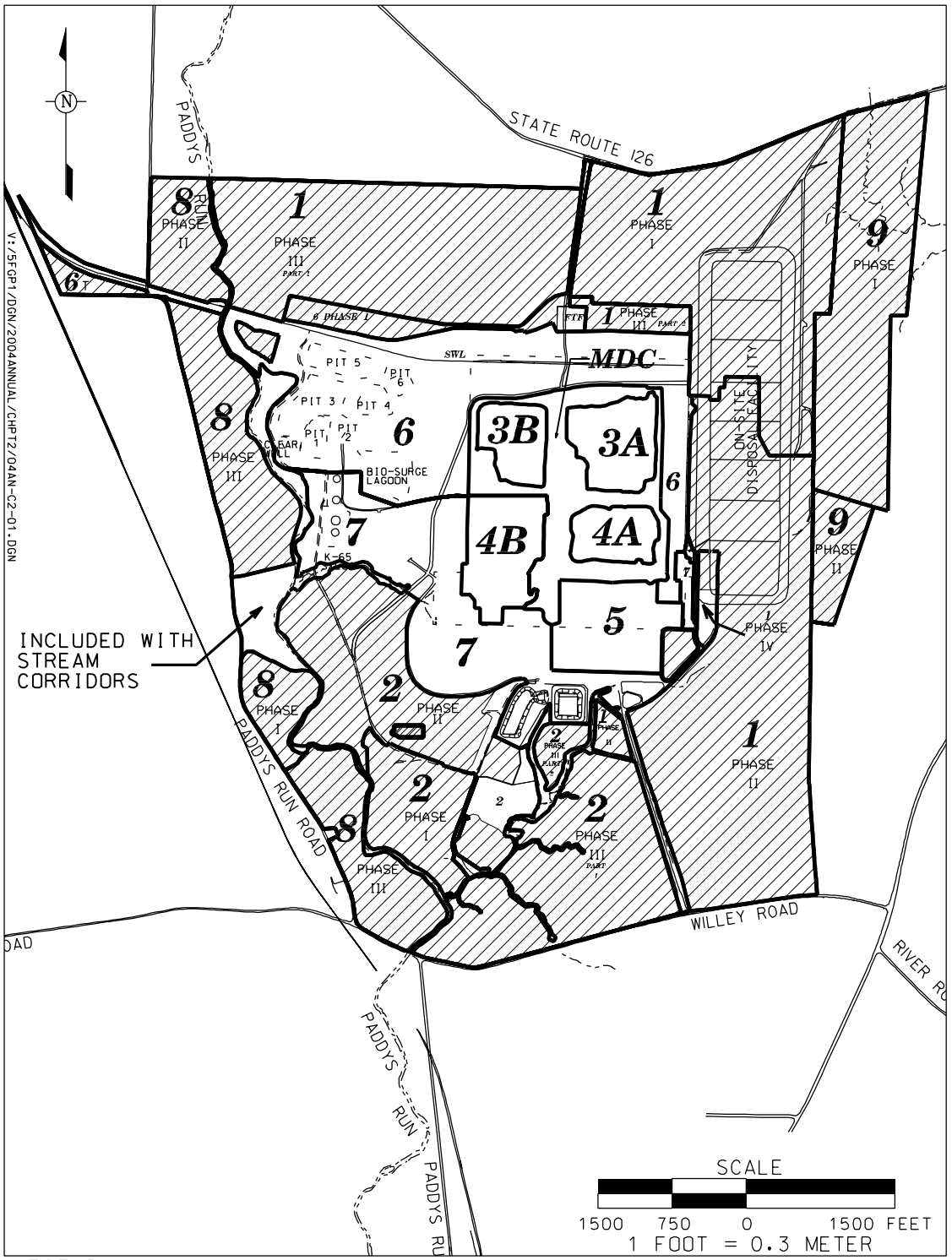


FIGURE 2-1. SITEWIDE SOIL REMEDIATION AND CERTIFIED AREAS

Prior to soil remediation, real-time scanning and soil sampling are performed to gather information related to the extent of surface and subsurface contamination; to identify the impacted materials that meet the waste acceptance criteria for the on-site disposal facility; and to identify the materials that do not meet the on-site disposal facility waste acceptance criteria and, therefore, must be sent off site for disposal. Engineering personnel use this information to design soil and debris excavations. Materials that cannot be placed in the on-site disposal facility are stockpiled and/or containerized, monitored, and tracked for off-site disposal.

Volume Descriptions: Bank and In-Place

Soil/debris can be described as "bank" (in the ground before excavation) or "in-place" (placed and compacted in the on-site disposal facility). When soil is designed and estimated for excavation, the soil volume is calculated by length, width, and height. When the soil is placed in the on-site disposal facility, considerable compaction is achieved, which reduces the volume that is actually in-place at the on-site disposal facility.

In 2004, the Soil and Disposal Facility Project continued soil and debris excavations. Approximately 677,097 bank yd^3 (517,708 bank m^3) total soil and material were excavated in 2004. By the end of the year, over 1.85 million in-place yd^3 (1.4 million m^3) of soil and debris (including above-grade decontamination and demolition debris) had been excavated and placed into the on-site disposal facility since remediation began, and the planned soil remediation activities at the site were about 64 percent complete. The following soil remedial excavation activities took place in 2004:

- Area 2 (Phase II). Small-scale remedial excavations began adjacent to the west storm water retention basin.
- Area 3A/4A. Large-scale remedial excavations were mostly completed on the east side of the former production area.
- Area 3B/4B/5. Large-scale remedial excavations continued on the west side of the former production area and the east parking lot.
- Area 6. Remedial excavations continued between the waste pit operations and the former Plant 1 Pad, and the solid waste landfill as well as a portion of the Waste Pit 4 cap.

When contaminated soil and debris have been excavated from each area, pre-certification real-time scanning and certification sampling are performed to demonstrate that the residual levels of the constituents of concern for that area are below the site's FRLs. After statistical analyses of the laboratory results are reviewed to confirm that contaminants of concern are demonstrated to be below the site's FRLs, a certification report is submitted to EPA and OEPA, and upon their approval the area is certified as meeting the soil remediation goals.

Figure 2-1 identifies all remediation areas that have been certified as of December 31, 2004. During 2004, the following areas of the Fernald site were certified or were in the process of certification:

- Area 2 (Phase II). Approximately 57 acres (23 hectares) of the area southwest of the former production area were certified.
- Areas 3A and 3B. Approximately 27 acres (11 hectares) of the northern section of the former production area were in the process of certification; the certification report was submitted to the agencies on December 15.
- Area 4A. Approximately 11 acres (4.5 hectares) of the southeast quadrant of the former production area were in the process of certification.
- Area 9 (Phase II). Approximately 12 acres (4.9 hectares) of off-property land adjacent to the central portion of the eastern site boundary were certified.
- Area 9 (Phase III). The abandoned outfall line, that extended from the eastern edge of the Fernald site to the Great Miami River, was excavated and in the process of certification.

As of December 31, 2004, approximately 64 percent of the Fernald site had been certified. After an area of the site is certified, natural resource restoration activities can begin. Chapter 7 discusses the specific natural resource restoration activities that took place in 2004.

During 2004, approximately 513,000 in-place yd^3 (392,240 m^3) of waste (including some excavated material, debris, etc.) were placed in Cells 4, 5, 6, 7, and 8 of the on-site disposal facility. Cell 3 was capped according to construction drawings, and it should be noted that a small amount (approximately 2,700 in-place yd^3) of material was placed in this cell to meet fill requirements. Cell 4 has also been filled to its capacity and the final cover system construction was in progress as of the end of the year. Cell 5 has reached approximately 55 percent of its capacity. Cell 6 has reached approximately 44 percent of its capacity. Cell 7, constructed in 2004, has reached approximately 9 percent of its capacity. Cell 8, also constructed in 2004, has reached approximately 2 percent of its capacity.

Other activities regarding the on-site disposal facility included placement of protective and select material on the Cell 7 floor and side slopes, placement of protective material on the Cell 8 flow and side slope, and placement of select material in Cell 4 in accordance with the Impacted Material Placement Plan (GeoSyntec 1996). A discussion of the ongoing performance monitoring of the on-site disposal facility is provided in Chapter 3.

2.1.2.2 Decontamination and Demolition Project

The Decontamination and Demolition Project (Operable Unit 3) is responsible for decontaminating and dismantling the above-grade structures and facilities associated with production operations and remedial actions. This includes decontamination of facilities; isolation of utilities; demolition of buildings, equipment, and other facilities; removal of uranium and other material from former processing equipment; and shipment of material and equipment off site. The scope includes the collection and proper management of associated decontamination wastewater.

During 2004, decontamination and demolition activities were completed at the following facilities:

- 2B GR/RS Control Building
- 2C Bulk Lime Handling Building
- 2H Conveyor Tunnel
- 3A Maintenance Building
- 3E Hot Raffinate Building
- 3H Refinery Sump
- 3L Electrical Power Center Building
- 8A Recovery Plant
- 11 Services Building
- 13A Pilot Plant Wet Side
- 14A Administration Building
- 14B Building 14 EOC Generator Set
- 15A Laboratory
- 15B Laboratory Chemical Storage Building
- 15C Laboratory Garage
- 16B Electrical Substation
- 16F Trailer Substation 1
- 16G Trailer Substation 2
- 18B General Sump
- 19B Caustic Storage Tank Area
- 20D East Water Tower
- 20K Administration Area Cooling Towers
- 21A Haul Road Wheel Wash Facility
- 22G Main Gate Truck Scale
- 31A Vehicle Repair Garage
- 35A Silo 4
- 53B In Vivo Building
- 54A Six to Four Reduction Facility #1
- 60 Quonset Hut #1
- 61 Quonset Hut #2
- 77 Finished Products Warehouse
- 79 Plant 6 Warehouse
- 82B Fuel Loading/Unloading Facility
- TSS-8 Tension Support Structure #8
- TSS-12 Tension Support Structure #12

Additionally, 73 site trailers were dismantled and either shipped off-site or demolished in 2004.

Demolition of these 35 structures brings the total number of structures demolished at the Fernald site to 185 out of a total of 316 structures.

Structural demolition of the Administration Building.

2.1.3 Silos Projects

The Silos Project (Operable Unit 4) includes Silos 1 and 2 (also known as the K-65 Silos), Silos 3 and 4, and several nearby structures. Silos 1 and 2 contain radium-bearing residues from the processing of uranium ore and ore concentrates during the 1950s. Silo 3 contains cold metal oxides generated from uranium recovery operations, and Silo 4 has never been used. The Silos Project remediation activities will include the retrieval, processing, and off-site disposal of the residues stored in the silos, as well as decontamination and dismantling of the silo structures and associated facilities.

In 1997, DOE, EPA, and OEPA reached the decision to separate the remediation of Silo 3 material from the remediation of Silos 1 and 2 material, and to re-evaluate the treatment remedies for both materials. In addition, the Silos 1 and 2 Accelerated Waste Retrieval Project was initiated to provide control of radon in Silos 1 and 2 headspaces and treatment facilities, and safe storage of the Silos 1 and 2 material during the interim period until treatment and disposal can be implemented. Following is a summary of each project's major activities during the year.

2.1.3.1 Silos 1 and 2 Remediation

An Explanation of Significant Differences (ESD) document was prepared and completed formal public review in December 2004. The ESD, which will be submitted for final EPA approval in early 2005, will modify the remedies for Silos 1, 2, and 3 materials to allow for temporary off-site storage at an appropriately licensed facility prior to permanent off-site disposal. The remedies for Silos 1, 2, and 3 materials will require on-site processing and packaging of the material in accordance with the previous remedies, followed by off-site disposal at the Nevada Test Site or a permitted commercial facility. Construction and most of the necessary start-up testing of the necessary equipment and facilities for implementation of the revised remedy for Silos 1 and 2 was completed during 2004.

Operable Unit 4 (silos) remediation facilities.

The Silos 1 and 2 Project initiated the Accelerated Waste Retrieval Project in 1998. The purpose of this project is to address the increasing radon concentrations in the Silos 1 and 2 headspace, as well as issues regarding silo integrity and heterogeneity of the material for the final treatment facility. The project scope includes design, construction, testing, and operation of interim storage facilities to hold the Silos 1 and 2 material until treatment is implemented. The project also includes design, construction, and startup of the Radon Control System (RCS) to provide control of radon emissions during the construction and operation phases of the Accelerated Waste Retrieval Project, as well as during interim storage and operation of the Silos 1 and 2 full-scale treatment facility. Operation of the RCS to reduce radon concentrations in the Silos 1 and 2 headspaces and waste retrieval equipment continued through the end of the year. Construction and start-up of the equipment required for transfer of the Silos 1 and 2 material from the silos to the four 750,000-gallon tanks in the Transfer Tank Area was completed during 2004. The tanks will be used to receive and store the material from Silos 1 and 2 pending transfer to the remediation facility. Transfer of material from Silos 1 and 2 to the Transfer Tank Area was initiated September 22, 2004, and as of the end of the year, approximately 60 percent of the material from Silos 1 and 2 had been transferred. Waste retrieval will be completed in early 2005.

2.1.3.2 Silo 3 Project

In 2001, re-evaluation of alternatives for implementation of Silo 3 remediation was initiated with input from DOE, regulators, and stakeholders to identify the optimal path forward for remediation of the Silo 3 material. This process continued during 2004 and the Draft Revised Proposed Plan for Silo 3 (DOE 2002b) was submitted to the EPA and OEPA for review. Upon completion of the EPA/OEPA review and approval process, the proposed plan was submitted for formal public review in 2003. After completion of the public review, a Record of Decision Amendment was prepared and subsequently approved by the EPA on September 24, 2003 documenting the revised remedy, which consists of retrieval, conditioning to the extent practical to reduce dispersability and mobility, and off-site disposal. Construction and start-up testing of facilities for retrieval, conditioning, and packaging of the Silo 3 material was completed during 2004. Due to uncertainty in the availability of off-site disposal capacity, the facilities were maintained in a state of readiness to allow prompt start-up, when required, through the end of 2004. Efforts to secure disposal capacity at the Nevada Test Site or an appropriately permitted commercial facility, and allow start-up of the Silo 3 remediation facility, were ongoing through the end of 2004.

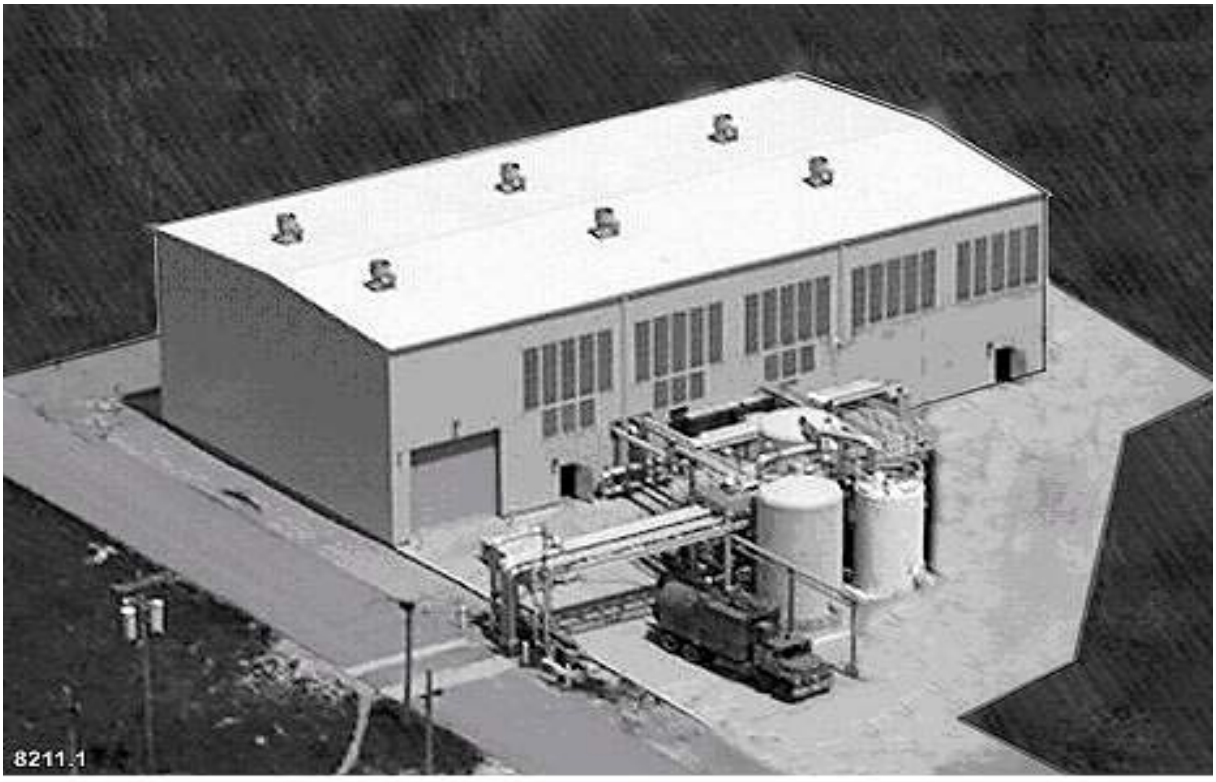
2.1.4 Aquifer Restoration/Wastewater Project

The Aquifer Restoration/Wastewater Project (Operable Unit 5) is responsible for the restoration of water quality in the affected portions of the Great Miami Aquifer, and for treating the site's extracted groundwater, storm water, sanitary wastewater, and remediation wastewater. These activities include the design, construction, operation, monitoring of, and reporting on the groundwater restoration and wastewater treatment systems at the Fernald site. This project is also responsible for managing the on-site disposal facility's leak detection monitoring program, as well as operation, maintenance, and monitoring of the leachate transmission system.

In May, EPA and OEPA approved the decision to reduce the size of the advanced wastewater treatment facility (AWWT); in June, they approved the decision to discontinue the use of well-base re-injection. Through September 24, 2004, the Aquifer Restoration/Wastewater Project continued to operate the South Plume Module (including the South Plume Optimization Module), the South Field Module, the Waste Storage Area Module, and the Re-injection Module. On September 25, 2004, well field operations were reduced to facilitate modifications to the water treatment system and re-injection operations were ceased. (Instead of restarting well-based re-injection after completion of the modifications to the water treatment system, other operational strategies to enhance the aquifer remedy will be explored, such as inducing infiltration to the Great Miami Aquifer through the Storm Sewer Outfall Ditch.) All extraction wells in the Waste Storage Area Module were shut down and pumping rates for the remaining operating modules (South Plume and South Field) were reduced. When increased water treatment capacity is available in 2005, it is expected that pumping rates from the various modules will increase.

In 2004, a total of 2,446 million gallons (9,258 million liters) of groundwater were extracted from the Great Miami Aquifer, 922 net pounds (419 kg) of uranium were removed from the aquifer, and 330 million gallons (1,249 million liters) of water were re-injected into the aquifer. Chapter 3 discusses groundwater monitoring.

During 2004, Phases I and II of the advanced wastewater treatment facility and the interim advanced wastewater treatment facility provided treatment of contaminated storm water, wastewater, and groundwater. The advanced wastewater treatment facility (Phase III) and the South Plume interim treatment facility were dedicated to treatment of contaminated groundwater associated with groundwater remediation. With site closure in 2006, several water treatment flows (remediation wastewater, sanitary wastewater, and storm water runoff) will be eliminated or reduced. Elimination or reduction of these flows provides an opportunity to reduce the size of the advanced wastewater treatment facility that will remain to service the aquifer restoration after site closure. Reducing the size of the treatment facility prior to site closure in 2006 will reduce the amount of impacted materials that may need future off-site disposal. On September 25, 2004 construction to downsize the advanced wastewater treatment facility began. It is anticipated that the new converted advanced wastewater treatment facility will be operational in early 2005.



Converted advanced wastewater treatment facility (CAWWT).

2.2 Summary of Compliance with Other Requirements

CERCLA requires compliance with other laws and regulations as part of remediation of the Fernald site. These other requirements are referred to as applicable or relevant and appropriate requirements (ARARs). ARARs that are pertinent to remediation of the site are specified in the record of decision for each operable unit. This section highlights some of the major requirements related to environmental monitoring and waste management, and how the FCP complied with these requirements in 2004.

The regulations discussed in this section have been identified as ARARs within the records of decision. The FCP must comply with these regulations while site remediation under CERCLA is underway; EPA and OEPA enforce compliance. Some of these requirements include permits for controlled releases, which are also discussed in this section.

2.2.1 Resource Conservation and Recovery Act (RCRA)

RCRA as amended regulates treatment, storage, and disposal of hazardous waste and the hazardous part of mixed waste (mixed waste contains both radioactive and hazardous waste components). Hazardous and mixed waste now generated at the site results from such activities as CERCLA remedial actions and maintenance activities. The Fernald site also has an inventory of mixed waste generated from former production activities. These wastes are regulated under RCRA and Ohio hazardous waste management regulations; therefore, the site must comply with legal requirements for managing hazardous and mixed wastes. OEPA has been authorized by EPA to enforce its hazardous waste management regulations in lieu of the federal RCRA program. In addition, hazardous waste management is subject to the 1988 Consent Decree and the 1993 Stipulated Amendment between the State of Ohio and DOE, as well as a series of Director's Final Findings and Orders issued by OEPA.

The FCP completed several administrative activities related to mixed waste storage and treatment during 2004, including:

- Submittal of the 2003 RCRA Annual Report (DOE 2004d), which describes hazardous waste activities for 2003.
- Submittal of the Fiscal Year 2004 Annual Update to the Site Treatment Plan (DOE 2004b) as required in the 1992 Federal Facility Compliance Act and the implementing Director's Findings and Orders issued by OEPA in October 1995.
- Submittal of several revisions to the RCRA Part B Permit Application

Additional details on projects involving treatment of mixed wastes are provided in subsection 2.2.1.4, Mixed Waste Treatment.

Based on a compliance inspection conducted by OEPA on November 18, 2004, OEPA found DOE to be in violation of OAC 3745-52-11 for failure to characterize certain wastes. OEPA issued a Notice of Violation on January 13, 2005. The rule states that any person who generated a waste, as defined in the Ohio Administrative Code, must determine if that waste is hazardous waste. There were approximately 30 containers of waste that had not been properly characterized. DOE has completed the required characterizations by OEPA as of March 31, 2005. No further enforcement action is expected.

2.2.1.1 RCRA Property Boundary Groundwater Monitoring

The Director's Findings and Orders, which were signed September 10, 1993, described an alternate groundwater monitoring system. A revision of this document was approved on September 7, 2000 to align with the groundwater monitoring strategy identified in the IEMP. The Property Boundary Groundwater Monitoring program is discussed in Chapter 3.

2.2.1.2 RCRA Closures

The 1993 Stipulated Amendment to Consent Decree required that DOE identify all hazardous waste management units at the site. As a result, burners, incinerators, furnaces, stills, process equipment, tank units, dust collectors, and other potential waste containment units were evaluated in the early 1990s to determine if they were hazardous waste management units or solid waste management units. This evaluation was completed in 1994. In 1996, OEPA issued Director's Findings and Orders to integrate RCRA closure requirements with CERCLA response actions for FCP hazardous waste management units. In 2004, the FCP initiated or completed the remediation of nine units: Pilot Plant Warehouse (Building 68), Nitric Acid Recovery System, Box Furnace, Oxidation Furnace #1, Plant 8 Warehouse (Building 80), Plant 8 Warehouse (Building 80), Fire Training Facility, Plant 1 Pad, and the Plant 6 Warehouse (Building 79).

2.2.1.3 Thorium Management

A thorium management strategy to improve the storage of thorium materials at the Fernald site, and a schedule to complete RCRA determinations of thorium materials, were developed as part of the Stipulated Amendment to the Consent Decree signed in 1991. This strategy is based on three primary objectives:

- To maintain environmentally stable interim storage of the thorium inventory while minimizing personnel radiation exposure.
- To implement actions required in order to complete RCRA evaluations of the thorium materials.
- To implement long-term storage and disposal alternatives.

The Thorium Overpacking Project was completed in 1997. It was under this project that the FCP removed 3,400 containers of thorium material and shipped 10,875 drum-equivalents (or 80,480 cubic feet (ft^3) [2,279 m^3]) of thorium material to the Nevada Test Site for disposal. The characterization documentation and formal RCRA waste determinations for the remaining estimated 8,500 containers of thorium legacy waste resumed in 1999.

In 2004, the FCP shipped 4,274 pounds (1,940 kg) of mixed thorium waste to Envirocare of Utah, Inc. for treatment and disposal, and 21,192 pounds (9,621 kg) of non-hazardous thorium waste to the Nevada Test Site for disposal. At the end of 2004, there were only a few containers of thorium waste remaining on site.

2.2.1.4 Mixed Waste Treatment

The FCP stores mixed wastes that are subject to RCRA land disposal restrictions. These restrictions currently prohibit the storage of certain hazardous waste streams for longer than one year, unless OEPA approves an extension.

The 1992 amendment to RCRA, the Federal Facilities Compliance Agreement (FFCA), provided DOE with an exemption from enforcement under the land disposal restrictions storage prohibition as long as DOE sites complied with the plans and schedules for mixed waste treatment. This is identified in the Site Treatment Plan, and the implementing Director's Findings and Orders issued by OEPA on October 4, 1995. The FCP submitted the first Site Treatment Plan Annual Update to OEPA in December 1996. These updates are due by December 31 of each year. Since then, eight additional annual updates have been submitted. The annual update describes the status of mixed waste treatment projects developed under the Site Treatment Plan. It also adds newly generated and newly identified mixed waste streams, and certifies that the FCP met all regulatory milestone dates for the treatment of mixed wastes identified in the plan and in the implementing Director's Findings and Orders.

In 2004, 336,049 pounds of mixed waste were shipped off site for treatment and/or disposal, or treated on site. These include the following waste streams:

- 82,985 pounds of liquid mixed waste was shipped to the K-25 Toxic Substances Control Act Incinerator in Oak Ridge, Tennessee for treatment.
- 2,631 pounds of treatability study residues were shipped to Waste Control Specialists in Andrews, Texas for treatment.
- 248,199 pounds of soil, sludge, debris, and other materials were shipped to Envirocare of Utah, Inc. for treatment and/or disposal.
- 2,314 pounds of liquid aqueous mixed wastes meeting NPDES Permit requirements were treated at the advanced wastewater treatment facility.

2.2.2 Clean Water Act

Under the Clean Water Act as amended, the FCP is governed by NPDES regulations that require the control of discharges of non-radiological pollutants to waters of the State of Ohio. The NPDES Permit, issued by the State of Ohio, specifies discharge and sample locations, sampling and reporting schedules, and discharge limitations. The FCP submits monthly reports on NPDES activities to OEPA. The Fernald site's current NPDES Permit, Permit No. 1IO00004*GD, became effective on July 1, 2003. Chapter 4 discusses the surface water and treated effluent information in detail.

2.2.3 Clean Air Act

NESHAP Subpart H imposes a limit of 10 millirem (mrem) per year on the effective dose equivalent to the maximally exposed individual as a result of all air emissions (with the exception of radon) from the facility in a single year. For 2004 the FCP was in compliance with the NESHAP dose limit as determined by ambient air monitoring at the site's fenceline boundary.

EPA regulates the Fernald site's radionuclide emission sources through NESHAP; OEPA has authority to enforce the State of Ohio's air standards including particulate, chemical, and toxic emission sources. In 2004, the FCP complied with all emissions standards, as discussed in Chapter 5. The NESHAP Annual Report for 2004 is included as Appendix D of this report.

Several remediation activities, including the waste pits remediation, decontamination and dismantling, soil excavation, and on-site disposal facility construction and waste placement, may result in the generation of fugitive dust, which is also regulated by OEPA. Compliance is accomplished by

implementing the Fugitive Dust Control Policy negotiated between DOE and OEPA in 1997. This policy is implemented in the Best Available Technology Determination for Remedial Construction Activities on the Fernald Environmental Management Project (DOE 1997b), the requirements of which are incorporated into each operable unit's remedial design and remedial action deliverables. The policy allows for visual observation of fugitive dust and implementation of dust control measures to determine compliance during remediation activities.

2.2.4 Superfund Amendments and Reauthorization Act of 1986

The Superfund Amendments and Reauthorization Act of 1986 (SARA) amended CERCLA and was enacted, in part, to clarify and expand CERCLA "Superfund" requirements. SARA Title III is also known as the Emergency Planning and Community Right-to-Know Act.

The SARA Title III, Section 312, Emergency and Hazardous Chemical Inventory Report for 2004 was submitted to OEPA, to the Local Emergency Planning Committees of Hamilton and Butler Counties, and to the Crosby Township Fire Department prior to the March 1, 2005 deadline. This report lists the amounts and locations of hazardous chemicals and substances stored or used in amounts greater than the minimum reporting threshold (generally 10,000 pounds for "hazardous chemicals," and 500 pounds for "extremely hazardous substances") at any time during the previous year. For 2004, several chemicals which had been reported in previous years, no longer exceeded reportable thresholds due to their use or disposition through transfers to other DOE sites, sales, or shipment off site for treatment and disposal. However, several chemicals increased above reportable thresholds due to their procurement for use in remediation operations, in particular the Silos 1 and 2 waste treatment project and the Silo 3 waste stabilization project.

Another SARA Title III report, the Section 313 Toxic Chemical Release Inventory Report (Form R), is required if the Fernald site exceeds an applicable threshold for any SARA 313 chemical. If required, the Toxic Chemical Release Inventory Report lists routine and accidental releases, as well as information about the activities, uses, and waste for each reported toxic chemical. No chemicals have exceeded the threshold for several years. An evaluation to determine if any chemicals used at the FCP during 2004 exceeded reporting thresholds will be completed and will be reported, if required, to EPA and OEPA prior to the July 1, 2005 compliance date.

Also under SARA Title III, any off-site release meeting or exceeding a reportable quantity as defined by SARA Title III, Section 304, requires that immediate notifications be made to local emergency planning committees and the state emergency response commission. Notifications are also made to the National Response Center and other appropriate federal, state, and local regulatory entities. All releases occurring at the Fernald site are evaluated and documented to ensure that proper notifications are made in accordance with SARA, and under CERCLA Section 103, RCRA, the Toxic Substances Control Act, the Clean Air Act, the Clean Water Act, and Ohio environmental laws and regulations.

In 2004, there was only one release at the Fernald site that met the reporting criteria under CERCLA. This was a release of fewer than 25 pounds of mixed waste from a 55-gallon drum inside a trailer parked on the site. The material did not reach off site; thus, it was not reportable under SARA Title III. Notification was made only to the National Response Center because it was a CERCLA, not a SARA, release. Other informational notifications (such as to the OEPA Southwest District Office, Division of Hazardous Waste Management) were made as deemed appropriate.

2.2.5 Other Environmental Regulations

The FCP is also required to comply with other environmental laws and regulations in addition to those described above. Table 2-2 summarizes compliance with each of these requirements for 2004.

2.2.6 Other Permits

Permits are the means by which certain environmental laws are implemented. The FCP has permits for controlled releases to surface water. The FCP's permit for discharging water under NPDES regulations is discussed in subsection 2.2.2, Clean Water Act. The only remaining facilities for which Permits to Install were obtained include the Storm Water Retention Basin and Bio-Surge Lagoon. Permits to Install govern the installation (and to a lesser degree, the operation) of specific wastewater treatment and control devices.

All sources previously covered by air Permits to Operate or Install have either been eliminated or are being addressed through the CERCLA remediation process. Due to this, the FCP has withdrawn all active air Permits to Operate. Therefore, the site no longer has any air permits associated with its operations.

TABLE 2-2
COMPLIANCE WITH OTHER ENVIRONMENTAL REGULATIONS

Regulation and Purpose	Background Compliance Issues	2004 Compliance Activities
Toxic Substances Control Act (TSCA)		
Regulates the manufacturing, use, storage, and disposal of toxic materials, including polychlorinated biphenyl (PCBs) and PCB items.	The last routine TSCA inspection of the FCP's program was conducted by EPA Region V on September 21, 1994. No violations of PCB regulations were identified during the inspection.	Non-radiologically contaminated PCBs and PCB items are shipped to TSCA-approved commercial disposal facilities for incineration on an as-needed basis. Radiologically contaminated PCB liquids were shipped to the TSCA-permitted DOE incinerator in Oak Ridge, Tennessee. Radiologically contaminated PCB solids were shipped off site for treatment by a commercial facility.
Ohio Solid Waste Act		
Regulates infectious waste.	The Fernald site was registered with OEPA as a generator of infectious waste (generating more than 50 pounds [23 kg] per month) until December 6, 1999, when OEPA concurred with the Fernald site's qualification as a small quantity generator.	All infectious wastes generated in the medical department were transported to a licensed treatment facility for incineration.
Federal Insecticide, Fungicide, and Rodenticide Act		
Regulates the registration, storage, labeling, and use of pesticides (such as insecticides, herbicides, and rodenticides).	The last inspection of the Federal Insecticide, Fungicide, and Rodenticide Act program conducted by EPA Region V on September 21, 1994, found the Fernald site to be in full compliance with the requirements mandated by Federal Insecticide, Fungicide, and Rodenticide Act.	Pesticide applications at the Fernald site were conducted according to federal and state regulatory requirements.
National Environmental Policy Act (NEPA)		
Requires the evaluation of environmental, socio-economic, and cultural impacts before any action, such as a construction or cleanup project, is initiated by a federal agency.	An environmental assessment for proposed final land use was issued for public review in 1998. It was prepared under DOE's guidelines for implementation of NEPA, 10 CFR 1021. The assessment requires consulting the public before any decisions on land use are made; it includes previous DOE commitments.	No NEPA activities were required in 2004.
Endangered Species Act		
Requires the protection of any threatened or endangered species found at the site as well as any critical habitat that is essential for the species' existence.	Ecological surveys conducted by Miami University and DOE, in consultation with the Ohio Department of Natural Resources, and the U.S. Fish and Wildlife Service, have established the following list of threatened and endangered species and their habitats existing on site: Cave salamander, state-listed endangered — marginal habitat, none found; Sloan's crayfish, state-listed threatened — found on northern sections of Paddys Run; Indiana brown bat, federally listed endangered — found in riparian areas along Paddys Run.	No endangered species surveys were conducted in 2004. Turbidity observations for the protection of Sloan's crayfish in Paddys Run were conducted until June 2004. No instances of increased sediment loading were observed. Turbidity observations ceased once grading activities for the Wetland Mitigation Project (Phase II) were completed.

TABLE 2-2
(Continued)

Regulation and Purpose	Background Compliance Issues	2004 Compliance Activities
Floodplains/Wetlands Review Requirements		
DOE regulations require a floodplain/wetland assessment for DOE construction and improvement projects.	A wetlands delineation of the FCP, completed in 1992 and approved by the U.S. Army Corps of Engineers in August 1993, identified 36 acres (15 hectares) of freshwater wetland on the Fernald site property. Updated delineations are conducted approximately every five years.	No assessments were performed in 2004.
National Historic Preservation Act		
Establishes a program for the protection, maintenance, and stewardship of federal prehistoric and historic properties.	The FCP is located in an area of sensitive historic and prehistoric cultural resources that are eligible for or on the National Register of Historic Places. These cultural resources include historic structures, buildings, and bridges, plus Native American villages and campsites.	No cultural resource surveys were necessary in 2004. Monitoring for unexpected discoveries was conducted during the Abandoned Outfall Line Project.
Native American Graves Protection and Repatriation Act		
Establishes a means for Native American Indians to request the return or "repatriation" of human remains and other cultural items. Federal agencies must return human remains, associated funerary objects, sacred objects, and objects of cultural patrimony to the Indian Nations or Tribes with cultural affiliation to the remains or material.	Native American Indian remains have been discovered during remediation activities at the FCP. Native American Indian remains and artifacts have been removed or left in place, with consultation from Native American Indian Nations, Tribes, and Groups.	No Native American remains were discovered or repatriated to Native American Indian Nations, Tribes, or Groups in 2004. As stated above, monitoring for unexpected discoveries was conducted during the Abandoned Outfall Line Project.
Natural Resource Requirements Under CERCLA and Executive Order 12580		
Requires DOE to act as a Trustee (i.e., guardian) for natural resources at its federal facilities.	DOE and the other Trustees, which include the U.S. Department of the Interior, the U.S. Fish and Wildlife Service, OEPA, the Ohio Attorney General's Office, and EPA, meet regularly to discuss potential impact to natural resources and to coordinate Trustee activities. The Trustees also interact with the Fernald Citizens Advisory Board and Community Reuse Organization.	In 2004, the Trustees and DOE continued to pursue settlement of the 1986 Natural Resource injury claim at Fernald. While the components of restoration have been established through a 2001 Memorandum of Understanding (DOE 2001c) and restoration of the site continues, the Trustees and DOE continue to negotiate issues such as maintenance and monitoring at the Fernald site.

2.2.7 Pollution Prevention and Source Reduction

The FCP is actively involved in an effort to reduce solid, hazardous, radioactive, and mixed-waste generation, and eliminate or minimize pollutant releases to all environmental media during site remediation. As part of the Annual Waste Reduction Report under DOE Order 5400.1 (DOE 1990), the FCP submitted the site's summary of waste generated and pollution prevention progress (DOE 2004a), which is available from the DOE's pollution prevention web site (http://www.eh.doe.gov/p2). This report includes 2004 data on waste quantities generated and avoided, as well as narrative text describing pollution prevention and waste minimization efforts and their effectiveness.

Various waste streams were recycled during 2004, including corrugated cardboard (approximately 62 tons [56 metric tons]), toner cartridges (approximately 0.19 tons [.17 metric tons]), scrap tires (approximately 1.8 tons [1.6 metric tons]), and scrap metal (approximately 384 tons [348 metric tons]). Additionally, the following approximate amounts of hazardous wastes were shipped to approved recycle centers or treatment facilities in 2004:

- 42,736 pounds (19,402 kg) of lead acid batteries for recycle
- 1,350 pounds (613 kg) of nickel-cadmium batteries for recycle
- 47,275 pounds (21,463 kg) of used oil for recycle
- 4,600 pounds (2,088 kg) of electrical waste (fluorescent light tubes) for recycle
- 335 pounds (152 kg) of photochemicals for silver recovery.

The FCP's affirmative procurement program involves source reduction and the use of EPA-designated materials to increase the market for recovered materials. In accordance with Executive Order 13101, Greening of the Government Through Waste Prevention, Recycling and Federal Acquisition, the FCP generates an annual report demonstrating compliance with this order.

2.2.8 Site-Specific Regulatory Agreements

2.2.8.1 Federal Facility Compliance Agreement

In July 1986, DOE entered into an FFCA with EPA, which requires the FCP to:

- Maintain a continuous sample collection program for radiological constituents at the treated effluent discharge points and report the results semi-annually to EPA, OEPA, and the Ohio Department of Health. The sampling program to address this requirement has been modified over the years and is currently governed by an agreement reached with EPA and OEPA that became effective May 1, 1996. This agreement requires sampling at the Parshall Flume (PF 4001), the point where treated effluent leaves the FCP, and the Storm Water Retention Basin spillway for radiological constituents. These data are reported through mid-year and annual reports (refer to Appendix B of this report) under the IEMP.

- Maintain a sampling program for daily flow and total uranium at the South Plume extraction wells and report the results semi-annually to the EPA, OEPA, and Ohio Department of Health. The sampling program conducted to address this requirement has also been modified over the years and is currently governed by the agreement reached with EPA and OEPA on May 1, 1996.

2.2.8.2 Federal Facility Agreement, Control, and Abatement of Radon-222 Emissions

The Federal Facility Agreement (FFA) between DOE and EPA, signed in November of 1991, ensures that DOE takes all necessary actions to control and abate radon-222 emissions at the Fernald site, under the authority of 40 CFR 61, Subpart Q. This agreement acknowledges that Silos 1 and 2 exceed the radon flux rate of 20 picoCuries per square meter per second ($pCi/m^2/sec$). But it allowed the FCP to address this exceedance by implementing a removal action (installation of a bentonite cap in 1991) to bring radon emissions from the silos to a level as low as reasonably achievable (ALARA), and to attain the NESHAP Subpart Q standard upon completion of final remediation. The FFA also requires demonstration of compliance with the Subpart Q standard upon completion of remedial actions for the waste pits, clearwell, and any other sources found to contain radium-226 in sufficient concentrations to emit radon in excess of 20 $pCi/m^2/sec$. Chapter 5 further discusses the results of the Radon Monitoring Program for 2004.

2.2.9 Environmental Management Systems Requirement

DOE has required that sites develop and implement Environmental Management Systems (EMS) as a means of systematically planning, implementing, evaluating, and improving processes and actions undertaken to achieve environmental goals. This requirement is specified in DOE Order 450.1, Environmental Protection Program (DOE 2005b), which directs that sites implement an EMS by December 2005. As a CERCLA remediation site, the Fernald site has progressed through, or is in the process of implementing, similar steps of investigation, risk evaluation, remedy selection, planning, execution, and evaluation. During 2004, the site conducted a cross-reference comparison of the elements of the EMS approach versus the systematic method of addressing environmental issues identified under the CERCLA-driven approach. The comparison demonstrated that the substantive elements of an EMS are satisfied through implementation of the CERCLA program at the Fernald site. In addition, the site's Integrated Safety Management System integrates environmental management into the overarching safety program in place at the site. The FCP's Safety Management System Description (DOE 2005c) defines "safety" as including all aspects of environmental, safety, and health including pollution prevention and waste minimization. Recognizing the remediation of the Fernald site through existing programs and processes as defined in the closure contract and CERCLA remediation documentation, the DOE Ohio Field Office has acknowledged that the site meets the intent of DOE Order 450.1 and no modification of the contract was required to incorporate the Order after its issue.

2.3 Split Sampling Program

Since 1987, DOE has participated in the split sampling program with the state. Split samples are obtained when technicians alternately add portions of a sample to two individual sample containers. This collection method helps ensure that both samples are as identical as possible. The split samples are then submitted to two different analytical laboratories; this allows for an independent comparison of data to ascertain laboratory analysis and field quality assurance. In addition to split sampling, OEPA performs some independent sampling. Results are provided in OEPA's Annual Report to the Public on the Fernald Closure Project.

In 2004, DOE and OEPA cooperated in the split sampling program. This time, samples of groundwater were split. The split sample locations for groundwater are shown in Figure 2-2. The results are provided in Table 2-3. The data from the split sampling program show reasonable agreement between DOE and OEPA results for groundwater.

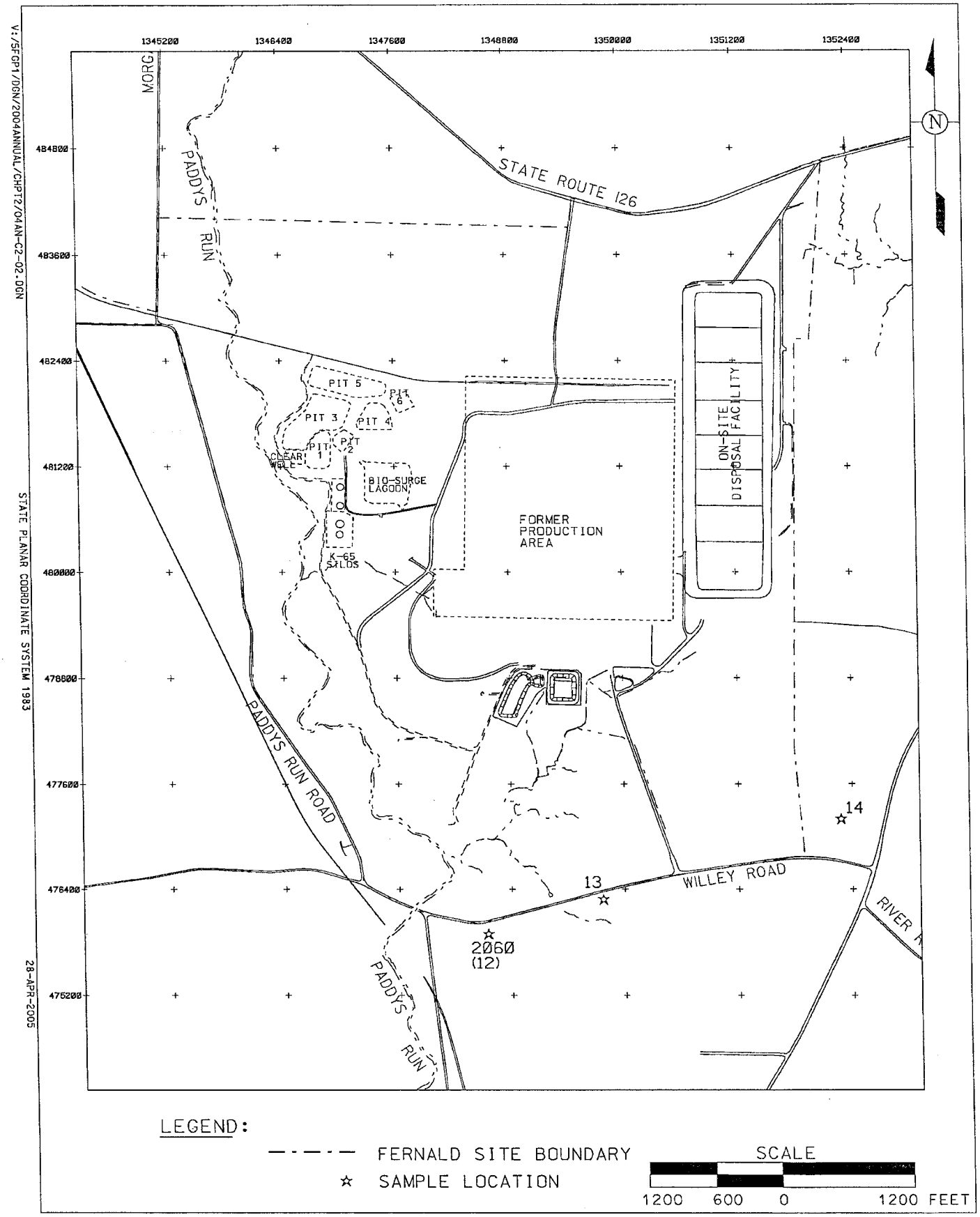


Figure 2-2. 2004 DOE and OEPA Groundwater Split Sample Locations

TABLE 2-3
2004 DOE/OEPA SPLIT SAMPLING COMPARISON

Media	Sample Location	Sample Date	Constituent	DOE Result	OEPA Result	FRL
Groundwater[a]				(µg/L)	(µg/L)	(µg/L)
	2060 (12)	April	Total Uranium	63.5	63.1	30
	2060 (12)	October	Total Uranium	68	78.6	30
	13	April	Total Uranium	16.8	16.4	30
	13	October	Total Uranium	12.7	16.3	30
	14	April	Total Uranium	3.24	3.17	30
	14	October	Total Uranium	3.59	4.28	30

[a]Refer to Figure 2-2 for groundwater split sample locations.