Department of Energy

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JAN 25 2010

Mr. W. Turpin Ballard
U.S. Environmental Protection Agency, Region 4
Federal Facilities Branch
61 Forsyth Street
Atlanta, Georgia 30303

PPPO-02-270-10

Mr. Edward Winner, FFA Manager
Kentucky Department for Environmental Protection
Division of Waste Management
200 Fair Oaks Lane, 2nd Floor
Frankfort, Kentucky 40601

Dear Mr. Ballard and Mr. Winner:

TRANSMITTAL OF THE ENGINEERING EVALUATION/COST ANALYSIS FOR THE C-340 METALS REDUCTION PLANT COMPLEX AND THE C-746-A EAST END SMELTER AT THE PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY, DOE/LX/07-0131&D2

Please find enclosed the certified D2 Engineering Evaluation/Cost Analysis for the C-340 Metals Reduction Plant Complex and the C-746-A East End Smelter at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-0131&D2) for your review. Also enclosed is a red-lined version of the document and a summary table in response to comments received from the Kentucky Department for Environmental Protection and U.S. Environmental Protection Agency.

Because this project is funded by the American Recovery and Reinvestment Act, it is important your review and approval of this document be completed within the agreed upon timeframe. This will ensure that our project schedules will not be jeopardized.

If you have any questions or require additional information, please contact Rob Seifert at (270) 441-6823.

Sincerely,

Reinhard Knerr
Paducah Site Lead
Portsmouth/Paducah Project Office

Enclosures:
1. Certification Page
2. D2 EE/CA for C-340 and C-746-A
3. Red-lined D2 EE/CA for C-340 and C-746-A
4. Comment Response Summary (Kentucky)
5. Comment Response Summary (EPA)

cc w/enclosures:
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DMC/Kevil
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CERTIFICATION

Document Identification: ***Engineering Evaluation/Cost Analysis for the C-340 Metals Reduction Plant Complex and the C-746-A East End Smelter at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,*** **DOE/LX/07-0131&D2**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Paducah Remediation Services, LLC
Operator

Dennis Ferrigno, PM, Site Manager
Paducah Remediation Services, LLC

1/22/10
Date Signed

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

U.S. Department of Energy (DOE)
Owner

Reinhard Knerr, Paducah Site Lead
Portsmouth/Paducah Project Office

1/22/10
Date Signed

DOE/LX/07-0131&D2
Primary Document

Engineering Evaluation/Cost Analysis for the C-340 Metals Reduction Plant Complex and the C-746-A East End Smelter at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

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Primary Document

Engineering Evaluation/Cost Analysis for the C-340 Metals Reduction Plant Complex and the C-746-A East End Smelter at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

Date Issued—January 2010

Prepared for the
U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Prepared by
PADUCAH REMEDIATION SERVICES, LLC
managing the
Environmental Remediation Activities at the
Paducah Gaseous Diffusion Plant
under contract DE-AC30-06EW05001

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PREFACE

This *Engineering Evaluation/Cost Analysis for the C-340 Metals Reduction Plant Complex and the C-746-A East End Smelter at the Paducah Gaseous Diffusion Plant*, DOE/LX/07-0131&D2, was prepared to evaluate alternatives for a non-time-critical removal action at the U.S. Department of Energy (DOE) Paducah Gaseous Diffusion Plant. This report was prepared in accordance with the requirements of the *Federal Facility Agreement for the Paducah Gaseous Diffusion Plant* (EPA 1998) and the joint DOE-U.S. Environmental Protection Agency policy of May 22, 1995, *Policy on Decommissioning Department of Energy Facilities under the Comprehensive Environmental Response, Compensation, and Liability Act*. This project is being accelerated by funding from the American Recovery and Reinvestment Act.

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CONTENTS

FIGURES

TABLES

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ACRONYMS

ACM	asbestos-containing materials
AEA	Atomic Energy Act
AEC	Atomic Energy Commission
ARAR	applicable or relevant and appropriate requirement
ARRA	American Recovery and Reinvestment Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
COC	contaminant of concern
COPC	chemical of potential concern
CRMP	Cultural Resources Management Plan
D&D	decontamination and decommissioning
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
FFA	Federal Facility Agreement
FIMS	Facilities Information Management System
GDP	gaseous diffusion plant
GSA	General Services Administration
HF	hydrogen fluoride
KDEP	Kentucky Department for Environmental Protection
KOW	Kentucky Ordnance Works
LCF	latent cancer fatalities
LDR	land disposal restriction
LLW	low-level radioactive waste
NCP	National Contingency Plan
NEPA	National Environmental Policy Act of 1969
NPL	National Priorities List
NRHP	National Register of Historic Places
NTCRA	non-time-critical removal action
NTS	Nevada Test Site
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plant
PPE	personal protective equipment
RAWP	removal action work plan
RCRA	Resource Conservation and Recovery Act
RAO	removal action objective
S&M	surveillance and maintenance
SMP	Site Management Plan
SWMU	solid waste management unit
TBC	to be considered
T&E	threatened or endangered
TSCA	Toxic Substances Control Act
TRU	transuranic
UF_4	uranium tetrafluoride
UF_6	uranium hexafluoride
USEC	United States Enrichment Corporation

WAC	waste acceptance criteria
WKWMA	West Kentucky Wildlife Management Area

EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) is planning to decommission the C-340 Metals Reduction Plant Complex (C-340 Complex) and C-746-A East End Smelter at the Paducah Gaseous Diffusion Plant (PGDP) under the existing Federal Facility Agreement. In accordance with DOE policy, the decommissioning activities will be undertaken as a non-time-critical removal action under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980. This engineering evaluation/cost analysis summarizes the evaluation of removal alternatives. Both the C-340 Complex and C-746-A East End Smelter are located within the secure portion of PGDP. The structures that comprise these two facilities were constructed during the 1950s and used for various support operations to the uranium enrichment process. The C-340 Complex was shut down in 1977. The C-746-A East End Smelter was shut down in 1985. Three areas of the C-340 Complex will be demolished under DOE's Atomic Energy Act (AEA) authority consistent with all applicable state and federal environmental laws: the south end annex of the C-340-A, -B, and -C structure, the C-340-D Magnesium Storage Building, and the C-340-E Emergency Power Building.

Deactivation activities for the C-340 Complex and the C-746-A East End Smelter are being conducted separately under DOE's AEA authority consistent with all applicable state and federal environmental laws. The deactivation activities, which will be conducted prior to the decommissioning discussed in this document, are expected to include de-energizing and draining systems, loose material and waste removal, asbestos abatement, equipment removal, removal or stabilization of equipment and piping, and disconnection from energy sources (electrical, steam, etc.). At the end of the deactivation process, the structure and transite exterior walls will remain in place. Additionally, some nonhazardous systems (utilities such as water, steam, air, electrical conduit, etc.) are expected to remain in place.

If risks are uncontrolled, workers who enter either the C-746-A East End Smelter or the C-340 Complex are at risk of exposure to hazardous substances, including radionuclides. Further continued deterioration of structures, piping, and equipment could result in failures causing releases that would present a risk to on-site personnel and the environment.

The following removal action objectives (RAOs) have been developed for the proposed removal action and form the basis for identifying and evaluating appropriate response actions:

- Reduce the potential exposure to on-site personnel from hazardous substances due to the structural deterioration of these facilities; and

- Reduce risks of releases to the environment and exposure to future industrial workers that may result from uncontrolled releases of hazardous substances, including radiological contamination, from these facilities.

The following three removal action alternatives were developed and evaluated for effectiveness, implementability, and cost:

1. No action;

2. Continued limited surveillance and maintenance, with needed repairs and eventual demolition after gaseous diffusion plant shutdown; and

3. Demolition to slab prior to gaseous diffusion plant shutdown.

The scope of the recommended alternative, Alternative 3, for the non-time-critical removal action includes the following: demolishing the buildings to slab; segregating wastes; taking advantage of recycling and reuse when feasible and consistent with DOE's suspension/moratorium on recycling radiologically contaminated scrap metal; plugging floor drains or verifying that those already plugged remain intact; decontaminating or covering the remaining floor slabs and other exposed surfaces; dispositioning waste at an approved facility; and stabilizing the subsurface structures.

Based upon the evaluations of the effectiveness, implementability, and cost of each proposed alternative, the preferred alternative identified for this removal action is demolition of both of these facilities before shutdown of PGDP. The cost analysis included herein is for the Comprehensive Environmental Response, Compensation, and Liability Act decommissioning activities only and does not include any on-going deactivation work. This alternative meets all the RAOs and is consistent with the overall site cleanup strategy as it is described in the Site Management Plan (DOE 2009a).

1. INTRODUCTION

As specific aspects of the uranium enrichment process at Paducah Gaseous Diffusion Plant (PGDP) have changed in its history of 50-plus years, some of the buildings are not needed any longer. Many of these buildings have the potential to release hazardous substances, including radiological contamination, to the environment. Because of this, the U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), and Kentucky Department for Environmental Protection (KDEP) have agreed to address this potential by conducting decommissioning activities under the existing Federal Facility Agreement (FFA) (EPA 1998) and in accordance with the joint EPA and DOE policy statement with respect to decommissioning of DOE facilities (DOE and EPA 1995). The purpose of this engineering evaluation/cost analysis (EE/CA) is to evaluate removal action alternatives for the C-340 Complex and the C-746-A East End Smelter in a manner that is consistent with the non-time-critical removal action (NTCRA) process.

In accordance with the requirements of Section X (E) of the PGDP FFA NTCRAs, this EE/CA develops and evaluates alternatives to address the potential for migration and release of hazardous substances associated with these inactive facilities. This EE/CA focuses on decommissioning the C-340 Complex and the C-746-A East End Smelter by demolishing them to slab. Further detail on the methods to accomplish the demolition of facilities, characterize structural components of the facilities, and appropriately disposition the resulting wastes will be addressed in a Removal Action Work Plan (RAWP) for each of the facilities.

Successful completion of this removal action will place the C-340 Complex and the C-746-A East End Smelter in a configuration that minimizes the risk posed to human health and the environment. If the C-340 Complex and C-746-A East End Smelter are not demolished to slab, as recommended in this EE/CA, a potential threat for the release of hazardous substances will continue to exist and, without action, adverse threats to human health and the environment eventually could occur.

1.1 BACKGROUND

Before World War II, the area now occupied by PGDP was used for agricultural purposes. Numerous small farms produced various grain crops and provided pasture for livestock. During World War II, a 16,126-acre tract was assembled for construction of the Kentucky Ordnance Works (KOW) for manufacturing trinitrotoluene, known as TNT, which subsequently was operated by the Atlas Powder Company until the end of the war. At that time, the 16,126-acre tract was turned over to the Federal Farm Mortgage Corporation and then to the General Services Administration (GSA).

In 1950, the U.S. Department of Defense (DOD) and DOE’s predecessor, the Atomic Energy Commission (AEC), began efforts to expand fissionable material production capacity. As part of this effort, the National Security Resources Board was instructed to designate areas within a strategically safe area of the United States that had the potential to provide the electrical power to support fissionable material production expansion. Eight government-owned sites were selected initially as candidate areas. In October 1950, as a result of joint recommendations from DOD, the Department of State, and AEC, President Truman directed the AEC to expand production of atomic weapons. One of the principal facets of this expansion program was the provision for a new gaseous diffusion plant (GDP). On October 18, 1950, AEC approved the Paducah Site for uranium enrichment operations and formally requested the U.S. Department of the Army to transfer the site from GSA to AEC. Although construction of PGDP was not completed until 1954, production of enriched uranium began in 1952. The plant’s mission of uranium enrichment has continued unchanged with the original facilities still in operation, albeit with substantial upgrading and refurbishment.

In October 1992, congressional passage of the National Energy Policy Act established the United States Enrichment Corporation (USEC). Effective July 1, 1993, DOE leased the plant production operation facilities to USEC.

On May 31, 1994, the Paducah Site was placed on the EPA National Priorities List (NPL), which is a list of sites across the nation designated by EPA as having the highest priority for site remediation. Section 120 of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires federal facilities on the NPL to enter into an FFA with the appropriate regulatory agencies. The FFA, which was signed February 13, 1998, established a decision making process for remediation of the Paducah Site and coordinates CERCLA response action requirements with Resource Conservation and Recovery Act (RCRA) corrective action requirements. Figure 1 is a map of the PGDP showing the locations of the two facilities that are the subject of this document.

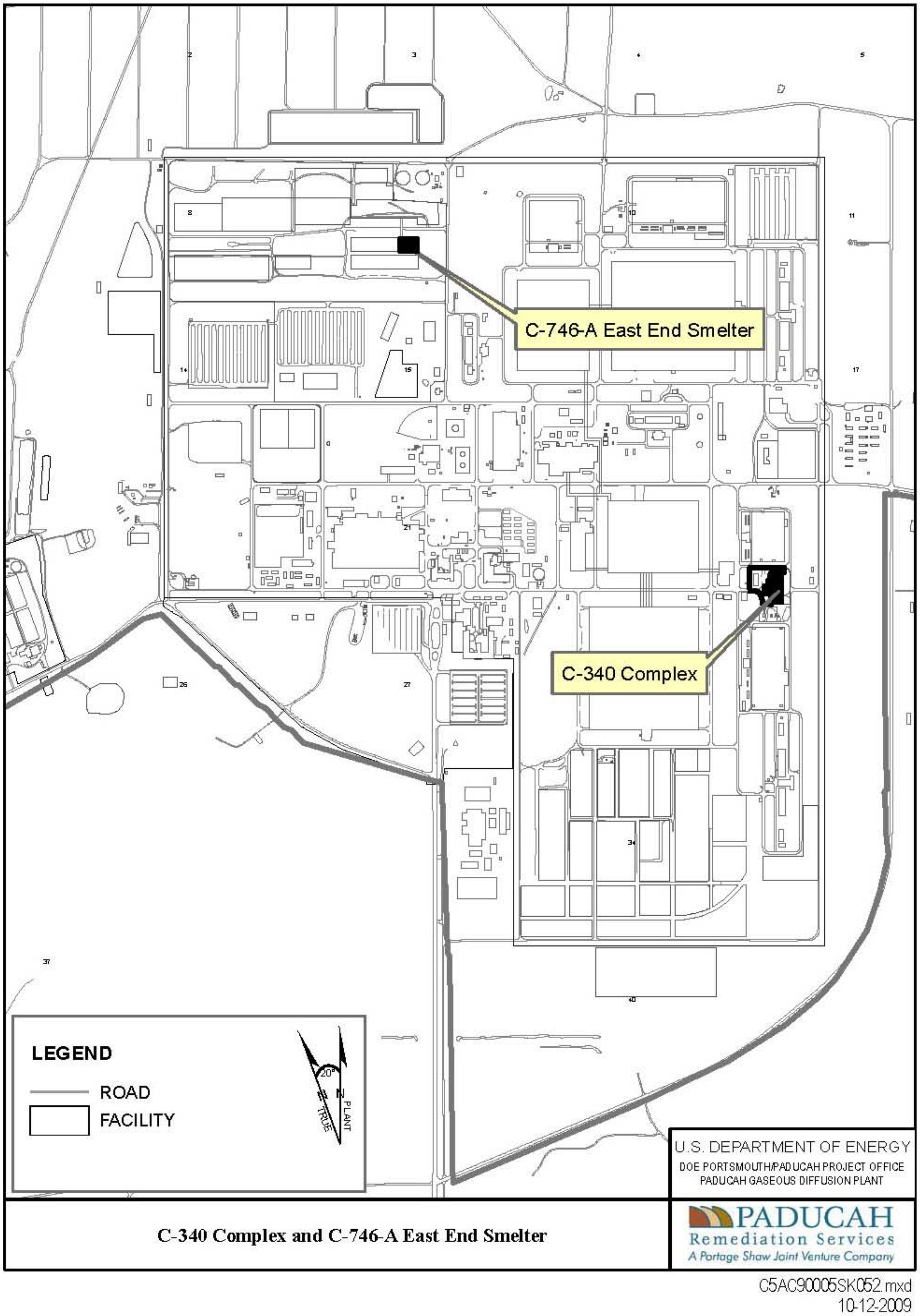

Figure 1. Locations of the C-340 Complex and the C-746-A East End Smelter

1.2 CURRENT STATUS OF FACILITIES

The two facilities that are the subject of the EE/CA have been the subject of limited surveillance and maintenance (S&M) for several years. The resources for implementation of the S&M program are outside the CERCLA projects and managed independently from them. This limited S&M activities include those required to ensure structural integrity, adequate lighting to allow inspections and structural integrity from minor maintenance actions. This level of S&M does not keep the buildings in either a “ready to operate” or a “ready to occupy” condition. No heat or ventilation is provided to the facilities, and inspections and corrective maintenance activities are not intended to maintain the integrity of internal process systems and components.

The C-340 Complex and the C-746-A East End Smelter currently are undergoing deactivation under DOE’s Atomic Energy Act (AEA) authority, using accelerated funding from the American Recovery and Reinvestment Act (ARRA). The deactivation will be followed by decommissioning outlined in this document.

The approach for completing the deactivation under the AEA and decommissioning under CERCLA was recommended to EPA and Kentucky on June 16, 2009 (DOE 2009b), and concurrence with this approach was received from EPA on July 1, 2009 (EPA 2009), and by Kentucky on September 25, 2009 (KDEP 2009).

At the C-340 Complex, three areas will be addressed under DOE’s AEA authority (consistent with all applicable state and federal environmental laws) prior to initiating the decommissioning activities in this EE/CA. Those areas are the C-340-D Magnesium Storage Building, the C-340-E Emergency Power Building, and the south end annex of the C-340 A, B, and C Building. The south end annex of the C-340 A, B, and C structure houses locker rooms, break rooms, and administrative offices. The C-340-D structure is a prefabricated metal building currently utilized as a warehouse/storage facility for ongoing decontamination and decommissioning (D&D) operations. It is connected to C-340-A, B, and C by an incline conveyor system enclosed in a protective housing. The C-340-E Emergency Power Building houses a generator powered by propone tanks that are located next to the building.

The intent of the deactivation process is to prepare the C-340 Complex and the C-746-A East End Smelter for decommissioning which will be conducted as a NTCRA under CERCLA. During the deactivation, activities including, but not limited to, the following will be performed as a non-CERCLA action.

- Isolate utilities from shared plant systems;
- Install temporary utilities to support deactivation and decommissioning activities;
- Construct, repair, or refurbish cranes and elevators (e.g., equipment needed for demolition);
- Establish boundary control stations and radiological air emission perimeter monitoring;
- Conduct field inventories/surveys and marking of equipment and materials;
- Apply fixatives and sealants;
- Disconnect and/or isolate equipment;

- Remove stored materials including both hazardous and nonhazardous loose and fixed materials to the extent practicable;

- Abate asbestos;

- Characterize the building to facilitate segregation of waste streams and planning for the appropriate treatment/disposal facility and to support worker safety

- Decontaminate building components, as needed, to protect deactivation and decommissioning workers, meet regulatory requirements, facilitate conventional demolition, or meet the waste acceptance criteria (WAC) for a disposal facility;

- Remove, disassemble, and process for disposition equipment and piping that contains hazards, including radiological, contamination.

At the completion of deactivation performed under DOE's AEA authority, consistent with all applicable state and federal laws, remaining contaminants are likely to include radiological contamination on the structure, polychlorinated biphenyls (PCBs) in paint, transite on external walls at the C-340 Complex, and minor quantities of hazardous materials, such as lead in circuit boards or similar items that cannot be accessed easily for removal. The volume of these items is expected to be small enough that if the facility is demolished the overall demolition waste stream will not be hazardous waste based on representative sampling. Following the deactivation process, the C-340 Complex and the C-746-A East End Smelter will be ready for decommissioning as a CERCLA NTCRA.

Should the decommissioning alternative be approved to address the C-340 Complex and the C-746-A East End Smelter, it is expected that the transite siding on the C-340 Complex and metal siding on the C-746-A East End Smelter will be removed and packaged for disposition; the building structures, including any remaining piping and equipment, will be demolished and packaged; sumps, pits, and basements will be backfilled with flowable fill or similar material, thereby minimizing the potential for contaminant releases from them. Slabs will be decontaminated or a fixative will be applied. Fugitive radiological air emissions will be monitored and mitigative measures taken as needed to address any health and safety concerns that may arise during building demolition. Details of the basement configuration and location of areas to be filled in will be included in the RAWP. Wastes generated will be packaged and dispositioned.

1.3 SCOPE AND PURPOSE OF THE C-340 COMPLEX AND C-746-A EAST END SMELTER NTCRA

Upon completion of deactivation (as described in Section 1.2) as a non-CERCLA activity, regulatory approval of this EE/CA and subsequent CERCLA documents, the fieldwork for decommissioning the C-340 Complex and C-746-A East End Smelter will begin in accordance with the approved RAWP.

The distinct structures in these complexes that are part of the NTCRA are listed in Table 1, and the associated solid waste management units (SWMUs) are listed in Table 2.

Table 1. C-340 Complex and C-746-A East End Smelter Structures under This NTCRA

C-340 Complex	
Facility Number	**Facility Name[1]**
C-340-A C-340-B C-340-C	Powder Building* Metals Plant* Slag Building*
C-746-A East End Smelter	
C-746-A	East End Smelter

*except for the south end annex, see Section 1.2

Table 2. C-340 Complex and C-746-A East End Smelter SWMUs

SWMU No.	SWMU Name[1]
C-340 Complex	
101	C-340 Hydraulic System
378	G-340-01 Generator Staging Area
379	G-340-03 Generator Staging Area
380	G-340-04 Generator Staging Area
381	G-340-05 Generator Staging Area
382	G-340-06 Generator Staging Area[2]
434	S-340-01 Satellite Accumulation Area
477	C-340 Metals Plant
514	C-340- Reject Magnesium Fluoride Storage Silo
515	C-340 “Dirty” Dust Collection System
516	C-340 Derby Preparation Area Sludge Collection System
521	C-340 Saw System Degreaser
522	C-340 Work Pit Located at Ground Floor Level at B-7-B-9
523	C-340 Metals Plant Pit Ground Floor at F-6 to F-11
524	C-340 Pickling Sump B-10 and B-11
529	C-340 Powder Plant Sump at Ground Floor Level
C-746-A East End Smelter	
137	C-746-A Inactive PCB Transformer Area
463	C-746-A East End Smelter

[1] The Facilities Information Management System (FIMS) for the Paducah GDP lists the five facilities for the C-340 Complex: C-340 (as a separate facility), C-340-A, C-340-B, C-340-C, and C-340-D. FIMS does not include C-340-E. C-340 is included in the C-340-A, C-340-B, and C-340-C (main facility) listing for ARRA work. C-340-E is an approximately 100 ft^2 building that housed the emergency propane generator external to the C-340 main facility.

[2] SWMU 382 has been determined to be a “No Further Action” site in the PGDP Site Management Plan for 2009a.

The following are the removal action objectives (RAOs) for this project:

- Reduce the potential exposure to on-site personnel from hazardous substances due to the structural deterioration of these facilities; and
- Reduce risks of releases to the environment and exposure to future industrial workers that may result from uncontrolled releases of hazardous substances, including radiological contamination, from these facilities.

The purpose of this EE/CA is to evaluate alternatives to achieve the objectives and to provide the opportunity for meaningful public involvement in the decision process. This EE/CA does not address characterization of specific building components for waste disposal or on-site worker safety. Characterization activities will be presented in the building-specific RAWPs. This removal action also does not include demolition of floor slabs, belowgrade structures (e.g., basements, valve pits) or remediation of contaminated soils or other environmental media, which will be addressed in separate CERCLA actions that are expected to take place after the shutdown of the GDP as discussed in the current Site Management Plan (SMP) of 2009 (DOE 2009a) as well as the proposed SMP for fiscal year 2010. Belowgrade structures and building slabs will be left in a safe and protective state.

It is assumed that equipment and piping that would result in the demolition debris being a waste type other than low-level radioactive waste (LLW)/PCB bulk product waste will be removed from the facility during deactivation. At this point, the building can be demolished with all other equipment and piping still in place, and the entire waste stream disposed of together.

1.4 PADUCAH INACTIVE FACILITIES DECOMMISSIONING PROCESS

In accordance with the joint DOE and EPA policy (DOE and EPA 1995), decommissioning for inactive facilities will be conducted as NTCRAs. The principal objectives of this policy are "to ensure that decommissioning activities are protective of worker and public health and the environment, consistent with CERCLA and where applicable, RCRA, ensure stakeholder involvement, and achieve risk reduction without unnecessary delay."

Upon review and approval of this EE/CA by the regulatory agencies, the EE/CA will be made available to the public for their input and comments. Upon incorporation of comments received during the public comment period for the EE/CA, an action memorandum that responds to public comments and describes the selected response action for the C-340 Complex and C-746-A East End Smelter will be developed.

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2. SITE DESCRIPTION AND FACILITY BACKGROUND

2.1 SITE DESCRIPTION

PGDP is located approximately 10 miles (5.6 km) west of Paducah, Kentucky, (population approximately 26,000) and 3.5 miles (5.6 km) south of the Ohio River in the western part of McCracken County. The plant is located on a DOE-owned site, approximately 644 acres of which are within a fenced security area, approximately 800 acres are located outside the security fence, and the remaining 1,986 acres are licensed to the Commonwealth of Kentucky as part of the West Kentucky Wildlife Management Area (WKWMA). There also are 133 acres in acquired easements, bringing the total area of the reservation to approximately 3,556 acres. Bordering the PGDP Reservation to the northeast, between the plant and the Ohio River, is a Tennessee Valley Authority reservation on which the Shawnee Steam Plant is located (Figure 2).

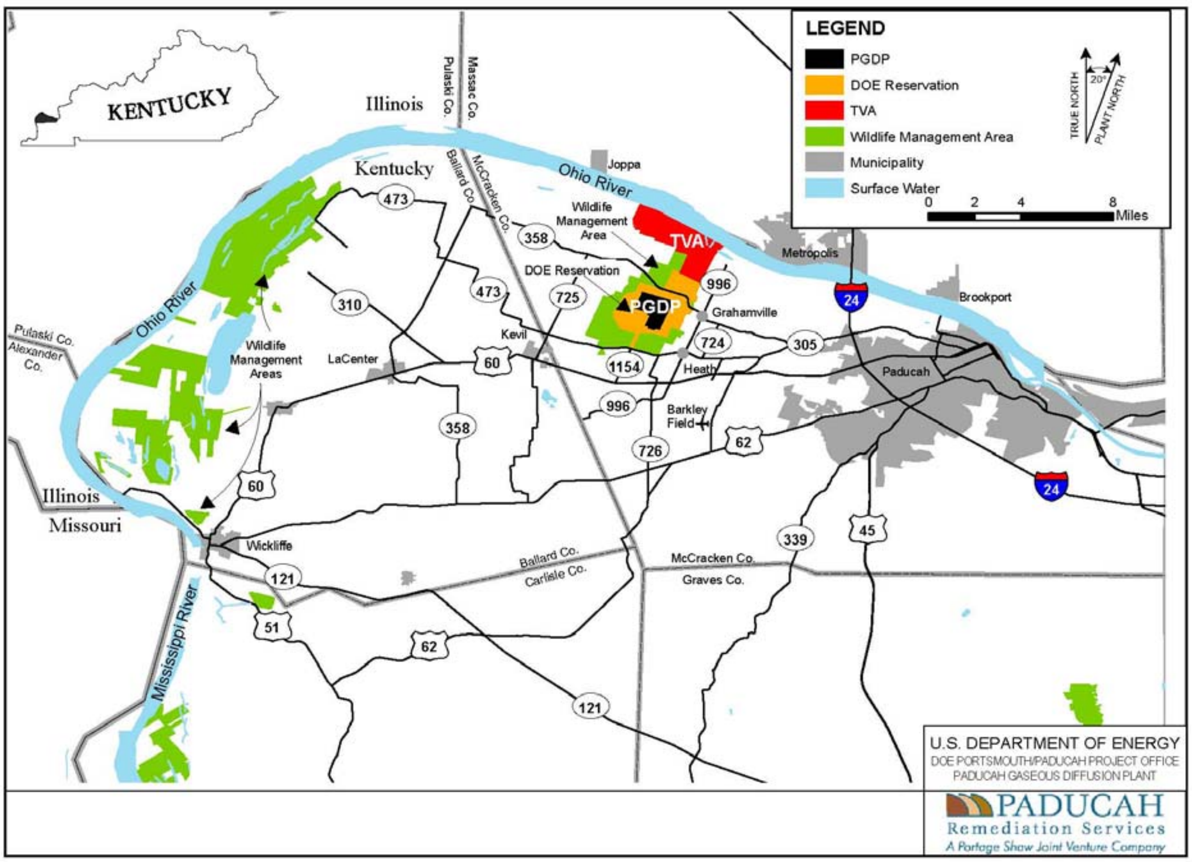


Figure 2. PGDP Vicinity

2.1.1 Topography

PGDP and the surrounding area are flat with elevations across the site ranging from about 350 ft (107 m) to 390 ft (119 m) above mean sea level. The ground surface slopes at a rate of about 27 ft/mile (5.1 m/km) toward the Ohio River. Two main features dominate the landscape in the surrounding area: the loesscovered plains and the Ohio River floodplain which is comprised mostly of alluvial sediments. The terrain is slightly modified by the dendritic drainage systems associated with the two principal streams in the area, Bayou Creek and Little Bayou Creek. These streams have eroded small valleys, which are about 20 ft (6 m) below the adjacent plain.

2.1.2 Population and Land Use

The facilities addressed in this removal action are in areas under the control of PGDP, which is heavily industrialized. PGDP is surrounded by WKWMA and some sparsely populated agricultural lands. The closest communities to the plant are Heath, Grahamville, and Kevil, all of which are located within three miles of DOE Reservation boundaries. The closest municipalities are Paducah, Kentucky; Cape Girardeau, Missouri, and the cities of Metropolis and Joppa, Illinois, which are located across the Ohio River from PGDP.

Historically, the economy of western Kentucky has been based on agriculture, although there has been increased industrial development in recent years. The population of McCracken County is estimated to be around 65,000 with a population density of 885–3,188 persons per square mile. Neighboring Ballard County has a population of approximately 8,300 with a population density of 72–254 persons per square mile, according to the 2000 U.S. Census, 2007 estimates.

In addition to the residential population surrounding the plant, WKWMA draws thousands of visitors each year for recreational purposes. This area is used by visitors, primarily for hunting and fishing, but also includes horseback riding, hiking, and bird watching. According to WKWMA management, an estimated 5,000 fishermen visit the area each year.

2.1.3 Climate/Meteorology

The 22-year average temperature is 58 ºF (14.44 ºC), with the coldest month being January which has an average temperature of 35.1 ºF (1.72 ºC) and the warmest month being July which has an average temperature of 79.2 ºF (26.22 ºC). The 22-year average monthly precipitation is 4 inches (10.16 cm), varying from an average of 2.72 inches (6.93 cm) in August (the lowest monthly average) to an average of 4.58 inches (11.63 cm) in April (the highest monthly average). Historically, stronger winds are recorded when the winds are from the southwest.

2.1.4 Hydrology and Storm Water

PGDP is located in the western portion of the Ohio River drainage basin. The plant is situated on the divide between the drainage areas of Bayou Creek and Little Bayou Creek. Man-made drainages receive storm water runoff and effluent from the PGDP. A combined average daily flow from all PGDP outfalls is 4.9 million gal per day.

The regional groundwater flow system occurs within the Mississippian Bedrock, Cretaceous McNairy Formation, Eocene Sands, Pliocene Terrace Gravel, Pleistocene Lower Continental Deposits, and Upper Continental Deposits (Figure 3) (DOE 2000). Gravel and sand lenses within the Lower Continental

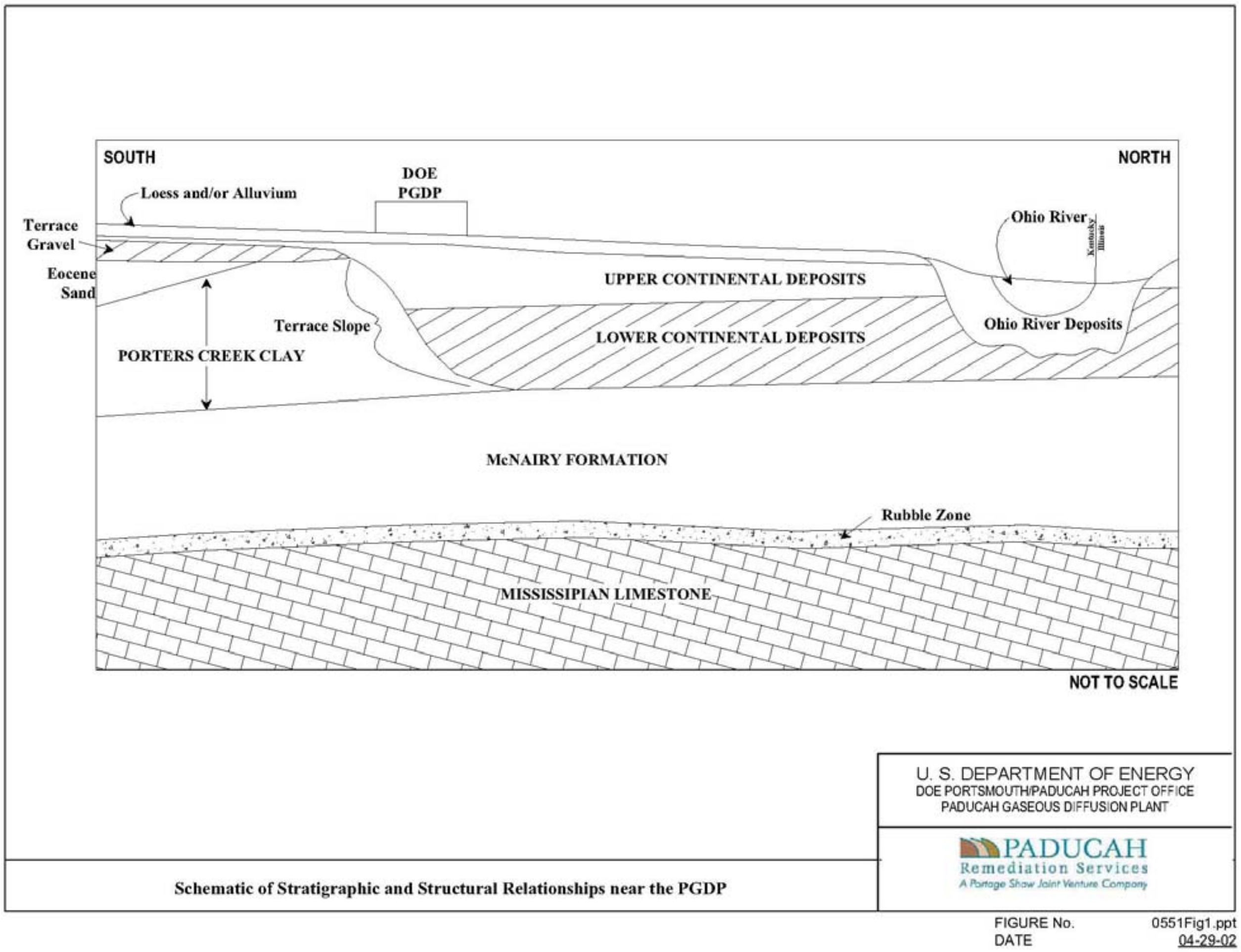


Figure 3. Schematic of Stratigraphic and Structural Relationships Near PGDP

Deposits, at a depth of approximately 55 to 90 ft (16.8 to 27.4 m) below ground surface (bgs), comprise the uppermost aquifer, termed the Regional Gravel Aquifer. The overlying sediments of the Upper Continental Deposits, comprised mainly of silts and clays with thin sand and gravel lenses, have been designated the Upper Continental Recharge System.

2.1.5 Geology

The Mississippian limestone bedrock under the fenced area of the plant lies from 351 to 449 ft (107 to 137 m) bgs. Overlying soils are poorly stratified layers of clay, silt, gravel, and sand.

Three major fault systems are recognized in the PGDP area. These include New Madrid, Rough Creek, and Saint Genevieve. The Rough Creek fault system appears to be inactive. The St. Genevieve fault system is active from south of St. Louis, Missouri, into western Kentucky. Historically, a large number of earthquakes associated with the New Madrid fault system have occurred in northeastern Arkansas and southeastern Missouri.

2.2 C-340 COMPLEX

The C-340 Complex, which was constructed in 1956, also is known as the metals plant (see Figure 4). It consists of five buildings (C-340-A Power Building, C-340-B Metals Plant, C-340-C Slag Building, C-340-D Magnesium Storage Building, and C-340-E Emergency Power Building). These buildings are inactive. The location of individual facilities within the C-340 Complex is shown in Figure 5.

Figure 4. C-340 Complex

The C-340 Complex operated from 1956 into the 1980s. Its purpose was to produce UF_4 and uranium metal. The powder unit, which produced UF_4 in the C-340 Complex, operated from 1956 until 1977. The primary purpose of those operations was to produce hydrogen fluoride (HF), also known as hydrofluoric acid. This process created a hot, dirty, dusty environment with high levels of airborne UF_4, magnesium powders, uranium metal oxides, and magnesium fluoride (MgF_2) dust. Just before the HF production operations ceased, the equipment (conveyors, towers, etc.) was "run until empty," which means that the process equipment was operated until bulk quantities of UF_6 and UF_4 no longer were present in the facility.

After 1977, the facility served a variety of supporting missions, such as electrical shop, training school, and valve-testing facility, which are not expected to have introduced additional contaminants to the structure. Consequently, the contaminants in C-340 after these operations are the same as they were before these operations. From 1978 to 1982, the facility served as a shipping point for UF_4 powder. In 1985 and 1986, special melting operations were conducted in C-340-B. The UF_4 powder shipping and special melting operations involved the same chemicals and radiological materials that were used in normal operations; therefore, the nature of contamination was not altered because of them, nor would the waste type generated during demolition be changed by these operations.

In December 1991, utilities were shut off with the exception of some power for building lighting. In 1994, the facility was fenced and locked. The facility has not been the subject of any previous CERCLA response actions; ongoing activities are routine S&M implemented outside of CERCLA projects.

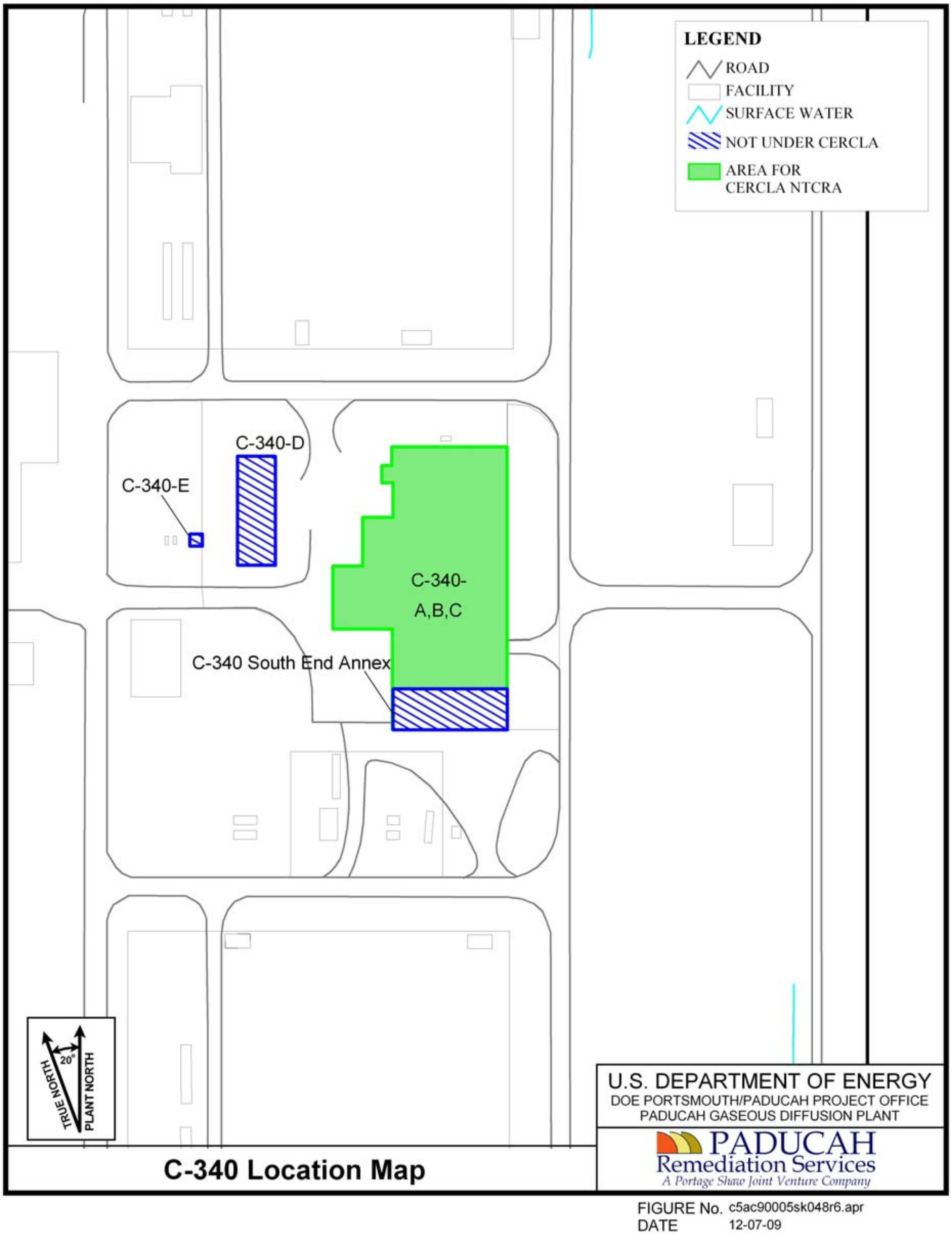


Figure 5. Location of Individual Facilities within the C-340 Complex

2.2.1 C-340 Complex Description

The C-340 Complex is made up of the C-340-A Powder Building (42,000 ft^2); C-340-B Metals Building (17,920 ft^2); C-340-C Slag Building (4,400 ft^2). C-340-A, B, and C are physically adjoining structures. They are metal frame structures with transite exterior walls, built-up roofs with concrete ground floors, and primarily steel plate upper floors. The locations of basements and subgrade structures will be included in the RAWP. C-340-A is a seven-level structure; C-340-B consists of a single level with operating platforms; and C-340-C includes four floors.

The single structure C-340 A, B, and C portion of the C-340 Complex, with the exception of the south end annex, is considered a radiological contamination area. Access to the radiological contamination areas is restricted and requires special entry procedures.

Facility Units A, B, and C, are located within a fence that, for all practical purposes, represents the boundary of the facility. The structure that contains C-340-A, C-340-B, and C-340-C has a steel beam framework with transite sheeting with some concrete block walls. The roof is composite tar and gravel.

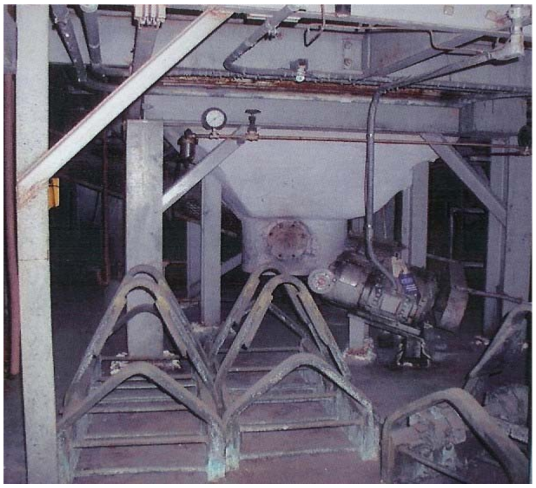
The C-340-A Powder Building contains heated reactor towers used for the UF_6 to UF_4 reduction process. In this process, UF_6 gas reacted with hydrogen gas in the reactor towers at high temperatures to form UF_4 and HF. The resulting solid UF_4 was dropped into a product/storage hopper and was transferred into drums for further storage. The off-gases, consisting primarily of HF, nitrogen, and hydrogen, passed through a cyclone separator, activated carbon chemical traps, condensers, and a potassium hydroxide scrubbing system. The HF condensed in this process was converted to an anhydrous liquid form, which is stored in tanks. The HF system was purged within 90 days after the system ceased operations. The remaining gases were vented to the atmosphere.

The C-340-B Metals Building houses reduction furnaces that converted some of the UF_4 powder, from C-340-A, to uranium metal through the firing of UF_4 and a powdered magnesium mixture at high temperatures. The UF_4 was mixed with magnesium and fed into MgF_2-lined firing reduction vessels, which then were placed in furnaces and heated until the magnesium ignited, precipitating the reaction between the magnesium and UF_4 resulting in molten uranium metal and MgF_2. The molten uranium was then formed into a metal ingot. The metal ingots were removed from the reduction vessel, cleaned and cut, processed further (as needed), staged for shipment, and finally shipped to customers. Hard MgF_2 slag was formed during the reaction.

The C-340-C Slag Building processed the hard MgF_2 slag from C-340-B, to powder for reuse as liner material in the firing process. The slag was crushed and then sent through a vibrating feeder to screens that removed larger particles. Some of the old equipment that remains inside the A, B, and C structure of C-340 is shown in Figure 6.

2.2.2 C-340 Complex Contamination

The radiological contamination in the C-340 Complex, which is the main contaminant of concern (COC) there, is primarily surface contamination from the historical processes performed in the facility. Uranium currently present in the C-340 Complex exists as residual UF_4 powder, present in the facility as residual/leftover material in process equipment, and uranium metal. The uranium originally was received as UF_6 consisting mostly of depleted uranium. Although some UF_6 containing enriched uranium was processed in the facility, enriched UF_6 was not the last material processed and would have been displaced by subsequent processing of depleted UF_6. This is confirmed by isotopic data collected to date, which indicate that uranium present is depleted, not enriched (see Table 3). Enriched UF_6 is not expected to be present from releases during the processing operations because it hydrolyzes with moisture in the air to form HF gasses and uranyl fluoride compounds upon release. If airborne releases occurred, they



C-340 UF_4 Collection Hopper

C-340 Quench Tank

C-340 Chemical Traps

Figure 6. C-340 Complex Equipment

Table 3. Summary of Radiological Data from the C-340 Metals Reduction Plant

Chemical Name	Units	Matrix	Total number of samples	Number of samples used to calculate maximum, minimum, and average	Maximum	Minimum	Average
Alpha activity	pCi/g	Solid	2	2	1,528.24	1378.71	1,453.48
Americium-241	pCi/g	Solid	2	0			
	pCi/sample	Filter	59	2	734	208	471
Beta activity	pCi/g	Solid	2	2	3,216.76	2751.07	2,983.92
Cesium-137	pCi/sample	Filter	59	1	99.1	99.1	99.1
Cobalt-60	pCi/sample	Filter	59	0			
Mass of U-235	gU235/g	Solid	2	2	1.68E-05	1.04E-05	1.36E-05
Neptunium-237	pCi/g	Solid	2	2	0.5	0.5	0.5
	pCi/ml	Oil	2	0			
		Water	2	0			
Plutonium-238	pCi/sample	Filter	4	1	0.892	0.892	0.892
Plutonium-239	pCi/ml	Oil	2	0			
		Water	2	0			
Plutonium-239/240	pCi/g	Solid	2	0			
	pCi/sample	Filter	4	3	11.4	0.7	4.3
Technetium-99	pCi/g	Solid	2	0			
	pCi/ml	Oil	2	2	17	17	17
		Water	2	0			
	pCi/sample	Filter	2	8	474	26.3	127
Thorium-228	pCi/sample	Filter	4	1	3.54	3.54	3.54
Thorium-230	pCi/g	Solid	2	0			
	pCi/ml	Oil	2	0			
		Water	2	0			
	pCi/sample	Filter	4	3	1,410	2.15	473
Thorium-232	pCi/sample	Filter	4	2	4.83	0.64	2.74
Uranium	pCi/g	Solid	2	2	3,080	1,910	2,495
	pCi/ml	Oil	2	2	12.4	11.6	12
		Water	2	2	212.4	16.9	114.7
	pCi/sample	Filter	56	54	1,140,000	326	114311
Uranium-234	pCi/sample	Filter	56	54	540,000	75.3	21360
Uranium-235	gU235/g	Filter	1	1	44.2	44.2	44.2
	pCi/sample	Filter	58	54	26,900	4.34	1706
	wt %	Filter	56	56	0.73	0.18	0.24
		Oil	2	2	0.2	0.2	0.2
		Solid	2	2	0.2	0.2	0.2
		Water	2	1	0.2	0.2	0.2
Uranium-238	pCi/sample	Filter	56	55	571,000	246	89514
Total number of samples			**526**	**316**			

[1] The data in the table above was evaluated in accordance with criteria developed by the Kentucky Radiation Health and Toxic Agents Branch (KYRHTAB) and was not included in the summary if any of the conditions below applied to any of the data.

- the radiological counting error is greater than 50% of the reported results;
- no counting uncertainty or zero counting uncertainty;
- the results are less than the detection limit; or
- the radiological counting error exhibits a negative value, which is a statistical outlier.

would be present as solid uranyl fluoride compounds on surfaces in the facility. The uranium currently in the facility is depleted uranium at 0.0015 wt % uranium-234 (^{234}U) and 0.2 wt % uranium-235 (^{235}U) with the remainder being uranium-238 (^{238}U). Various radionuclides are present as surface contamination. Beta-gamma contamination consists entirely of uranium and plutonium daughters and strontium-90 (^{90}Sr). Alpha contamination other than uranium consists entirely of plutonium-238 (^{238}Pu).

Chemical hazards known to exist or suspected of being present prior to deactivation in the C-340 Complex include, but may not be limited to, the following:

- Uranium compounds in various stages of fluorination;
- Sloughing paint potentially containing lead and/or other heavy metals and PCBs;
- Asbestos-containing materials (ACM) (asbestos is present throughout the facility as part of the original building construction);
- Mercury;
- Metals-contaminated dusts (potentially containing lead, arsenic, and beryllium;
- Material contained in process piping and vessels (Mg and MgF_2 are stored in the facility in feed hoppers and equipment);
- HF and various intermediaries;
- Corrosive chemicals such as fluorides, potassium, hydroxides, etc.;
- PCBs; and
- Volatile organic compounds.

A portion of these hazardous substances are expected to be removed during deactivation of the C-340 Complex. At the completion of deactivation, remaining contaminants are expected to include radiological contamination on the structure, PCBs in paint, and transite on external walls at the C-340 Complex. Additionally, minor quantities of hazardous substances such as circuit boards or similar items for which access was not feasible or potentially would have been unsafe for site workers could remain in the facility.

2.3 C-746-A EAST END SMELTER

The C-746-A North Warehouse is a one-floor pre-fabricated steel building with a poured 8-inch wire-reinforced concrete floor area of approximately 72,000 ft^2 (6,690 m^2). The building is approximately 600 ft (183 m) long, 120 ft (36.6 m) wide, and 30 ft (9.1 m) high at the highest peak. The facility is located in the northwest portion of the PGDP complex and is inside the security fence, as shown in Figure 7. Figure 8 is a photograph of the exterior of the facility.

2.3.1 C-746-A East End Smelter Description

C-746-A structure is divided into three sections:

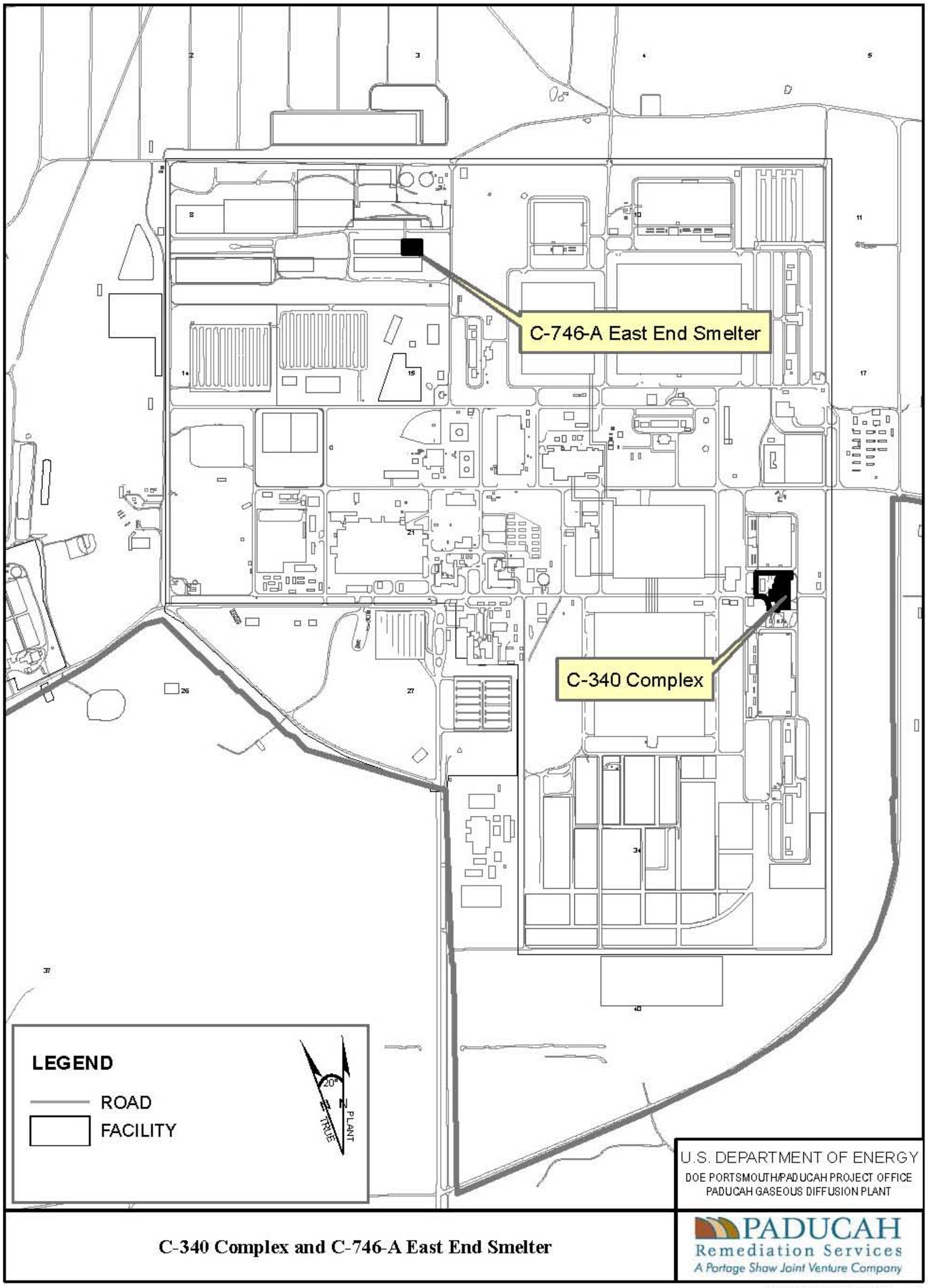


Figure 7. Location of the C-746-A East End Smelter

Figure 8. Exterior of the C-746-A East End Smelter

- East end smelter area
- West end smelter area (demolished in 2008)
- Central waste storage and treatment area

The east end of C-746-A was used to recover metal from various pieces of equipment. The east end area is used to store excess equipment such as empty drums and depressurized gas cylinders. The smelting furnaces remain in the East End Area. The central waste storage section is constructed of concrete block walls. The east smelter area is 160 ft (48.8 m) × 120 ft (36.6 m). The west end smelter has been demolished.

The east smelter has one coreless electrical induction furnace and a gas-fired calciner. The furnace and calciner ceased operations in 1985. The 3-inch natural gas supply line to C-746-A has been disconnected and the electric power supply has been de-energized at the power panel in C-746-A. The smelter is locked when not in use.

2.3.2 C-746-A East End Smelter Contamination

The contaminants known to exist in the equipment in the East End Smelter, as well as inside of the building itself, are as follows:

- Uranium resulting from smelting equipment that had radiological contamination on its surfaces prior to smelting;

- RCRA characteristically hazardous wastes, such as mercury switches and electrical equipment, inside the building;

- Hydraulic fluids containing PCBs;

- Metals such as beryllium and mercury switches; and
- Lead based paints.

A portion of these are expected to be removed during deactivation. At the completion of deactivation, remaining contaminants will include radiological contamination on the structure and PCBs in paint. Additionally, minor quantities of hazardous substances such as circuit boards or similar items for which access was not feasible or potentially would have been unsafe for site workers could remain in the facility.

2.4 STREAMLINED QUALITATIVE RISK EVALUATION

The C-340 Complex and C-746-A East End Smelter are contaminated with radioactive and nonradioactive hazardous substances. The following discussion provides a qualitative discussion of the risks.

On-site personnel are the most likely receptors that may be exposed to these chemicals of potential concern (COPCs) due to the location of the facilities. Under current access restrictions, risks to workers from exposure to these COPCs are minimal, but unrestricted industrial exposure could cause risks to workers to exceed *de minimis* levels.[3]

Building degradation over time could result in a potential structural failure and contaminant migration. This degradation, including roof and wall deterioration, could allow rainwater to infiltrate the building. Infiltration of rainwater could wash transferable or soluble contaminants out of the building through cracks in the floor or walls. Over time, asbestos-containing building materials, such as transite wall panels, may degrade into finer particles or become friable. Furthermore, there is an increased potential for site personnel not involved with S&M activities to be exposed to hazardous substances, including radiological contamination, associated with deteriorating structural components. There is a potential risk from hazardous substances, including radiological contamination that could be released to the environment if the structural elements that contain the contamination were to fail. Decommissioning will reduce the risk of exposure to workers located near these deteriorating facilities.

The building structures currently prevent releases of contaminants; however, building deterioration could lead to releases from C-340 that could impact ecological receptors through Outfall 011 to Little Bayou Creek and eventually to Bayou Creek. Similar such releases from C-746-A East End Smelter could impact ecological receptors through Outfall 001 to Bayou Creek.

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[3] Per guidance in *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Volume 1. Human Health*, DOE/OR/07-1506&D2, *de minimis* risk is defined as a cumulative cancer risk less than 1×10^{-6} and a cumulative hazard index less than 1 (DOE 2001a). For comparison, the EPA acceptable cancer risk range for site-related exposures is 10^{-6} to 10^{-4} (EPA 1999).

3. REMOVAL ACTION JUSTIFICATION AND OBJECTIVES

This section summarizes DOE response authority under CERCLA for decommissioning actions, RAOs, justification for decommissioning of DOE facilities, and proposed applicable or relevant and appropriate requirements (ARARs).

3.1 RESPONSE AUTHORITY AND STATUTORY LIMITS

Section 104 of CERCLA addresses the response to releases or threats of release of hazardous substances through removal actions. Executive Order 12580, "Superfund Implementation," delegates to DOE the response authorities for DOE facilities. As lead agency, DOE is authorized to conduct response measures (e.g., removal actions) under CERCLA. A response under CERCLA is appropriate when (1) hazardous substances or contaminants are released or (2) there is a substantial threat of a release into the environment and response is necessary to protect human health and the environment. DOE and EPA have issued a joint policy statement (DOE and EPA 1995) stating that facility decommissioning activities should be conducted as NTCRAs unless circumstances at the facility make it inappropriate.

3.2 REMOVAL ACTION OBJECTIVES

The following RAOs have been developed for this removal action and form the basis for identifying and evaluating appropriate response actions:

- Reduce the potential exposure to on-site personnel from hazardous substances due to the structural deterioration of these facilities; and
- Reduce risks to the environment, and to future industrial workers that may result from exposure to uncontrolled releases of hazardous substances, including radionuclides, from these facilities.

3.3 REMOVAL ACTION JUSTIFICATION

A removal action is appropriate for the C-340 Metals Reduction Plant Complex and the C-746-A East End Smelter given the potential risk to workers from exposure to hazardous substances, including radiological contamination, combined with the potential for migration of hazardous substances, including radiological contamination, associated with the deterioration of facilities, structures, and ancillary materials. Also, the factors described in 40 *CFR* § 300.415 (b)(2)(i), (v), and (viii) were considered in determining whether a removal action is appropriate. These factors are as follows:

> *(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;*

Building degradation over time could result in potential structural failure and contaminant migration. This degradation, including roof and wall deterioration, could allow rainwater to infiltrate the buildings. Infiltration of rainwater could wash transferable or soluble contaminants out of the buildings through cracks in the floor or walls. Over time, asbestos-containing building materials, such as transite wall panels, may degrade into finer particles or become friable. Furthermore, there is an increased potential for site personnel not involved with surveillance and maintenance activities to be exposed to hazardous substances, including radiological contamination, associated with deteriorating structural components. There is a potential risk from hazardous substances, including radiological contamination, that could be released to the environment if the structural elements that contain the contamination were to fail. Decommissioning will reduce the risk of exposure to workers located near these deteriorating facilities.

> *(v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released;*

As the facilities continue to age, they will become more susceptible to damage from weather, thereby increasing the likelihood of a contaminant release. The structural instability of deteriorating facilities will make them more difficult to repair should either of them be damaged by a weather-related event, such as high winds and/or ice, thereby increasing the probability of a contaminant release. High-risk repairs could lead to a higher potential for other site personnel to be exposed to chemical and radiological hazards.

> *(viii) Other situations or factors that may pose threats to public health or welfare of the United States or the environment.*

The controlled demolition of these facilities will ensure that risks to human health and the environment from exposure to hazardous substances, including radiological contamination, are reduced or eliminated. Controlled demolition using engineered safety measures is safer and reduces the probability of risks posed by releases of hazardous substances, including radiological contamination, that would result from an uncontrolled collapse (i.e., building “falling in on itself”). Uncontrolled collapse likely would result in spread of hazardous substances and radiological contamination to site personnel and the environment because contamination in buildings would no longer be contained by structures.

3.4 COMPLIANCE WITH ARARS

In accordance with Section 300.415(j) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), on-site removal actions conducted under CERCLA are required to attain ARARs, to the extent practicable considering the exigencies of the situation. ARARs include only federal and state environmental or facility siting laws/regulations; they do not include occupational safety or worker radiation protection requirements. Additionally, per 40 *CFR* § 300.400(g) (3), other advisories, criteria, or guidance may be considered in determining remedies [to be considered (TBC) category].

ARARs typically are divided into three categories: (1) location-specific, (2) chemical-specific, and (3) action-specific. Location-specific requirements establish restrictions on permissible concentrations of hazardous substances or establish requirements for how activities will be conducted solely because they are in special locations (e.g., floodplains or historic districts). Chemical-specific ARARs provide health- or risk-based concentration limits or discharge limitations in various environmental media (i.e., surface water, groundwater, soil, or air) for specific hazardous substances, pollutants, or contaminants. Action-specific ARARs include operation, performance, and design requirements or limitations based on waste types, media, and removal/remedial activities to be implemented.

CERCLA activities conducted on-site must comply with the substantive but not administrative requirements of ARARs. Administrative requirements include applying for permits, recordkeeping, consultation, and reporting. EPA interprets “on-site” for purposes of administrative (i.e., permitting) requirements to mean the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action (EPA 1988). In the EE/CA, project activities in and around the C-340 Complex and the C-746-A East End Smelter would be considered in the areal extent of contamination. Decommissioning activities that are conducted outside the areas necessary for implementation of the alternative, such as shipment of waste for treatment and/or disposal at an off-site facility, must comply with both the substantive and administrative requirements of applicable laws.

In addition, CERCLA Section 121(d)(3) provides that the off-site transfer of any hazardous substance, pollutant, or contaminant generated during CERCLA response actions be sent to a treatment, storage, or disposal facility that complies with applicable federal and state laws and has been approved by EPA. Accordingly, DOE will verify with the appropriate EPA regional contact that any needed off-site facility is acceptable for receipt of CERCLA wastes before transfer.

In addition to ARARs, TBC information also may be used in developing and evaluating removal action alternatives. TBC information consisting of advisories, criteria, or guidance, such as DOE Orders, may be useful in determining cleanup levels that are protective of human health and the environment in the absence of ARARs. A list of potential ARARs and TBCs identified to address the alternatives proposed in this EE/CA is included in the appendix.

When DOE proposes a response action, Section XXI of the FFA requires DOE to identify the state and federal permits that otherwise would have been required in the absence of CERCLA Section 121(e)(1) and the NCP. DOE also must identify the otherwise required permits, the standards, requirements, criteria, or limitations necessary to obtain such permits and provide an explanation of how the proposed action will meet the standards, requirements, criteria, or limitations identified.

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4. REMOVAL ACTION TECHNOLOGIES AND DEVELOPMENT OF ALTERNATIVES

There are limited options for decommissioning facilities such as the C-340 Complex and the C-746-A East End Smelter. Essentially, the facilities either can undergo decommissioning in the near term or undergo S&M outside of CERCLA, with eventual decommissioning. A "no action" alternative has been developed and evaluated.

This chapter summarizes the identification and screening of potential decommissioning technologies and describes the development of the two removal action alternatives for decommissioning of the C-340 Complex and C-746-A East End Smelter.

4.1 TECHNOLOGY IDENTIFICATION AND SCREENING

This section identifies the technologies and disposal options based on site-specific conditions, contaminants, affected media, and anticipated activities. Technologies for building dismantlement and size reduction are identified based on their ability to meet RAOs, provide safety to workers, the feasibility of the technology under site-specific conditions, and the ability to provide radiological control of the decommissioning activity. Disposal options for waste streams that will be generated from decommissioning activities also are presented.

4.1.1 Building Dismantlement and Size-Reduction Technologies

Multiple dismantlement and stabilization technologies exist and could be used for this project. Table 4 identifies the dismantlement and size-reduction technologies that are the most appropriate for this removal action and addresses their applicability and limitations. Dismantlement technologies include conventional disassembly using hand tools, circular cutters, hydraulic shears, and oxyacetylene torches. Size-reduction techniques also have been identified for use in the decommissioning efforts. Compaction has been used as the representative process option, because this technique can be applied easily to a variety of materials, and it results in substantial volume reduction.

4.1.2 Concrete Slab Decontamination and Stabilization Technologies

Multiple decontamination and stabilization technologies exist for the concrete slabs and could be used for this project. Table 5 identifies the technologies considered for the concrete slabs that will remain after removal of the buildings and addresses their applicability and limitations. These technologies are the most appropriate for this removal action.

The application of fixative/stabilizer coatings (such as latex paints, gums, or resins) is considered a viable technology to fix any contamination found on the concrete slabs. An encapsulant, such as concrete or polymer, could be applied to the concrete that has radioactive or other hazardous contamination. Any fixative, stabilizer, or encapsulant may degrade over time and likely will require maintenance prior to the comprehensive site operable unit CERCLA action. Table 5 shows technologies that are considered viable for decontamination of the concrete: scabbling, sponge blasting, and abrasive blasting.

Table 4. Description and Evaluation of Building Dismantlement and Size-Reduction Technologies

Technology	Description	Applicability	Limitations	Comments
Conventional disassembly	Hand-held tools and saws; used for hand removal of nuts and bolts.	May be applied to any area.	Labor intensive and slow; recommended for limited application. Vacuuming with high efficiency particulate air filtration will be used for activities creating large amounts of airborne particulate.	No additional worker training required; rotary saws, grinders, and other high-speed mechanical tools would produce airborne particulates and fines that may need to be collected.
Mobile hydraulic shear	Two-bladed cutter attached to excavator; typically uses hydraulic power from excavator.	Can cut 1/4-inch (0.6-cm) thick steel (large-diameter pipe, structural steel, tanks); up to 1-inch (2.5-cm) thick pipe can be cut with reduced blade life.	Pipe ends are pinched, requiring further processing before decontamination, treatment, or disposal; eliminates airborne contamination associated with thermal cutting processes.	Good for conduit and small piping.
Circular cutters	Self-propelled; cut as they move around a track on outside circumference.	Metal pipes from 1.25 inch (3.175 cm) 20 ft (6 m) diameter; wall thickness up to (6 inch) (15 cm), depending on type of circular cutter used.	4 inch (10-cm) to 21 inch (53 cm) clearance required, depending on type of circular cutter used; requires multiple passes for thickness greater than 0.75 inch (1.9 cm).	There are safety concerns but these can be managed.
Plasma arc cutting devices	High voltage low current electricity combines with pressurized gas (air or nitrogen) to create a focused stream of high temperature ionized gas, melting away the metal.	Provides high speed cutting and gouging for most metals up to 2 inches (5.8 cm) in thickness. Metal thickness may restrict widespread applicability.	May ignite uranium; alloys uranium with the metal, however, generally does not affect cutting operation. Existing worker protection for uranium is adequate for alloying and subsequent segregation that would take place after using a torch.	Additional worker protection may be required if torch is used to cut metals that have PCB or lead-based coatings.
Oxy-fuel torch	Oxygen and a fuel gas mixed and ignited at the tip of a torch; the metal is heated and burned away.	Very effective in cutting carbon steel; depth of cut up to 4 to 6 inches (10 to 15 cm); cutting speed up to 30 inches/min (76 cm/min); common technique for structural carbon steel member disassembly.	May ignite uranium; alloys uranium with the metal, however, generally does not affect cutting operation. Existing worker protection for uranium is adequate for alloying and subsequent waste segregation that would take place after using a torch.	Gasoline will be the primary fuel source for most applications. Not recommended for aluminum or stainless steel due to formation of refractory oxides; additional worker protection may be required if torch is used to cut metals that have PCB or lead-based coatings.

PCB = polychlorinated biphenyl

Table 5. Description and Evaluation of Concrete Slab Decontamination and Stabilization Technologies

Technology	Description	Applicability	Limitations	Comments
Encapsulation	Fixes wastes by encasement in low solubility solid matrix.	Used for wastes that are unstable.	Increases volume and mass of waste.	Reduces potential for leaching to groundwater.
Applying fixative stabilizer coatings	Application of paints, films, and resins used as coatings to fix and stabilize contaminants in place.	Stabilizes PCBs and radioactive contamination.	No removal of contaminant is achieved; experiments to ensure effectiveness of stabilizer generally are required due to site-specific requirements.	Useful for containment of contaminants to minimize worker exposure and the potential for releases to the environment during demolition. The lifespan of the sealer depends on application specifics, including the sealer itself, weather, use of the slab, and the original condition of the slab.
Scabbling	Uses physical means (steel shot, steel rods, carbide cutters, etc.) to loosen and remove surface contamination.	Effective on flat, shatterproof surfaces (concrete).	Effective for near surface contamination; creates additional waste.	Highly effective for removal of surface layer of concrete, technology readily available, and dust can be suppressed.
Abrasive blasting	Uses an abrasive media (sand, glass beads, grit, or CO_2 pellets) suspended in an air spray to loosen and remove surface contamination.	Effective on flat, shatterproof surfaces (concrete, aluminum, steel, and painted or coated surfaces) and on hard to reach areas, such as ceilings.	Effective for surface contaminants up to 0.25-inch (0.64-cm) deep, depending on abrasive technique; creates additional waste; slow, labor-intensive technique that causes high potential for worker exposure.	Can produce substantial amount of contaminated dust; appropriate for items that can be effectively decontaminated for reuse or “clean” disposal; CO_2 minimizes additional waste streams.

PCB = polychlorinated biphenyl

4.1.3 Waste Containerization Options

It will be necessary to containerize the waste generated during decommissioning activities if it is shipped off-site for disposal. If waste from decommissioning activities is disposed of at the C-746-U Landfill, dump trucks or roll-off boxes will be used to transport it there. Prior to containerization, and depending on the characteristics and regulatory status of the waste, the debris may be temporarily staged in RCRA staging piles and/or PCB risk-based storage. Containerization, staging, and storage will be performed in accordance with the ARARs in the appendix. The waste streams and volume of waste requiring containerization will depend heavily on the decommissioning technologies that are used and the disposal options that are selected. A large variety of containers is available that would be appropriate for the different waste streams that would be generated. The containers that are the most appropriate for this removal action include gondolas, Sealand containers, intermodal containers, roll-off boxes, ST-boxes (B-25), steel drums, and polyethylene drums. Due to the variety of waste that will be generated from the decommissioning activities, it is possible that multiple container types will be used during implementation of the removal action.

4.1.4 Waste Disposal Options

Table 6 summarizes the waste volumes anticipated from decommissioning of the C-340 Complex and C-746-A East End Smelter. Take-offs were developed from building, structural, and equipment drawings to quantify the waste volumes. A volume of piping and equipment that would remain in place was assumed; then a packaging efficiency factor was added to the total to estimate packaged quantities. When combined, the total waste volume is anticipated to be approximately 290 x 10^3 ft^3 (8 x 10^3 m^3).

Table 6. Summary of Anticipated Packaged Waste Volumes in C-340 Complex and the C-746-A East End Smelter

Structure	Waste Volume, ft^3 x 1,000
C-340 Complex	253
C-746-A East End Smelter	37

Prior to and during waste generation in the decommissioning phase of this project, waste will be characterized to ensure that it meets the WAC for its disposal facility. Characterization may consist of process knowledge, sampling and analysis, or a combination thereof and will be performed in accordance with applicable requirements. Results of the characterization efforts will be used to separate the debris into waste streams that conform to the proposed disposal facility WAC. The volume of hazardous materials in the waste is expected to be small enough that the overall demolition waste stream is not expected to be hazardous waste; it is expected to be LLW. Mixed waste and RCRA hazardous waste will be treated, if necessary, to meet RCRA land disposal restrictions (LDRs) prior to disposal. Disposal at off-site facilities will depend on the nature of the wastes generated. It is anticipated that the majority of the waste will be classified as LLW requiring off-site disposal [e.g., DOE's Nevada Test Site (NTS) and Energy*Solutions*, Clive, UT]. A listing of anticipated potential waste streams is presented in Table 7.

The C-746-U Landfill is a contained landfill designed for solid waste generated at PGDP. Acceptable waste categories include, but are not limited to, brick, concrete, rock, lumber, vitrified clay materials, polyvinyl chloride pipe, polyethylene sheeting, roofing materials, and certain metals. Asbestos-containing building material (friable), petroleum-containing soil, and empty containers (aerosol cans, paint cans, pesticide containers, etc.) also are accepted at the C-746-U Landfill. The C-746-U Landfill cannot accept waste that has radiological contamination that exceeds its authorized limits, RCRA hazardous waste, mixed waste, PCB waste (> 49 ppm), or free liquids (see Table 8). Table 9 shows which facilities, including the C-746-U Landfill, may be considered and the type of waste that can be disposed of at each facility.

A summary of the current waste disposal options for the various waste types that are likely to be generated from either the C-340 Complex and/or the C-746-A East End Smelter is presented in Table 9. The disposal options may change whenever any of the facilities' WACs change or whenever any new disposal facilities become available.

Table 7. Description of Anticipated Potential Waste Types

Waste types	Description
LLW	LLW is defined as waste that has become contaminated with radioactive material. The waste streams can include slag, scrap metal, PPE, concrete, decontamination materials, Transite (also ACM), and miscellaneous waste types from process areas or systems.
Nonradioactive, nonhazardous [non-PCB (< 50 ppm)] solid wastes, and debris	Waste streams that can be certified as meeting DOE radiological release criteria and disposal site criteria and are nonhazardous and non-PCB (< 50 ppm). This may be disposed of in the C-746-U Landfill if all WAC are met.
Radioactive ACM	Radioactive ACM from posted radiological material areas and/or that exceeds the authorized limits of the C-746-U Landfill.
Nonradioactive ACM	ACM that can be demonstrated to meet the appropriate radiological release criteria.
PCB wastes (> 50 ppm)	PCB electrical equipment, PCB oils, process ventilation system components, and other wastes that are regulated for disposal under TSCA. PCB wastes may be categorized as radioactive PCB wastes or as nonradioactive PCBs if radiological release criteria are met. PCB wastes include PCB bulk product and PCB remediation wastes. Most of the waste is expected to meet the definition of PCB remediation waste and not require incineration.
Mixed wastes	Waste streams that have both a RCRA hazardous component and radioactive component based on their origin within a radioactive materials management area, surface contamination exceeding release limits, or available characterization data. Among the wastes included in this category are inherently hazardous, radioactively contaminated, nonrecyclable metal items, trap materials, concrete dusts from decontamination of process floors where lube oil leaked, and lamps.
Hazardous wastes	RCRA hazardous waste streams that are not mixed wastes and do not exceed radiological release criteria, but meet the definition of hazardous in 40 *CFR* Part 261.
PCB/RCRA/Rad	PCB/RCRA/Rad wastes are those mixed wastes that also contain PCBs. This category also includes ACM that is commingled with mixed and PCB waste. These wastes may include residual hydraulic fluids, concrete dust and wastewater, ventilation duct gaskets, and deposits within the ventilation ducts.
Classified materials and/or waste	Materials that must receive special handling because of security concerns, including enriched uranium or items whose composition or function could divulge classified information.
TRU waste	Transuranic waste are those wastes that are contaminated with alpha-emitting transuranic radionuclides, with half-lives > 20 years, in concentrations > 100 nCi/g (3.7 MBg/kg).

ACM = asbestos-containing material
DOE = U.S. Department of Energy
LLW = low-level (radioactive) waste
PCB = polychlorinated biphenyl
PPE = personal protective equipment
Rad = radiological
RCRA = Resource Conservation and Recovery Act
TRU = transuranic
WAC = waste acceptance criteria

Table 8. C-746-U Landfill Waste Acceptance Limitations

Size limitations	Weight limitations	Waste limitations
Case-by-case	Case-by-case	• Authorized limits for radioactive material (DOE 2003): Neptunium-237 3 pCi/g Plutonium-238 3 pCi/g Plutonium-239/240 3 pCi/g Technetium-99 500 pCi/g Thorium (Th230 + Th232) 15 pCi/g Total Uranium 150 pCi/g Cesium-137 3 pCi/g Americium-241 3 pCi/g • Less than or equal to 49 ppm PCBs (including waste origination concentration) • No RCRA hazardous waste • No free liquids • No batteries • No bulky metal objects (desks, filing cabinets, etc.) • No circuit boards • No classified waste • No light bulbs (except "green-end" fluorescent)

DOE = U.S. Department of Energy
PCB = polychlorinated biphenyl
RCRA = Resource Conservation and Recovery Act of 1976

Table 9. Summary of Disposal Options for Decommissioning Wastes

Facility	Low-level radioactive waste	Mixed waste	Hazardous (RCRA) waste	Nonradioactive, nonhazardous, non-PCB solid waste	PCB (TSCA) waste	Radioactive and nonradioactive ACM	Liquid waste	Classified material	TRU
PGDP									
C-746-U Landfill				X		X Non-rad only			
Off-Site									
Energy*Solutions*, Clive, UT	X	X Treated as necessary			X w/Rad	X w/Rad	X w/Rad		
DOE NTS	X	X Treated as necessary			X w/Rad	X w/Rad		X	
Other permitted or authorized commercial facilities*	X	X Treated as necessary	X Treated as necessary	X	X	X	X		
Waste Isolation Pilot Plant									X

Notes: All waste accepted at NTS must be radiological waste.
ACM = asbestos-containing material
NTS = Nevada Test Site
Rad = radiological
RCRA = Resource Conservation and Recovery Act of 1976
TSCA = Toxic Substances and Control Act of 1976
TRU = waste that has been contaminated with alpha-emitting transuranic radionuclides possessing half-lives greater than 20 years and in concentrations > 100 nCi/g

*An example facility for hazardous waste is Perma-Fix Environmental Services in either Oak Ridge, Tennessee, or Gainesville, Florida. DOE's contractor has a standing contract with Perma-Fix for disposal of hazardous waste, including treatment, if necessary.

4.2 DEVELOPMENT OF ALTERNATIVES

In accordance with NCP and EPA guidance, DOE has identified three alternatives to address the potential risks to human health and the environment associated with the C-340 Complex and the C-746-A East End Smelter:

1. No action for either facility;

2. Continued S&M with needed repairs and eventual demolition with the entire gaseous diffusion plant; and

3. Near-term demolition to slab.

4.2.1 Alternative 1—No Action

Under this option, the facilities will be abandoned in place following completion of the deactivation. Assumptions for this alternative include the following:

- The fence surrounding the C-340 Complex will be locked, and the doors of the C-746-A East End Smelter will be locked.

- Utilities isolated during deactivation will remain disconnected.

- Temporary power generators used during deactivation will be demobilized, leaving the facilities with no heating, ventilation, or light.

- No routine S&M would be performed (grass mowing, pest control, relamping, etc.) and no corrective maintenance would be performed (repair of broken windows, failing structures, repair of damage due to storms or natural phenomena).

- For this alternative, GDP decommissioning, targeted to begin in 2017, is assumed not to include the C-340 Complex or the C-746-A East End Smelter.

4.2.2 Alternative 2—Continued Limited S&M with Needed Repairs and Eventual Demolition

The assumptions for this alternative include the following:

- Both facilities would be maintained until 2017 or later at current levels of performance, at which time they will be demolished to slab.

- Building access controls and delineation of contaminated areas will continue to be maintained, as will security fences and access gates. No new physical barriers or controls administered by PGDP are assumed.

- The buildings would not be upgraded or renovated in any manner, except for the assumption that a single roof replacement per building will be required during this time period to prevent rainwater intrusion.

PGDP has an on-going S&M program that addresses maintenance activities for all DOE-owned facilities, both active and inactive. Miscellaneous repairs, such as leaking pipes or broken windows would be addressed by this program. Because the costs of these miscellaneous activities are not significant, these costs were not addressed individually in the cost estimate. The roof repair, however, would be a significant cost for the program, so it was called out specifically in the cost estimate.

Activities included in this alternative are as follows:

- Maintenance of critical building systems, such as security and fire protection systems, and sump operations;
- Security patrols;
- Periodic building walk-through inspections and inspections required by regulatory requirements or agreements;
- Periodic radiation surveys to determine any significant changes in the radiological conditions of the building;
- Corrective maintenance, such as repair of broken windows, deteriorating doors or locks, or failed building exterior panels to minimize water and/or weather infiltration and rodent and/or pest intrusion;
- Minimum relamping so that walkthrough inspections can be performed safely; and
- No operation of the heat, ventilation, or air conditioning systems.

4.2.3 Alternative 3—Near-Term Demolition to Slab

This alternative includes near-term demolition of the abovegrade structures.

The key components of decommissioning include the following:

- Abovegrade structures will be disassembled or demolished to slab (e.g., concrete floor slabs and foundations will be left in place).
- Controls will be used to minimize fugitive dust during demolition.
- Material and waste streams will be segregated into appropriate categories, as necessary.
- Disposition of scrap metal will take advantage of recycling, reuse, or unrestricted release when economically feasible.
- Remaining floor slabs and other exposed surfaces may require some limited decontamination or a cover (e.g., fixative, earthen, asphalt, concrete) for protection of on-site workers, to control the spread of contaminants, and to minimize S&M (which are outside of this CERCLA project) costs pending remediation as part of other operable units, as described in the 2009 SMP (DOE 2009a).
- Subsurface structures (e.g., pits, sumps, valve boxes, dry wells) will be vacuumed to remove accumulated contamination, dust, and/or loose paint.
- The subsurface structures will be stabilized in place by backfilling with stabilizing material, such as soil or flowable fill.
- Wastes will be disposed of at a waste disposition facility that is approved to receive the waste.

- Items will be decontaminated or fixative applied and sealed as necessary to mitigate airborne emissions during demolition.

Details of the removal approach to be taken for individual structures will be established in the RAWP for each facility.

It should be noted that the remaining slabs and basements will require S&M after the demolition project is completed. The S&M activity will be a part of an ongoing DOE program conducted outside this or other CERCLA actions. A brief description of the condition of the slabs and basement will be included in the FFA semiannual progress reports. The PGDP has an active S&M program that includes many such inspections throughout the facility, as well as other activities that are required to maintain the active and inactive facilities for which DOE retains ownership. The resources required to implement this program are administered separately from CERCLA actions; therefore, the costs for S&M after demolition are not described in this CERCLA document. The CERCLA project includes filling the basements with flowable fill to prevent retention of precipitation, thereby minimizing the potential for contaminant release from them.

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5. ANALYSIS OF REMOVAL ACTION ALTERNATIVES

In accordance with NCP and EPA guidance (EPA 1993), the three alternatives presented in Section 4.2 have been evaluated using the criteria of effectiveness, implementability, and cost. The three criteria are briefly described below. Each of the alternatives that was evaluated includes activities that will begin after the deactivation of the facilities has been completed.

- The effectiveness of each alternative considers the RAOs. Other specific effectiveness considerations include the following:

  - Ability to protect human health and the environment by reducing potential hazards;

  - Ability to comply with ARARs (a complete listing of ARARs and TBCs is presented in the appendix);

  - Long-term effectiveness and permanence; and

  - Short-term effectiveness.

- The implementability of each alternative is based on the technical and administrative feasibility and the availability of services and materials required for the alternative. Specific implementability factors include the following:

  - Ability to construct and operate the technology;
  - Reliability of the technology;
  - Ease of implementing additional responses (if necessary);
  - Ability to monitor effectiveness;
  - Ability to obtain approval from regulatory agencies;
  - Availability of treatment, storage, and disposal services and capacity;
  - Availability of equipment, prospective technologies, and specialists; and
  - Likelihood of treatability studies being required to define operational characteristics.

- The cost of each alternative is presented for comparison purposes. Each cost estimate includes capital costs and operation and maintenance costs. Costs are escalated using an annual escalation factor of 2.4% and are calculated through the end of the implementation period.

The National Environmental Policy Act (NEPA) requires federal agencies to evaluate and document the effect of their proposed actions on the quality of the human environment. DOE issued a *Secretarial Policy Statement* on NEPA in June of 1994 (DOE 1994) stating that DOE hereafter will rely on the CERCLA process for review of actions to be taken under CERCLA and incorporate NEPA values in CERCLA documents to the extent practicable. Such values may include analysis of socioeconomic, cultural, ecological, and cumulative impacts and the impacts of waste disposition including off-site transportation. NEPA values described above have been incorporated into this evaluation of alternatives in accordance with the Secretarial Policy.

5.1 ALTERNATIVE 1—NO ACTION

In this alternative, the C-340 Complex and the C-746-A East End Smelter essentially will be abandoned following completion of deactivation activities under the AEA. During the period of PGDP operations, the security controls and perimeter administered by PGDP would be maintained to limit public access to the facilities through the current target date of 2017 for D&D of the GDP. No controls are assumed after 2017.

5.1.1 Effectiveness

Contamination present in the C-340 Complex and the C-746-A East End Smelter would remain in place under this alternative. The public would be protected from direct exposure as a result of access controls for the operating GDP; however, on-site workers would not be protected, nor would the environment be protected from potential releases as the buildings degrade. This alternative would not be protective of human health or the environment, and RAOs would not be achieved. Current levels of exposure to on-site personnel and the environment would continue or increase as the facilities deteriorate until eventual failure.

The primary unavoidable adverse impact expected under Alternative 1 is continued exposure for the on-site workers. Because the contaminated materials currently are inside the buildings, there would be limited impacts to air, soil, and other affected environments in the short term. Air, soil, and other environments would be impacted in the future as the buildings deteriorated and eventually failed. Wetlands and floodplains would not be affected. No federal- or state-listed threatened or endangered (T&E) plant or animal species have been identified in the area of the C-340 Complex or the C-746-A East End Smelter. The only sensitive resource located in close proximity to PGDP is the nesting habitat for the Indiana bat (*Myotis sodalis*), but PGDP facilities do not provide suitable habitat; therefore, this alternative is not expected to have any adverse impact on T&E species.

Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations,” requires agencies to identify and address disproportionately high and adverse human health or environmental effects that their activities may have on minority and low-income populations. There is a disproportionately high percentage of minority and low-income populations within 50 miles of the PGDP site (DOE 2004). Low-income families are those whose annual income is below the poverty levels, based on the family size and number of minor children. For example, in 1999, the poverty level for a family of three with one child under 18 was $13,410, while the poverty threshold for a family of five with one child under 18 was $21,024. If a family’s income fell below the poverty level, all members of the household are considered to be below the poverty level. Information from the U.S. Bureau of Census was used to determine the percentage of households whose income was less than the poverty level in the area within a 50-mile radius of the PGDP. Figure 9 shows that approximately half of the area within a 50-mile radius of PGDP has a higher percentage of low-income persons than other areas in Kentucky, Missouri, Illinois, or Tennessee (DOE 2004). Under this alternative, there will be no disproportionately high and adverse off-site impacts.

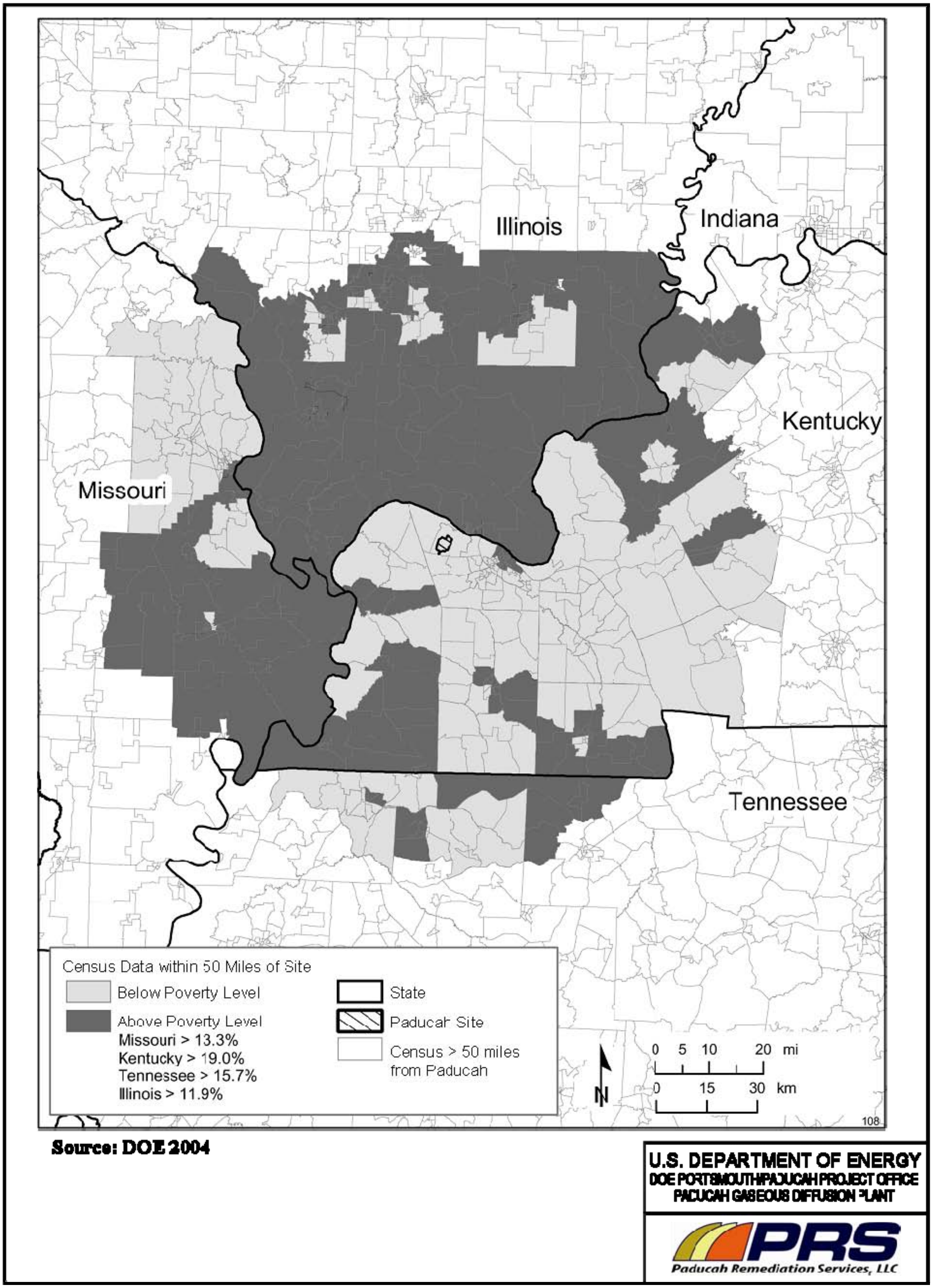

Figure 9. Regional Poverty Level Surrounding PGDP

5.1.2 Implementability

The no action alternative is readily implementable in the near term. Under this alternative, there would be no irretrievable commitment of resources, but the land currently occupied by the buildings would be unavailable for other uses, such as construction of new structures or implementation of response actions for underlying soils. No waste would be generated by this alternative, and no treatability studies would be required to implement this alternative.

5.1.3 Cost

There are no costs associated with this alternative.

5.2 ALTERNATIVE 2—CONTINUED LIMITED S&M WITH NEEDED REPAIRS AND EVENTUAL DEMOLITION

In this alternative, the C-340 Complex and C-746-A East End Smelter would be maintained until 2017 and then demolished. The current level of S&M activities, which are implemented outside of CERCLA, is intended to ensure structural integrity, adequate lighting to allow inspections, and minor corrective maintenance would be continued. This level of S&M does not keep the buildings in either a “ready to operate” or a “ready to occupy” condition. No heat or ventilation is provided to the facilities, and inspections and corrective maintenance activities are not intended to maintain the integrity of internal process systems and components. The facility would not be upgraded; however, a roof replacement would be needed during the eight-year S&M time period to prevent rainfall intrusion. Existing controls administered by PGDP would be maintained to limit public and worker access. For the purpose of alternative evaluation, this EE/CA assumes that decommissioning activities for the GDP will be initiated in 2017.

5.2.1 Effectiveness

Continued S&M of the C-340 Complex and the C-746-A East End Smelter, as described in Section 4.2, and which is conducted outside of CERCLA, would provide protection of human health and the environment and comply with ARARs for the short-term and upon completion; however, it would not achieve the RAOs until eventual demolition. A complete listing of the ARARs is presented in the appendix. Current levels of exposure to on-site personnel would continue or increase as the facilities deteriorate until eventual decommissioning.

This alternative would result in a much more complex demolition due to the structures, piping, and equipment deteriorating prior to implementing decommissioning. If left in place for several years, piping and equipment would be in worse condition complicating removal. The potential exists for the structure to deteriorate to the point that mitigation of physical hazards, such as collapsing equipment and structurally unsound floors and platforms, would be required to allow safe implementation of decommissioning activities. No treatment to reduce mobility, toxicity, or volume of wastes would be included in the short term. On the contrary, mobility of contaminants could increase if structural failures or piping and equipment breaches occurred and contaminants were released. Further, the exterior of the structures would continue to be exposed to the elements and deteriorate, increasing the probability of failure and a subsequent release of contaminants from inside the structure. At the C-340 Complex, which has transite exterior walls, deterioration of the walls may result in a release of asbestos from the transite. Upon eventual decommissioning, the mobility of contaminants would be reduced through proper containerization and disposal.

The primary unavoidable adverse impact expected under Alternative 2 is continued exposure for the on-site workers. Because the contaminated materials are inside the buildings, there would be limited impacts to air, soil, and other affected environments. Wetlands and floodplains would not be affected. No federal- or state-listed T&E plant or animal species have been identified. The only sensitive resource located in close proximity to PGDP is the nesting habitat for the Indiana bat (*Myotis sodalis*), but PGDP facilities do not provide suitable habitat; therefore, this alternative is not expected to have any adverse impacts on T&E species. Building S&M would not have any direct or indirect adverse impacts on local socioeconomic resources.

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations," requires agencies to identify and address disproportionately high and adverse human health or environmental effects that their activities may have on minority and low-income populations. There is a disproportionately high percentage of minority and low-income populations within 50 miles of the PGDP site (DOE 2004, see Section 5.1.1), but because the only impact for this alternative is exposure to the on-site workers, there would not be any disproportionately high and adverse impacts to these off-site populations.

5.2.2 Implementability

Building S&M, as described in Section 4.2, is readily implementable in the near term, but the degree of difficulty and efforts required for performing S&M will increase in the longer term as buildings degrade. The increase in difficulty results from deterioration of building roofs, walls, piping, and equipment that would require greater levels of corrective maintenance. As an example, over time paint will slough off of interior and exterior surfaces, particularly those that are not heated or cooled. The paint may be contaminated with radioisotopes, heavy metals, or PCBs, creating potential health hazards to S&M workers or to the environment, if not contained. Furthermore, deterioration of structures or equipment or piping would make the eventual decommissioning actions more complicated, especially if structures fail or become unstable, or if piping and/or equipment breaches result in migration of contaminants.

Under this alternative, there would be no irretrievable commitment of resources, but the land currently occupied by the buildings would be unavailable for other uses, such as construction of new structures or implementation of response actions for underlying soils. Only small volumes of waste resulting from maintenance activities would be generated by this alternative. Adequate disposal capacity is available to accept these wastes. Standard construction and demolition equipment required to implement this alternative is readily available commercially. No treatability studies would be required to implement this alternative.

5.2.3 Cost

The total cost for continued S&M through 2016, with one roof replacement for each building, as described above, is \$1.4 million for the C-340 Complex and \$0.7 million for the C-746-A East End Smelter. Costs for demolition, using a 2.4% per year escalation rate, as well as unescalated costs (present worth), are summarized in Table 10.

The costs presented for decommissioning the C-340 Complex and the C-746-A East End Smelter could be substantially higher due to building deterioration over the course of time, which would create a more complicated demolition project. Mitigative measures or structural improvements may be required for worker safety prior to removing equipment and piping. While the potential cost increase to decommission a deteriorated facility is unknown, it adds uncertainty to the total cost for this alternative.

Table 10. Costs for Alternative 2 for the C-340 Complex and the C-746-A East End Smelter ($ million)

	Escalated Costs		Unescalated Costs/Present Worth	
	C-340 Complex	**C-746-A East End Smelter**	**C-340 Complex**	**C-746-A East End Smelter**
Roof Replacement and S&M	1.4	0.7	1.2	0.6
Demolition in 2017	19	6.0	16	5.0
Sub-total Alternative 2	20.4	6.7	17.2	5.6
Grand total Alternative 2		**27.1**		**22.8**

5.3 ALTERNATIVE 3—DEMOLITION TO SLAB BEFORE GDP SHUTDOWN

This alternative would include demolishing the building structure to slab and stabilizing the slab. All generated wastes would be dispositioned.

5.3.1 Effectiveness

Based on the qualitative streamlined risk evaluation, demolition of the C-340 Complex and C-746-A East End Smelter would prevent, minimize, or eliminate potential and actual risks to on-site personnel and to ecological receptors posed by the release or threat of release of the COCs. The decontamination and/or stabilization of the remaining building slabs and belowgrade structures will isolate any remaining contaminants from the environment.

This alternative is expected to meet ARARs. These ARARs include chemical-specific requirements for the protection of public health and the environment; location-specific requirements for impacting wetlands and protection of cultural resources; and action-specific requirements that include waste management, transportation, and disposal requirements. The transportation of waste to on-site and/or off-site disposal facilities, and any treatment that may be required to satisfy LDRs, would be performed in accordance with ARARs (see Appendix). Waste may be shipped by truck or rail. All disposal activities would be conducted in accordance with requirements and disposal site permits, authorizations, or agreements.

Disposal at off-site facilities will depend on the nature of the wastes generated. It is anticipated that the majority of the waste will be designated as LLW requiring off-site disposal (e.g., DOE's NTS and Energy*Solutions*, Clive, UT).

DOE developed the *Cultural Resources Management Plan for the Paducah Gaseous Diffusion Plant, Paducah Gaseous Diffusion Plant, McCracken County, Kentucky* (CRMP) (BJC 2006a) to define the preservation strategy for PGDP and to ensure compliance with the National Historic Preservation Act and federal archaeological protection legislation. No archaeological resources have been identified within the vicinity of the C-340 Complex or the C-746-A East End Smelter.

An intensive cultural resources survey of PGDP facilities is documented in *Cultural Resources Survey for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (BJC 2006b). The cultural survey and CRMP provide further detail for the buildings and sites on PGDP that are eligible for listing on the National Register of Historic Places (NRHP) and those that are identified as NRHP-eligible properties in the PGDP Historic District. The C-340 Complex is in the PGDP Historic District, and the C-746-A East End Smelter is not in the PGDP Historic District. In order to comply with the substantive requirements of the National Historic Preservation Act, photographs and drawing of the C-340 complex have been prepared.

The photos and drawings were submitted to the State Historic Preservation Office and are available in the DOE reading room at the McCracken County, KY, Public Library; the DOE Information Center in Paducah, KY; and the KDEP offices in Frankfort, KY.

Demolition would ensure that contaminants in the abovegrade building structures remain in a controlled environment. Wastes would be disposed of at an appropriate site that would provide long-term containment for any hazardous and/or radioactive constituents. Controls put in place by DOE's remediation contractor's maintenance S&M program, CERCLA projects, will include engineered barriers that will limit access to the remaining belowgrade structures until they are addressed in separate CERCLA actions that will take place after the shutdown of the GDP. These actions are described in the current SMP (DOE 2009a) as well as the proposed SMP for fiscal year 2010.

No long-term impacts to air quality will result from demolition. At the implementation of this alternative, the remaining contamination in the structures is expected to consist of radiological contamination and PCB-contaminated paint on the structural steel or equipment in both facilities and transite siding on C-340. Short-term impacts to air quality will be limited to the potential release of the contaminants, which will be mitigated by vacuuming, application of fixatives or sealants, and water misting. Perimeter monitoring will be conducted during field activities. Additionally after deactivation, minor quantities of hazardous substances such as circuit boards or similar items for which access was not feasible or potentially would have been unsafe for workers could remain in the structure. During demolition, a combination of water spraying, vacuuming, and application of fixatives will minimize air quality impacts.

Demolition of buildings will have no impact on geology and only short-term impacts on soils. Backfilling or grading and contouring will alter the topography of the area of the removal action, but the geologic formations underlying those sites will not be affected. Demolition, backfilling, or grading may disturb existing soils in the short-term, with some topsoil removed in the process. Short-term soil erosion impacts will be mitigated through the use of best management practice control measures (e.g., covers and silt fences). No conversion of prime farmland soils will occur. Any activity that will create disturbances also will include restoration to the areas.

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations," requires agencies to identify and address disproportionately high and adverse human health or environmental effects that their activities may have on minority and low-income populations. There is a disproportionately high percentage of minority and low-income populations within 50 miles of the PGDP site (DOE 2000), but because the only impacts for this alternative is exposure to the demolition workers, there would not be any disproportionately adverse impacts to these off-site populations.

Slabs will be made structurally stable and they will be decontaminated, if required, by the standards in 10 *CFR* § 835 Appendix D, and 40 *CFR* § 761.30 (p), or a fixative applied, as appropriate. These two activities will minimize the potential for contaminant release from them following demolition.

Building deterioration that would result in a significant increase in contaminant release would not be expected during demolition. Further, this alternative would decommission the building before structures deteriorated to the point that decommissioning would be further complicated. Chemical, radiological, and physical risks to on-site workers would be controlled by engineering controls and/or personal protective equipment (PPE).

Because wastes will be shipped to off-site disposal facilities, there would be increased cargo- and vehicle-related transportation risks[4] to transportation workers and members of the public. Transportation risks for off-site waste shipments have been modeled for two similar PGDP projects.

1. In the *Engineering Evaluation/Cost Analysis for Scrap Metal Disposition at Paducah Gaseous Diffusion Plant* (DOE 2001b), the cargo- and vehicle-related risks resulting from road and rail shipment of waste to disposal facilities in Nevada and Utah were estimated. In this analysis, the cargo-related risks, reported as the probability of latent cancer fatalities (LCF), and the vehicle-related risks, reported as expected accidents and expected fatalities resulting from accidents, were determined to be < 1.

2. In the *Final Environmental Assessment for Waste Disposition Activities at the Paducah Site* (DOE 2002), the cargo- and vehicle-related risks resulting from road and rail shipment of waste over a 10-year period to disposal facilities in Texas, Washington, Nevada, Tennessee, and Utah were estimated. In this analysis, the cargo-related risks, reported as the probability of LCF to crew and the public, were determined to be < 1. The cargo-related risks to a hypothetical maximum exposed individual were < 1 in 1 million for all destinations modeled. The vehicle-related risks, reported as expected accidents and fatalities from accidents, ranged from 1.1 to < 1, respectively. Over all shipments to all locations, the total number of accidents and fatalities predicted for the 10-year period was < 2 and < 1, respectively.

The wastes generated by both of the projects mentioned above are similar in nature to those that will be generated by the C-340 Complex and C-746-A East End Smelter decommissioning. That is, the majority of the waste will be low-level radiologically contaminated waste, along with smaller volumes of TSCA regulated PCB wastes, RCRA hazardous wastes, and small volumes of low-level radiological waste. In addition to uranium, trace amounts of technetium, neptunium, plutonium, thorium, and strontium are expected. There will be small volumes of sanitary waste, too. Some waste streams will be combinations of any of those types. Also, the disposal facilities for both projects are the same; most of the wastes will go either to Energy*Solutions* in Utah or NTS. The risks posed by transportation are based on both the types of wastes generated and the volume of wastes shipped. Current estimates indicate that the volume of wastes generated by the C-340 Complex and C-746-A East End Smelter decommissioning will be less than that used to develop the transportation risk assessment for scrap metal disposition by a factor of more than 5. Consequently, the risks posed by transporting wastes from the C-340 Complex and C-746-A East End Smelter decommissioning will be less than those calculated for the Scrap Metal Disposition Project. The cumulative impacts of shipping wastes from decommissioning projects, while continuing to ship the waste addressed in the waste disposition environmental assessment will not be any greater than the risks posed while the scrap metal project was shipping simultaneously with the waste disposition project between 2000 and 2006.

5.3.2 Implementability

Technical and administrative feasibility—Demolition is a technically feasible alternative. Conventional construction/demolition techniques will be used to demolish the structure. Decontamination and/or stabilization of the concrete slabs and belowgrade structures will utilize techniques that have been used effectively at PGDP in other areas with similar concerns. On-site and/or off-site disposal of waste materials will take place at existing facilities with sufficient capacities.

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[4] Vehicle-related transportation risks are independent of the types of material sent, but are related to the method of transportation (e.g., road, rail), the number of shipments, and the distance traveled. Cargo-related transportation risks are concerned with the risks to expected receptors (e.g., drivers, members of the public) from hypothetical exposure to waste transported.

Availability of services and materials—Sufficient equipment and personnel are available for this alternative. On-site and off-site disposal services are available.

5.3.3 Cost

The total estimated cost of Alternative 3 is $16.2 million for the C-340 Complex, and $5.0 million for the C-746-A East End Smelter (see Table 11). Because cost is dependent on the actual waste type and volume, the estimated cost may vary after the wastes are fully characterized and the actual waste volumes are known. Because this action will take place in the near-term, the escalated and unescalated/present worth costs are identical.

Table 11. Unescalated/Present Worth Costs for Alternative 3, Demolition and Waste Transport and Disposal in the Near-Term, for the C-340 Complex and the C-746-A East End Smelter ($ million)

	C-340 Complex	**C-746-A East End Smelter**
Demolition, waste transport, and disposal in the near term	16.2	5.0
Total Alternative 3		**21.2**

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6. COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

In this section, the alternatives are compared for each of the criteria used in the analysis. Table 12 summarizes the comparative analysis.

Table 12. Qualitative Comparative Analysis of Removal Action Alternatives

Alternative 1 **No Action**	**Alternative 2** **Continued S&M with Needed Repairs and Eventual Demolition**	**Alternative 3** **Near-term Demolition to Slab**
Effectiveness		
• Not effective in meeting RAOs • Does not reduce risk or potential for exposure • Does not comply with ARARs	• Not as effective in meeting RAOs before shutdown of the GDP • Defers potential hazard reduction to the future • Complies with ARARs	• Effective in meeting RAOs before shutdown of the GDP • Reduces potential hazards now • Complies with ARARs
Implementability		
• Implementable and feasible	• Highly implementable and feasible; procedures/protocol for S&M already in place • Conventional demolition methods used in the future • Services and materials needed will be available in the future	• Highly implementable and feasible • Conventional demolition methods used now • Services and materials needed are available now
Cost		
• No costs for this alternative	• High costs associated with maintenance and roof repairs • Increased demolition cost resulting from deterioration of the facility. Compliant waste segregation and safe demolition could require structural improvements • Escalated cost of demolition is higher at a later date <u>Escalated costs, $ million</u> • C-340– Roof Replacement and S&M $ 1.4 Demolition in 2017 <u>19</u> Subtotal 20.4 C-746-A– Roof Replacement and S&M $ 0.7 Demolition in 2017 <u>6.0</u> Subtotal 6.7 Grand Total $ 27.1	• Reduced costs associated with maintenance; roof repair costs have been eliminated • Lower cost of demolition in current dollars <u>Costs, $ million</u> • C-340– Demolition $16.2 • C-746-A– Demolition <u>5.0</u> Total $ 21.2

6.1 EFFECTIVENESS COMPARISON

Major subcriteria for evaluating effectiveness are protectiveness, ability to comply with ARARs, and the ability to meet the RAOs.

Protectiveness is the primary objective of a removal action. As was previously discussed in the streamlined risk assessment, in Section 2.4, as the facilities continue to age, the threat of substantial release of radiological and hazardous substances increases and the difficulty of confining these materials from the environment increases. Alternative 1, the no action alternative, is not protective of human health and the environment. Alternative 3, demolition to slab before GDP shutdown, would mitigate the hazards from the structure permanently. Hazards from the slabs and the subsurface will be controlled by applying fixatives and/or covers. Alternative 2, limited S&M with needed repairs and eventual demolition, would delay demolition, therefore, delays mitigation of hazards to the year 2017 or later. Although both Alternative 2 and Alternative 3 would be protective of human health, Alternative 3 is considered the more protective because it would eliminate the hazards sooner and preclude the threat of a release due to aging facilities.

Both Alternatives 2 and 3 would achieve the RAOs and comply with ARARs; however, Alternative 1 does not achieve RAOs. Alternative 3 achieves RAOs in the near-term; whereas in Alternative 2, the RAOs would not be achieved until at least the year 2017 or later. Alternative 3 achieves the RAOs by removing and disposing of materials contaminated with hazardous substances. Alternative 2 would prevent unacceptable exposures through continued S&M and physical controls until the buildings are demolished.

Alternatives 2 and 3 will have the same transportation risks because both will require transport of wastes to off-site disposal facilities. If additional waste disposal facilities are constructed in the future, the transportation risks incurred by Alternative 2 could change, depending on the type of waste the facility can receive, the amount of that waste, and the location of the facility. No transportation risks are associated with Alternative 1.

6.2 IMPLEMENTABILITY COMPARISON

Implementability is evaluated based on technical and administrative feasibility and availability of equipment, personnel, services, and disposal facilities.

All three alternatives are technically feasible. The methods for performing Alternatives 2 and 3 can be planned and engineered using existing available knowledge and procedures. The methods have been performed at PGDP and elsewhere. Existing on- and off-site disposal facilities are available to receive the waste to be generated by the activities.

No equipment, technologies, or personnel are required for implementation of Alternative 1. Conventional demolition methods would be utilized for Alternatives 2 and 3. Equipment to support both Alternatives 2 and 3 is available either at the PGDP or commercially available. End-loaders and track hoes with processor end-effectors, transport trucks, and cranes capable of heavy lifts are available both on-site and commercially. Advanced cutting methods are available for cutting contaminated equipment. Trained personnel are available to perform work for both Alternatives 2 and 3. On-site or off-site disposal or recycling services are available for the types of wastes expected to be generated under Alternative 3.

6.3 COST COMPARISON

Alternative 1 has the least cost, although it is not protective and does not achieve the RAOs. There are higher costs associated with maintenance and capital repairs in Alternative 2, and cost of demolition later is higher because of systems and structures that are much older and as a result of escalation.

The costs associated with maintenance and capital repair (roof replacement) are eliminated by Alternative 3. Additionally, in Alternative 2, the potential exists for cost of demolition to increase due to the need for structural reinforcement resulting from deterioration that occurs prior to facility demolition. Table 13 summarizes the costs for the recommended alternative. A comparison of these costs is included in Table 12. Because this action will take place in the near-term, escalated and unescalated/present worth costs are identical.

Table 13. Unescalated/Present Worth Cost for the Recommended Alternative, Alternative 3, Decommissioning in the Near Term of the C-340 Complex and the C-746-A East End Smelter ($ million)

C-340 Complex	C-746-A East End Smelter
16.2	5.0

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7. RECOMMENDED REMOVAL ACTION ALTERNATIVE

As seen in Table 12, both Alternatives 2 and 3 will meet RAOs and reduce potential hazards, but Alternative 1 does not. Alternative 2 does so only in the year 2017 or later; therefore, Alternative 3 provides protection of human health and the environment in the more immediate term. Both Alternatives 2 and 3 comply with ARARs. These alternatives fare equally well using the criterion of implementability, as both are highly implementable and feasible and will utilize services and materials that readily are available now and in the future. In the final category of cost, Alternative 3 is more desirable than Alternative 2 because higher maintenance costs are greatly reduced or eliminated, capital repair costs are no longer incurred, and the costs of demolition are lower now than in the future when costs will be greater due to inevitable structural degradation. Thus, Alternative 3 is the preferred removal action alternative based on the criteria of effectiveness, implementability, and cost.

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APPENDIX

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND TO BE CONSIDERED GUIDANCE FOR THE DISPOSITIONING OF INACTIVE FACILITIES AT THE PADUCAH GASEOUS DIFFUSION PLANT

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A.1. INTRODUCTION

In accordance with the National Oil and Hazardous Substances Pollution Contingency Plan, 40 *CFR* § 300 415(j), on-site removal actions conducted under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) are required to attain applicable or relevant and appropriate requirements (ARARs) to the extent practicable or provide grounds for invoking a CERCLA waiver. ARARs include only federal and state environmental or facility siting laws/regulations; they do not include occupational safety or worker radiation protection requirements. Additionally, per 40 *CFR* § 300.400(g)(3), other advisories, criteria, or guidance may be considered in determining remedies [to be considered (TBC) category].

When the U.S. Department of Energy (DOE) proposes a response action, Section XXI of the Federal Facility Agreement requires that DOE identify each state and federal permit that otherwise would have been required in the absence of CERCLA § 121(e)(1) and the National Contingency Plan. DOE also must identify the standards, requirements, criteria, or limitations necessary to obtain such permits and provide an explanation of how the proposed action will meet the standards, requirements, criteria, or limitations identified. This evaluation determined that the otherwise required permits may include a Kentucky Pollutant Discharge Elimination System (KPDES); Resource Conservation and Recovery Act of 1976 (RCRA) treatment, storage, and disposal facility; and solid waste landfill permits.

Response actions conducted on-site must comply with the substantive but not administrative requirements of ARARs. Administrative requirements include applying for permits, recordkeeping, consultation, and reporting. Response actions conducted off-site must comply with both the substantive and administrative requirements of applicable laws. A brief description of key ARAR/TBC issues follows.

ARARs typically are divided into three categories: (1) chemical-specific, (2) location-specific, and (3) action-specific. Chemical-specific ARARs provide health- or risk-based concentration limits or discharge limitations in various environmental media (i.e., surface water, groundwater, soil, or air) for specific hazardous substances, pollutants, or contaminants. Location-specific ARARs establish restrictions on permissible concentrations of hazardous substances or establish requirements for how activities will be conducted because they are in special locations (e.g., floodplains or historic districts). Action-specific ARARs include operation, performance, and design requirements or limitations based on waste types, media, and removal/remedial activities to be implemented.

A.2. CHEMICAL-SPECIFIC ARARs/TBCs

"Chemical-specific requirements set health or risk-based concentration limits or discharge limitations in various environmental media for specific hazardous substances, pollutants, or contaminants" (55 *FR* 8741, March 8, 1990). These requirements generally set protective cleanup levels for the chemicals of concern in the designated media or otherwise indicate a safe level of discharge that may be incorporated when considering a specific remedial activity. There are no chemical-specific ARARs identified for this decommissioning and demolition action.

A.3. LOCATION-SPECIFIC ARARS/TBCS

Location-specific ARARs generally are restrictions placed upon the concentration of hazardous substances or the conduct of activities solely because they are in special locations [53 *FR* 51394, 51437 (December 21, 1988)]. Table A.1 lists location-specific ARARs for protection of cultural or sensitive resources.

A.3.1 CULTURAL RESOURCES

DOE developed the *Cultural Resources Management Plan for the Paducah Gaseous Diffusion Plant, McCracken County, Kentucky* (CRMP) to define the preservation strategy for Paducah Gaseous Diffusion Plant (PGDP) per the National Historic Preservation Act and federal archaeological protection legislation at PGDP. The CRMP provides further detail for the buildings and sites on PGDP eligible for listing on the National Register of Historic Places (NRHP) and identifies as NRHP-eligible contributing properties to the PGDP Historic District. The C-340 Complex is in the PGDP Historic District; the C-746-A East End Smelter is not. In order to comply with the substantive requirements of the National Historic Preservation Act, photographs and drawing of the C-340 Complex have been prepared. They have been submitted to the State Historic Preservation Office and are available in the DOE reading room at the McCracken County, KY, Public Library; the DOE Information Center in Paducah, KY; and the Kentucky Department for Environmental Protection offices in Lexington, KY.

A.4. ACTION-SPECIFIC ARARs/TBCs

Performance, design, or other action-specific requirements set controls or restrictions on particular kinds of activities related to the management of hazardous waste (55 *FR* 8741, March 8, 1990). ARARs for the removal alternative include requirements related to building decommissioning and demolition; waste management; scrap metal removal; and transportation of hazardous materials.

A.4.1 BUILDING DECOMMISSIONING AND DEMOLITION

Prior to the demolition of building structures and disposition of the resulting wastes, loose material will be removed from the resulting slabs or foundations and the slabs placed in a stable configuration. Loose radioactive contamination and/or fixtures (including any electrical equipment) would be removed as well. Any regulated Class I/II refrigerants found must be evacuated from any air handling equipment. Requirements under the Clean Air Act (CAA) of 1970, as amended, for control of Class I/II refrigerants included in Table A.2 would have to be met.

Reusable scrap metal may be segregated from the waste materials/debris. Any scrap metal otherwise considered hazardous waste under RCRA, as amended, regulations is not subject to RCRA Subtitle C requirements if it is intended for recycle or reuse. On July 13, 2000, DOE temporarily suspended the unrestricted release of scrap metal for recycling from radiological areas at DOE facilities. The suspension was to remain in effect until DOE directives and guidance were reviewed and amended as necessary to ensure no metal with detectable radioactivity above background would undergo unrestricted release for recycle. Clean structural steel would be released to scrap dealers or, if available, to a DOE-operated recycler provided this is in compliance with guidance in effect during implementation of the removal action. Materials for unrestricted release must meet DOE Order 5400.5 requirements listed on Table A.2

for residual surface radioactive contamination. Polychlorinated biphenyl (PCB)-contaminated equipment or metal surfaces should be decontaminated if intended for recycle or reuse in accordance with the requirements specified on Table A.2.

A.4.2 WASTE MANAGEMENT

Building decommissioning activities may result in generation of RCRA solid or hazardous waste (e.g., mercury switches, lead paint containing hazardous debris); low-level radioactive waste (LLW); mixed waste; asbestos-containing waste materials; Toxic Substances Control Act (TSCA) of 1976, as amended; PCBs in fluorescent light ballasts, capacitors, or drained equipment; PCB bulk-product waste; and/or PCB remediation wastes. Although some characterization has been performed, additional waste streams may be identified during implementation of the removal action.

PCB bulk-product waste, as defined by 40 *CFR* § 761.3, is derived from manufactured products containing PCBs in a non-liquid state at any concentration where the concentration at the time of designation for disposal was greater than or equal to 50 ppm. 40 *CFR* § 761.50(b)(4) states that PCB bulk product waste is waste that was greater than or equal to 50 ppm when originally removed from service even if current PCB concentration is less than 50 ppm. It includes non-liquid bulk wastes and debris from demolition (of buildings and other man-made structures) that was manufactured, coated, or serviced with PCBs. Examples of bulk PCB product waste are insulation, dried paints, varnishes, sealants, caulking, and gaskets.

PCB remediation waste, as defined in 40 *CFR* § 761.3, contains PCBs as a result of a spill, release, or other unauthorized disposal. It includes rags and other debris generated as a result of any PCB-spill cleanup in buildings and other man-made structures containing concrete, wood floors, or walls contaminated from leaking PCBs or PCB-contaminated transformers. PCB remediation waste also includes PCB-contaminated nonporous surfaces such as smooth glass, unpainted marble, granite, or porous surfaces such as fiberglass, painted stone, and corroded metal.

All primary wastes (e.g., demolition debris, removed waste materials) and secondary wastes (e.g., contaminated personal protective equipment, decontamination wastes) generated during building remediation activities must be characterized appropriately as either RCRA (solid or hazardous waste), asbestos, TSCA, LLW(s), and/or mixed wastes and managed accordingly. Table A.2 lists the requirements associated with the characterization, storage, treatment, and disposal of the aforementioned waste types.

A.4.3 TRANSPORTATION

Any wastes transferred off-site or transported in commerce along public rights-of-way must meet the requirements summarized on Table A.2, depending on the type of waste (e.g., RCRA, TSCA, LLW, or mixed). These include packaging, labeling, marking, manifesting, and placarding requirements for hazardous materials at 49 *CFR* § 170–180; however, transport of decommissioning wastes along roads within the PGDP site that are not accessible to the public would not be considered “in commerce.”

In addition, CERCLA § 121(d)(3) provides that the off-site transfer of any hazardous substance, pollutant, or contaminant generated during CERCLA response actions be sent to a treatment, storage, or disposal facility that complies with applicable federal and state laws and has been approved by the U.S. Environmental Protection Agency for acceptance of CERCLA waste (see the “Off-Site Rule” at 40 *CFR* § 300.440).

Table A.1. Location-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities

Location Characteristic(s)	Summary of Requirements	Prerequisite	Citation
Cultural resources			
Presence of historical resources	Federal agencies must take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register.	Federal agency undertaking that may impact historical properties listed or eligible for inclusion on the National Register of Historic Places—**applicable**.	16 *USC* 470f
	Federal agencies must initiate measures to assure that where, as a result of federal action, a historic property is to be substantially altered or demolished, timely steps are taken to make or have made appropriate records.		16 *USC* 470h-2(b)

ARAR = applicable or relevant and appropriate requirement
CFR = Code of Federal Regulations
DOE = U.S. Department of Energy
NWP = Nationwide Permit
PGDP = Paducah Gaseous Diffusion Plant
TBC = to be considered
USC = United States Code

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities

Action	Summary of Requirements	Prerequisite	Citation
General standards of performance			
Activities causing fugitive dust emissions	No person shall cause, suffer, or allow any material to be handled, processed, transported, or stored; a building or its appurtenances to be constructed, altered, repaired, or demolished, or a road to be used without taking reasonable precaution to prevent particulate matter from becoming airborne. Such reasonable precautions shall include, when applicable, but not be limited to, the following: • Use, where possible, of water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads or the clearing of land; • Application and maintenance of asphalt, oil, water, or suitable chemicals on roads, materials stockpiles, and other surfaces which can create airborne dusts; • Covering, at all times when in motion, open bodied trucks transporting materials likely to become airborne; • The maintenance of paved roadways in a clean condition; The prompt removal of earth or other material from a paved street which earth or other material has been transported thereto by trucking or earth moving equipment or erosion by water.	Fugitive emissions from land-disturbing activities (e.g., handling, processing, transporting or storing of any material, demolition of structures, construction operations, grading of roads, or the clearing of land, etc.)—**applicable**.	401 *KAR* 63:010 § 3(1) and (1)(a), (b), (d), (e) and (f)
	No person shall cause or permit the discharge of visible fugitive dust emissions beyond the lot line of the property on which the emissions originate.		401 *KAR* 63:010 § 3(2)
Activities causing radionuclide emissions	Emissions of radionuclides to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive, in any year, an EDE of 10 mrem/yr.	Radionuclide emissions at a DOE facility—**applicable**.	40 *CFR* § 61.92 401 *KAR* 57:002

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
Activities causing toxic substances or potentially hazardous matter emissions	Persons responsible for a source from which hazardous matter or toxic substances may be emitted shall provide the utmost care and consideration in the handling of these materials to the potentially harmful effects of the emissions resulting from such activities. No affected facility shall emit potentially hazardous matter or toxic substances in such quantities or duration as to be harmful to the health and welfare of humans, animals and plants.	Emissions of potentially hazardous matter or toxic substances as defined in 401 *KAR* 63:020 § 2 (2)—**applicable**.	401 *KAR* 63:020
Radiation dose limits for individual members of the public	Exposure to individual members of the public from radiation shall not exceed a total EDE of 0.1 rem/year (100 mrem/year), exclusive of the dose contributions from background radiation, any medical administration the individual has received, or voluntary participation in medical/research programs. Shall use, to the extent practicable, procedures and engineering controls based on sound radiation protection principles to achieve doses to members of the public that are ALARA.	Dose received from operations —**relevant and appropriate**.	10 *CFR* § 20.1301(a)(1) 902 *KAR* 100:019 § 10 (1) 10 *CFR* § 20.1101(b) 902 *KAR* 100:019 § 2(2)
	Except as provided in 5400.1(II)(1)(a)(4), the exposure of members of the public to radiation sources as a consequence of all routine DOE activities shall not cause, in a year, an EDE greater than 100 mrem per year. The ALARA process shall be implemented for all DOE activities and facilities that cause public doses.	Dose received from all exposure modes from all DOE activities (including remedial actions) at a DOE facility—**TBC**.	DOE O 5400.5(II)(1)(a) and (2)
Activities causing storm water runoff (e.g., clearing, grading, excavation)	Implement good construction techniques to control pollutants in storm water discharges during and after construction in accordance with substantive requirements provided by permits issued pursuant to 40 *CFR* § 122.26(c).	Storm water discharges associated with small construction activities as defined in 40 *CFR* § 122.26(b)(15) and 401 *KAR* 5:002 § 1 (157)—**applicable**.	40 *CFR* § 122.26(c)(1)(ii)(C) and (D) 401 *KAR* 5:060 § 8
	Storm water runoff associated with construction activities taking place at a facility with an existing Best Management Practices (BMP) Plan shall be addressed under the facility BMP and not under a storm water general permit.	Storm water discharges associated with small construction activities as defined in 40 *CFR* § 122.26(b)(15) and 401 *KAR* 5:002 § 1 (157)**—TBC**.	Fact Sheet for the KPDES General Permit For Storm water Discharges Associated with Construction Activities, June 2009

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
	Best management storm water controls will be implemented and may include, as appropriate, erosion and sedimentation control measures, structural practices (e.g., silt fences, straw bale barriers) and vegetative practices (e.g., seeding); storm water management (e.g., diversion); and maintenance of control measures in order to ensure compliance with the standards in Section C.5. Storm Water Discharge Quality.	Storm water runoff associated with construction activities taking place at a facility [PGDP] with an existing BMP Plan—**TBC**.	Appendix C of the PGDP Best Management Practices Plan (2007) —Examples of Storm water Controls
Decontamination and waste removal standards			
Release of property with residual radioactive material	Property with residual radioactive material will be released from DOE control under survey methods and criteria of DOE Order 5400.5.	Release of soil, equipment and material with residual radioactive material from DOE control —**TBC**.	DOE O 5400.5
Decontamination of PCB nonporous surface	For unrestricted use, meet standard of • 10 µg/100 cm^2 as measured by a standard wipe test (40 *CFR* § 761.123) at locations selected in accordance with 40 *CFR* § 761, Subpart P, and	Nonporous surfaces previously in contact with liquid PCBs, where no free-flowing liquids are present—**applicable**.	40 *CFR* § 761.79(b)(3)(i)(A)
	• Clean to Visual Standard No. 2 of NACE. Verify compliance by visually inspecting all cleaned areas.	Nonporous surfaces in contact with non-liquid PCBs—**applicable**.	40 *CFR* § 761.79(b)(3)(i)(B)
	For disposal in a smelter operating in accordance with 40 *CFR* § 761.72(b), meet standard of • < 100 µg/100 cm^2 as measured by a standard wipe test (40 *CFR* § 761.123) at locations selected in accordance with 40 *CFR* § 761, Subpart P and	Nonporous surfaces previously in contact with liquid PCBs at any concentration, where no free-flowing liquids are present—**applicable**.	40 *CFR* § 761.79(b)(3)(ii)(A)
	• Clean to Visual Standard No. 3 of NACE. Verify compliance by visually inspecting all cleaned areas.	Nonporous surfaces in contact with non-liquid PCBs, including nonporous surfaces covered with a porous surface (e.g., paint or coating on metal)—**applicable**.	40 *CFR* § 761.79(b)(3)(ii)(B)
Decontamination of movable equipment contaminated by PCBs	May decontaminate by • Swabbing surfaces that have contacted PCBs with a solvent; • A double wash/rinse as defined in 40 *CFR* § 761.360-378; or • Another applicable decontamination procedure under 40 *CFR* § 761.79.	Movable equipment contaminated by PCBs, tools, and sampling equipment—**applicable**.	40 *CFR* § 761.79(c)(2)

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
Decontamination of metal surfaces in contact with PCBs	For surfaces in contact with liquid or non-liquid PCBs < 500 ppm, may be decontaminated in an industrial furnace for purposes of disposal in accordance with 40 *CFR* § 761.72.	Use of thermal processes to decontaminate metal surfaces, as required by 40 *CFR* § 761.61 (a)(6)—**applicable**.	40 *CFR* § 761.79 (c)(6)(i)
	For surfaces in contact with liquid or non-liquid PCBs ≥ 500 ppm, may be smelted in an industrial furnace operating in accordance with 40 *CFR* § 761.72(b), but must first be decontaminated in accordance with 40 *CFR* § 761.72(a) or to a surface concentration of < 100 µg/100 cm^2.		40 *CFR* § 761.79 (c)(6)(ii)
Decontamination of PCB-contaminated concrete	If commenced within 72 hours of initial spill, ≤ 10 µg/100 cm^2 as measured by the standard wipe test (40 *CFR* § 761.123).	Spill of liquid PCBs—**applicable**.	40 *CFR* § 761.79 (b)(4)
Decontamination of PCB-contaminated water	For discharge to a treatment works as defined in 40 *CFR* § 503.9 (aa), or discharge to navigable waters, meet standard of < 3 ppb PCBs; or	Water containing PCBs regulated for disposal—**applicable**.	40 *CFR* § 761.79 (b)(1)(ii)
	For unrestricted use, meet standard of 0.5 ppb PCBs.		40 *CFR* § 761.79(b)(1)(iii)
Decontamination of PCB-contaminated liquids	Meet standard of < 2 ppm PCBs.	Organic liquids and nonaqueous inorganic liquids containing PCBs—**applicable**.	40 *CFR* § 761.79(b)(2)
Decontamination of PCB-containers	Must flush the internal surfaces of the container three times with a solvent containing < 50 ppm PCBs. Each rinse shall use a volume of the flushing solvent equal to approximately 10% of the PCB container capacity.	PCB container as defined in 40 *CFR* § 761.3—**applicable**.	40 *CFR* § 761.79(c)(1)
Cleanup of porous surfaces with PCBs (self-implementing option)	May be cleaned up for use in accordance with 40 *CFR* § 761.79(b)(4) or § 761.30(p).	PCB remediation waste porous surfaces (as defined in 40 *CFR* § 761.3) on which PCBs have been spilled—**applicable**.	40 *CFR* § 761.61(a)(4)(iii)
Cleanup verification for self-implementing option(s)	Must collect and analyze the wastes in accordance with 40 *CFR* §§ 761.280-298 (Subpart O).	Collection and analysis of samples to verify cleanup and on-site disposal of bulk PCB remediation wastes and porous surfaces—**applicable**.	40 *CFR* § 761.61(a)(6)(i)
	Must collect and analyze the waste in accordance with 40 *CFR* §§ 761.300-316 (Subpart P).	Collection and analysis of samples from PCB remediation waste non-porous surfaces—**applicable**.	

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
	Must collect and analyze the waste in accordance with 40 *CFR* § 761.269.	Collection and analysis of samples from liquid PCB remediation waste—**applicable**.	
	May use PCB field screening tests to determine when to sample to verify that cleanup is complete.	Interim sampling during PCB remediation waste cleanup—**applicable**.	
	Self-implementing cleanup of PCB remediation waste is complete.	Sample analysis results in measurement of PCBs less than or equal to levels specified in 40 *CFR* § 761.61(a)—**applicable**.	40 *CFR* § 761.61(a)(6)(ii)(A)
	Cleanup is not complete and must either dispose of the sampled PCB remediation waste, or reclean the waste represented by the sample and reinitiate sampling and analysis in accordance with 40 *CFR* § 761.61(a)(6)(i).	Sample analysis results in measurement of PCBs greater than or equal to levels specified in 40 *CFR* § 761.61(a)—**applicable**.	40 *CFR* § 761.61(a)(6)(ii)(B)
Removal of refrigeration equipment	May not knowingly vent or otherwise release into the environment any refrigerant or substitute from such appliances, with the exception of the following substitutes in the following end-uses: • Ammonia in commercial or industrial process refrigeration or in absorption units; • Hydrocarbons in industrial process refrigeration (processing of hydrocarbons); • Chlorine in industrial process refrigeration (processing of chlorine and chlorine compounds); • Carbon dioxide in any application; • Nitrogen in any application; or • Water in any application.	Disposal of appliances that contain Class I or II substances used as a refrigerant—**applicable**.	40 *CFR* § 82.154(a)(1)
	De minimis releases associated with good faith attempts to recycle or recover refrigerants or non-exempt substitutes are not subject to this prohibition.		40 *CFR* § 82.154(a)(2)

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
	No person may dispose of such appliances, with certain exceptions, without • Observing the required practices set forth in 40 *CFR* § 82.156 and • Using equipment that is certified for that type of appliance pursuant to 40 *CFR* § 82.158.	Disposal of appliances that contain Class I or II substances used as a refrigerant—**applicable**.	40 *CFR* § 82.154(b)
Removal of RACM from a facility	Must thoroughly inspect the affected facility or part of the facility where the demolition will occur for the presence of asbestos, including Category I and Category II nonfriable ACM.	Demolition of a facility containing RACM—**applicable**.	40 *CFR* § 61.145(a) 401 *KAR* 58:025
	Procedures for asbestos emission control per 40 *CFR* § 61.145(c)(1) through (10) shall be followed, as appropriate.	Demolition of a facility containing RACM exceeding the volume requirements of 40 *CFR* § 61.145(a)(1)—**applicable**.	40 *CFR* § 61.145(c) 401 *KAR* 58:025
Removal of friable asbestos prior to demolition	Any demolition of a structure or portion of a structure which contains facility components composed of or covered by friable asbestos material shall be preceded by a removal of all such materials prior to demolition, according to the relevant requirements of 401 *KAR* 58:040 § 4 (1) as provided below.	Demolition of a facility which may cause a disturbance of friable asbestos material and the demolition exceed the thresholds in 40 *CFR* § 61.145(a)(1)—**relevant and appropriate**.	401 *KAR* 58:040 § 4(2)(a)
	In lieu of the requirements specified in 401 *KAR* 58:040 § 4 (1)(a), (b), (c), (e), and (l), shall comply with the following requirements:		401 *KAR* 58:040 § 4(2)(b)
	Before beginning a demolition project, all doors, windows, floor drains, vents, and other openings to the outside of the building and to areas within the building that do not contain asbestos materials, shall be sealed off with polyethylene sheeting and waterproof tape.		401 *KAR* 58:040 § 4(2)(b)(1)

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
	Prior to demolition, clearance air monitoring shall be performed as provided below in 401 *KAR* 58:040 § 4 (1)(s). At least five (5) samples of air per work area, or one (1) sample per room, whichever is greater, shall be obtained for the clearance air monitoring. A sample volume of 3,000 liters of air shall be used. The air samples shall be obtained when the air is being artificially circulated so that the fibers remain airborne during the sampling. Barriers shall not be dismantled, and openings shall not be uncovered, until the final samples show total fiber concentrations of less than or equal to 0.01 fibers per cubic centimeter of air. The method for determining compliance with the provisions of this paragraph shall be either of the methods specified in Appendix M to "Guidance for Controlling Asbestos-Containing Materials in Buildings" (U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances, EPA 560/5-85-024, June 1985). Appendix M, "Detailed Specifications for Sampling and Analyzing Airborne Asbestos," is hereby adopted and filed herein by reference.		401 *KAR* 58:040 § 4(2)(c)
	The following requirements of 401 *KAR* 58:040 § 4 (1), unless specifically deleted in 401 *KAR* 58:040 § 4 (2)(b), shall apply to the demolition abatement activities.		401 *KAR* 58:040 § 4(2)(d)
	Negative pressure ventilation units with HEPA filtration and in sufficient number to provide one (1) workplace air change every fifteen (15) minutes shall be operated continuously for the duration of the project. The duration of the project for this requirement shall be considered to be from the time that a containment area is established and wall and floor sheeting are installed through the time that acceptable final clearance air monitoring results are obtained.		401 *KAR* 58:040 § 4(1)(g)
	All friable asbestos material shall be thoroughly wetted through to the substrate prior to removal.		401 *KAR* 58:040 § 4(1)(h)
	Facility components shall be removed intact or in large sections whenever possible and shall be carefully lowered to the floor. Other friable asbestos material shall be removed in small sections.		401 *KAR* 58:040 § 4(1)(i)

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
	Materials located at heights greater than fifteen (15) feet but less than or equal to fifty (50) feet above the floor shall be dropped into inclined chutes or onto scaffolding or containerized at their elevated levels for eventual disposal. For materials located at heights greater than fifty (50) feet above the floor, a dust-tight enclosed chute shall be constructed to transport removed material to containers on the floor.		401 *KAR* 58:040 § 4(1)(j)
	At no time shall the friable asbestos material that has been removed be allowed to accumulate or become dry.		401 *KAR* 58:040 § 4(1)(k)
	Following abatement, wall sheeting and floor sheeting shall be removed and containerized for disposal. A sequence of HEPA filtration vacuuming, wet wiping all exposed surfaces, and surface drying shall be performed until no visible residue is observed in the work area. A minimum of twenty-four (24) hours after wet wiping shall be required to ensure that sufficient drying has occurred.		401 *KAR* 58:040 § 4(1)(m)
	All asbestos-containing waste, except for large facility components, shall be thoroughly wetted before being placed into containers for disposal. Large components shall be thoroughly wetted before being wrapped in polyethylene sheeting for disposal.		401 *KAR* 58:040 § 4(1)(n)
	Wet asbestos-containing waste shall be double bagged in polyethylene bags placed in sealed, rigid containers (for example: steel drums, fiber drums, or heavy cardboard boxes) for transport to a landfill. Large facility components may be wrapped in two (2) layers of polyethylene sheeting which are secured with waterproof tape for disposal.		401 *KAR* 58:040 § 4(1)(o)
	All polyethylene sheeting that is used in an asbestos abatement project shall be treated as asbestos-containing waste.		401 *KAR* 58:040 § 4(1)(p)
	All wrapping or containerizing of asbestos-containing waste shall be done in such a manner so as to prevent the outside of the wrapping or container from being contaminated with asbestos fibers.		401 *KAR* 58:040 § 4(1)(q)
	All packaged wastes (boxes, drums, and wrapped components) shall be labeled according to the provisions of 40 *CFR* § 61.152, filed by reference in 401 *KAR* 58:025.		401 *KAR* 58:040 § 4(1)(r)

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
	Transport and disposal of asbestos-containing waste shall occur in a manner that will not permit the release of asbestos fibers into the outside air.		401 *KAR* 58:040 § 4(1)(t)
	In lieu of the work practice requirements of 401 *KAR* 58:040 § 4 (1)(a) to (e), (g), (i), (m), (n), (p), and (s); and (2)(b) and (c); and (3)(a) and (c), the glove bag technique or other alternative work practice requirements may be used for an asbestos abatement project where the requirements prescribed in this section is not practical or not feasible and that the proposed alternative to the requirements provides an equivalent control of asbestos and is not in conflict with any applicable local, state, or federal law.		401 *KAR* 58:040 § 4(4)
Waste Management			
Management of PCB waste	Any person storing or disposing of PCB waste must do so in accordance with 40 *CFR* § 761, Subpart D.	Storage or disposal of waste containing PCBs at concentrations ≥ 50 ppm**—applicable**.	40 *CFR* § 761.50(a)
	Any person cleaning up and disposing of PCBs shall do so based on the concentration at which the PCBs are found.	Cleanup and disposal of PCB remediation waste as defined in 40 *CFR* § 761.3**—applicable**.	40 *CFR* § 761.61
Management of PCB/Radioactive waste	Any person storing such waste ≥ 50 ppm PCBs must do so taking into account both its PCB concentration and radioactive properties, except as provided in 40 *CFR* § 761.65(a)(1), (b)(1)(ii) and (c)(6)(i).	Storage of PCB/Radioactive waste for a disposal**—applicable**.	40 *CFR* § 761.50(b)(7)(i)
	Any person disposing of such waste must do so taking into account both its PCB concentration and its radioactive properties. If, taking into account only the properties of the PCBs in the waste, the waste meets the requirements for disposal in a non-hazardous waste landfill then the PCB/radioactive waste may be disposed without regard to the PCB component of the waste.	Disposal of PCB/Radioactive waste for a disposal**—applicable**.	40 *CFR* § 761.50(b)(7)(ii)
Waste characterization			
Characterization of solid waste	Must determine if solid waste is excluded from regulation under 40 *CFR* § 261.4.	Generation of solid waste as defined in 40 *CFR* § 261.2**—applicable**.	40 *CFR* § 262.11(a) 401 *KAR* 32:010 § 2

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
	Must determine if waste is listed as a hazardous waste in subpart D of 40 *CFR* Part 261.	Generation of solid waste which is not excluded under 40 *CFR* § 261.4—**applicable**.	40 *CFR* § 262.11(b) 401 *KAR* 32:010 § 2
	Must determine whether the waste is characteristic waste (identified in subpart C of 40 *CFR* Part 261) by using prescribed testing methods <u>or</u> applying generator knowledge based on information regarding material or processes used.	Generation of solid waste that is not listed in subpart D of 40 *CFR* Part 261 and not excluded under 40 *CFR* § 261.4—**applicable**.	40 *CFR* § 262.11(c) 401 *KAR* 32:010 § 2
	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Chapter 40 for possible exclusions or restrictions pertaining to management of the specific waste.	Generation of solid waste which is determined to be hazardous waste—**applicable**.	40 *CFR* § 262.11(d) 401 *KAR* 32:010 § 2
Characterization of hazardous waste	Must obtain a detailed chemical and physical analysis on a representative sample of the waste(s), which at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with pertinent sections of 40 *CFR* 264 and 268.	Generation of RCRA-hazardous waste for storage, treatment or disposal—**applicable**.	40 *CFR* § 264.13(a)(1) 401 *KAR* 34:020 § 4
Characterization of industrial wastewater	Industrial wastewater discharges that are point source discharges subject to regulation under section 402 of the Clean Water Act, as amended, are not solid wastes for the purpose of hazardous waste management. [Comment: This exclusion applies only to the actual point source discharge. It does not exclude industrial wastewaters while they are being collected, stored or treated before discharge, nor does it exclude sludges that are generated by industrial wastewater treatment.] *NOTE:* For purpose of this exclusion, the CERCLA on-site treatment system for extracted VOCs and groundwater will be considered equivalent to a wastewater treatment unit and the point source discharges subject to regulation under CWA Section 402, provided the effluent meets all identified CWA ARARs.	Generation of industrial wastewater for treatment and discharge into surface water—**applicable**.	40 *CFR* § 261.4(a)(2) 401 *KAR* 31:010 § 4

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
Determinations for land disposal of hazardous waste	• Must determine each EPA Hazardous Waste Number (Waste Code) to determine the applicable treatment standards under 40 *CFR* § 268.40 *et. seq*. Note: This determination may be made concurrently with the hazardous waste determination required in Sec. 262.11	Generation of hazardous waste—**applicable**.	40 *CFR* § 268.9(a) 401 *KAR* 37:010 § 8
	Must determine the underlying hazardous constituents [as defined in 40 *CFR* § 268.2(i)] in the characteristic waste.	Generation of RCRA characteristic hazardous waste (and is not D001 non-wastewaters treated by CMBST, RORGS, or POLYM of Section 268.42 Table 1) for storage, treatment or disposal—**applicable**.	40 *CFR* § 268.9(a) 401 *KAR* 37:010 §8
	Must determine if the hazardous waste meets the treatment standards in 40 *CFR* §§ 268.40, 268.45, or 268.49 by testing in accordance with prescribed methods or use of generator knowledge of waste. Note: This determination may be made concurrently with the hazardous waste determination required in Sec. 262.11	Generation of hazardous waste—**applicable**.	40 *CFR* § 268.7(a) 401 *KAR* 37:020 § 7
Characterization of LLW	Shall be characterized using direct or indirect methods and the characterization documented in sufficient detail to ensure safe management and compliance with the WAC of the receiving facility.	Generation of LLW for storage or disposal at a DOE facility—**TBC**.	DOE M 435.1-1(IV)(I)
	Characterization data shall, at a minimum, include the following information relevant to the management of the waste:		DOE M 435.1-1(IV)(I)(2)
	• physical and chemical characteristics;		DOE M 435.1-1(IV)(I)(2)(a)
	• volume, including the waste and any stabilization or absorbent media;		DOE M 435.1-1(IV)(I)(2)(b)

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
	• weight of the container and contents;		DOE M 435.1-1(IV)(I)(2)(c)
	• identities, activities, and concentration of major radionuclides;		DOE M 435.1-1(IV)(I)(2)(d)
	• characterization date;		DOE M 435.1-1(IV)(I)(2)(e)
	• generating source; and		DOE M 435.1-1(IV)(I)(2)(f)
	• any other information that may be needed to prepare and maintain the disposal facility performance assessment, or demonstrate compliance with performance objectives.		DOE M 435.1-1(IV)(I)(2)(g)
Temporary on-site storage of hazardous waste in containers	A generator may accumulate hazardous waste at the facility provided that	Accumulation of RCRA hazardous waste on-site as defined in 40 *CFR* § 260.10—**applicable**.	40 *CFR* § 262.34(a) 401 *KAR* 32:030 § 5
	• waste is placed in containers that comply with 40 *CFR* § 265.171-173;		40 *CFR* § 262.34(a)(1)(i) 401 *KAR* 32:030 § 5
	• the date upon which accumulation begins is clearly marked and visible for inspection on each container;		40 *CFR* § 262.34(a)(2) 401 *KAR* 32:030 § 5
	• container is marked with the words "hazardous waste."		40 *CFR* § 262.34(a)(3) 401 *KAR* 32:030 § 5
Waste Accumulation, Storage and Staging			
Accumulation area	Container may be marked with other words that identify the contents.	Accumulation of 55 gal or less of RCRA hazardous waste or one quart of acutely hazardous waste listed in 40 *CFR* § 261.33(e) at or near any point of generation—**applicable**.	40 *CFR* § 262.34(c)(1) 401 *KAR* 32:030 § 5
Use and management of containers holding hazardous waste	If container is not in good condition or if it begins to leak, must transfer waste into container in good condition.	Storage of RCRA hazardous waste in containers—**applicable**.	40 *CFR* § 265.171 401 *KAR* 35:180 § 2

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
	Use container made or lined with materials compatible with waste to be stored so that the ability of the container is not impaired.		40 *CFR* § 265.172 401 *KAR* 35:180 § 3
	Keep containers closed during storage, except to add/remove waste.		40 *CFR* § 265.173(a) 401 *KAR* 35:180 § 4
	Open, handle, and store containers in a manner that will not cause containers to rupture or leak.		40 *CFR* § 265.173(b) 401 *KAR* 35:180 § 4
Storage of hazardous waste in container area	Area must have a containment system designed and operated in accordance with 40 *CFR* § 264.175(b).	Storage of RCRA hazardous waste in containers with free liquids—**applicable**.	40 *CFR* § 264.175(a)
	Area must be sloped or otherwise designed and operated to drain liquid from precipitation, or Containers must be elevated or otherwise protected from contact with accumulated liquid.	Storage of RCRA-hazardous waste in containers that do not contain free liquids (other than F020, F021, F022, F023,F026 and F027)—**applicable**.	40 *CFR* § 264.175(c)
Storage of PCB waste and/or PCB/radioactive waste in a RCRA-regulated container storage area	Does not have to meet storage unit requirements in 40 *CFR* 761.65(b)(1) provided unit:	Storage of PCBs and PCB Items at concentrations ≥ 50ppm designated for disposal— **applicable**.	40 *CFR* § 761.65(b)(2)
	• is permitted by EPA under RCRA § 3004 to manage hazardous waste in containers and spills of PCBs cleaned up in accordance with Subpart G of 40 *CFR* § 761; or		40 *CFR* § 761.65(b)(2)(i)
	• qualifies for interim status under RCRA § 3005 to manage hazardous waste in containers and spills of PCBs cleaned up in accordance with Subpart G of 40 *CFR* § 761; or		40 *CFR* § 761.65(b)(2)(ii)

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
	• is permitted by an authorized state under RCRA § 3006 to manage hazardous waste in containers and spills of PCBs cleaned up in accordance with Subpart G of 40 *CFR* § 761 • *NOTE:* For purpose of this exclusion, CERCLA remediation waste, which is also considered PCB waste, can be stored on-site provided the area meets all of the identified RCRA container storage ARARs and spills of PCBs cleaned up in accordance with Subpart G of 40 § 761		40 *CFR* § 761.65(b)(2)(iii)
Storage of PCB waste and/or PCB/radioactive waste in non-RCRA regulated unit	Except as provided in 40 *CFR* § 761.65 (b)(2), (c)(1), (c)(7), (c)(9), and (c)(10), after July 1, 1978, owners or operators of any facilities used for the storage of PCBs and PCB Items designated for disposal shall comply with the storage unit requirements in 40 *CFR* § 761.65(b)(1).	Storage of PCBs and PCB Items at concentrations ≥ 50ppm designated for disposal—**applicable**.	40 *CFR* § 761.65(b)
	Storage facility shall meet the following criteria: • Adequate roof and walls to prevent rainwater from reaching stored PCBs and PCB items;		40 *CFR* § 761.65(b)(1) 40 *CFR* § 761.65(b)(1)(i)
	• Adequate floor that has continuous curbing with a minimum 6-inch high curb. Floor and curb must provide a containment volume equal to at least two times the internal volume of the largest PCB article or container or 25% of the internal volume of all articles or containers stored there, whichever is greater. *Note*: 6 inch minimum curbing not required for area storing PCB/radioactive waste;		40 *CFR* § 761.65(b)(1)(ii)
	• No drain valves, floor drains, expansion joints, sewer lines, or other openings that would permit liquids to flow from curbed area;		40 *CFR* § 761.65(b)(1)(iii)
	• Floors and curbing constructed of Portland cement, concrete, or a continuous, smooth, non-porous surface that prevents or minimizes penetration of PCBs; and		40 *CFR* § 761.65(b)(1)(iv)
	• Not located at a site that is below the 100-year flood water elevation.		40 *CFR* § 761.65(b)(1)(v)

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
Risk-based storage of PCB remediation waste	May store PCB remediation waste in a manner other than prescribed in 40 *CFR* § 761.65(b) if approved in writing from EPA provided the method will not pose an unreasonable risk of injury of human health or the environment. *NOTE*: EPA approval of alternative storage method will be obtained by approval of the FFA CERCLA document.	Storage of waste containing PCBs in a manner other than prescribed in 40 *CFR* § 761.65(b) (see above) —applicable.	40 *CFR* § 761.61(c)
Temporary storage of PCB waste (e.g., PPE, rags) in container(s)	Container(s) shall be marked as illustrated in 40 *CFR* § 761.45(a).	Storage of PCBs and PCB Items at concentrations ≥ 50ppm in containers for disposal—applicable.	40 *CFR* § 761.40(a)(1)
	Storage area must be properly marked as required by 40 *CFR* § 761.40(a)(10).		40 *CFR* § 761.65(c)(3)
	Any leaking PCB Items and their contents shall be transferred immediately to a properly marked nonleaking container(s).		40 *CFR* § 761.65(c)(5)
	Except as provided in (c)(6)(i) and (c)(6)(ii) of 40 *CFR* § 761.65, container(s) shall be in accordance with requirements set forth in DOT HMR at 49 *CFR* §§ 171-180.		40 *CFR* § 761.65(c)(6)
Storage of PCB/radioactive waste in containers	For liquid wastes, containers must be nonleaking.	Storage of PCB/radioactive waste in containers other than those meeting DOT HMR performance standards —applicable.	40 *CFR* § 761.65(c)(6)(i)(A)
	For nonliquid wastes, containers must be designed to prevent buildup of liquids if such containers are stored in an area meeting the containment requirements of 40 *CFR* § 761.65(b)(1)(ii).		40 *CFR* § 761.65(c)(6)(i)(B)
	For both liquid and nonliquid wastes, containers must meet all substantive requirements pertaining to nuclear criticality safety. Acceptable container materials include polyethylene and stainless steel provided that the container material is chemically compatible with the waste being stored. Other containers may be used if the use of such containers is protective of health and the environment as well as public health and safety.		40 *CFR* § 761.65(c)(6)(i)(C)

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
Management of asbestos-containing waste prior to disposal	Discharge no visible emissions to the outside air, or use one of the emission control and waste treatment methods specified in 40 *CFR* § 61.150(a)(1) through (a)(4).	Collection, processing, packaging, or transporting of any asbestos-containing waste material generated by demolition activities—**applicable**.	401 *KAR* 58:025 40 *CFR* § 61.150(a)
Segregation of scrap metal for recycle	Scrap metal is not subject to RCRA requirements for generators, transporters, and storage facilities under 40 *CFR* §§ 262-266, 268, 270, or 124.	Scrap metal as identified in 40 *CFR* § 261.1(c)(6) intended for recycle—**applicable**.	40 *CFR* § 261.6(a)(3)(ii) 401 *KAR* 31:010 § 6
Staging of LLW	Staging of low-level waste shall be for the purpose of the accumulation of such quantities of waste as necessary to facilitate transportation, treatment, and disposal.	Management of LLW—**TBC**.	DOE M 435.1-1 (IV)(N)(7)
Packaging of LLW for storage	Shall be packaged in a manner that provides containment and protection for the duration of the anticipated storage period and until disposal is achieved or until the waste has been removed from the container.	Storage of DOE LLW in containers at a DOE facility—TBC.	DOE M 435.1-1 (IV)(L)(1)(a)
	Vents or other measures shall be provided if the potential exists for pressurizing or generating flammable or explosive concentrations of gases within the waste container.		DOE M 435.1-1 (IV)(L)(1)(b)
	Containers shall be marked such that their contents can be identified.		DOE M 435.1-1 (IV)(L)(1)(c)

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
Waste Treatment/disposal			
Treatment, storage, transportation or conveyance of collected RCRA wastewater using a WWTU located on the facility	Any dedicated tank systems, conveyance systems, and ancillary equipment used to treat, store or convey wastewater to an on-site KPDES-permitted wastewater treatment facility subject to regulation under the CWA are exempt from the requirements of RCRA Subtitle C standards. *NOTE*: For purposes of this exclusion, any dedicated tank systems, conveyance systems, and ancillary equipment used to treat, store or convey CERCLA on-site wastewater treatment unit that meets all of the identified CWA ARARs for point source discharges from such a facility, are exempt from the requirements of RCRA Subtitle C standards.	On-site wastewater treatment unit (as defined in 40 CFR 260.10) subject to regulation under § 402 or § 307(b) of the CWA (i.e., KPDES-permitted) that manages hazardous wastewaters—**applicable**.	40 *CFR* § 264.1(g)(6) 401 *KAR* 34:010 § 1
Treatment and disposal of RCRA waste	Hazardous waste must be treated and disposed of in accordance with substantive requirements of 40 *CFR* §§ 264 and 268.	Generation of a hazardous waste as defined in 401 *KAR* 31:010 § 3 —**applicable**.	40 *CFR* § 262.11(d) 401 *KAR* 32:010
Disposal of RCRA wastewaters in an CWA wastewater treatment unit	Are not prohibited, unless the wastes are subject to a specified method of treatment other than DEACT in 40 *CFR* § 268.40, or are D003 reactive cyanide.	Restricted RCRA characteristic hazardous wastewaters managed in a wastewater treatment system—**applicable**.	40 *CFR* § 268.1(c)(4)(i) 401 *KAR* 37:010 § 2
Characterization of industrial wastewater	Industrial wastewater discharges that are point source discharges subject to regulation under Section 402 of the Clean Water Act, as amended, are not solid wastes for purposes of hazardous waste determinations.	Generation of industrial wastewater for discharge—**applicable**.	40 *CFR* § 261.4(a)(2) 401 *KAR* 31:010 § 4

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
Disposal of PCB-contaminated nonporous surfaces on-site	Shall be cleaned on-site or off-site to levels in 40 *CFR* § 761.61(a)(4)(ii) using • Decontamination procedures under 40 *CFR* § 761.79, • Technologies approved under 40 *CFR* § 761.60(e), or • Risk-based procedures/technologies under 40 *CFR* § 761.61(c).	PCB remediation waste porous surfaces as defined in 40 *CFR* § 761.3—**applicable**.	40 *CFR* § 761.61(a)(5)(ii)(A)
Disposal of PCB-contaminated porous surfaces	Shall be disposed on-site or off-site as bulk PCB-remediation waste according to 40 *CFR* § 761.61(a)(5)(i) or decontaminated for use according to 40 *CFR* § 761.79(b)(4).		40 *CFR* § 761.61(a)(5)(iii)
Disposal of PCB-contaminated nonporous surfaces off-site	Shall be disposed of in accordance with 40 *CFR* § 761.61(a)(5)(i)(B)(3)(ii) [sic] 40 *CFR* § 761.61(a)(5)(i)(B)(2)(ii). Metal surfaces may be thermally decontaminated in accordance with 40 *CFR* § 761.79(c)(6)(i).	PCB remediation waste nonporous surfaces as defined in 40 *CFR* § 761.3 having surface concentrations < 100 µg/100 cm^2—**applicable**.	40 *CFR* § 761.61(a)(5)(ii)(B)(1)
	Shall be disposed of in accordance with 40 *CFR* § 761.61(a)(5)(i)(B)(3)(iii) [sic] [40 *CFR* § 761.61(a)(5)(i)(B)(2)(iii)].	PCB remediation waste nonporous surfaces having surface concentrations ≥ 100 µg/100 cm^2—**applicable**.	40 *CFR* § 761.61 (a)(5)(ii)(B)(2)
	Metal surfaces may be thermally decontaminated in accordance with 40 *CFR* § 761.79(c)(6)(ii).		40 *CFR* § 761.61 (a)(5)(ii)(B)(2)

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
Disposal of PCB cleanup wastes	Shall be cleaned on-site or off-site to levels in 40 *CFR* § 761.61(a)(4)(ii) using • Decontamination procedures under 40 *CFR* § 761.79, • Technologies approved under 40 *CFR* § 761.60(e), or • Risk-based procedures/technologies under 40 *CFR* § 761.61(c).	Generation of non-liquid PCBs at any concentration during and from the cleanup of PCB remediation waste—**applicable**.	40 *CFR* § 761.61(a)(5)(v)(A)
Reuse of PCB cleaning solvents abrasives, and equipment	Shall be disposed on-site or off-site as bulk PCB-remediation waste according to 40 *CFR* § 761.61(a)(5)(i) or decontaminated for use according to 40 *CFR* § 761.79(b)(4).	Generation of PCB wastes from the cleanup of PCB remediation waste—**applicable**.	40 *CFR* § 761.61(a)(5)(v)(B)
Performance-based disposal of PCB remediation waste	May dispose of by one of the following methods: • In a high-temperature incinerator approved under 40 *CFR* § 761.70(b); • By an alternate disposal method approved under 40 *CFR* § 761.60(e); • In a chemical waste landfill under 40 *CFR* § 761.75; • In a facility under 40 *CFR* § 761.77; or	Disposal of non-liquid PCB remediation waste as defined in 40 *CFR* § 761.3—**applicable**.	40 *CFR* § 761.61(b)(2) 40 *CFR* § 761.61(b)(2)(i)
	• Through decontamination in accordance with 40 *CFR* § 761.79.		40 *CFR* § 761.61(b)(2)(ii)
Risk-based disposal of PCB remediation waste	May dispose of in a manner other than prescribed in 40 *CFR* § 761.61(a) or (b) if approved in writing from EPA and method will not pose an unreasonable risk of injury to [sic] human health or the environment. *NOTE*: EPA approval of alternative disposal method will be obtained by approval of the FFA CERCLA document.	Disposal of PCB remediation waste —**applicable**.	40 *CFR* § 761.61(c)
Performance-based disposal of PCB bulk product waste	May dispose of by one of the following: • In an incinerator under 40 *CFR* § 761.70;	Disposal of PCB bulk product waste as defined in 40 *CFR* § 761.3—**applicable**.	40 *CFR* § 761.62(a) 40 *CFR* § 761.62(a)(1)
	• In a chemical waste landfill under 40 *CFR* § 761.75;		40 *CFR* § 761.62(a)(2)
	• In a hazardous waste landfill under 3004 of RCRA or under 3006 of RCRA;		40 *CFR* § 761.62(a)(3)

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
	• Under alternate disposal approved under 40 *CFR* § 761.60(e);		40 *CFR* § 761.62(a)(4)
	• In accordance with decontamination provisions of 40 *CFR* § 761.79; or		40 *CFR* § 761.62(a)(5)
	• In accordance with thermal decontamination provisions of 40 *CFR* § 761.79(e)(6) for metal surfaces in contact with PCBs.		40 *CFR* § 761.62(a)(6)
Disposal of PCB bulk-product waste in solid waste landfill	May dispose of in a nonhazardous waste landfill.	Non-liquid PCB bulk-product waste (known or presumed to leach < 10 μg/L PCBs) that is not RCRA hazardous—**applicable**.	40 *CFR* § 761.62(b)(1)(i) and (ii)
	May dispose of in a facility if • PCB bulk-product waste is segregated from organic liquids disposed of in the landfill and • Leachate is collected from the landfill and monitored for PCBs.	Other PCB bulk-product waste not meeting conditions of 40 *CFR* § 761.62(b)(1) (e.g., paper/felt gaskets contaminated by liquid PCBs)—**applicable**.	40 *CFR* § 761.62(b)(2)
Risk-based disposal of PCB bulk-product waste	May dispose of in a manner other than prescribed in 40 *CFR* § 761.61(a) or (b) if approved in writing from EPA and method will not pose and unreasonable risk of injury to [sic] human health or the environment. *NOTE*: EPA approval of alternative disposal method will be obtained by approval of the FFA CERCLA document.	Disposal of PCB bulk-product waste—**applicable**.	40 *CFR* § 761.62(c)
Disposal of PCB capacitor(s)	Shall comply with all requirements of 40 *CFR* § 761.60, unless it is known from label or nameplate information, manufacturer's literature, or chemical analysis that the capacitor does not contain PCBs.	Generation of PCB capacitors with ≥ 50 PCBs for disposal—**applicable**.	40 *CFR* § 761.60(b)(2)(i)
	May dispose of in a municipal solid waste landfill.	Generation for disposal of intact, non-leaking PCB small capacitors as defined in 40 *CFR* § 761.3—**applicable**.	40 *CFR* § 761.60(b)(2)(ii)

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
	Shall dispose of in accordance with either of the following: • Disposal in an incinerator that complies with 40 *CFR* § 761.70 or • Disposal in a chemical waste landfill that complies with 40 *CFR* § 761.75.	PCB large capacitor which contains ≥ 500 ppm PCBs—**applicable**.	40 *CFR* § 761.60(b)(2)(iii)
	Shall dispose of in one of the following disposal facilities: • Incinerator under 40 *CFR* § 761.70, • Chemical waste landfill under 40 *CFR* § 761.75, • High-efficiency boiler under 40 *CFR* § 761.70, or • Scrap metal recovery oven and smelter under 40 *CFR* § 761.71.	Disposal of large capacitors that contain ≥ 50 ppm but < 500 ppm PCBs—**applicable**.	40 *CFR* § 761.60(b)(4)
Disposal of PCB articles	Must be disposed of	Generation of PCB articles (with ≥ 500 ppm PCBs) for disposal—**applicable**.	40 *CFR* § 761.60(b)(6)(i)
	• In an incinerator that complies with 40 *CFR* § 761.70 or		40 *CFR* § 761.60(b)(6)(i)(A)
	• In a chemical waste landfill that complies with 40 *CFR* § 761.75, provided that all free-flowing liquid PCBs have been thoroughly drained from any articles before the articles are placed in the chemical waste landfill and that the drained liquids are disposed of in an incinerator that complies with 40 *CFR* § 761.70.		40 *CFR* § 761.60(b)(6)(i)(B)
	• In a chemical waste landfill that complies with 40 *CFR* § 761.75, provided that all free-flowing liquid PCBs have been thoroughly drained from any articles before the articles are placed in the chemical waste landfill and that the drained liquids are disposed of in an incinerator that complies with 40 *CFR* § 761.70.		40 *CFR* § 761.60(b)(6)(i)(B)
Disposal of PCB-contaminated articles	Must remove all free-flowing liquid from the article, disposing of the liquid in compliance with the requirements of 40 *CFR* § 761.60(a)(2) or (a)(3).	Generation for disposal of PCB-contaminated articles as defined in 40 *CFR* § 761.3—**applicable**.	40 *CFR* § 761.60(b)(6)(ii)
	Dispose by one of the following methods:	Disposal of PCB-contaminated articles with no free-flowing liquid—**applicable**.	40 *CFR* § 761.60(b)(6)(ii)

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
	• In accordance with the decontamination provisions at 40 *CFR* § 761.79;		40 *CFR* § 761.60(b)(6)(ii)(A)
	• In a nonhazardous waste facility;		40 *CFR* § 761.60(b)(6)(ii)(B)
	• In an industrial furnace operating in compliance with 40 *CFR* § 761.72; or		40 *CFR* § 761.60(b)(6)(ii)(C)
	• In a disposal facility under Part 761.		40 *CFR* § 761.60(b)(6)(ii)(D)
Disposal of PCB-contaminated electrical equipment	Must remove all free-flowing liquid from the electrical equipment and dispose of the removed liquid in accordance with 40 *CFR* § 760.61(a).	Generation of PCB-contaminated electrical equipment as defined in 40 *CFR* § 761.3 for disposal—**applicable**.	40 *CFR* § 761.60(b)(4)
	Except as specifically provided in paragraphs (b)(1) through (b)(5) of § 761.60, dispose of by one of the following methods: • In a nonhazardous waste facility; • In a scrap metal recovery oven or smelter operating in compliance with 40 *CFR* § 761.72; and • In a disposal facility under Part 761.	Drained PCB-contaminated electrical equipment including any residual liquids—**applicable**.	40 *CFR* § 761.60(b)(6)(ii)(A)
Disposal of PCB liquids	Must be disposed of in an incinerator that complies with 40 *CFR* § 761.70, except	PCB liquids at concentrations ≥ 50 ppm—**applicable**.	40 *CFR* § 761.60(a)
	• For mineral oil dielectric fluid may be disposed of in a high-efficiency boiler according to 40 *CFR* § 761.71(a), and	PCB liquids at concentrations ≥ 50 ppm but > 500 ppm—**applicable**.	40 *CFR* § 761.60(a)(1)
	• For liquids other than mineral oil dielectric fluid, may be disposed of in a high-efficiency boiler according to 40 *CFR* § 761.71(b).		40 *CFR* § 761.60(a)(2)
Disposal of decontamination waste and residues	Such waste shall be disposed of at their existing PCB concentration unless otherwise specified in 40 *CFR* § 761.79(g)(1-6).	PCB decontamination waste and residues—**applicable**.	40 *CFR* § 761.79(g)
Disposal of fluorescent light ballasts	Must be disposed of in a TSCA-approved disposal facility, as bulk-product waste under 40 *CFR* § 761.62, or in accordance with the decontamination provisions of 40 *CFR* § 761.79.	Generation for disposal of fluorescent light ballasts containing PCBs in the potting material—**applicable**.	40 *CFR* § 761.60(b)(6)(iii)

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
Disposal of asbestos-containing waste material	Shall be deposited as soon as practicable at	Asbestos-containing waste material or RACM (except Category I non-friable asbestos-containing material) from demolition activities—**applicable**.	40 *CFR* § 61.150(b) 401 *KAR* 58:025
	• A waste disposal site operated in accordance with 40 *CFR* § 61.154, or		40 *CFR* § 61.150(b)(1) 401 *KAR* 58:025
	• A site that converts RACM and asbestos-containing waste material into non-asbestos (asbestos-free) material according to the provisions of 40 *CFR* § 61.155.		40 *CFR* § 61.150(b)(2) 401 *KAR* 58:025
Unit closure			
Closure of RCRA container management unit and RCRA tank management unit	Facilities must close the container management unit in a manner that • minimizes the need for further maintenance; • controls, minimizes or eliminates, to the extent necessary to protect human health and environment, postclosure escape of hazardous waste, hazardous constituents, contaminated run-off or hazardous waste decomposition products to ground or surface waters or to the atmosphere; and • complies with the substantive closure requirements of this part, including, but not limited to, the container requirements of 40 *CFR* § 264.178 and tank requirements of 40 *CFR* § 264.197.	Identification of newly discovered RCRA hazardous waste in containers or in tanks (stored >90-days)—**applicable**.	40 *CFR* § 264.111 401 *KAR* 34:070 § 2

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
Packaging and Transportation			
Determination of radionuclide concentration	The concentration of a radionuclide may be determined by an indirect method, such as use of a scaling factor which relates the inferred concentration of one (1) radionuclide to another that is measured or radionuclide material accountability if there is reasonable assurance that an indirect method may be correlated with an actual measurement. The concentration of a radionuclide may be averaged over the volume or weight of the waste if the units are expressed as nanocuries per gram.	Preparation for off-site shipment of LLW to a commercial NRC or Agreement State licensed disposal facility—**relevant and appropriate**.	10 *CFR* § 61.55 (a)(8) 902 *KAR* 100:021 § 6(8)(a) and (b)
Labeling of LLW packages	Each package of waste shall be clearly labeled to identify if it is Class A, Class B, or Class C waste, in accordance with 10 *CFR* § 61.55 or Agreement State waste classification requirements.	Preparation for off-site shipment of LLW to a commercial NRC or Agreement State licensed disposal facility—**relevant and appropriate**.	10 *CFR* § 61.57 902 *KAR* 100:021 § 8
Transportation of RCRA hazardous waste on-site	The generator manifesting requirements of 40 *CFR* §§ 262.20–262.32(b) do not apply.	Transportation of hazardous wastes on a public or private right-of-way within or along the border of contiguous property under the control of the same person, even if such contiguous property is divided by a public or private right-of-way—**applicable**.	40 *CFR* § 262.20(f) 401 *KAR* 32:020 § 1
Transportation of RCRA hazardous waste off-site	Must comply with the generator requirements of 40 *CFR* §§ 262.20–23 for manifesting, Sect. 262.30 for packaging, Sect. 262.31 for labeling, Sect. 262.32 for marking, Sect. 262.33 for placarding, Sect. 262.40, 262.41(a) for record keeping requirements, and Sect. 262.12 to obtain EPA ID number.	Preparation and offering of hazardous waste for transport off-site—**applicable**.	40 *CFR* § 262.10(h) 401 *KAR* 32:010 § 1
Transportation of PCB wastes off-site	Must comply with the manifesting provisions at 40 *CFR* §§ 761.207 through 218.	Relinquishment of control over PCB wastes by transporting, or offering for transport—**applicable**.	40 *CFR* § 761.207(a)
Transportation of radioactive waste	Shall be packaged and transported in accordance with the substantive requirements of DOE O 460.1B and DOE O 460.2.	Preparation of shipments of radioactive waste—**TBC**.	DOE M 435.1-1(I)(1)(E)(11)
Transportation of LLW	To the extent practical, the volume of the waste and the number of the shipments shall be minimized.	Preparation of shipments of LLW—**TBC**.	DOE M 435.1-1(IV)(L)(2)

Table A.2. Action-Specific ARARs and TBC Guidance for Decommissioning the Paducah Gaseous Diffusion Plant Facilities (Continued)

Action	Summary of Requirements	Prerequisite	Citation
Transportation of hazardous materials	Shall be subject to and must comply with all applicable provisions of the HMR at 49 *CFR* Parts 171–180 related to marking, labeling, placarding, packaging, emergency response, etc.	Any person who, under contract with a department or agency of the federal government, transports "in commerce," or causes to be transported or shipped, a hazardous material—**applicable**.	49 *CFR* § 171.1(c)
Transportation of hazardous materials on-site	Shall comply with 49 *CFR* Parts 171-174, 177, and 178 or the site- or facility-specific Operations of Field Office approved Transportation Safety Document that describes the methodology and compliance process to meet equivalent safety for any deviation from the Hazardous material Regulations [i.e., Transportation Safety Document for On-Site Transport within the Paducah Gaseous Diffusion Plant, PRS-WSD-0661, (PRS 2007b)].	Any person who, under contract with the DOE, transports a hazardous material on the DOE facility—**TBC**.	DOE O 460.1B(4)(b)
Transportation of hazardous materials off-site	Off-site hazardous materials packaging and transfers shall comply with 49 *CFR* Parts 171-174, 177, and 178 and applicable tribal, State, and local regulations not otherwise preempted by DOT and special requirements for Radioactive Material Packaging.	Preparation of off-site transfers of LLW—**TBC**.	DOE O 460.1B(4)(a)

ARAR = applicable or relevant and appropriate requirement; ACM = asbestos-containing material; ACM = asbestos-containing material; ALARA = as low as reasonably achievable; *CFR = Code of Federal Regulations*; DOE = U.S. Department of Energy; DOE M = DOE Manual; DOE O = DOE Order; DOT = U.S. Department of Transportation; EDE = effective dose equivalent; EPA = U.S. Environmental Protection Agency; HMR = Hazardous Materials Regulations; *KAR =Kentucky Administrative Regulations*; LDR = land disposal restrictions; LLW = low-level waste; NACE = National Association of Corrosion Engineers; NPDES = National Pollutant Discharge Elimination System; PCB = polychlorinated biphenyl; PPE = personal protective equipment; RACM = regulated asbestos-containing material; RCRA = Resource Conservation and Recovery Act; TBC = to be considered; TSCA = Toxic Substances Control Act; WAC = waste acceptance criteria

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