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EMCBC-00327-07

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Dear Mr. Saric and Mr. Schneider:

SUBMISSION OF THE FINAL REMEDIAL ACTION REPORT FOR OPERABLE UNIT 3

Reference: 1) DOE Letter DOE-0089-07, Johnny W. Reising to James Saric and Thomas Schneider "Submission of the Final Remedial Action Report for Operable Unit 3," dated December 7, 2006

2) USEPA Letter, James Saric to Johnny Reising, "OU3 Remedial Action Report," dated January 10, 2007

3) Ohio EPA Letter, Thomas Schneider to Johnny Reising, "Approval – Final Remedial Action Report for Operable Unit 3 at the Fernald Closure Project," dated January 17, 2007

Enclosed are three signed copies of the *Final Remedial Action Report For Operable Unit 3 (February 2007)* as requested by the United States Environmental Protection Agency (USEPA) (Reference 2). Also enclosed is a response to comments document related to the review and comments received from USEPA. The Ohio EPA approved the document without comments (Reference 3).

Please contact me at (513) 648-3139, if you have any questions.

Sincerely,

Johnny Reising

Johnny W. Reising
Director, Fernald Closure Project

Enclosures:

cc w/o enclosures
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Final Remedial Action Report For Operable Unit 3 at the Fernald Closure Project

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1.0 INTRODUCTION

This document serves as the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial action closeout report for Operable Unit 3 at the U.S. Department of Energy's (DOE's) Fernald Closure Project (FCP) located near Cincinnati, Ohio. It has been prepared to meet U.S Environmental Protection Agency (EPA) guidance for CERCLA site closeout as described in EPA Office of Solid Waste and Emergency Response (OSWER) Directive No. 9320.2-09A-P, *Closeout Procedures for National Priorities List (NPL) Sites* (January 2000). The aim of this EPA Directive is to communicate EPA's key principles and expectations for remedial action closeout, along with "best practices" based on CERCLA program experience that should be consulted for closing out NPL sites in a consistent and reasonable manner across the program. EPA's guidance recommends a standard closeout report outline that has been followed in the preparation of this Operable Unit 3 FCP closeout report.

During the fall of 2004, EPA and DOE identified the manner in which the time-sequenced individual closeout reports would be coordinated across the five operable units. This approach recognizes that the source-control remedial actions (i.e., Operable Units 1, 2, and 4), decontamination and dismantlement (D&D) and legacy waste disposition activities (Operable Unit 3), the majority of soils remediation (part of Operable Unit 5), and the closure of the FCP's on-site disposal facility (OSDF) are all targeted for completion in 2006, while groundwater restoration (part of Operable Unit 5) will continue beyond 2006. The remaining activities that extend beyond 2006 are: 1) continued restoration activities for the Great Miami Aquifer; 2) the performance monitoring and final certification activities necessary to demonstrate completion of aquifer restoration; and 3) the final D&D and removal of groundwater related facilities and any affected soils above final remediation levels (FRLs) beneath the groundwater facilities as required. As the mechanism to communicate the agreed-to closeout report strategy, EPA and DOE issued a Spring 2005 fact sheet describing the coordination approach across the operable units [DOE 2005] and described in detail in Section 1.5. Under the coordination strategy, this closeout report for Operable Unit 3 documents the completion of Operable Unit 3's remedial actions along with the completion of D&D activities for the remediation facilities constructed to support the waste pits and silos projects (Operable Units 1 and 4). As stated in the fact sheet, the completion of D&D activities for the groundwater remediation facilities will be documented in the final Operable Unit 5 Remedial Action Report, which will be prepared once ongoing groundwater restoration activities are complete (projected completion in the year 2026, based on computer modeling).

Operable Unit 3 is one of five operable units at the FCP, and is comprised of the former uranium processing facilities and equipment as well as other site man-made facilities. The Operable Unit 3 clean-up mission includes the remedial actions to address the D&D and final disposal of the physical structures and facilities (e.g.,

production-area buildings, storage pads, warehouses, and above-grade storage tanks), containerized legacy waste inventories, remaining uranium product, and other equipment items that were impacted during Fernald's former production activities and waste generating activities. Operable Unit 3 also encompasses the D&D of the new remedial facilities constructed to support the site-wide CERCLA remedial actions for the other operable units at the FCP.

This closeout report is organized into ten major sections and nine appendices, consistent with EPA's recommended format in its closure guidance. Section 1.0 provides an overview of the FCP, the cleanup objectives, and the overall remedial activities comprising the FCP's site-wide cleanup program. Section 2.0 provides an overview specific to Operable Unit 3 and the remedial actions that were selected in the Operable Unit 3 Record of Decision (ROD). Section 3.0 addresses activities associated with the Operable Unit 3 remedial actions, including the D&D of the new remedial action facilities for Operable Units 1 and 4 that are covered by this report. Section 4.0 provides an annotated chronology of the key events contributing to successful completion and documentation of the actions. Sections 5.0 and 6.0 address performance standards, quality control, and final inspections and certifications, while Section 7.0 summarizes operations and maintenance information as appropriate. Section 8.0 summarizes remedy cost information, and compares actual remedial costs with the original estimates contained in the Operable Unit 3 ROD. Section 9.0 identifies lessons learned during remedy implementation, and Section 10.0 summarizes key Operable Unit 3 remedial action contact information.

1.1 Fernald Closure Project Overview

The FCP is a 1050-acre government-owned contractor-operated facility located in southwestern Ohio approximately 18 miles northwest of downtown Cincinnati. The facility is located just north of Fernald, Ohio, a small farming community, and lies on the boundary between Hamilton and Butler counties. Of the total site area, approximately 850 acres are in Crosby Township in Hamilton County and 200 acres are in Ross and Morgan Townships in Butler County.

The Atomic Energy Commission (AEC), predecessor to the U.S. Energy Research and Development Administration (ERDA) and then the DOE, established the Feed Materials Production Center (FMPC) in conformance with AEC orders in the early 1950s. In 1951, National Lead Company of Ohio, Inc., (now NLO) entered into a contract with the AEC as the Management and Operations Contractor for the facility. This contractual relationship lasted until January 1, 1986. Westinghouse Materials Company of Ohio (WMCO), a wholly owned subsidiary of Westinghouse Electric Corporation, then assumed management responsibilities for the site operations and facilities. In 1991, Westinghouse renamed this subsidiary the Westinghouse Environmental Management Company of Ohio (WEMCO). During that same year, DOE renamed the site the Fernald Environmental Management Project (FEMP) to reflect the site's revised mission. On December 1, 1992, Fernald Environmental Restoration Management Company (FERMCO) (now Fluor Fernald) assumed responsibility for the site as the Environmental Restoration Management Contractor for DOE. The FEMP was renamed the Fernald Closure Project on January 27, 2003.

1.2 Mission of the Site

The primary mission of the FMPC during its 37 years of operation was the processing of uranium feed materials to produce high purity uranium metal. These high purity uranium metals were then shipped to other DOE or U.S. Department of Defense facilities for use in the nation's weapons program. Manufacture of the uranium metal products occurred in a concentrated 140-acre area of the site known as the Production Area, where 255 production, storage, support, and administrative buildings and structures were situated. During the 37 years

of production operations, nearly 500 million pounds of uranium metal products were produced. The site also served as the nation's key federal repository for thorium-related nuclear products, and it also recycled uranium used in the reactors at the Hanford site. These recycled reactor returns were the source of technetium 99, a radiological contaminant that was prevalent at the site.

In accomplishing the site mission, liquid and solid wastes were generated by the various operations between 1952 and 1989. Before 1984, solid and slurried wastes from FEMP processes were deposited in the on-property waste storage area. This area, located west of the former production area, includes: six low-level radioactive waste storage pits; two earthen-bermed concrete silos containing K-65 residues; one concrete silo containing metal oxides; one unused concrete silo; two Lime Sludge Ponds; a Burn Pit; a Clearwell; a Solid Waste Landfill; and a and a lagoon known as the bio-surge lagoon to treat wastewater. After 1984, wastes produced from operations were containerized for eventual shipment to off site disposal facilities. Contaminants from material processing and related activities were released into the environment through air emissions, wastewater discharges, storm water runoff, and leaks and spills.

1.3 Regulatory History

The CERCLA Remedial Investigation/Feasibility Study (RI/FS) process at the FEMP began in 1986, in accordance with a Federal Facility Compliance Agreement (FFCA) between DOE and EPA to cover environmental impacts associated with the FEMP. The FFCA was intended to ensure that environmental impacts associated with activities at the facility would be thoroughly and adequately addressed. In response to the FFCA, a site-wide RI/FS was initiated pursuant to CERCLA, as amended by the Superfund Amendment and Reauthorization Act (SARA). Production operations at the facility were suspended in 1989 and the facility was placed on the National Priorities List. The FFCA was amended in April 1990 by a Consent Agreement (under §120 106[a] of CERCLA) that revised the milestone dates for the RI/FS and provided for implementation of removal actions. The Consent Agreement was amended in September 1991 to revise schedules for completing the RI/FS process. This amended Consent Agreement (ACA) provided for implementation of the operable unit concept. The FEMP was partitioned into five operable units to promote a more structured and expeditious cleanup. The schedule for preparation of a remedial investigation report and feasibility study report for each operable unit was included in the amended Consent Agreement.

The Ohio Environmental Protection Agency (Ohio EPA) Office of Federal Facilities Oversight (OFFO) also oversees cleanup activities at the site as a support agency primarily through the December 1988 Consent Decree and its January 1993 amendment. Ohio EPA conducts environmental monitoring, public outreach, restoration and remediation oversight at the FCP, as well as maintaining authority for Resource Conservation and Recovery Act (RCRA) enforcement. The June 1996 Director's Final Findings and Orders between the DOE/Fluor Fernald and the Ohio EPA provide orders for closure activities relative to several Hazardous Waste Management Units (HWMUs) established at the site to satisfy both RCRA and CERCLA requirements.

1.4 Site-Wide Operable Units and Cleanup Strategy

For purposes of investigation and study, the remedial issues and concerns that were similar in location, history, type/level of contamination, and inherent characteristics were grouped into operable units under the 1991 amended Consent Agreement. Specifically, the site was divided into five operable units. Four of the operable units (1 through 4) are considered contaminant "source" operable units as they represent the physical sources of contamination that have affected the site's environmental media. The fifth operable unit (Operable Unit 5) is considered the "environmental media" operable unit as it represents the environmental media affected by past

production operations and waste disposal practices (i.e., beyond the contaminant "source" operable unit boundaries), as well as the pathways of contaminant migration at the site. The four contaminant "source" operable units and the fifth environmental media operable unit are described below:

- Operable Unit 1: Waste Pit Area. Waste Pits 1 through 6, Clearwell, Burn Pit, berms, liners, and affected soil residing within the operable unit boundary.
- Operable Unit 2: Other Waste Units. The Active and Inactive Flyash Piles, the South Field disposal area, north and south Lime Sludge Ponds, the Solid Waste Landfill, and the berms, liners, and affected soil residing within the operable unit boundary. The Active and Inactive Flyash Piles and South Field area are collectively known as the "Southern Waste Units" because they are collocated in close geographic proximity to one another.
- Operable Unit 3: Former Production Area. Former production and production-associated facilities and equipment (including all above- and below-grade improvements), including, but not limited to, all structures, equipment, utilities, drums, tanks, solid waste, waste, product, thorium, effluent lines, a portion of the K-65 transfer line, wastewater treatment facilities, fire training facilities, scrap metal piles, feedstocks, and coal pile. Note that all affected soil beneath the facilities falls within Operable Unit 5.
- Operable Unit 4: Silos 1 through 4. Contents of Silos 1, 2, and 3 (Silo 4 has remained empty); the silos structures, berms, decant sump tank system, and affected soil residing within the operable unit boundary.
- Operable Unit 5: Environmental Media. Affected groundwater, surface water, all soil not included in the definitions of Operable Units 1, 2, and 4, sediment, flora, and fauna.

During the time period 1994 to 1996, DOE and EPA signed the final RODs for each operable unit, in cooperation with the Ohio EPA and the Fernald Citizen's Advisory Board, which set in motion the major cleanup requirements and approaches that collectively define the FCP cleanup. The RODs employ a combination of off-site and on-site disposal, under which approximately 77 percent of the remedial waste volume (the site's lower concentration, higher volume materials) was to be disposed of in an engineered on-site disposal facility while approximately 23 percent (the site's higher concentration, lower volume materials) were to be sent off site for disposal, primarily at permitted facilities in Utah, Nevada, and Texas.

At the time the RI/FS activities were completed and the RODs put in place, an estimated 31 million pounds of uranium products, 2.5 billion pounds of waste, 255 buildings and structures, and 2.75 million cubic yards of contaminated soil and debris were identified as requiring action. In addition, a 223-acre portion of the Great Miami Aquifer was found to be contaminated at levels above radiological drinking water standards. Under the site-wide approach, the final remedial actions contained in the operable unit RODs are:

- Production and support facility D&D
- On-site disposal of contaminated soil, above-and below-grade debris, and Operable Unit 2 waste-unit materials, provided on-site waste acceptance criteria (WAC) are met
- Off-site disposal of the contents of the silos, the waste pit materials, nuclear product inventories, containerized low-level and mixed waste inventories, and the quantities of soil and debris that do not meet OSDF WAC
- Extraction and treatment of contaminated groundwater to restore the contaminated portions of the Great Miami Aquifer to meet Safe Drinking Water Act requirements.

At completion, approximately 975 acres of the 1,050-acre property will be restored for use as an undeveloped park (the target land use selected in the Operable Unit 5 ROD), and approximately 75 acres will be dedicated to

the footprint of the OSDF. The Great Miami Aquifer will be restored to drinking water standards, and long-term stewardship actions and requisite institutional controls will be put in place consistent with the target land use. Groundwater restoration for the Great Miami Aquifer is estimated to be complete in 2006, based on modeling projections.

Taken together, the individual RODs for the operable units provide a site-wide cleanup approach that encompasses all contaminant source areas and all affected environmental media at the site. Collectively the RODs provide a natural link between the remediation of the sources of contamination and the media affected. Each ROD progressively built on the decisions of the earlier RODs, yielding a cohesive and comprehensive remedy for the FCP. The dates of ROD signature and progressive sequence of decisions adopted under the RODs are shown below:

- Operable Unit 3 ROD for Interim Remedial Action (July 22, 1994) – provided accelerated approval for the D&D of the FCP's buildings and structures.
- Operable Unit 4 ROD for Final Remedial Action (December 7, 1994) – provided for the remediation of Silos 1 through 4, affected soil within the operable unit boundary, and other sources of contamination with the boundary. The D&D of all remedial facilities constructed for the Operable Unit 4 remedial action are to be addressed as part of Operable Unit 3.
- Operable Unit 1 ROD for Final Remedial Action (March 1, 1995) – provided for the remediation of the waste pit contents, caps and liners, affected soil within the operable unit boundary, and other sources of contamination within the boundary. The D&D of all remedial facilities constructed for the Operable Unit 1 remedial action are to be addressed as part of Operable Unit 3.
- Operable Unit 2 ROD for Final Remedial Action (June 8, 1995) – provided for the remediation of the Active and Inactive Flyash Piles, South Field disposal area, the two Lime Sludge Ponds, Solid Waste Landfill, affected soil within the operable unit boundary, and other sources of contamination within the boundary. This decision set in motion the approval of on-site disposal at the FCP and the construction of the OSDF; however, at the time it was formally limited to the disposal of the Operable Unit 2 wastes since the Operable Unit 5 and 3 decisions related to waste disposition (on site or off site) were not yet final.
- Operable Unit 5 ROD for Final Remedial Action (January 31, 1996) – provided for the remediation of the FCP's on-site and off-site environmental media. This ROD addressed the cleanup of the Great Miami Aquifer at all locations, and the remediation of affected site-wide soil and sediment outside the source operable unit boundaries. It also addressed the monitoring of air, surface water, groundwater, sediment, and biota. The Operable Unit 5 ROD finalized the concept of a site-wide OSDF, and further incorporated the "balanced approach" concept into FCP on-site and off-site waste disposition decisions. The D&D of all remedial facilities constructed to support the Operable Unit 5 groundwater remedial action were to be addressed as part of Operable Unit 3.
- Operable Unit 3 ROD for Final Remedial Action (September 24, 1996) – provided a final disposition decision for the D&D materials generated through the Interim Remedial Action ROD. Consistent with the Operable Unit 5 decision, this final decision document adopted on-site disposal as the selected remedy for disposition of the D&D debris. It also adopted earlier decisions as part of the "balanced approach" to send the FCP's containerized waste inventories and nuclear materials off site. The ROD also acknowledged that the D&D of new remedial facilities constructed at the site would be addressed as part of Operable Unit 3.

1.5 Site-Wide Remedial Action Closeout Report Strategy -- Spring 2005 Fact Sheet

In the spring of 2005, DOE and EPA developed a fact sheet to describe the strategy for producing the closeout reports for the CERCLA operable unit remedial actions completed for the FCP. Where affected media (primarily soil within an operable unit boundary) was a part of the source operable unit remedy, it was determined to be

appropriate to accommodate the documentation of the remediation of that soil under the Operable Unit 5 closeout report. Therefore, only the source waste material would be addressed in their respective Final Remedial Action Reports, while the contaminated media within the source operable unit boundaries would be addressed under Operable Unit 5. In essence, this fact sheet adopted the following strategy for submitting remedial action closeout reports for EPA approval (and summarized in Figure 1-1 on the following page):

- Proceed with formal closeout of Operable Unit 1 when the waste pit contents and liners have been successfully dispositioned off site. The remaining operable unit scope (soil remediation within the Operable Unit 1 boundary, and D&D of Operable Unit 1 remediation facilities) would be documented in the closeout reports for Operable Units 5 and 3, respectively.
- Proceed with formal closeout of Operable Unit 2 when the waste materials from the Solid Waste Landfill, the two Lime Sludge Ponds, Active and Inactive Flyash Piles, and the South Field area have been successfully placed in the OSDF, or dispositioned off site as necessary based on OSDF WAC restrictions. The remaining operable unit scope (soil remediation within the Operable Unit 2 waste unit boundaries) would be documented in the closeout report for Operable Unit 5.
- Proceed with formal closeout of Operable Unit 3 when the D&D of site-wide facilities -- including the remediation facilities constructed for Operable Units 1 and 4 -- are complete and all legacy-era containerized wastes have been successfully dispositioned off site.
- Proceed with formal closeout of Operable Unit 4 when the silo contents for Silos 1&2 and Silo 3 have been successfully dispositioned off site. The remaining operable unit scope (soil remediation within the Operable Unit 4 boundary, and D&D of Operable Unit 4 remediation facilities and the empty silo structures) would be documented in the closeout reports for Operable Units 5 and 3, respectively.
- Proceed with an interim Remedial Action report for Operable Unit 5 that recognizes that Great Miami Aquifer restoration activities will continue beyond DOE's 2006 baseline closure date. As an interim Remedial Action Report, the three major subsections will address completion of soil restoration activities (including those within the Operable Units 1, 2 and 4 boundaries) and closure of the OSDF, but will also need to recognize that ongoing aquifer restoration activities, future D&D of groundwater infrastructure, and final soil remediation (as necessary beneath the remaining groundwater infrastructure) remain as open items that will be closed out with a future final Remedial Action Report for Operable Unit 5 once groundwater actions are complete (estimated completion date in 2026, based on modeling projections). The interim Remedial Action Report under Operable Unit 5 will therefore consist of three independent subsections: soil and sediment remediation, OSDF closeout, and aquifer restoration activities.

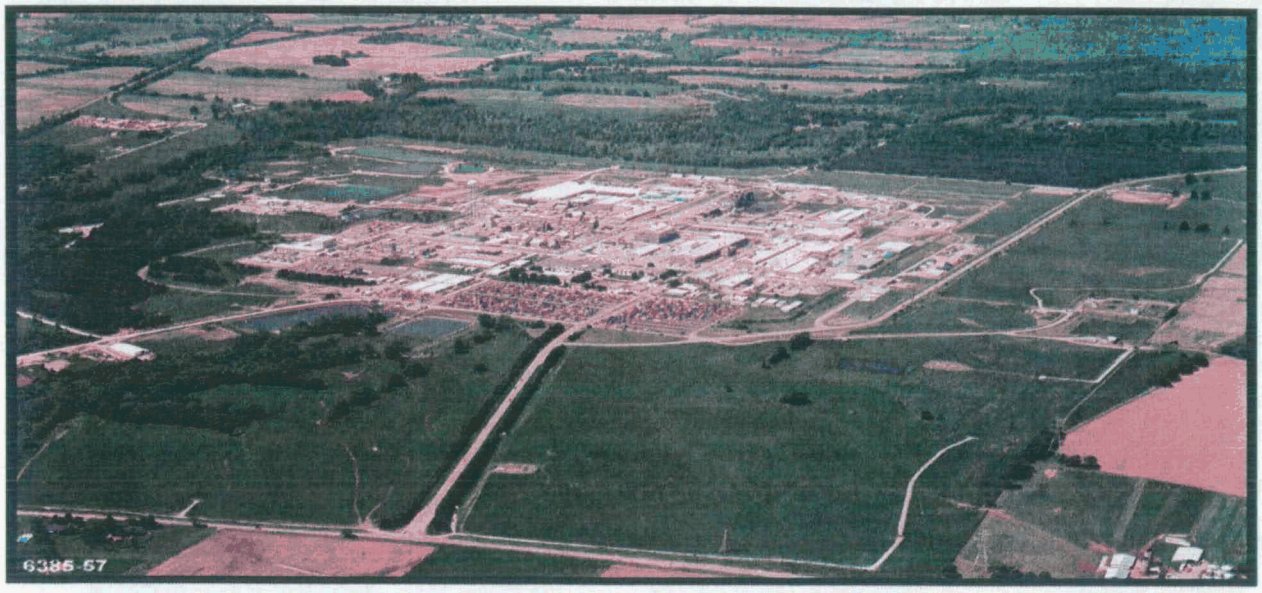
Figure 1-1 Summary of CERCLA Remedial Action Closeout Reports and Schedule

Operable Unit	Key Closeout Activity	Where Documented	Remaining Scope	Where Documented
Operable Unit 1 Waste Pits	Waste pit contents successfully dispositioned off site	Final Remedial Action Report for Operable Unit 1 (Approved August 30, 2006)	Soil Remediation within Operable Unit 1 boundary D&D of Operable Unit 1 Remediation Facilities	Interim Remedial Action Report for Operable Unit 5 (Summer 2007) Final Remedial Action Report for Operable Unit 3 (Winter 2007)
Operable Unit 2 Other Waste Units	Wastes from Solid Waste Landfill, Lime Sludge Ponds, Flyash Piles, and South Field area successfully placed in OSDF or dispositioned off site as required	Final Remedial Action Report for Operable Unit 2 (Approved September 27, 2006)	Soil Remediation within Operable Unit 2 boundary	Interim Remedial Action Report for Operable Unit 5 (Summer 2007)
Operable Unit 3 Production Area Facilities	D&D of site-wide facilities (except for groundwater infrastructure); completion of Legacy Waste disposal	Final Remedial Action Report for Operable Unit 3 (Winter 2007)	None	NA
Operable Unit 4 Silos	Silo 3 material successfully disposed offsite; Silos 1 & 2 material successfully treated, packaged, and transported offsite into temporary storage.	Final Remedial Action Report for Operable Unit 4 (Approved September 27, 2006)	Soil Remediation within Operable Unit 4 boundary D&D of Operable Unit 4 Remediation Facilities Permanent offsite disposal of Silos 1 & 2 material	Interim Remedial Action Report for Operable Unit 5 (Summer 2007) Final Remedial Action Report for Operable Unit 3 (Winter 2007) An addendum to the Final Remedial Action Report for Operable Unit 4 (post-closure)
Operable Unit 5 Environmental Media	Groundwater remediation infrastructure is installed and operating. Completion of all soil remediation site wide, except for beneath long-term groundwater facilities The On-Site Disposal Facility is capped	Interim Remedial Action Report for Operable Unit 5 (Summer 2007) Interim Remedial Action Report for Operable Unit 5 (Summer 2007) Interim Remedial Action Report for Operable Unit 5 (Summer 2007)	D&D of groundwater facilities once groundwater remedy is complete; certification of surface water and sediments Soil remediation and certification beneath groundwater facilities Long-term care and monitoring	Final Remedial Action Report for Operable Unit 5 (post-closure) Final Remedial Action Report for Operable Unit 5 (post-closure) Final Remedial Action Report for Operable Unit 5 (post-closure)

2.0 OPERABLE UNIT 3 BACKGROUND

At the time Fernald's uranium production mission formally ended in August 1991, a total of 255 production-era legacy process-related buildings, structures, and administrative facilities were present and required remedial action. (Note that when the new facilities constructed as a result of the RODs for the site-wide remedial activities are added, the total number of facilities and structures increased to 316.) Figure 2-1 is an aerial view of the Fernald facility at about the time production operations ceased. The major production facilities and structures that comprise the former Production Area and which made up the bulk of the Operable Unit 3 dismantlement activities occupy the central portion of the photo.

Figure 2-1: Former Production Area (circa 1990)



At the time production operations ceased, an estimated quantity of approximately 10,160 cubic yards (31 million pounds) of uranium product inventory, 35,600 cubic yards of containerized legacy wastes, and 1,000 cubic yards of containerized thorium inventory required disposal. Many of the legacy production facilities (process lines, drumming stations, etc.) and associated equipment still contained quantities of raw, intermediate, and finished production-related products, which were termed "holdup materials." The facility safe shutdown program was initiated as a removal action (see Removal Action 12, discussed below) to remove and properly disposition all nuclear product and in-process residue materials, excess supplies, chemicals, and associated process equipment items left in place when the facility ceased production. The safe shutdown program also provided for the isolation and de-energizing of utilities and equipment prior to the start of D&D activities for the individual production-area facilities.

As discussed in detail below, DOE and EPA decided through the site's initial removal action decisions that the "holdup materials" and other process-related materials removed through safe shutdown – along with the FCP's containerized legacy waste inventories – would be sent off site for disposal ahead of the main CERCLA remedy decisions contained in the RODs.

2.1 Approach to Operable Unit 3 Remedial Decision Making

The CERCLA decision-making approach for selecting cleanup actions for Operable Unit 3 involved an interim remedial action ROD; a final remedial action ROD; and several removal actions initiated ahead of the RODs. The decisions adopted for the earlier removal actions that were still ongoing were incorporated by reference into the final remedial action ROD, and adopted by the Operable Unit 3 Integrated Remedial Design/Remedial Action (RD/RA) Work Plan [DOE 1997a] for continued implementation during the final remedial action.

Each of the removal action decisions and the interim and final remedial action RODs are described below.

2.1.1 Interim Remedial Action ROD

At the time that uranium production operations ceased at Fernald, the former production buildings were at or beyond their design lives, and no viable future mission existed for the aging buildings and structures. As a result, DOE and EPA officially decided all of Fernald's buildings and structures would be dismantled, and the resulting dismantlement debris would be placed in interim storage. The initial dismantlement and interim storage decision was formally documented in the July 1994 Operable Unit 3 ROD for Interim Action (IROD) [DOE 1994]. The IROD also provided that a subsequent final remedial action ROD would establish the final disposition strategy and locations for the materials generated by the interim remedial action. The first-step remedial activities approved through the IROD were:

- Surface decontamination of the buildings and structures by removing/fixing loose contamination
- Dismantlement of the above-grade buildings and structures
- Removal of foundations, storage pads, ponds, basins, and underground utilities and other at- and below-grade structures
- Off-site disposal, of up to ten percent by volume, of the non-recoverable waste and debris generated from structural D&D, until issuance of the final remedial action ROD
- Interim storage of the remaining waste and debris until a final disposition decision is identified in the final remedial action ROD.

The sequence and schedule for which the above-grade portions of the structures would undergo D&D were outlined in the 1995 Operable Unit 3 Remedial Design Prioritization and Sequencing Report [DOE 1995a], which was updated and approved by EPA in 1996. Work practices and implementation strategies for the interim activities were defined in the Operable Unit 3 RD/RA Work Plan for Interim Remedial Action [DOE 1995b], which was approved by EPA in 1995. It was also agreed at that time that the at- and below-grade remediation of the Operable Unit 3 structures, storage pads, etc. would be sequenced and scheduled as part of the Operable Unit 5 remedial design/remedial action process, to allow the at- and below-grade activities to be coordinated with soil remediation activities.

In summary, the main advantage offered by the 1994 ROD for interim remedial action was in its ability to allow structural D&D and temporary debris stockpiling activities to proceed concurrently while Operable Unit 3 field investigations were underway -- thereby allowing significant early skyline change and demolition work to begin ahead of the final treatment and dispositioning decisions accomplished by the final remedial action ROD.

2.1.2 Integration of Operable Unit 3 Removal Actions with the Final Action

When production operations ceased in 1989, 30 removal actions were put in place across the site by DOE and EPA (ahead of the CERCLA RODs) to further stabilize existing site conditions, prepare the site for longer-term actions, and abate any immediate physical or environmental threats posed by the site's facilities and contaminants.

Under CERCLA a removal action is defined as "short-term cleanup often completed before a more formal ROD process." Four of the removal actions were programmatic in nature, and were subsequently integrated directly into the final Operable Unit 3 ROD:

- Removal Action 9 – Removal of Waste Inventories
- Removal Action 12 – Safe Shutdown
- Removal Action 17 – Improved Storage of Soil and Debris
- Removal Action 26 – Asbestos Abatement.

A summary of the four programmatic removal actions that were incorporated into the final remedial action ROD is provided below.

Removal Action 9 – Removal of Waste Inventories

Removal Action 9 involved the safe, off-site disposal of existing waste inventories. Containerization of Fernald's major waste streams was initiated in August 1985, and Removal Action 9 was formally set in motion in 1991 to provide for the transfer of inventoried waste to the Nevada Test Site (NTS). The waste management program initiated by Removal Action 9 defined the procedures for waste characterization, treatment, packaging, and transportation of waste in a manner that provides compliance with DOE Orders, Department of Transportation shipping requirements, and NTS WAC. The procedures and disposition decisions of Removal Action 9 were adopted directly by the final remedial action ROD and incorporated by reference in the Operable Unit 3 Integrated RD/RA work plan for continued implementation during the execution of the Operable Unit 3 remedy. Removal Action 9 addressed the FCP's inventory of low-level waste, mixed waste, and Toxic Substances Control Act (TSCA) wastes that were generated as a result of production operations, facility maintenance, site upgrades, and pre-ROD cleanup activities. The procedures developed through the evolution of Removal Action 9 were also used to prepare, package, and ship the FCP's nuclear materials off-site for transfer to other approved DOE facilities.

Removal Action 12 – Safe Shutdown

Removal Action 12 was created to provide the planning, engineering, and program control for the removal and disposition of in-process residue materials, excess supplies, chemicals, and the associated process equipment that remained when Fernald stopped production in 1989. Residue materials removed during safe shutdown were containerized and sent for off-site disposal under the procedures developed under Removal Action 9. The removal action also provided for the isolation and de-energizing of former production-related equipment and utilities and provided for the identification of new customers for Fernald equipment and nuclear products. On a programmatic basis the scope, planning, and procedures that comprised Removal Action 12 were incorporated by reference into the final remedial action ROD and Integrated RD/RA work plan for continued implementation during the Operable Unit 3 final remedial action.

Removal Action 17 – Improved Storage of Soil and Debris

Removal Action 17 was initiated to provide controlled storage of excess contaminated soil and debris generated during maintenance, construction, removal, and remedial actions through a soil and debris management plan. On a programmatic basis the scope, planning, and procedures that comprise this removal action were adopted by the final remedial action ROD and incorporated into the Operable Unit 3 final remedial action. The EPA approved Removal Action 17 Work Plan was incorporated by reference into the Operable Unit 3 Integrated RD/RA work

plan, to provide the ongoing direction necessary for interim storage and staging of Operable Unit 3 materials during the interim and final remedial actions.

Removal Action 26 – Asbestos Removal

Removal Action 26 was established as a specialized maintenance-related activity to mitigate potential asbestos release during conduct of ongoing maintenance, safe shutdown, and site cleanup activities. Since asbestos removal and abatement activities were going to continue throughout the life of the Operable Unit 3 remedy, the final remedial action ROD adopted the earlier management procedures and approaches established under Removal Action 26, while also deciding on the final destination disposal locations (on site and off site) and eligibility for the categories of asbestos-containing materials generated during the remedial actions.

With the signing of the final remedial action ROD (discussed below), the four programmatic removal actions were officially incorporated into the formal Operable Unit 3 remedy. A letter issued by DOE in June 1997 and approved by EPA [DOE 1997b] formally closed the administrative record file for the four removal actions.

2.2 Final Remedial Action ROD

2.2.1 Findings of the Operable Unit 3 Remedial Investigation (RI) and Feasibility Study (FS)

As a backdrop for the final remedial action ROD discussed in Section 2.3.2, this section summarizes the findings of the Operable Unit 3 RI/FS [DOE 1996a], leading to a definition of the categories and an estimate of the volumes of waste materials associated with Operable Unit 3.

The sources of contamination within Operable Unit 3 consist of the legacy waste inventories and the various types of materials that make up the physical structures of the former process areas at the FCP. The RI sampling approach involved the analysis of intrusive samples from major media (concrete, asphalt, acid brick, masonry, transite, and steel coatings) and loose samples from supplemental media (residues, floor sweepings, sediment, sludges, etc.). The samples were analyzed for a broad suite of radionuclides, metals, volatile organics, semi-volatile organics, and poly-chlorinated bi-phenols (PCBs).

Consistent with Fernald's production history, the results of the RI showed that that the most common and highest levels of radiological contamination are associated with uranium and its decay products followed by thorium and its decay products. The highest levels of uranium were associated with residual material remaining in piping and equipment. Along with uranium, technetium-99 (Tc-99), and thorium-230 were also found to be significant radiological constituents affecting remedial action decision-making. Uranium was considered significant due to its widespread distribution across the Operable Unit 3 materials and its impact on potential on-site and off-site disposition decisions contemplated in the final remedial action ROD. Thorium-230 (an impurity in the uranium ores and ore concentrates processed at Fernald) was considered significant because it poses a potential inhalation hazard to workers during remedial activities if the proper personal protective equipment is not in place. Tc-99 (a trace impurity in recycled uranium processed at Fernald) was considered significant because of its mobility in the environment when leached from affected materials.

The most common non-radiological contaminants found in association with the Operable Unit 3 materials were the inorganic contaminants barium, chromium, cadmium, lead, and mercury. Based on the presence of the inorganic contaminants, a total of about 2,270 cubic yards of Operable Unit 3 material was estimated in the RI/FS as potentially qualifying as mixed hazardous/radioactive waste under RCRA. The majority of this mixed waste volume was found as a subset of containerized wastes within the containerized waste inventory while about 200

cubic yards was estimated to be associated with the acid brick and lead flashing material categories that would be encountered during the dismantlement of Operable Unit 3 structures. The presence of the acid brick and lead flashing was factored into the on-site waste acceptance criteria eligibility decisions for the D&D materials in the final remedial action ROD. The acid brick and lead flashing were deemed ineligible for disposal in the OSDF and were required to be sent off site for disposal.

During the RI/FS, the containerized waste inventories, nuclear materials, and the construction materials that make up the buildings, structures, and associated facilities were classified into ten distinct material categories based on similar or inherent properties and physical configuration. Table 2-1 summarizes the ten categories and the types of materials that fall within each category. These categories were used during the RI/FS to support remedy decision-making for the final remedial action ROD.

Table 2-1 Operable Unit 3 Material Categories/Descriptions

Category A Accessible Metals	Category B Inaccessible Metals	Category C Process-Related Metals	Category D Painted Light-Gauge Metals	Category E Concrete	Category F Brick	Category G Non-Regulated ACM	Category H Regulated ACM	Category I Miscellaneous Materials	Category J Project, Residues, and Special Materials
Structural and Misc. Steel	Doors	Electrical Equipment	Ductwork	Asphalt	Acid Brick	Ceiling Demo.	Ductwork Insulation	PVC Conduit	Coal Pile
	Conduit/Wire/ Cable Tray	HVAC Equipment	Lead Flashing	Slabs		Feeder Cable	Piping Insulation	Basin Liners	Gravel Pile
	Electrical Wiring and Fixtures	Material Handling Equipment	Louvers	Columns		Fire Brick	Personal Protective Equipment	Fabric	Hazardous/Mixed Waste
	Electrical Transformers	Process Equipment	Metal Wall and Roof Panels	Beams		Floor Tile	Copper Scrap Metal Pile	Drywall	Low-Level Waste
	Misc. Electrical Items	Misc. Equipment		Foundations		Transite Wall and Roof Panels		Building Insulation	Marketable Nuclear Material
	Electrical Equipment	Process Piping		Walls				Miscellaneous Debris	Outside Equipment Storage Area
	HVAC Equipment			Masonry				Personal Protective Equipment	Rock Salt Pile
	Material Handling Equipment			Clay Piping				PVC Piping	Sand Piles
	Process Equipment							Roofing Build-Up	Soil Piles
	Misc. Equipment							Process Trailers	Thorium Inventory
	Piping							Non-Process Trailers	Scrap Metal Pile
								Windows	
								Wood	

2.2.2 Final Remedial Action ROD – The Final Disposition Remedy for Operable Unit 3

Three final remedial action alternatives were identified in the FS and carried forward for detailed evaluation: No Further Action (Alternative 1); Selected Material Treatment, On-Property Disposal, and Off-Site Disposition (Alternative 2); and Selected Material Treatment and Off-Site Disposition (Alternative 3). As described below, DOE and EPA selected Alternative 2 as the preferred alternative.

DOE and EPA signed the final remedial action ROD [DOE 1996b] in September 1996, following the receipt and closeout of public comments on the Proposed Plan. The final remedial action ROD adopted Alternative 2 – Selected Material Treatment, On-Property Disposal, and Off-Site Disposition, as the selected remedy for final dispositioning of the Operable Unit 3 materials. The key components of the selected remedy for final remedial action are:

- Adoption of Previous Operable Unit 3 Decisions
  - Incorporates the facility and structural D&D decisions contained in the IROD so as to provide for an integrated implementation of the interim and final decisions
  - Adopts the procedures and off-site disposition decisions (primarily Removal Actions 9 and 12) to continue the off-site disposition of the containerized wastes, products, residues, and nuclear materials generated during historical site operations
  - Adopts the prior procedures and decisions for the management of Safe Shutdown (Removal Action 12), management of asbestos abatement (Removal Action 26), and management of debris (Removal Action 17)
- Approved Alternatives to Disposal – permitting the restricted/unrestricted release of materials, as economically feasible, for recycling or reuse
- Treatment of Operable Unit 3 Materials – permitting the treatment of materials to meet the OSDF WAC and/or off-site disposal facility WAC
- Off-Site Disposal of Materials Above the OSDF WAC
  - Requires the off-site disposal of process residues, product materials, and process-related metals generated during D&D activities
  - Requires off-site disposition of acid-resistant brick, lead sheeting, concrete from four designated locations to further minimize the total quantities of Tc-99 contaminated materials placed in the OSDF (top inch of concrete from two areas in Plant 9; an area in Plant 8; and an area in the Pilot Plant), and any other materials exceeding the OSDF physical and numerical WAC
- On-Property Disposal – Materials Eligible for Placement in the OSDF
  - Deems the remaining quantities of Operable Unit 3 D&D materials eligible for disposal in the OSDF; requires that the materials pass visual inspections for the presence of process residues during implementation
  - Recognizes the need for institutional controls at the completion of the remedy (consistent with Operable Unit 5)
  - Recognizes the need for long-term monitoring and maintenance of the OSDF and operation of a groundwater-monitoring network to evaluate performance of the OSDF consistent with Operable Unit 5. (Note: The scope for the long-term monitoring and maintenance of the OSDF, and the implementation of the site's institutional controls, are part of the FCP's post-closure long-term stewardship program and are not part of Operable Unit 3.)

The ten material categories developed during the RI/FS were evaluated as part of the final ROD to determine whether the categories would be eligible for on-site disposal in the OSDF, or required off-site disposal based on exceeding OSDF numerical WAC and/or other administrative on-site disposal prohibitions. Note that the January 1996 Operable Unit 5 ROD [DOE 1996c], which preceeded the Operable Unit 3 decision by nine months, established the site-wide numerical OSDF WAC limits and administrative prohibitions for use in Fernald's decision-making, including for adoption by the final Operable Unit 3 ROD.

Table 2-2 summarizes the waste volume estimates for the Operable Unit 3 materials considering the final ROD disposition pathways and the OSDF eligibility requirements. As stated in the final remedial action ROD, the combination of the earlier removal action decisions and procedures, the initial D&D remedial actions adopted by the IROD, and the selected remedy for the final disposition of the Operable Unit 3 materials in the final ROD represents a comprehensive and complete remedy for Operable Unit 3.

Table 2-2 Operable Unit 3 Waste Volume Estimates

Material Category	Waste Volume (in place cubic yards)	Primary Disposition Pathway
OSDF eligible bulk D&D debris	261,481	OSDF
Ineligible (above-WAC) D&D debris (primarily acid brick, lead flashing, Tc-99 affected concrete identified in the final ROD, process-related metals, and other prohibited items)	6,444	Envirocare and Nevada Test Site
Unrestricted release	11,444	Various
Total	**279,369**	

2.3 Integrated Closeout of Operable Unit 3's RCRA Hazardous Waste Management Units

In June 1996, Ohio EPA issued a set of Director's Final Findings and Orders (DF&O) to identify the requirements and strategy for the closeout of Fernald's RCRA HWMUs in conjunction with the site's CERCLA remediation activities. Ohio EPA has regulatory jurisdiction for the closeout of the HWMUs as part of their RCRA regulatory authority at the site. The 1996 DF&O identified the following integration approach and documentation strategy:

- All parties desire to avoid duplication of effort at the facility and to integrate the Ohio EPA RCRA hazardous waste closure requirements into the remediation requirements of CERCLA as detailed in Fernald's CERCLA ACA.
- The HWMUs fall within the scope of Operable Units 1 (waste pit area) and 3 (production area). Operable Unit 5 includes the contaminated environmental media associated with the site, including the media adjacent to and underlying the HWMUs.
- Attachment A to the DF&O identifies the 30 individual HWMUs that are to be closed through a CERCLA/RCRA integrated process.
- The DF&O designated the Operable Unit 1 and 3 CERCLA remedial action closeout reports as the formal deliverables to provide certification that the removal, treatment, and/or disposal of the physical and structural elements of the HWMUs identified in Attachment A of the DF&O has been completed (consistent with Ohio EPA Closure Guidance Items 3.14 and 3.16). The Final Remedial Action ROD for Operable Unit 3 identifies the removal, treatment and/or disposal requirements for the HWMUs, and the status of the units after closure (consistent with Ohio EPA Closure Guidance Items 3.14, 3.15, and 3.17).
- The DF&O designated the Operable Unit 5 remedial action closeout report as the formal deliverable to provide certification that any environmental contamination associated with the HWMUs has been satisfactorily remediated to achieve health-protective remediation standards for the affected environmental media (consistent with Ohio EPA Closure Guidance Item 3.16). The Operable Unit 5 ROD provides the health-protective remediation standards for soil and groundwater for the intended post-remediation land use, and designates the use of institutional controls to achieve the intended land use (consistent with Ohio EPA Closure Guidance Items 3.11 and 3.12).

Consistent with the DF&O, this remedial action closeout report serves as the certification statement of the formal closeout of the physical and structural HWMUs listed in Attachment A of the DF&O that reside within Operable Unit 3. Note that the individual complex-specific Project Completion Reports (see Section 2.5) provide the remediation details for the HWMU closeout process within the individual D&D complexes, and the management of materials generated. (The individual Project Completion Reports are adopted by reference in this final Operable Unit 3 remedial action closeout report.) As a companion to this Operable Unit 3 report, the Operable Unit 1 remedial action closeout report addresses the other HWMUs that reside within Operable Unit 1, and the Operable Unit 5 report addresses the remediation of the affected environmental media adjacent to and below the HWMU geographic footprints, and the achievement of health-protective cleanup standards.

In accordance with Section V, Order #2 of the Director's Final Findings and Orders a cross-reference index of HWMU closure components with the corresponding CERCLA documents implementing the closure components has been provided to Ohio EPA within seven days following the submittal of a referenced CERCLA document. This mechanism has kept Ohio EPA fully engaged with HWMU closure activities throughout the FCP remediation.

Appendix C of this report provides specific details relative to the HWMUs remediated under Operable Unit 3, a description of the agreed mechanism to certify HWMU closure, and the certification of HWMU closures under the purview of this remedial action report.

2.4 Operable Unit 3 Post-ROD Decision Changes

There was one formal change to the Operable Unit 3 Final Remedial Action ROD after its signature in September 1996. A Fact Sheet [DOE 2006a] was developed to identify the types of facilities and structures that can remain at Fernald, for beneficial use as part of legacy management to support stewardship services. This decision recognized the beneficial use of the structures in the post-cleanup phase and provided specific relief from the general Operable Unit 3 ROD expectation that all man-made structures would be removed at the FCP as part of facility D&D. The reuse decisions described in the Fact Sheet included the use of four clean buildings to support the legacy management phase of the FCP, the beneficial reuse of the clean intact concrete pads beneath the Operable Unit 4 Silos Treatment Facility and Tank Transfer Area, and the reuse of clean rubblized concrete and railroad ballast as clean hard fill through out the FCP for erosion control, drainage topography, and the enhancement of certain aquatic habitats at key areas of the site.

2.5 Remedial Design Summary

In May 1997, the Operable Unit 3 Integrated RD/RA Work Plan was approved as the master remediation plan for implementing the Operable Unit 3 remedial actions. Because of the close relationship between the interim and the newly selected final remedial actions, the Integrated RD/RA Work Plan was developed for project planning and project execution purposes to combine the remaining activities into one integrated action for Operable Unit 3. This work plan therefore updated the previous D&D strategies and sequence in the 1995 Interim Remedial Action RD/RA Work Plan, and, following its 1997 approval it became the governing document that directed all future Operable Unit 3 remedial action activities across the site.

A key element for the implementation of the Operable Unit 3 integrated remedial action was the utilization of individual *implementation plans* for each of the discrete above-grade D&D projects. The implementation plans communicated the detailed project-specific remedial design information for each project and served as a logical extension of the technical approach, work sequencing, and requirements definitions provided by the broader

Integrated RD/RA Work Plan. To facilitate and streamline the work execution processes steps and regulatory approvals for the D&D efforts, a work "bundling" strategy was employed whereby the 316 legacy and new remedial buildings and structures were logically grouped into major complexes, each with its own approved implementation plan, schedule, and stand-alone work completion report. This strategy permitted the grouping of similar work activities and processes, simplified project-specific and area-wide environmental monitoring, and facilitated the accuracy and development of necessary out-year funding profiles for the DOE. Each implementation plan was approved by EPA as a formal remedial design deliverable prior to field execution of the activities. Likewise EPA also approved the stand-alone work completion reports for each individual complex as logical steps leading to the development of this final overall remedial action closeout report.

Using the concept of economies of scale, the expenditures involved in the development and review of contracts, work plans, health and safety plans, and other field procedures -- as well as other expenditures such as subcontractor training, establishment of control zones, mobilization and demobilization of crews and equipment, and air monitoring – were optimized through the grouping of the work into complexes. The individual above-grade D&D components were therefore assembled into the broader complexes using the following considerations:

- Relative location/geographic proximity of the components
- Minimization of physical impacts between dismantlement activities and other ongoing site operations and services
- Ability to safely partition the work into discrete "construction zone" geographic areas without adversely impacting the safety and logistics of other projects/activities
- Consideration of the current and/or future use of the facility (for example, many of the components that support the distribution of electricity across the site were combined into the Electrical Station Complex, even though not all of the components were geographically located together)
- Consideration of the types of materials that would be generated, so that like or unique categories of materials could be effectively dismantled and dispositioned together
- Physical availability of the facilities (for example, if certain facilities were needed as part of the cleanup mission to support ongoing remedial activities for the other operable units, or provide needed site services)

Based on these attributes, a total of 24 Remediation Complexes were initially identified and included in the first version of the approved 1997 Integrated RD/RA Work Plan. The 24 complexes encompassed all 255 legacy-era structures as well as the new remedial structures constructed to support the cleanup mission (which brought the total number of structures addressed through the interim and final RODs to 316). The initial 24 complexes were assembled based on the 1995 annual funding profiles, and the resultant site-wide remediation schedules which showed that upwards of 25 years would be necessary to complete the site-wide facility demolition activities. The 1995 funding profiles and remediation schedules (and the progressive need for various facilities over the 25 years) in turn drove the physical availability of the individual facilities for D&D and inclusion within a complex. Shortly thereafter, DOE's accelerated closure plan and funding levels were approved which shortened considerably the original 25-year facility demolition schedule with a targeted completion date in 2006. This made certain facilities available quicker for D&D, and the revised availability allowed several of the original 24 complexes to be combined together or otherwise redefined into new, broader groupings for accelerated implementation. This redefinition resulted in a total of 20 final complexes from the originally envisioned 24 complexes; each of the 20 then had individual implementation plans formulated and approved by EPA. Section 4.0 of this report (Project Chronology) identifies the final complexes by name and also identifies the corresponding Implementation Plans and Project

Completion Reports (discussed in Section 2.5.1 below) produced for each complex. The initial version of the Integrated RD/RA Work Plan, which was approved as a "living document" for use over the course of the D&D effort, was kept current with the latest definitions of the complexes, their phases, and the sequencing of the work through a formal "page change" update process when necessary.

Serving to provide the next level of remedial design detail beneath the 1997 Integrated RD/RA Work Plan, the individual implementation plans were developed to convey the following remedial design information:

- Project implementation approach – described the strategy for project planning, control, procurement, and coordination.
- D&D tasks – described the overall approach to performing the field activities typically required for each project.
- Materials management – described the strategy for managing the materials that result from the D&D activities, including handling, storage, treatment, reuse, recycling, release, transportation, and disposal, consistent with eligibility requirements of the Waste Acceptance Criteria Attainment Plan for the On-Site Disposal Facility [DOE 1998a].
- Coordination with other site activities – described the integration of other FCP activities with the Operable Unit 3 remedial actions, both during the planning and the implementation phases.
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) – described the plan for meeting all ARARs, such as satisfying permitting requirements, contained in the RODs.
- Environmental monitoring – described the project-specific approach and sampling plans for monitoring air and water during project execution, in conjunction with the site-wide approach contained in the FCP's Integrated Environmental Monitoring Plan (IEMP).
- Project responsibilities – described the roles of the FCP's work execution organizations, oversight organizations, and various outside subcontractors participating in the project.
- Procurement design packages for subcontractors – where work was performed by outside remediation subcontractors, procurement design packages were prepared for the complexes and typically consisted of engineering drawings, photographs and videos, technical specifications, performance requirements, and a project schedule. The designs were of sufficient detail for inclusion into an Invitation to Bid (IFB) or Request for Proposal (RFP) packages for distribution to qualified remediation contractors bidding on the individual projects. For smaller projects, the designs were included in task orders for subcontractors that were retained under a Site Support Contract or a Task Order Agreement.

For the majority of the above-grade complexes (primarily those complexes dismantled between 1994 through 2003), field dismantlement and material management activities were conducted by competitively procured fixed-price remediation/demolition subcontracts with construction management, field oversight, environmental/safety monitoring, and reporting provided by Fluor Fernald. Beginning in 2003, nearly all of the remaining D&D activities were completed by Fluor Fernald under a self-performance approach. The same type of remediation design documents, field implementation plans, and reporting/closeout documents were used whether the work was performed through the fixed-price subcontractor approach or through the self-performance approach.

2.6 Complex-Specific Project Completion Reports

The final element in the RD/RA document sequence was the production of the complex-specific Project Completion Reports, once the D&D activities for a given complex were complete. Generally, one Project Completion Report was produced and approved by EPA for each of the complexes for which individual implementation plans were developed. Section 4.0 (Project Chronology) identifies the Project Completion

Reports and the dates of their approval. As shown in Section 4.0 there were several instances where multiple Project Completion Reports were necessary for a given complex, based on the time phasing of the work: 1) the Administration Complex, where the work was broken out into two phases (I and II), each with a separate completion report; 2) the Maintenance Tank Farm Complex, which had both interim and final completion reports approved; and 3) the Plant 6 Complex, which was broken out into two phases, each with separate completion report (one for Plant 6 and one for the East Warehouse). Each project completion report was subject to EPA approval and was formally entered into the Administrative Record for the site. The dates of approval are shown in Section 4.0. Readers should also note that there were two associated activities – not directly linked to the individual D&D complexes -- for which Project Completion Reports were prepared: 1) a completion report to conclude Operable Unit 3 recycling evaluations; and 2) a completion report to conclude the surface concrete removal demonstrations conducted in the Plant 8. Both of these associated completion reports are identified in Section 4.0.

For the individual complexes, the project completion reports were organized to convey the following completion information, for agency approval and formal documentation in the FCP Administrative Record:

- Project Background – A discussion of the description of the complex and project chronology
- Remediation Approach – A discussion of necessary preparatory actions and component-specific remediation approach
- HWMU Closures Within the Complex – A discussion of unit descriptions, decontamination objectives, control measures, treatment of aqueous waste, demolition activities, waste disposition, chronology, conclusions, and required site documentation
- Material Management – A discussion of generated debris, secondary wastes generated, debris stockpiling, collection and disposition of wastewater
- Environmental Monitoring – A discussion of radiological/air monitoring and wastewater monitoring
- References

3.0 CONSTRUCTION ACTIVITIES

Construction activities relative to the scope of the Operable Unit 3 remediation involved the physical decontamination, dismantlement, and demolition of the above-grade and at- and below-grade structures across all areas of the site. In order to proceed with dismantlement and demolition activities for the individual structures, several foundational documents had to be prepared that would define how the work would be conducted, how the work would be sequenced, and where and how the generated material would be dispositioned. In addition to the Integrated RD/RA Work Plan and the complex-specific Implementation Plans discussed in the previous section, the following technical guidance documents were developed to support the field efforts and construction activities conducted.

First, it was recognized that a site-wide sequencing plan and technical guidance document was needed to guide the excavation and removal of at- and below-grade structures (part of Operable Unit 3) with the soil excavation activities occurring across the site (part of Operable Unit 5). The intent was to ensure remediation-area-specific conditions were addressed as well as integrating the numerous soil excavations and at- and below-grade debris removal efforts into a comprehensive site-wide approach. The Site-Wide Excavation Plan (SEP) [DOE 1998b] was developed to serve this purpose. The SEP was an Operable Unit 5 Remedial Design deliverable, and supported the development of the detailed Operable Unit 5 Integrated Remedial Design Packages. It outlined the general steps of each soil excavation and at- and below grade debris remediation project and provided a remediation document hierarchy. The SEP included remediation drivers, restoration goals, health and safety requirements, environmental controls and monitoring requirements, impacted material management programs, manifesting and record keeping, and data management requirements. The SEP also described representative area-specific conditions expected to be encountered based on the depth and extent of contamination and the types of at- and below-grade structures present in a given area. The SEP included the methods and protocols to address these conditions and the manner in which Operable Unit at- and below-grade 3 structural excavation requirements would be integrated with the Operable Unit 5 soil excavation requirements.

Second, while the vast majority of the Operable Unit 3 above-, at-, and below-grade D&D debris was eligible for disposition in the OSDF (with the exception being the specific categories of prohibited debris identified in the Operable Unit 3 final remedial action ROD), specific waste acceptance criteria and waste placement methods had to be developed to ensure the OSDF was constructed to meet the required design criteria and be protective of human health and the environment. The Impacted Materials Placement Plan (IMPP) [DOE 1996d] was written primarily to address the physical acceptance criteria of waste received (including the sizing requirements for the D&D wastes) and define the placement, compaction, and quality assurance/quality control (QA/QC) activities undertaken throughout the construction, filling, and closure of the OSDF. The IMPP also provided a crosswalk that combined the Operable Unit 3 material categories into the OSDF debris placement categories developed during the OSDF design.

The WAC Plan was prepared to complement the IMPP by describing the material management approaches for demonstrating attainment of radiological, chemical, and physical acceptance criteria for all eligible materials destined for placement in the OSDF. The radiological and chemical attainment criteria for debris, including visual inspection requirements, were formally established in the WAC Plan. The WAC Plan also identified the specific categories of debris that were ineligible for disposal in the OSDF, based on the prohibitions contained in the final remedial action ROD.

A summary of the construction activities for the above grade and the at- and below-grade D&D activities is provided below. Table 3-1 provides the actual amounts of Operable Unit 3 debris generated.

3.1 Above-Grade D&D Construction Activities

The above-grade D&D activities typically began with preparatory actions related to placing each facility in its final safe shutdown configuration. These preparatory actions typically consisted of: 1) removal of all salvageable equipment; 2) removal of loose, gross contamination; 3) removal of process-related hold-up material; general cleanup and housekeeping; and 4) isolation/disconnection of all utilities. An initial wash down of the process-related building interiors was performed prior to the start of dismantlement. The purpose of this activity was to remove visible dust and loose debris (including biohazards, such as pigeon remains) from building surfaces, walls, and floors. Building penetrations were sealed to prevent animal access and to minimize the potential for migration of loose contamination to the environment. Paint was applied as an airborne lock-down agent to all process-related building and equipment surfaces to minimize particulate release, and dust suppression water was used to further control airborne emissions during dismantlement. Asbestos abatement areas were established to remove asbestos containing materials and minimize the amount of area required to be released from asbestos concerns. The above-grade buildings and structures, and the interior items that remained in the building after asbestos abatement and removal of process equipment, were typically dismantled using hydraulic shears, and size reduced to the appropriate size for placement in the OSDF. Implosion techniques were also used to dismantle four of the FCP's structures (Plant 7, Plant 4, Plant 1A, and the west water tower) at which point final size reduction was accomplished using the hydraulic shears.

A key strategy for the implementation of the above-grade D&D and material handling activities was the use of performance specifications to direct the remediation subcontractor in the performance of the work. Performance specifications differ from descriptive or detailed specifications in that the remediation work methods are not specified. The performance specifications state what is to be done and what regulations, standards, and codes apply. They also identify any limitations on activities. Details and approaches of how to accomplish the work are left to the remediation subcontractor. This approach allowed the remediation subcontractor to use past experience and existing equipment in the development of a competitive bid or proposal, thereby optimizing costs. The remediation subcontractor submitted detailed work plans identifying proposed methods for approval by FCP management.

Materials generated were visually inspected by Waste Acceptance Organization (WAO) personnel and sorted into OSDF debris placement categories (or segregated for off-site disposal if ineligible for OSDF placement). The resultant quantities for off-site disposal were entered into the FCP's Site-wide Waste Information Forecasting and Tracking System (SWIFTS) database for tracking purposes. Materials that were cleared for on-site disposal in the OSDF were entered into the Integrated Information Management System (IIMS) database, which tracked eligible materials destined for disposal in the OSDF. Debris that was ineligible for OSDF disposal, but was eligible for bulk waste shipment and off-site disposal at Envirocare, was processed and sent to Envirocare via rail through the FCP's Waste Pits Remedial Action Project (WPRAP) rail load-out facilities. Other materials that did not meet either the OSDF criteria or rail shipment/Envirocare disposal criteria were containerized and sent by truck for disposal at NTS.

Prior to the availability of the OSDF, generated debris was placed in interim storage following the strategies and procedures contained in the Removal Action 17 Work Plan and later adopted into the Integrated Operable Unit 3 RD/RA Work Plan. Once the OSDF was operational, generated debris was transported directly to the OSDF for

placement, or else temporarily staged in stockpiles in the OSDF Material Transfer Area (OMTA) based on material demands and/or seasonal requirements (e.g., winter shutdown).

Project-specific environmental monitoring during above-grade D&D activities typically consisted of wastewater monitoring and radiological air monitoring. Decontamination water was containerized in collection tanks, sampled for Advanced Wastewater Treatment Facility (AWWT) constituents of concern, and transferred to the AWWT for treatment. Water applied for dust suppression was collected in the FCP's storm-water collection system and routed to the AWWT for treatment via the Storm-Water Retention Basins. Radiological air monitoring typically consisted of FCP boundary air monitoring conducted through the IEMP, coupled with project-area/occupational monitoring as deemed appropriate for the needs of the individual projects to satisfy area worker health and safety requirements. In general, the FCP's environmental regulatory compliance point for the airborne pathway is at the FCP fenceline, where the IEMP program monitors the cumulative impact of all FCP projects on a continual basis at the property boundary, and assesses those impacts in comparison to regulatory environmental thresholds. The IEMP data was used to provide feedback to the D&D project teams about the effectiveness of particulate controls (lockdown agents and dust suppression water) and the dismantlement methods employed. In all cases, the FCP maintained fenceline air pathway concentrations below regulatory thresholds as documented in the FCP's individual annual environmental monitoring reports. The annual monitoring reports were prepared under the IEMP program for agency approval and reside in the FCP Administrative Record.

From a field construction viewpoint, the above-grade D&D activities were considered complete when dismantlement actions reached the building foundations and all materials were successfully staged for disposal at either the OSDF or the off-site locations as appropriate. At this point, the OSDF labor forces completed the on-site placement activities for the eligible materials, with material tracking and manifesting conducted by WAO. Where materials were transferred to WPRAP for rail shipment and off-site disposal at Envirocare, the WPRAP project team completed the shipping activities and manifesting of the waste to the disposal site; where materials were containerized for truck shipment to NTS or other off-site disposal facilities, the FCP's Waste Management organization completed the shipping activities and manifesting, using on-site labor forces. All hard-copy disposal records for the Operable Unit 3 actions are part of the FCP's records management program with permanent archiving at the National Archive Records Administration (NARA) following site closure; NARA in turn will retain the records for 75 years (see Section 6.0).

3.2 At- and Below-Grade D&D Construction Activities

All Operable Unit 3 at- and below-grade D&D activities were conducted in an integrated manner with the Operable Unit 5 soil excavation activities. The FCP site was divided into 10 principal soil remediation areas (and various sub-areas) each with its own separate design and construction subcontractor procurement package as appropriate. These design and construction packages addressed the planning, implementation, and coordination requirements for both the soil excavation and the concurrent at-and below-grade debris removal activities. The field remediation for each remediation area was divided into two separate construction activities. The Site Preparation phase prepared the remediation areas for the eventual soil and at- and below-grade debris excavation. This involved establishing site boundaries and support areas, providing the necessary utility hook-ups, necessary clearing and grubbing of vegetation and the installation of a surface water management system including diversion and collection ditches and sedimentation basins to collect contaminated runoff and sediment from the

excavation areas. Site preparation activities began in 1997 and continued throughout the remedial effort as each successive remediation area was cued up and made ready for the follow-on excavation work.

The at- and below-grade debris was removed in conjunction with soil excavation activities and therefore shared work planning, execution, and coordination commonalities with soil excavation regarding material handling and tracking. However, because the at-and below-grade debris remained a part of Operable Unit 3, its WAC attainment demonstration strategy and visual inspection requirements were identical to those used for above-grade debris, with visual inspections performed in the field by WAO personnel. The bulk of the debris encountered during the excavation activities included concrete pads, asphalt roads, below-grade piping and storm sewers, and structural steel. Below-grade piping that was not process-related (e.g., storm sewers, steam lines, potable water lines, conduit, etc.) was excavated, size reduced, and dispositioned to the OSDF. Below-grade piping that had historically been process related was inspected, drained of any residual wastewater, sediment, or sludge, and then size reduced and visually inspected for WAC acceptance prior to dispositioning to the OSDF. Materials removed from the piping were collected and containerized for off-site disposal. Piping that failed the visual inspection was either decontaminated further until it passed a follow-up inspection, or sent off-site for disposal.

Material tracking and documentation for at- and below-grade debris followed a similar set of protocols for above-grade debris. The excavation projects used the IIMS as the data management tool and tracking system for both soil and at- and below-grade debris. Tracking forms were used to document at- and below-grade debris generation and movement in the same way as for above-grade debris. Manifests were used to document the placement of each load of materials sent to the OSDF (to off-site facilities as appropriate), and all hard-copy records for the Operable Unit 3 actions are maintained as part of the FCP's records management program with permanent archiving at NARA following site closure; NARA in turn will retain the records for 75 years (see Section 6.0).

Environmental controls in place during excavation included the aforementioned storm water collection basins, fugitive dust control activities including the control of dust during excavation, during the loading of material into the trucks used to transfer material to the OSDF, speed restriction of the trucks, and the installed wheel wash facilities, and the continual monitoring/dust controls applied to the haul roads as well as dust control during placement in the OSDF. Environmental monitoring during excavation activities included fugitive emission monitoring, airborne radiological monitoring, radon, and direct radiation as appropriate.

Table 3-1 Actual Operable Unit 3 D&D Debris Generated

Material Category	Waste Volume (in place cubic yards)	Disposition Pathway
OSDF eligible bulk D&D debris	523,455*	OSDF
Ineligible (above-WAC) D&D debris (primarily acid brick, lead flashing, Tc-99 affected concrete identified in the final ROD, process-related metals, and other prohibited items)	21,724	Envirocare and Nevada Test Site
Unrestricted release	NA**	Various

*Based on the manifested amounts of Category 2, 3, and 5 material placed

**Debris released in an unrestricted manner were generally tracked only by container. No specific quantity released is available.

3.3 Waste Management Activities

As indicated in Sections 2.1.2, DOE had a continuing program of containerized waste disposal from the time wastes began to be containerized in 1985. Removal Action 9 set in motion defined the procedures necessary to ensure this containerized waste (low-level radioactive waste, low-level mixed waste, and TSCA waste) was disposed in full compliance with applicable environmental regulations, DOE orders, Department of Transportation (DOT) shipping requirements, and receiving disposal facility acceptance criteria. In addition, DOE had significant quantities of nuclear materials remaining on site that required proper disposition in accordance with DOE requirements. From 1989 through the completion of the major containerized waste management activities all of these wastes were successfully dispositioned.

- 6.6 million cubic feet of low-level waste was shipped to NTS
- 59,147 cubic feet of low-level mixed waste was shipped for off-site treatment
- 174,912 gallons of low-level mixed waste was shipped off-site for incineration
- 31 million pounds of nuclear materials was shipped off-site for other DOE programmatic uses, for private sector uses, or interim storage under DOE's Uranium Facility Management Group.

4.0 CHRONOLOGY OF EVENTS

The following table provides a chronology of the decisions and events for the remediation of Operable Unit 3. The chronology includes the removal actions associated with Operable Unit 3 that were implemented ahead of the main remedy contained in the Interim and Final RODs. It also lists the dates for each of the D&D complex-specific implementation plans and completion reports that are adopted by reference in this overall Remedial Action Report.

Table 4-1 Summary of Events for Operable Unit 3 Remediation

Event	Date
Operable Unit 3 RI/FS Documents	
Operable Unit 3 Remedial Investigation and Feasibility Study Report	May 1993
Operable Unit 3 Remedy Decision Documents	
Operable Unit 3 Record of Decision for Interim Remedial Action	June 1994
Operable Unit 3 Record of Decision for Final Remedial Action	August 1996
Operable Unit 3 Fact Sheet – Beneficial Reuse of Clean Buildings and Structures	May 2006
Operable Unit 3 General Remedial Design Documents	
Remedial Design Work Plan for Interim Remedial Action at Operable Unit 3	March 1995
Operable Unit 3 Remedial Design Prioritization and Sequencing Report	June 1995
Integrated Remedial Design Work Plan for Remedial Action	May 1997
Operable Unit 3 Removal Action Completion	
Nitric Acid Rail Car (Removal Action 25)	November 1993
Pilot Plant Sump (Removal Action 24)	January 1994
Scrap Metal Piles (Removal Action 15)	November 1994
Contaminated Soils Adjacent to Solid Waste Incinerator (Removal Action 14)	January 1995
Plant 1 Pad Continuing Release (Removal Action 7)	February 1995
Fire Training Facility (Removal Action 28)	July 1995
Plant 7 D&D (Removal Action 19)	August 1995
Plant 1 Ore Silos D&D (Removal Action 13)	November 1995
Uranyl Nitrate Neutralization (Removal Action 20)	January 1997
Operable Unit 3 Complex D&D Implementation Plans	
Operable Unit 3 Building 4A Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	March 1995
Operable Unit 3 Plant 1 Complex – Phase I Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	March 1996
Operable Unit 3 Implementation Plan for Above–Grade Dismantlement of the High and Low Nitrate Tanks (Final)	May 1996
Operable Unit 3 Boiler Plant/Water Plant Complex Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	February 1997
Operable Unit 3 Integrated Remedial Action Thorium/Plant 9 Complex Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	July 1997
Operable Unit 3 Sewage Treatment Plant Complex Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	July 1998
Operable Unit 3 Integrated Remedial Action Maintenance/Tank Farm Complex Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	July 1998
Operable Unit 3 Integrated Remedial Action Miscellaneous Small Structures Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	September 1998

Table 4-1 Summary of Events for Operable Unit 3 Remediation

Event	Date
Operable Unit 3 Plant 5 Complex Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	April 1999
Operable Unit 3 Implementation Plan for Above–Grade Decontamination and Dismantlement of the Plant 6/East Warehouse Complex (Final)	July 1999
Operable Unit 3 Multi-Complex Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	September 2001
Operable Unit 3 Pilot Plant Complex Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	January 2002
Operable Unit 3 Administration Complex Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	February 2002
Operable Unit 3 Laboratory Complex Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	March 2002
Operable Unit 3 Plant One Complex – Phase II Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	June 2002
Operable Unit 3 Miscellaneous Small Structures Phase II Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	September 2002
Operable Unit 3 Operable Unit One Complex Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	June 2004
Operable Unit 3 Operable Unit Four (OU4) Complex Silo 3 Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	July 2004
Operable Unit 3 Operable Unit Four (OU4) Complex Silos 1&2 Components 34A (Silo 2), 34B (Silo 1) and Silos 1&2 Bridges Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	March 2005
Operable Unit 3 Advanced Wastewater Treatment Facility (AWWT) Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	March 2005
Operable Unit 3 Operable Unit Four (OU4) Complex Silos 1&2 Remediation Facility Implementation Plan for Above–Grade Decontamination and Dismantlement (Final)	September 2005
Operable Unit 3 Complex D&D Completion Reports	
Project Completion Report for the Above-Grade Dismantlement of the High and Low Nitrate Tanks	March 1997
Operable Unit 3 Building 4A Complex Project Completion Report	August 1997
Operable Unit 3 Plant 1 Complex Phase I Project Completion Report	December 1997
Operable Unit 3 Project Completion Report Sewage Treatment Plant Complex Decontamination and Dismantlement Project	October 1998
Project Completion Report for Surface Concrete Removal Demonstration in the Plant 8 Muffle Furnace Area	October 1998
Project Completion Report Boiler Plant/Water Plant Complex Decontamination and Dismantlement Project	February 1999
Operable Unit 3 Project Completion Report Thorium/Plant 9 Complex Decontamination and Dismantlement Project	April 1999
Project Completion Report Recycling Supplemental Environmental Projects	April 1999
Operable Unit 3 Interim Project Completion Report Maintenance/Tank Farm Complex Decontamination and Dismantlement Project	April 2000
Operable Unit 3 Plant 5 Complex Project Completion Report	July 2001
Operable Unit 3 Final Project Completion Report Plant 6 Complex Decontamination and Dismantlement	September 2002
Operable Unit 3 Final Project Completion Report Maintenance/Tank Farm Complex Decontamination and Dismantlement	September 2002
Operable Unit 3 Administration Complex Phase I Decontamination and Dismantlement Project Completion Report	October 2002

Table 4-1 Summary of Events for Operable Unit 3 Remediation

Event	Date
Operable Unit 3 Plant 1 Complex Phase II Decontamination and Dismantlement Project Completion Report	November 2003
Operable Unit 3 Laboratory Complex Decontamination and Dismantlement Project Completion Report	May 2004
Operable Unit 3 Multi-Complex Decontamination and Dismantlement Project Completion Report	July 2004
Operable Unit 3 Pilot Plant Complex Decontamination and Dismantlement Project Completion Report	September 2004
Operable Unit 3 East Warehouse Project Completion Report	June 2005
Operable Unit 3 Administration Complex Phase II Project Completion Report	July 2005
Operable Unit 3 Advanced Wastewater Treatment Facility Decontamination and Dismantlement Project Completion Report	September 2005
Operable Unit 3 Operable Unit 1 Complex Decontamination and Dismantlement Project Completion Report	October 2005
Operable Unit 3 Operable Unit 4 Complex Silos 1&2 Components 34A (Silo 2), 34B (Silo 1) and Silos 1&2 Bridges Decontamination and Dismantlement Project	November 2005
Operable Unit 3 Operable Unit 4 Complex Silo 3 Decontamination and Dismantlement Project Completion Report	August 2006
Operable Unit 4 Silos 1 and 2 Remediation Facility D&D Project Completion Report	August 2006
Operable Unit 3 Miscellaneous Small Structures Phase II Project Completion Report	October 2006
Operable Unit 3 Miscellaneous Small Structures Completion Reports	
Operable Unit 3 Miscellaneous Small Structures Decontamination and Dismantlement Project Task Order #384 Completion Report	October 1998
Operable Unit 3 Miscellaneous Small Structures Decontamination and Dismantlement Project Task Order #387 Completion Report	November 1998
Operable Unit 3 Miscellaneous Small Structures Decontamination and Dismantlement Project Task Order #405 Completion Report	January 1999
Operable Unit 3 Miscellaneous Small Structures Decontamination and Dismantlement Project Task Order #432 Completion Report	October 1999
Operable Unit 3 Miscellaneous Small Structures Decontamination and Dismantlement Project Task Order #464 Completion Report	November 2000
Operable Unit 3 Miscellaneous Small Structures Decontamination and Dismantlement Project Task Order #033 Completion Report	September 2001
Operable Unit 3 Miscellaneous Small Structures Decontamination and Dismantlement Project Task Order #627 Completion Report	October 2001
Operable Unit 3 Miscellaneous Small Structures Decontamination and Dismantlement Project Task Order #049 Completion Report	May 2002
Operable Unit 3 Miscellaneous Small Structures Decontamination and Dismantlement Project Task Order #080 Completion Report	June 2002
Operable Unit 3 Miscellaneous Small Structures Decontamination and Dismantlement Project Task Order #086 Completion Report	October 2002

5.0 PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROL

DOE provided direct project oversight of the above-grade dismantlement activities and the at- and below-grade excavation activities to ensure that remedial activities were performed according to project specifications and requirements. The DOE Office of Safety Assessment assigned a Facility Representative from the Fernald Area Office whose responsibilities were to perform independent field oversight of all activities performed at the Operable Unit 3 project sites. Along with the Fluor Fernald Project Manager, the Facility Representative worked to ensure that the remediation subcontractors were provided with the proper direction and support necessary to meet the remediation objectives and performance standards for the Operable Unit 3 projects, and that quality assurance reviews and quality audits were conducted to assure adherence with project specifications. The Facility Representative along with Fluor Fernald Project Manager also conducted the pre-final and final inspections of the projects as they were completed, as the necessary precursor action to prepare the project completion reports.

Both EPA and Ohio EPA participated in continuous technical oversight of the Operable Unit 3 projects and the formal review and approval of the various regulatory submittals required by the Operable Unit 3 decision documents.

The QA/QC programs necessary to ensure field activities were conducted in a manner to meet project goals, and associated radiological and environmental data were of the necessary quality to be used for the intended objectives, were defined in the FCP Quality Assurance Program Description (RM-0012) and the Site-wide CERCLA Quality Assurance Project Plan (SCQ; FD-1000). Additional considerations in the derivation of this QA/QC program included requirements relative to 10 CFR 830.120 "Quality Assurance Requirements"; DOE Order 5700.6C "Quality Assurance"; ANSI/ASQC E4 "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs"; and ASME NQA-1, "Quality Assurance requirements for Nuclear Facilities".

The SCQ covers all execution activities carried out by Fluor Fernald employees and subcontractors. Key activities covered under the plan include radiological surveys, field measurements, sampling and analysis during pre-field activities, preparation of data quality objectives and project specific plans, engineering controls of the remedial design, preparation of the remedial design packages, at- and below-grade excavations and segregation, and waste acceptance criteria attainment at the OSDF.

The plan defined work processes for all sampling and analysis, document preparation, computer hardware, software, and database management (e.g., Site-wide Environmental Database (SED) and IIMS). It defined objectives for design document preparation, design change control, and procurement requirements. It defined requirements for construction quality control and inspection and acceptance testing for all work conducted in the field. With the necessary programs in place, the plan also described the necessary QA assessments to verify quality performance.

The primary performance standards applicable to Operable Unit 3 involved ensuring the debris and waste materials was disposed in accordance with the applicable WAC established by the facility receiving the waste.

The majority of waste materials generated as a result of D&D activities were destined for the OSDF consistent with the decision in the Final Remedial Action ROD. There were three OSDF support plans that functioned together to define the requirements and associated implementation methodologies for impacted material (i.e.,

waste) acceptance, placement, and compaction activities. These plans, which also addressed quality assurance/quality control activities, are:

- Impacted Material Placement Plan for the OSDF
- OSDF Impacted Material Placement Plan for Winter Months [DOE 2004]
- Waste Acceptance Criteria Attainment Plan for the OSDF

The Impacted Material Placement Plan for the OSDF defined the material size and configuration considerations associated with waste placement in the OSDF. It also provided the engineering-based requirements for material conditioning, segregation, placement, and compaction to enhance the long-term integrity and performance characteristics of the facility. The corresponding plan for winter months addressed the same topics for January through March waste placement. The Impacted Material Quality Assurance Plan (part of the Impacted Material Placement Plan) established the specific quality control requirements and documentation practices to be used to monitor and test impacted materials that are placed in the OSDF.

To support the independent field visual observations required of the D&D projects to verify WAC compliance, in 1997 the FCP formed an independent quality assurance/oversight organization known as the Waste Acceptance Organization that was responsible for observing all above-grade dismantlement activities, at- and below-grade debris excavations, and all placements of waste in the OSDF. During the Operable Unit 3 field activities, WAO was charged with implementing the manifesting system used to track material from generation to disposal, making field calls on material engineering categories and size restrictions for OSDF placement, and for providing oversight and support in identifying and removing OSDF-prohibited items from the dismantled materials or excavated materials, and as a second independent check at the point of placement in the OSDF. WAO also identified the off-site disposition material handling requirements for shipping OSDF prohibited items and above-WAC materials to the respective off-site disposal facilities. WAO also produced daily records of material quantities removed and placed, and oversaw the administrative management of the FCP's interim soil and debris stockpiles and material transfer locations. Finally, because the completion of the Operable Unit 3 at- and below-grade debris removal activities was verified by visual observation of the materials remaining at the excavation sites, WAO served as the primary observing entity to ensure that visual completion obligations were satisfied.

6.0 FINAL INSPECTION AND CERTIFICATIONS

The intent of this Operable Unit 3 Final Remedial Action Report is to convey DOE and EPA's determination that:

- The D&D work scope associated with the Operable Unit 3 remedy is complete;
- The above-grade and the at- and below grade D&D debris generated from the FCP's dismantlement projects has been dispositioned following the requirements of the Final Remedial Action ROD;
- All remaining structures at the FCP have been approved by EPA to remain and include those structures associated with the Operable Unit 5 groundwater remediation infrastructure and the clean structures and materials approved to remain on site to support post-cleanup legacy management activities and other beneficial uses delineated in the Beneficial Reuse Fact Sheet;
- All of the FCP's nuclear product inventories have been successfully transferred off site for re-use or disposal; and
- All of the FCP's containerized waste inventories addressed by Operable Unit 3 have been successfully dispositioned off site.

Completion for Above Grade D&D and Debris Placement

All buildings and structures have been removed and successfully dispositioned, with the exception of the legacy management support structures and clean concrete materials approved and the groundwater restoration infrastructure (Converted Advanced Wastewater Treatment Facility (CAWWT), groundwater extraction wells, pipelines, and pumps, groundwater monitoring wells) that is required to remain until groundwater treatment and/or groundwater extraction activities for the Great Miami Aquifer are complete per the Operable Unit 5 ROD. When the groundwater remedy has been completed the infrastructure will be removed as appropriate and this removal will be documented in the future Final Remedial Action Report for Operable Unit 5.

All debris generated as a result of these D&D activities have been successfully dispositioned to the appropriate receiving facility. The FCP's Records Inventory, including the on-site and off-site disposal manifests for generated debris, will be transferred and archived with NARA, who in turn will retain the records for 75 years.

Completion for At- and Below-Grade Debris

The Operable Unit 3 at- and below-grade debris demolition, removal, and disposal activities were conducted as concurrent field activities with the Operable Unit 5 soil excavation activities. As a result, the soil certification process and documentation steps developed for soil excavation also encompassed the removal and disposal activities for the at- and below-grade debris. DOE and EPA used a progressive "remediation area" approach to conduct the soil and debris removal activities, phased over time. Each remediation area had its own certification report that served as the regulatory documentation that soil and debris activities were complete in a given area. Taken together, all of the remediation area certification reports then demonstrate that the entire site has collectively gone through the process and is certified as complete. EPA's acceptance and approval of the individual remediation area certification reports under Operable Unit 5 provides the basis for declaring the Operable Unit 3 at-and below grade debris removal and disposal activities as complete.

Completion for Above-Grade HWMU Closures

Appendix C contains the specific certification of closure for above grade HWMUs.

Completion for the Off-Site Transfer of the FCP's Nuclear Material Inventory

All of the FCP's nuclear product inventory transfers are complete. The materials formerly comprising the FCP's inventory have been formally transferred to other DOE installations for storage, sale, or re-use, or have been sold by DOE to other approved users.

The transfers of nuclear material were tracked and documented through several methods. As the first step, the FCP's SWIFTS database kept track of each container of nuclear material in inventory. Whenever a container was moved, packaged, or shipped it was tracked with material movement records and entered into SWIFTS. A printout of SWIFTS shows that all of the FCP's nuclear material has been shipped. As the second step, DOE's Nuclear Materials Management Safeguards System (NMMSS) was used to track the final dispositioning of the materials. NMMSS is the official DOE complex-wide nuclear material inventory system. The FCP, like all DOE sites, utilized NMMSS to account for all uranium materials and/or products received by and shipped from the site, which included detailed tracking of its inventory to its final disposition. All hard-copy records related to the management of nuclear materials, including NMMSS and SWIFTS system reports, have been entered into the FCP's records management program, which in turn requires that all such records be transferred and archived at final site closure with NARA, who in turn will retain the dispositioning records for 75 years.

Completion for the Off-Site Disposal of the FCP's Containerized Waste Inventories

Similar to the dispositioning of the nuclear materials, the off-site disposal of the FCP's containerized waste inventories was tracked using the FCP's SWIFTS database, and documented using signed shipping manifests that produced the formal record that the waste inventories were properly shipped to and received by the off-site permitted disposal facility. For the FCP's TSCA-regulated wastes (i.e., the FCP's PCB-contaminated waste inventories) that were sent to DOE's TSCA incinerator in Oak Ridge Tennessee for incineration, certificates of destruction (as required by TSCA) were also furnished to DOE along with the signed shipping manifests documenting that the wastes were received by the facility.

A printout of SWIFTS shows that all of the FCP's containerized waste inventories have been shipped from the site and received by the appropriate facility. All of the hard-copy manifests, SWIFTS system reports, and certificates of destruction as required by TSCA have been entered into the FCP's records management program. All such records are to be transferred and archived at final site closure with NARA, who in turn will retain the disposal records for 75 years.

During the execution of the site-wide remedial actions at the FCP, new containerized remediation wastes requiring off-site disposal were generated by the other operable units as an adjunct to their respective remediation activities. These containerized wastes were managed and tracked in the FCP's containerized inventory alongside the legacy production-era inventory that was present at the site when production operations ceased. Both the legacy production-era containers and the remediation-related containers were then dispositioned as one principal inventory, using identical shipping and disposal record-keeping procedures and documentation. In executing the shipping and off-site disposal activities, a working date of February 1, 2004 was assigned to begin tracking all newly generated remediation-related containers as a separate population, with each new container assigned to the particular operable unit generating the container. (An example is the ongoing quantities of newly generated water treatment sludges produced by the FCP's groundwater treatment facility, which require containerization for off-site disposal). The February 1, 2004 date was chosen to facilitate individual operable unit closeout and to identify when the official Operable Unit 3 legacy production-era population of containers could be declared complete for purposes of this Operable Unit 3 Remedial Action Report. Under this strategy, once all containers with a

generation date earlier than February 1, 2004 (and all new Operable Unit 3 specific containers generated by D&D activities after February 1, 2004) are successfully dispositioned off site, the Operable Unit 3 containerized waste dispositioning activities can be declared officially complete.

Only those wastes in the process of being generated or are in the process of disposition as a result of continuing operations associated with groundwater remediation and legacy management remain on site.

7.0 OPERATION AND MAINTENANCE ACTIVITIES

As a complete dismantlement, excavation, and disposal remedy there are no post-remedy operational issues or maintenance requirements associated with the remediation activities conducted for Operable Unit 3. Maintenance activities for these areas are generally related to controlling access to prevent re-contamination and maintaining the vegetation planted for natural resource restoration purposes. For the former production area, restoration will focus on the creation of open water habitats and re-vegetation of the area with native species. These activities are conducted as part of the Operable Unit 5 resource restoration activities.

Maintenance of restored areas prior to closure is described in the individual restoration design packages. The following are the general maintenance activities that will be carried out in each restored area:

- Controlling invasive/noxious species by spot removal using manual, mechanical, or chemical methods.
- Reseeding and/or replanting of restored areas as required by implementation monitoring and adaptive management decisions to ensure appropriate vegetative cover.
- Maintain prairie and savanna ecosystems and diversity through appropriate disturbance regimes and thatch removal. Activities may include mowing, burning, or physical disturbance.
- Correcting soil erosion problems at drainage channels, stream banks, outfall structures, or wetland berms by appropriate means that are impacting or have the potential to impact restored areas.
- Repairing wildlife structures/boxes as needed.
- Clearing debris, tripping hazards, overhanging limbs, excessive weed growth, and replacing mulch on pathways and public access areas.
- Keeping access points and parking areas in good condition including the replacement of gravel and mowing and trimming as appropriate.

Legacy management is required at the FCP to ensure that the remedial actions implemented at the site continue to be effective and protective of human health and the environment. Legacy management in restored areas will include ensuring that natural and cultural resources are protected in accordance with applicable laws and regulations. Institutional controls are implemented to limit access and land use. Institutional controls include continued federal ownership of the FCP and placing restrictions on the use of the property on the property deed before the property could be sold or transferred to another party. All the legacy management and institutional control requirements and initiatives are defined in the Comprehensive Legacy Management and Institutional Controls Plan [DOE 2006b].

8.0 SUMMARY OF PROJECT COSTS

The Operable Unit 3 IROD and final remedial action ROD together identify the remedial action elements selected for Operable Unit 3. The interim remedial alternative selected in the IROD was Alternative 3 – D&D Of All Above- And Below-Grade Buildings And Facilities. The follow-on final disposition alternative selected in the final remedial action ROD was Alternative 2 – Selected Material Treatment, On-Property Disposal, and Off-Site Disposition. A summary of the estimated costs for the selected interim and final remedies at the time of their selection was provided in the IROD and the final remedial action ROD, with the details and backup provided in the Remedial Investigation and Feasibility Study report.

The primary remedies implemented as a result of the Operable Unit 3 IROD and final remedial action ROD involved the D&D of all above and below grade buildings and facilities and the on-property disposal of the resultant debris in the OSDF. There were ancillary activities associated with recycle/reuse initiatives and small quantities of off-site shipment of debris. Additionally, there were the programmatic removal actions incorporated into the scope of work as D&D of facilities were implemented. However, fundamentally the remedy implemented was a D&D action and placement of debris in the OSDF.

The final remedial action ROD provided estimated costs associated with the placement of debris in the OSDF. The Operable Unit 3 RI/FS provided the basis for this estimates based on primarily an estimated unit rate of disposal in the OSDF. Disposal costs were tracked as a part of the OSDF remedial action. These costs will be reported in the Interim Remedial Action Report of Operable Unit 5 – OSDF Section. Therefore, for the purposes of comparing estimated costs of the remedy implemented with the actual cost experienced, the focus is appropriately on the D&D of facilities as delineated in the IROD. The evaluation that follows involves the comparison of costs estimated in the IROD with those actual D&D costs incurred. Consistent with EPA's closeout guidance, an explanation is provided when the actual costs fall outside the range of –30 to +50 percent of the estimate. Appendix A provides a full accounting of all the costs experienced in implementing the Operable Unit 3 remedy with the exception of disposal costs of debris in the OSDF.

Readers should note that for all of the cost evaluations presented in the FCP's individual operable unit closeout reports (including this Operable Unit 3 report), the evaluations focus on those direct and indirect remedial costs specifically associated with the individual remedies conducted for the operable unit of interest. The cost evaluations do not include FCP administrative or overhead costs for managing the site as a whole, such as for oversight, site administration and management, communications and reporting, site-wide utilities, office space, and the like. The comparisons are aimed at the specific direct and indirect costs required to complete the individual remedies required by the FCP's CERCLA process across the five operable units. In this way, users of this report will be able to more readily compare costs from other sites within the Superfund program for like remedies with those experienced at Fernald.

8.1 IROD Cost Adjustments

The cost estimate provided in the Operable Unit 3 IROD for the interim work scope activities was $2.164 billion (1994 base dollars). The IROD scope of work and associated cost estimates prepared at the time the IROD was issued included above-grade D&D, at- and below-grade D&D costs, and landlord costs. The above-grade and at- and below-grade D&D costs were divided between two categories: direct costs and indirect costs.

In order to permit a fair comparison with the actual costs experienced for Operable Unit 3, several adjustments to the original estimate are needed. First, additional work scope and costs (estimated at $12.3 million) were added to the original IROD cost estimate to address the D&D costs required to dismantle and dispose of the remedial facilities constructed by the other operable units to support cleanup. The added D&D items included the remediation-related structures for Operable Unit 1 and Operable Unit 4.

Secondly, an adjustment is required deducting the estimated costs associated with the removal of at-and below-grade structures from the original IROD estimate since all at- and below-grade debris was removed concurrently with the excavation of the Operable Unit 5 soils, and the actual costs experienced for soil excavation activities include the concurrent removal of the debris. All costs associated with the excavation of soil and at-and below grade debris will be accounted for in the Interim Remedial Action Report for Operable Unit 5 – Soil Remediation Section. An estimated cost of $84.3 million was deducted from the IROD estimate based on subtracting a $17.4 million line item for at and below grade cost and a proportional amount of the indirect costs.

Finally, the costs associated with landlord activities ($1,089 million) identified as a line item in the original IROD estimate were also excluded from evaluation, since the actual costs for landlord activities are borne by the FCP as a whole, and are not assigned or tracked as Operable Unit 3 costs.

It is important to note the costs associated with three programmatic removal actions that support the D&D activities addressed by the IROD are within the actual costs experienced and are not addressed separately. These activities are: 1) the safe shutdown tasks needed to prepare the buildings for dismantlement, as identified in Removal Action 12; 2) the tasks associated with improved interim storage of debris, as identified in Removal Action 17; and 3) the asbestos abatement tasks associated with building D&D as identified in Removal Action 26. These three activities generally started as time-critical removal actions before the IROD was developed, and the costs were originally estimated on an annual "as needed" priority basis, rather than as total life-cycle project costs.

The IROD cost estimate was prepared in 1994 constant dollars and it was necessary to escalate the dollars to future dollars to permit comparison with actual costs. An annual escalation factor of 3 percent was used for all escalation calculations.

8.2 Cost Comparison

Table 8-1 contains a tabulation of costs after accounting for all the adjustments and escalations used to modify the original IROD cost estimate to facilitate its comparison to actual costs. Based on all of the adjustments described above and the escalation of 1994 constant dollars to future dollars, the IROD adjusted escalated cost estimate is $1,447.1 million based on actual completion in 2006.

Actual costs for the adjusted IROD tasks total to $174.0 million. When compared to the 2006 escalated adjusted estimate of $1,384.6 million, an 87 percent reduction in costs was achieved. This significant level of cost savings, which falls below EPA's -30 to +50 percent guideline for discussion in this report, can best be explained based on how the work was performed. The IROD D&D cost estimate was based on a "take it down piece by piece, beam by beam" approach, recognizing the inherent risks and contaminant release mechanisms associated with radiological demolition work. This "piece by piece" approach was adopted for planning purposes in 1993, and drove the cost estimates and schedules under consideration at the time of the IROD. The Plant 7, Plant 4, and Plant 1 design packages were bid, awarded, and executed in 1994 through 1996. Experience with these large-scale and challenging projects demonstrated that the use of current commercial demolition practices including implosion and mechanical shearing, would drastically reduce the time, labor requirements, and overall cost of the

D&D work as compared to the original IROD "piece by piece" deconstruction approach, while still maintaining a safe occupational, radiological, and environmental posture for the work. The dramatic schedule and cost savings that were experienced with these projects formed the basis for the "ten-year plan" project acceleration objective for Fernald, which was approved for funding by DOE in 1996. For fiscal year 1997 and beyond, the funding profile for the site was developed considering the use of the proven safe cost-reducing commercial practices, and all subsequent funding decisions and schedules developed for the site adopted the accelerated approach and resultant savings. Therefore, while the original IROD cost estimate using the "piece by piece" deconstruction method remains in the record for comparative purposes, all funding and scheduling decisions made for the FCP beginning in 1997 endorsed the schedule savings and cost savings associated with the utilization of commercial practices and innovative techniques to perform D&D.

Table 8-1 Decontamination & Decommissioning Remedy Costs (in millions)

Scope	Total Actual Cost	Total ROD Cost Estimate (Unescalated)	Total ROD Cost Estimate (Escalated to 2006)
Direct Costs	$101.0	$204.5	$283.1
Indirect Costs	$61.4*	$786.8	$1,089.2
Subtotal	$162.4	$991.3	$1,372.3
Add Operable Unit 1 and Operable Unit 4 D&D	11.6	$12.3	$12.3
D&D Remedy TOTAL	**$174.0**	**$1,003.6**	**$1,384.6**

* Actual indirect costs experienced are limited to project management and oversight. Actual engineering costs incurred are included in the direct costs

9.0 OBSERVATIONS AND LESSONS LEARNED

Lessons learned from the FCP's earliest D&D and excavation activities were continuously incorporated into the planning and design for later projects to ensure that remedial activities met all applicable requirements and achieved the highest quality level possible, while also enhancing the cost effectiveness of the projects. Some of the key lessons included:

- At the time the decision was made to cease production in 1989, it was decided to end production while much in-process material remained in the various production facility's tanks and pipelines. This complicated the eventual D&D process. This hold-up material resulted in the need for Removal Action 12, Safe Shutdown, which was created to provide the planning, engineering, and program control for the removal and disposition of in-process residue materials, excess supplies, chemicals, and the associated process equipment that remained when Fernald stopped production.
- Since most of the material eligibility, size, and other waste acceptance requirements for the Operable Unit 3 materials were visually based, it proved important to utilize consistent crews within a given project and properly trained and qualified WAO personnel to render consistent visual judgments in the field. WAO inspection personnel were required both at the point of debris generation and at the location of placement in the OSDF.
- Crews needed to perform continuous real-time visual observation of the at- and below-grade debris excavations and above-grade dismantlement and decontamination activities to identify debris requiring special handling or segregation. Where necessary, try and provide a working area to perform the observations away from ongoing heavy equipment operations.
- Recognize the inherent safety risks and considerations in performing the visual inspections; remain clear of pinch points and keep body parts out from between stationary and/or moving objects. Plan for the impact of personal protective equipment (PPE) on the visual inspection process.
- Provide proper lighting for the visual inspections, especially when multiple day and night shift work is required.
- Develop open lines of communication and a consistent process for obtaining EPA consensus on the types of field decisions that accompany visual-based acceptance criteria.
- Utilize weekly conference calls with EPA and Ohio EPA to plan upcoming work, field observation activities, and observations from the previous week.
- Recognize stockpiling is a necessary requirement to smooth the flow of materials for placement; recognize the impacts of weather delays and winter shutdown conditions on the need for debris stockpiles, while striving to minimize the double handling of material.
- Large articulated dump trucks proved to be more efficient than smaller articulated or road trucks for the pace and quantities of at- and below-grade debris generated during soil excavation in the former production area.
- Dust and erosion controls in the excavation and dismantlement areas can become major, nearly continuous efforts and should be planned for properly. Such efforts generate large quantities of impacted water that need to be accounted for in storm-water planning.
- Feedback from project-boundary perimeter air monitors needs to be coordinated with site-wide efforts to determine the impact of individual projects on the air pathway, so that continuous improvements can be evaluated and implemented.
- Use large mechanical equipment such as backhoes with heavy-duty shears rather than hand removal techniques (e.g., saw cutting) wherever possible, to significantly reduce occupational risk to employees. Hand injuries were a key occupational injury category that was significantly reduced by shearing.

- Use implosion techniques on taller structures where feasible to reduce the risks of structural demolition.
- Use a borescope wherever possible to conduct interior inspections of piping. Avoids the need to re-cut piping for inspection that has been crimped through mechanical shearing.
- The use of the oxy-gasoline cutting torch (tested and deployed under the DOE innovative technologies program) was more effective and efficient compared to the standard acetylene torch in cutting through the thicker plate steel encountered.
- The use of fixatives after the gross decontamination of structure was completed provide very effective in mitigating against airborne contamination
- Utilize multiple progressive walkthroughs to identify eligible/ineligible WAC materials as early as possible, as work progresses and inspection access avenues develop during the course of the project.
- Develop effective contracting mechanisms to control the work of the D&D subcontractor to the requirements of the site, while still allowing for innovation and adoption of safe, proven, commercial practices in project execution. Address the need for effective independent oversight and construction management interactions with the contractor under in a fixed-price environment.

10.0 CONTACT INFORMATION

Remedial Action Contacts

U.S. Department of Energy Contact Public Information Fernald Closure Project U.S. Department of Energy P.0. Box 538705 Cincinnati, OH 45253-8705 513-648-3153	**Fluor Fernald Contact** Fernald Closure Project Fluor Fernald P.O. Box 538704 Cincinnati, OH 45253-8704 513-648-4898
U.S. Environmental Protection Agency Contact Remedial Project Manager U.S. EPA SRF-6J 77 W. Jackson Blvd. Chicago, IL 60604-3590 312-886-0992	**Ohio Environmental Protection Agency Contact** Fernald Project Manager Ohio Environmental Protection Agency 401 E. Fifth St. Dayton, OH 45402-2911 937-285-6357

APPENDIX A – COST AND PERFORMANCE SUMMARY

Appendix A is focused on two fundamental topics. The first is a more complete explanation of the reasons for the dramatic cost savings described in Section 8.0 of this report. The second topic involves providing a tabulation of all costs associated with Operable Unit 3 including waste management activities and D&D costs that were incurred prior to the signing of the Operable Unit 3 IROD and final remedial action ROD. All of the costs associated with Operable Unit 3, with the exception of the disposal costs of debris in the OSDF (as explained in Section 8.0) are included in Table A.1-1.

A.1 Explanation of Cost Savings

The comparison shows that the savings between the estimated costs and the actual costs fall outside the –30 to +50 percent guideline contained in EPA's CERCLA closeout guidance document, and therefore explanations of the savings-related differences are necessary.

An integrated plan was made for remediation of the FCP in 1995 after many of the ROD documents had been approved or were in the later stages of approval. This plan integrated the actions of all of the Operating Units. The final goal chosen was FY2006 completion. Operable Unit 3 was originally planned for completion by FY2012. Therefore, the D&D effort was planned one way in the ROD but executed in a different manner. The execution schedule along with the funding provided by DOE allowed Fernald to complete the D&D effort by FY2006. This acceleration reduced escalation, project management and engineering staffing, and contingency as stated in the ROD. The execution schedule, sequence changes and the identification of complexes caused the cost of D&D to be reduced greatly. The significant savings experienced on the project are documented below for the improvements and processes that resulted in an accelerated schedule, lower cost, and safer project.

Engineering Costs

- The IROD engineering estimate shows a cost of $222.9 million to be budgeted over the 16 years. The remedy solution would have required a budget of $13.9 million per year. The D&D of Plant 7 (RA19) formed a basis for the first remedial implementation plan initiated for Plant 4 and Plant 1. Upon successful completion of these projects, DOE accepted the 10-year Plan in 1996 for Operable Unit 3. This change caused the duration of the project to be reduced by 7 years. A reduction of 7 years at $13.9 million per year equates to a savings of $97.3 million (FY94 dollars).
- A contribution to a reduction of engineering costs is the use of a standard engineering specification for all D&D projects. Rather than repeating typical elements common to all projects, the document was approved the first time and issued with slight enhancements in all following contract packages. This eliminated the need to produce an engineering package for each project. Significant amounts of engineering process time and paperwork were saved because less engineering packages were required.
- The buildings were grouped into logical D&D complexes thereby reducing the number of engineering and construction packages.

Construction Direct/Indirect Costs

- The IROD assigned a contingency value of 20% to the sum of the cost of the direct costs, indirect costs, engineering costs and escalation. The risk for the D&D work scope was greatly reduced by executing the D&D work scope using the engineering methodology described above.
- Direct costs were reduced because a great emphasis was placed on planning the work before it started. Much of the work was subcontracted based upon a performance based fixed price contracting strategy. This lowered the risk to DOE. Planning packages required approval by Fluor prior to the start of each of the eight key tasks in a complex contract package. All technical aspects of the project were agreed to before the work started.

- New work methods were adopted to improve productivity including the use of more D&D being accomplished by mechanical means rather than manual means. The use of demolition equipment rather than manual cutting of material was emphasized. The use of a mechanical shear inside a building removing equipment, non-process piping, electrical conduit, wiring, equipment reduced the amount of manpower required, the amount of scaffolding used and the amount of decontamination needed, thus reducing cost. This had the dual benefit of providing a safer project while realizing schedule improvement.
- Pre-qualifying subcontractors reduced bidding costs. Experienced, financially stable contractors with a proven track record of safety performance were asked to pre-qualify.
- Identification of a clear scope of work clearly identified the roles and responsibilities of the subcontractor and the contract manager, Fluor Fernald. As an example, Fluor Fernald managed the radiation safety programs to reduce the risk to DOE.
- Fluor took advantage of new emerging technologies and existing technologies that were applied to D&D work. Two examples include the use of platform scaffolding used to removed large amounts of transite siding from buildings and the use of a gasoline powered cutting torch to improve the productivity of cutting thick walled steel vessels and tanks.
- The use of implosion techniques on high structures reduced the amount of time to remove high structures.
- As Fluor accomplished more work, the new ideas were rolled into the new contract documents and schedules. Staffing of the projects became more efficient as the new methods proved worthy and less oversight was required. Reduction of safety injuries has been proven to cause fewer disruptions and the projects/ overhead costs are reduced because the project is done quicker.
- Eventually, Fluor Fernald self performed the D&D which proved to be a quicker, safer, less costly strategy to remove the last of the large buildings and Operable Unit 1 and 4 remediation facilities.
- The Central Storage Facility was planned in the IROD. This facility and its infrastructure was never designed or built. Other means of temporary storage of debris were found while protection of the environment was maintained (control of storm water runoff and run on; control of fugitive dust).

A.2 Tabulation of Operable Unit 3 Costs

Section 8 of this report provided the tabulation and comparison of costs relative to the D&D of above grade facilities. However, there were other costs incurred under Operable Unit 3 involving D&D work in advance of the records of decision as well as the disposition of large quantities of low-level radioactive waste, mixed waste, thorium contaminated waste and nuclear materials conducted primarily under Removal Action 9; Removal of Waste Inventories. Table A.2-1 tabulates these costs.

Table A.2-1 Operable Unit 3 Remedy Costs Excluding Debris Placement in OSDF (in millions)

Scope	Total Actual Cost
Above Grade D&D (subsequent to IROD)	$174.0
RA 13 Plant 1 Ore Silos D&D (pre-IROD)	$6.1
RA 19 Plant 7 (pre-IROD)	$6.4
RA Fire Training Facility (pre-IROD)	$1.8
Safe Shut Down	$52.9
Removal of Waste Inventories*	$329.9
Off-Site Debris Disposal	$6.1
Remedy TOTAL	**$577.2**

*Includes low-level waste, mixed waste, thorium products and nuclear materials disposition

APPENDIX B – SCHEMATIC OF TREATMENT SYSTEMS

None of the D&D, containerized waste, and nuclear material dispositioning activities that comprise the Operable Unit 3 remedy involved on-site treatment; so therefore no treatment systems or schematics were employed.

In support of the Final Remedial Action ROD requirement to evaluate recycling on a case-by-case basis during each above-grade project design, an evaluation of disposition alternatives was performed for each D&D complex for potentially unrestricted recyclable/reusable materials projected to be generated by each project. A decision methodology for Fernald material recycling/reuse disposition alternatives was finalized in July 1997 following extensive stakeholder involvement and evaluation of FCP-specific unit costs for recycling of accessible metals. The decision methodology consisted of three phases: 1) a threshold phase; 2) a life-cycle analysis phase; and 3) a decision phase. The first phase included a comparative evaluation of project costs for each alternative. A threshold criterion of 25 percent was established for the threshold phase to compare the recycling option to the costs of on-site disposal in the OSDF. Where the recycling option exceeded the 25 percent criterion, no further consideration of recycling was considered justified. Each of the D&D complex implementation plans presented an evaluation of recycling/reuse for the complex-specific accessible metals using the decision methodology.

In the early 1990's a demonstration treatment technology was evaluated at the FCP to test the efficacy of grit blasting lightly contaminated structural steel for possible recycle. The evaluation revealed that the technology was cost prohibitive and led to the development and acceptance of the 1997 Fernald decision methodology for material recycling/reuse. These established cost factors from the demonstration were incorporated into the threshold phase of the decision methodology, and updated as new vendor/market information became available.

APPENDIX C – HWMU CLOSURES

In June 1996, Ohio EPA issued a set of Director's Final Findings and Orders (DF&O) to identify the requirements and strategy for the closeout of Fernald's HWMUs in conjunction with the site's CERCLA remediation activities. As discussed in Sections 2.3 and 2.5.1, this Final Remedial Action Report serves as the certification mechanism to formally document that the physical and structural HWMUs listed in Attachment A of the 1996 Ohio EPA Director's Findings and Orders that reside within Operable Unit 3 have been successfully closed through the FCP's integrated CERCLA/RCRA strategy.

A process for closure certification required by Section V.4 of the DF&O was proposed by DOE in December 2003 [DOE 2003] and accepted by Ohio EPA in February 2004 [Ohio EPA 2004]. The agreed strategy provided that the Operable Unit 3 Final Remedial Action Report would contain the certification of closure for all above grade HWMUs without soil contamination. The agreed strategy also included the certification statement to be used. The Operable Unit 5 Interim Remedial Action Report would then provide the certification of Operable Unit 3 above grade HWMUs with soil contamination as well as for the at -and below grade HWMUs. This strategy recognized that Ohio EPA's review and approval of CERCLA documents such as Operable Unit 3 Project Completion Reports and Operable Unit 5 Soil Certification Reports signified Ohio EPA's concurrence that remediation of the HWMUs had been completed in accordance with the DF&O.

In accordance with the DF&O and the agreed strategy for certification:

> "DOE hereby certifies that the HWMUs identified in Table C-1 have been closed"

The signature page included in Appendix I contains the signature attesting to this certification.

Table C-1 Operable Unit 3 Above Grade HWMUs Closed Under The RCRA/CERCLA Integrated Process*

HWMU Identification	FCP Component Number	Remediation Complex	Project Completion Report
HWMU #10, NAR System Components	2A	Plant 2 Complex	July 2004, Operable Unit 3 Multi-Complex Decontamination and Dismantlement Project Completion Report
HWMU #14, Box Furnace	74R	Plant 8 Complex	
HWMU #15, Oxidation Furnace #1	8A	Plant 8 Complex	
HWMU #19, CP Storage Warehouse (Butler Building)	56A	Plant 1 Complex Phase II	November 2003, Operable Unit 3 Plant 1 Complex – Phase II Decontamination and Dismantlement Project Completion Report
HWMU #25, Plant 1 Storage Building	67	Plant 1 Complex – Phase I	December 1997, Operable Unit 3 Plant 1 Complex – Phase 1 Project Completion Report
HWMU #29, Plant 8 Warehouse	80	Plant 8 Complex	July 2004, Operable Unit 3 Multi-Complex Decontamination and Dismantlement Project Completion Report
HWMU #33, Pilot Plant Warehouse	68	Pilot Plant Complex	July 2004, Operable Unit 3 Laboratory Complex Decontamination and Dismantlement Project Completion Report
HWMU #34, KC-2 Warehouse	63	Plant 1 Complex – Phase II	October 1999, Operable Unit 3 Miscellaneous Small Structures Decontamination and Dismantlement Project Task Order #432 Completion Report
HWMU #35, Plant 9 Warehouse	81	Thorium Plant 9 Complex	April 1999, Operable Unit 3 Project Completion Report Thorium/Plant 9 Complex Decontamination and Dismantlement Project
HWMU #37, Plant 6 Warehouse	79	East Warehouse Complex	June 2005, East Warehouse Decontamination and Dismantlement Project Completion Report
HWMU #54, Thorium Nitrate Tank (T2)	13D	Pilot Plant Complex	September 2004, Operable Unit 3 Pilot Plant Complex Decontamination and Dismantlement Project Completion Report

* It was agreed in a meeting on September 21, 2004 between members of Ohio EPA, DOE, and Fluor Fernald that the footprints of HWMU 28 (Trane Incinerator) and HWMUs 46-50 (UNH Tanks) would be specifically sampled during soil certification to verify the HWMU-specific contaminants of concern meet Operable Unit 5 Soil Final Remediation Levels. As such, these HWMUs will be discussed in the Operable Unit 5 Interim Remedial Action Report with the other HWMUs with soil contamination, consistent with the strategy discussed above

APPENDIX D – REMOVAL ACTIONS

As discussed in Section 2.1.2, there were four programmatic removal actions associated with Operable Unit 3 that were conducted as an effort to minimize the release or threat of release of contaminants and to accelerate cleanup activities. All four programmatic removal actions were incorporated into the September 1995 Final Remedial Action ROD. These four removal actions are summarized below.

Removal Action 9 – Removal of Waste Inventories

Removal Action 9 involved the safe, off-site disposal of existing waste inventories. Containerization of Fernald's major waste streams was initiated in August 1985, and Removal Action 9 was formally set in motion in 1991 to provide for the transfer of inventoried waste to NTS. The waste management program initiated by Removal Action 9 defined the procedures for waste characterization, treatment, packaging, and transportation of waste in a manner that provides compliance with DOE Orders, Department of Transportation shipping requirements, and all applicable waste acceptance criteria (WAC). The procedures and disposition decisions of Removal Action 9 were adopted directly by the final remedial action ROD and incorporated by reference in the Operable Unit 3 integrated RD/RA work plan for continued implementation during the execution of the Operable Unit 3 remedy. Removal Action 9 addressed the FCP's inventory of low-level waste, mixed waste, and toxics substances control act (TSCA) wastes that were generated as a result of production operations, facility maintenance, site upgrades, and pre-ROD cleanup activities. The disposition of this inventory of waste, known in general as legacy waste, was completed February 17, 2004.

Removal Action 12 – Safe Shutdown

Removal Action 12 was created to provide the planning, engineering, and program control for the removal and disposition of in-process residue materials, excess supplies, chemicals, and the associated process equipment that remained when Fernald stopped production in 1989. Residue materials removed during safe shutdown were sent for off-site disposal under Removal Action 9. The removal action also provided for the isolation and de-energizing of former production-related equipment and utilities and provided for the identification of new customers for Fernald equipment and nuclear products. On a programmatic basis the scope, planning, and procedures that comprised Removal Action 12 were incorporated by reference into the final remedial action ROD and integrated RD/RA work plan for continued implementation during the Operable Unit 3 final remedial action. Activities within the scope of this removal action were completed in March 1999.

Removal Action 17 – Improved Storage of Soil and Debris

Removal Action 17 was initiated to provide controlled storage of excess contaminated soil and debris generated during maintenance, construction, removal, and remedial actions through a soil and debris management plan. On a programmatic basis the scope, planning, and procedures that comprise this removal action were adopted by the final remedial action ROD and incorporated into the Operable Unit 3 final remedial action. The EPA approved Removal Action 17 Work Plan was incorporated by reference into the Operable Unit 3 integrated RD/RA work plan, to provide the ongoing direction necessary for interim storage and staging of Operable Unit 3 materials during the interim and final remedial actions. These activities continued through the completion of site remediation which was concluded on October 29, 2006

Removal Action 26 – Asbestos Removal

Removal Action 26 was established as a specialized maintenance-related activity to mitigate potential asbestos release during conduct of ongoing maintenance, safe shutdown, and site cleanup activities. Since asbestos removal and abatement activities were going to continue throughout the life of the Operable Unit 3 remedy, the

final remedial action ROD adopted the earlier management procedures and approaches established under Removal Action 26, while also deciding on the final destination disposal locations (on site and off site) and eligibility for the categories of asbestos-containing materials generated during the remedial actions. The last asbestos abatement activities conducted under this removal action occurred in April 2005.

With the signing of the final remedial action ROD the four programmatic removal actions were officially incorporated into the formal Operable Unit 3 remedy. A letter issued in June 1997 formally closed the administrative record file for the four removal actions and acknowledged that future documentation associated with the completion of the activities would be included in the Operable Unit 3 Post ROD File, of which this Remedial Action Closeout Report is the final step.

In addition to the four programmatic removal actions adopted by the Final Remedial Action ROD, there were ten precursor removal actions associated with Operable Unit 3 that were conducted ahead of the remedial action RODs. These removal actions are summarized in Table D-1 below. Each of the removal actions had a separate work plan and completion report approved by EPA.

Table D-1 Removal Action Summary For Operable Unit 3

Document	Date
Operable Unit 3 Pre-ROD Removal Action Work Plans	
Plant 1 Pad Continuing Release Removal Action Number 7 Work Plan	June 1991
Scrap Metal Piles Removal Action Number 15 Work Plan	April 1992
Plant 1 Ore Silos Removal Action Number 13 Work Plan	July 1992
Contaminated Soils Adjacent to the Sewage Treatment Plant Incinerator Removal Action Number 14 Work Plan	July 1992
Pilot Plant Sump Removal Action Number 24 Work Plan (Abandoned Sump West of Pilot Plant)	March 1993
Nitric Acid Tank Car and Area Removal Action Work Plan and Closure Plan Information and Data Package Final (Removal Action Number 25)	March 1993
Plant 7 Dismantling Removal Action Number 19 Work Plan	April 1993
Contamination at the Fire Training Facility Removal Action Number 28 Work Plan	September 1993
Uranyl Nitrate Hexahydrate Neutralization Project Removal Action Work Plan Removal Action Number 20	June 1994
Operable Unit 3 Removal Action Closeout Reports	
Nitric Acid Tank Car and Area Removal Action and Closure Final Report (Removal Action Number 25)	October 1993
Pilot Plant Sump Removal Action Number 24 (Abandoned Sump West of Pilot Plant) Final Report	December 1993
Final Report Phase I Scrap Metal Piles Removal Action Number 15	September 1994
Removal Action Number 14 Contaminated Soils Adjacent to the Sewage Treatment Plant Incinerator Final Report	November 1994
Removal Action Number 7 Plant 1 Pad Continuing Release Final Report	December 1994
Removal Action Number 13, Plant 1 Ore Silos Final Report	May 1995
Plant 7 Dismantling Removal Action Number 19 Final Report	May 1995
Contamination at the Fire Training Facility Removal Action Number 28 Final Report	May 1995
Thorium Nitrate Solidification Final Report Completed Under Removal Action Number 9	February 1996
Removal Action Number 20, Uranyl Nitrate Neutralization (UNH) Project Final Report	October 1996
Operable Unit 3 Project Close-out Report Removal Action Number 12 Safe Shutdown	May 1999

APPENDIX E – LEGAL AGREEMENTS

The DOE has conducted operations at the Fernald Site under several legal agreements beginning with the 1986 Federal Facility Compliance Agreement. This includes the Consent Agreement and Amended Consent Agreement under CERCLA 121 and other agreements such as Ohio EPA Directors Findings and Orders, and Consent Decrees. This appendix, however, describes the legal agreements specific to Operable Unit 3, which are summarized below.

Stipulated Amendment to Consent Decree Entered December 2, 1988 and Settlement of Charges in Contempt – January 22, 1993

The specific impacts upon Operable Unit 3 as a result of this amended decree entered into U.S. District Court (Civil No. C-1-86-0217) included provisions to implement the provisions of the Waste Determination Plan of approximately 16,000 drums of material and proper operation of the Plant 1 Pad (proper aisle spacing, inspections, over-packing locations and controls). Other amendments to the 1988 Consent Decree were included in this agreement as well as the settlement of Ohio's charges in Contempt of Court.

Ohio EPA Director's Findings and Orders for Uranyl Nitrate Neutralization Project (UNH) – December 27, 1994

These orders were issued as a result of Ohio PEPA continued and serious concerns relative to the integrity of the UNH System. The orders included a schedule for initiation and completion of the neutralization/removal of the UNH from the UNH system, the requirement for continued inspection including repairs of deteriorations/malfunctions, the preparation of a contingency plan in the event of a catastrophic failure of the UNH system, decontamination of the UNH systems tanks and equipment after the neutralization/removal of UNH material including a report demonstrating such decontamination. Ohio EPA acknowledged the completion of this project and the terms of the DF&O in their letter of January 24, 1997.

Ohio EPA Director's Findings and Orders for the Site Treatment Plan – October 4, 1995

These orders approved the Proposed Site Treatment Plan (an attachment to the actual orders) which addressed the storage and treatment of all mixed wastes at the FCP, compliance schedules for the treatment and disposition of all mixed wastes, and the requirement for an annual report with an updated Site Treatment Plan incorporating all approved amendments and schedule changes. Ohio EPA informed DOE on March 9, 2006 that all obligations under this DF&O had been met and the DF&O was terminated [Ohio EPA 2006].

Programmatic Agreement among the U.S. Department of Energy, The Advisory Council on Historic Preservation and The Ohio Historic Preservation Office Regarding Disposition of Facilities Under the Operable Unit Three Record of Decision for Interim Remedial Action – January 23, 1996

Because many of the buildings and structures were eligible for inclusion in the National Register of Historic Places, this agreement was executed to fulfill Section 106 of the National Historic Preservation Act. The agreement required the DOE to provide report packages for the nine primary production facilities and four main support facilities. These packages included construction details, production process, and structural conditions. These packages would consist of written descriptions, pictures, engineering drawings, and other information that documents the history and use of the FCP production and main support facilities.

Ohio EPA Director's Findings and Orders RCRA/CERCLA Integrated Closure – June 6, 1996

This agreement is discussed in detail in Section 2.3 and Appendix C of this report.

APPENDIX F – REFERENCES

U.S. Department of Energy, 1994, Operable Unit 3 Record of Decision for Interim Remedial Action, Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, Ohio.

U.S. Department of Energy, 1995a, Operable Unit 3 Remedial Design Prioritization and Sequencing Report, Final, prepared by Fernald Environmental Restoration Management Corporation, Cincinnati, Ohio

U.S. Department of Energy, 1995b, Remedial Design Work Plan for Interim Remedial Action Final, prepared by Fernald Environmental Restoration Management Corporation, Cincinnati, Ohio

U.S. Department of Energy, 1996a, Remedial Investigation/Feasibility Study Report for Operable Unit 3, Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, Ohio

U.S. Department of Energy, 1996b, Operable Unit 3 Record of Decision for Final Remedial Action, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, Ohio.

U.S. Department of Energy, 1996c, Record of Decision for Remedial Actions at Operable Unit 5, Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, Ohio.

U.S. Department of Energy, 1996d, On-Site Disposal Facility Impacted Material Placement Plan , Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, Ohio.

U.S. Department of Energy, 1997a, Operable Unit 3 Integrated Remedial Design/Remedial Action Work Plan, Final, prepared by Fluor Daniel Fernald Corporation, Cincinnati, Ohio

U.S. Department of Energy, 1997b, Letter DOE-1009-97, "Operable Units 3 and 5 Removal Action Files in the Comprehensive Environmental Response, Compensation, and Liability Act Administrative Record," to EPA Region V and Ohio EPA from DOE Fernald Area Office, Cincinnati Ohio.

U.S. Department of Energy, 1998a, Waste Acceptance Criteria Attainment Plan for the On-Site Disposal Facility," Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, Ohio

U.S. Department of Energy, 1998b, Site Wide Excavation Plan, Final, Fernald Environmental Management Project, DOE, Fernald Area Office, Cincinnati, Ohio

U.S. Department of Energy, 2003, Letter DOE-0061-04, William Taylor to Paul Pardi, "Certification of Closure of Fernald Closure Project Hazardous Waste Management Units"

U.S. Department of Energy, 2004, On-Site Disposal Facility Impacted Material Placement Plan for Winter Months, Revision 1, Fernald Closure Project, DOE, Fernald Area Office, Cincinnati, Ohio.

Ohio EPA, 2004, Letter Phillip Harris to William Taylor, "USDOE Letter Dated 12/23/2003; Certification of Closure of Fernald Closure Project Hazardous Waste Management Units"

U.S. Department of Energy, 2005, "Fact Sheet for Minor Record of Decision Modifications," Fernald Closure Project, Fernald Area Office, Cincinnati, OH.

U.S. Department of Energy, 2006a, Fact Sheet, "The Fernald Closure Project Identifies Clean Buildings and Structures for Beneficial Reuse Under Legacy Management," Fernald Closure Project, DOE, Fernald Area Office, Cincinnati, Ohio

U.S. Department of Energy, 2006b, "Comprehensive Legacy Management and Institutional Controls Plan," Final, Fernald Closure Project, DOE, Fernald Area Office, Cincinnati, Ohio

Ohio EPA, 2006, Michael Savage to Johnny Reising, "Director's Findings and Orders"

APPENDIX G – OPERABLE UNIT 3 PHOTOS

Figure G-1 Former Production Area (circa Spring 1996)

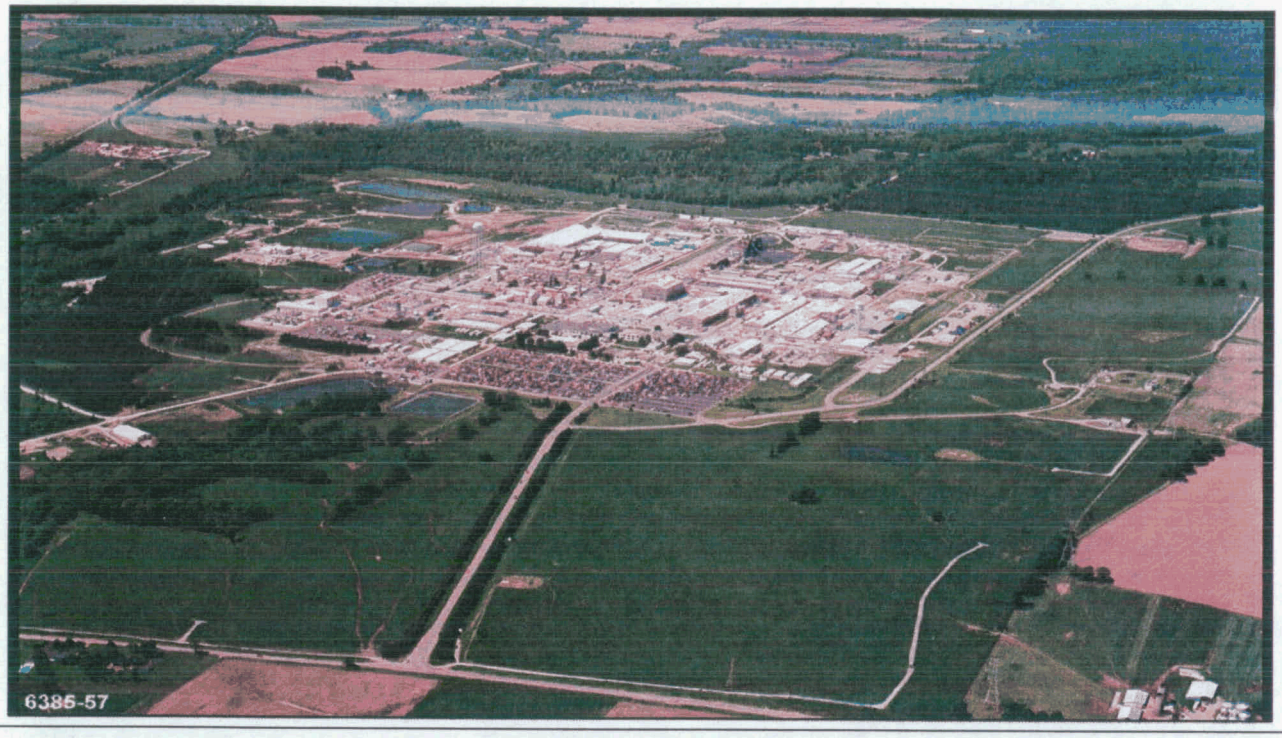


Figure G-2 Former Production Area (circa Fall 2004)

Figure G-3 Plant 4 Implosion (circa Spring 1996)

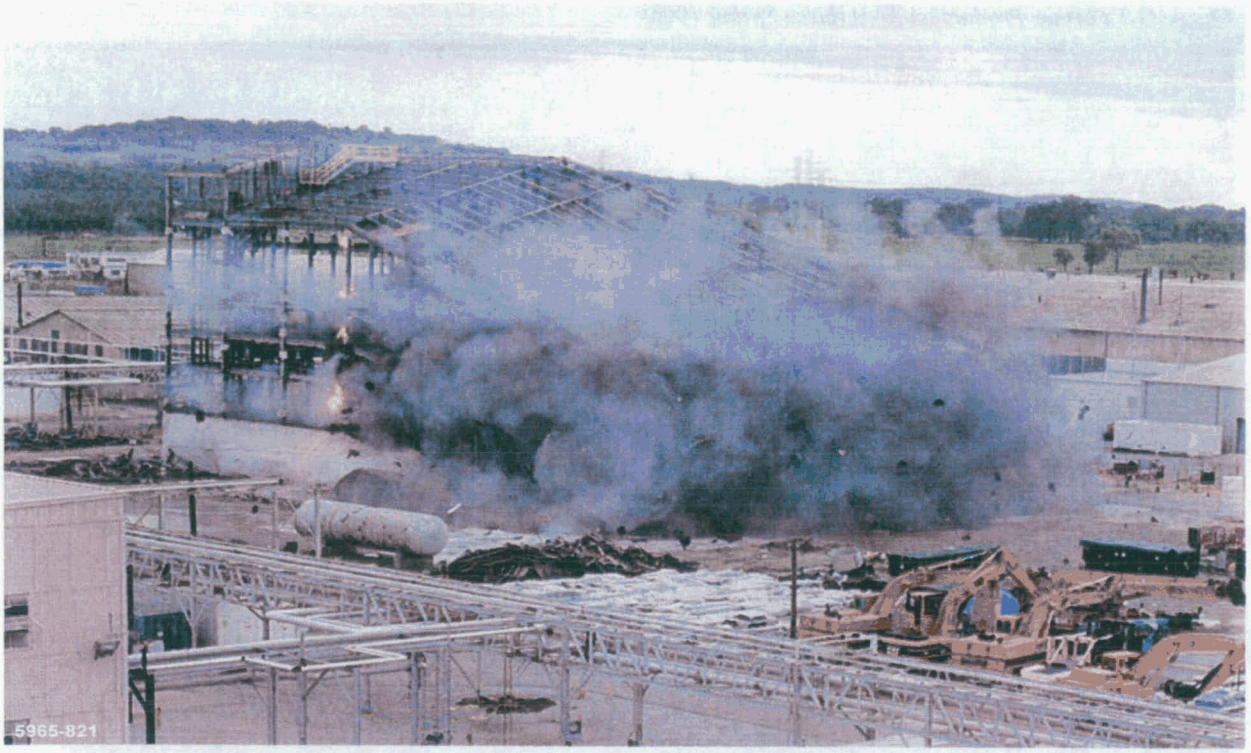
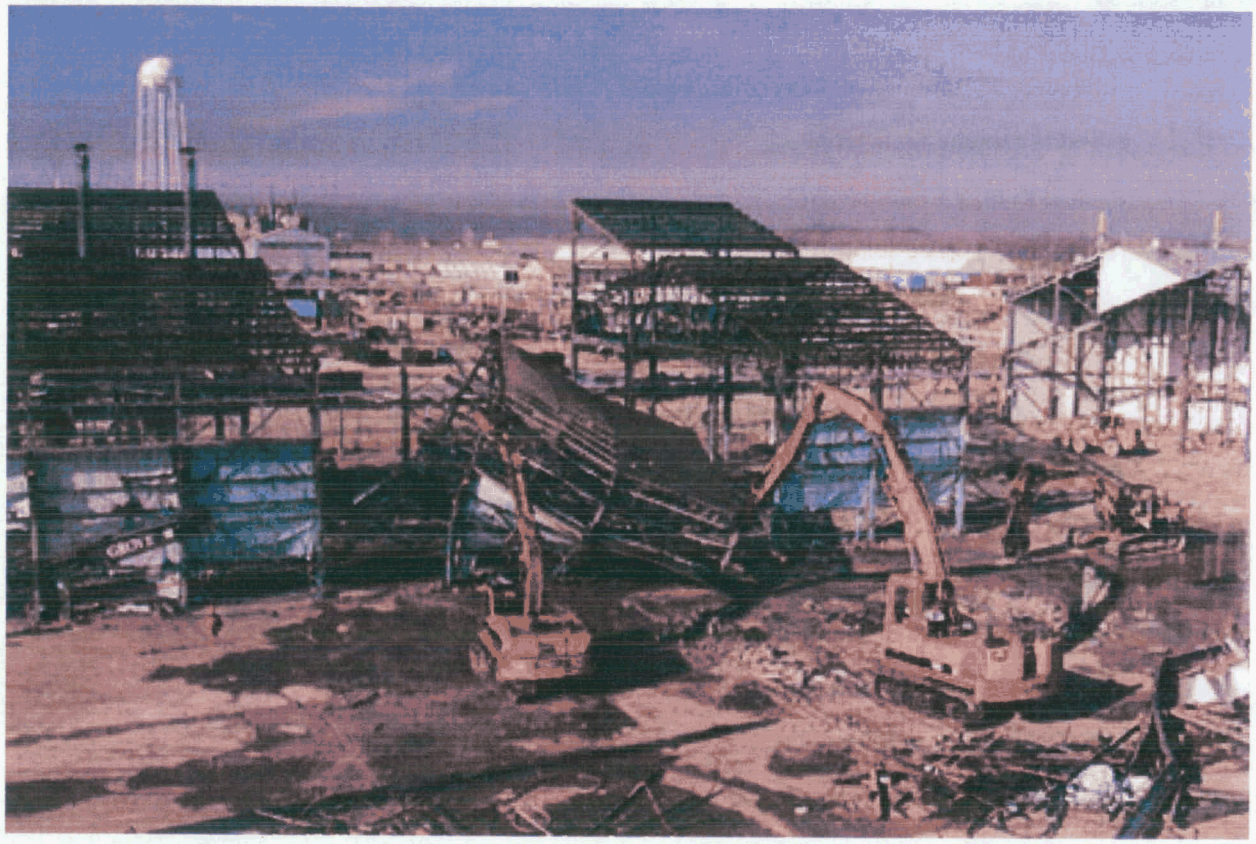


Figure G-4 Use of Mechanical Shearing Equipment Inside Plant 5 (circa 2001)

Figure G-5 Use of Mechanical Shearing Equipment Outside of Plant 6 (circa 2002)



APPENDIX H – LIST OF ACRONYMS

ACA	Amended Consent Agreement
ACM	asbestos containing material
AEC	Atomic Energy Commission
ANSI	American National Standards Institute
ARAR	applicable or relevant and appropriate requirements
ASQC	American Society of Quality Control
ASME	American Society of Mechanical Engineers
AWWT	Advanced Wastewater Treatment
CAWWT	Converted Advanced Wastewater Treatment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
D&D	decontamination & dismantlement
DF&O	Director's Findings & Orders
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
ERDA	U.S. Energy Research & Development Administration
FCP	Fernald Closure Project
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Company
FFCA	Federal Facilities Compliance Agreement
FMPC	Feed Materials Production Center
FRL	final remediation levels
FY	fiscal year
HWMU	Hazardous Waste Management Unit
IEMP	Integrated Environmental Management Plan
IFB	Invitation to Bid
IIMS	integrated information management system
IMPP	Impacted Material Placement Plan

IROD	Interim Record of Decision
LMICP	Legacy Management and Institutional Controls Plan
NARA	National Archives and Records Administration
NLO	National Lead of Ohio
NMMSS	Nuclear Materials Management Safeguards System
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NQA	National Quality Assurance
NTS	Nevada Test Site
OFFO	Office Federal Facilities Oversight (Ohio EPA)
Ohio EPA	Ohio Environmental Protection Agency
OMTA	OSDF material transfer area
OSDF	On-site Disposal Facility
OSWER	Office of Solid Waste and Emergency Response (U.S. EPA)
PCB	Poly-chlorinated biphenol
PPE	Personal Protective Equipment
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RFP	Request for Proposal
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RSE	Removal Site Evaluation
SARA	Superfund Amendments and Reauthorization Act
SCQ	Site-wide CERCLA Quality Assurance Plan
SED	Site-wide Environmental Database
SEP	Site-wide Excavation Plan
SWIFTS	Site-wide Waste Information Forecasting and Tracking System
TCLP	toxicity characteristic leaching procedure
TSCA	Toxic Substances Control Act

UNH	Uranyl Nitrate Neutralization Project
VOC	volatile organic compound
WAC	waste acceptance criteria
WAO	Waste Acceptance Organization
WEMCO	Westinghouse Environmental Management Company of Ohio
WMCO	Westinghouse Materials Company of Ohio
WPRAP	Waste Pits Remedial Action Project

APPENDIX I – SIGNATURE PAGE

I certify that the remedial actions as described within this report have been completed.

Johnny W. Reising 2/22/07

Johnny W. Reising, Director
United States Department of Energy
Fernald Closure Project