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Primary Document

Removal Action Work Plan for the C-340 Complex Decommissioning at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

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Removal Action Work Plan for the C-340 Complex Decommissioning at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

Date Issued—July 2010

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

Managed by
LATA ENVIRONMENTAL SERVICES OF KENTUCKY, LLC
managing the
Environmental Management Activities at the
Paducah Gaseous Diffusion Plant
under contract DE-AC30-10CC40020

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ACRONYMS

ACM	asbestos-containing material
AHA	Activity Hazard Analysis
AM	Action Memorandum
ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EE/CA	Engineering Evaluation/Cost Analysis
EPA	U.S. Environmental Protection Agency
ES&H	Environment, Safety, and Health
FFA	Federal Facility Agreement
FIMS	Facilities Information System
HASP	Health and Safety Plan
ISMS	Integrated Safety Management System
KDEP	Kentucky Department for Environmental Protection
LLW	low-level waste
NTCRA	non-time-critical removal action
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plant
RCRA	Resource Conservation and Recovery Act
RAWP	Removal Action Work Plan
SWMU	solid waste management unit
TBC	to be considered
WAC	Waste Acceptance Criteria
WMP	Waste Management Plan

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EXECUTIVE SUMMARY

This Removal Action Work Plan (RAWP) describes the decommissioning (structural demolition) of several buildings within the C-340 Complex at the Paducah Gaseous Diffusion Plant (PGDP) near Paducah, Kentucky. The primary emphasis of this RAWP is to provide details regarding project management, execution, and regulatory compliance measures related to the removal action.

The work will be performed as a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) non-time-critical removal action (NTCRA) as part of the decontamination and decommissioning of the C-340 Complex. This particular removal action will include demolition of the C-340-A, C-340-B, and C-340-C Buildings to the slab, as well as the removal of nonprocess systems in these buildings. The following documents have been prepared and approved for the removal action covered in this RAWP:

- *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 (EE/CA) (DOE 2010a); and

- *Action Memorandum for the C-340 Metals Reduction Plant Complex and the C-746-A East End Smelter Non-Time-Critical Removal Action at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0290&D1 (AM) (DOE 2010b).

The C-340 Complex is undergoing deactivation under U.S. Department of Energy (DOE's) Atomic Energy Act authority, using accelerated funding from the American Recovery and Reinvestment Act. The project is being conducted in accordance with applicable DOE, state, and federal regulations. The deactivation will be followed by the decommissioning outlined in this document.

During the deactivation activities, all accessible interior asbestos-containing materials will be removed and chemical- and/or radionuclide-containing systems (e.g., process piping, equipment) will be emptied of residual material to the extent practicable. Additionally, certain wastes such as polychlorinated biphenyls (PCB), capacitors, mercury switches, or manometers, etc., will have been removed. The building surfaces and remaining infrastructure that are designated to be removed during structural demolition (i.e., floors, walls, residual piping, and equipment) will be vacuumed and sealed to the extent practicable to contain and minimize airborne releases during the demolition process.

The CERCLA NTCRA decommissioning activities included in this RAWP will involve the structural demolition of the C-340 Complex, specifically C-340-A, C-340-B, and C-340-C and the removal of nonprocess systems within these buildings. C-340-D, C-340-E, and the south annex of C-340-B will be decommissioned as non-CERCLA removal actions and are not addressed in this Plan. Unless otherwise noted, "C-340 Complex" refers only to buildings addressed in this removal action.

Activities addressed by this RAWP include the structural demolition of the C-340 Complex and removal of certain low-hazard infrastructure (e.g., empty water, air, and nitrogen piping), and residual waste material. This removal action meets the following removal action objectives agreed to by DOE, the U.S. Environmental Protection Agency (EPA), and the Kentucky Department for Environmental Protection, as defined in the AM:

- 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.

This removal action supports the long-term remediation of the PGDP. Demolishing the structures will remove a source of a potential release to the environment thereby reducing the risk that would be posed if the structures were left standing. Demolition also will satisfy the substantive Resource Conservation and Recovery Act closure requirements for any areas where hazardous waste is discovered during deactivation, as summarized in DOE's letter "American Recovery and Reinvestment Act Projects—Regulatory Process for Resource Conservation and Recovery Act Reporting and Closure of Areas Containing Newly Discovered Hazardous Waste," of October 6, 2009 (DOE 2009a), which was approved by Kentucky on October 20, 2009 (KDEP 2009a).

The major radiological contaminants of concern, as documented in the EE/CA and AM, are uranium and the associated daughter products. Other materials that may be present at the C-340 Complex include asbestos-containing materials; PCBs; selenium; and heavy metals, such as lead, chromium, mercury, and cadmium.

Specific activities that will be performed during the decommissioning activities include characterization; demolition; segregation; packaging; transportation and disposition of demolition debris, piping, and small quantities of hazardous materials. The project also will entail leaving the groundlevel slabs, pits, and foundations in a protective state. The slabs and underlying soil will be addressed as described in the AM.

Demolition debris generated from this removal action will be treated, if necessary, and disposed of at an approved on-site or off-site facility with possible reuse/recycle of equipment from the C-340 Complex in accordance with applicable state laws, EPA, DOE policies, and applicable or relevant and appropriate requirements.

The DOE's prime remediation services contractor will perform the work described in this RAWP, using subcontractors as necessary. The project will be implemented in accordance with Integrated Safety Management System practices and principles, including worker involvement. The Demolition Plan, the Removal Action Verification Plan, the Health and Safety Plan, and a list of procedures are included as appendices to the RAWP.

1. INTRODUCTION AND PURPOSE

This Removal Action Work Plan (RAWP) addresses the structural demolition of specific buildings (defined previously) of the C-340 Complex as a non-time-critical removal action (NTCRA). The U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the Kentucky Department for Environmental Protection (KDEP) have agreed to address 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 regulatory approach for this project was approved by EPA by letter dated July 1, 2009 (EPA 2009), and by KDEP by letter dated September 25, 2009 (KDEP 2009b).

Deactivation activities including removal of the hazardous materials located within the facility, as well as the infrastructure that may contain such material, was initiated under DOE's Atomic Energy Act authority and is presently ongoing.

The approach in this removal action anticipates that some infrastructure will be left in place following deactivation to be decommissioned with the facility structures. After the deactivation is completed, it is anticipated that all accessible interior asbestos-containing materials (ACM) will have been removed in accordance with applicable regulations and DOE policy. Chemical and/or radionuclide containing systems (e.g., process piping) will have been emptied of residual material to the extent practicable. Certain wastes, such as polychlorinated biphenyl (PCB) capacitors, mercury switches, manometers, etc., will have been removed. The building surfaces and remaining infrastructure that will be removed during structural demolition (i.e., floors, walls, residual piping, and equipment) will have been vacuumed and sealed to the extent practicable to contain and minimize airborne releases during the demolition process.

The structures and nonhazardous process systems that remain following the deactivation of the C-340 Complex are expected to contain low-level waste (LLW), PCB bulk product waste, and/or ACM. Small quantities of hazardous substances, such as paint chips or vacuum dust, also may be generated during building demolition. These small quantities are not expected to make the demolition debris waste stream Resource Conservation and Recovery Act (RCRA)-hazardous waste.

Demolishing the C-340 structures will remove a source of a potential release to the environment, thereby reducing the risk that would be posed by the structures were they left standing. This removal action meets the removal action objectives defined in Section 2.2 and supports the long-term remediation of the Paducah Gaseous Diffusion Plant (PGDP).

This RAWP defines the demolition of the building structures to the slab, and removal of certain low-hazard infrastructure (e.g., empty water, air, and nitrogen piping, etc.) and residual waste material. The activities addressed by this RAWP include the characterization; structural demolition; segregation; on-site or off-site treatment (if necessary); packaging; disposal; transportation; disposition of demolition debris, piping, and small quantities of hazardous materials; and possible reuse/recycle of reusable equipment from the C-340 buildings.

1.1 PURPOSE OF THE REMOVAL ACTION WORK PLAN

The purpose of this RAWP is to provide details on how the NTCRA will be executed in accordance with the Engineering Evaluation/Cost Analysis (EE/CA) and Action Memorandum (AM). The EE/CA describes the evaluation of alternatives that could be used to address the potential threats posed to human health and the environment from the release or potential release of hazardous substances from the C-340 Complex. The AM documents the decision to proceed with structural demolition of the C-340 Complex as a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) NTCRA.

1.2 SCOPE OF THE REMOVAL ACTION WORK PLAN

This RAWP was prepared in accordance with requirements of CERCLA and the Paducah FFA.

This RAWP includes the following:

- Planning schedule for the decommissioning of the C-340 structures and for subsequent documents;
- Description of plans and objectives for the structural demolition removal action; and
- Strategy for waste characterization during demolition of the C-340 structures.

The primary emphasis of the RAWP is to supplement the AM information and to provide greater detail regarding project management, project execution, and applicable or relevant and appropriate requirement (ARAR) compliance measures.

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

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

*except for the south end annex

[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 American Recovery and Reinvestment Act work. C-340-E is an approximately 100 ft^2 building that housed the emergency propane generator external to the C-340 main facility.

Table 2. C-340 Complex SWMUs

C-340 Complex SWMU No.	SWMU Name
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-D 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 Power Plant Sump at Ground Floor Level

[2] SWMU 382 has been determined to be a "No Further Action" site in the PGDP Site Management Plan (DOE 2009b).

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2. PROJECT DESCRIPTION

2.1 FACILITY DESCRIPTION

The C-340 Complex is located on the eastern side of the PGDP site as shown in Figure 1. Figure 2 is a photograph of the exterior of the facility. As it pertains to this CERCLA NTCRA, the C-340 Complex consists of three inactive buildings as depicted in Figure 1:

- C-340-A Powder Building,
- C-340-B Metals Building, and
- C-340-C Slag Building.

The areas of the C-340 Complex that are addressed in this RAWP include the C-340-A Powder Building (42,000 ft^2); C-340-B Metals Building (17,920 ft^2); and C-340-C Slag Building (4,400 ft^2). C-340-A, B, and C are physically adjoining structures (See Figure 2). 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. These are metal frame structures with corrugated asbestos transite exterior walls, built-up roofs with concrete slab foundations and steel plate upper floors. These facilities are located within a fence that, for all practical purposes, represents the boundary of the facility.

The C-340 Complex produced UF_4 and uranium metal from 1956 into the 1980s. The powder unit, which produced uranium tetrafluoride (UF_4) in the C-340 Complex, operated from 1956 until 1977. These operations generated 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." Operations continued until bulk quantities of uranium hexafluoride (UF_6) and UF_4 no longer were present in the facility.

After 1977, the facility also served as an electrical shop, training school, and valve-testing facility, which are not expected to have introduced additional contamination to the structures. From 1978 to 1982, the facility served as a shipping point for UF_4 product. In 1985 and 1986, special melting operations were conducted in C-340-B. The last two operations involved the same chemicals and radiological contamination as materials used during normal operations; therefore, the nature and distribution of contamination were not altered.

In December 1991, utilities were shut off with the exception of power for building lighting. In 1994, the facility was fenced and locked. Until 2009, ongoing activities were limited to routine surveillance and maintenance. In 2009, facility deactivation activities began. The facility has not been the subject of any previous CERCLA response actions.

The C-340 Complex is considered a radiological contamination area, and access is restricted. 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 was stored in tanks.

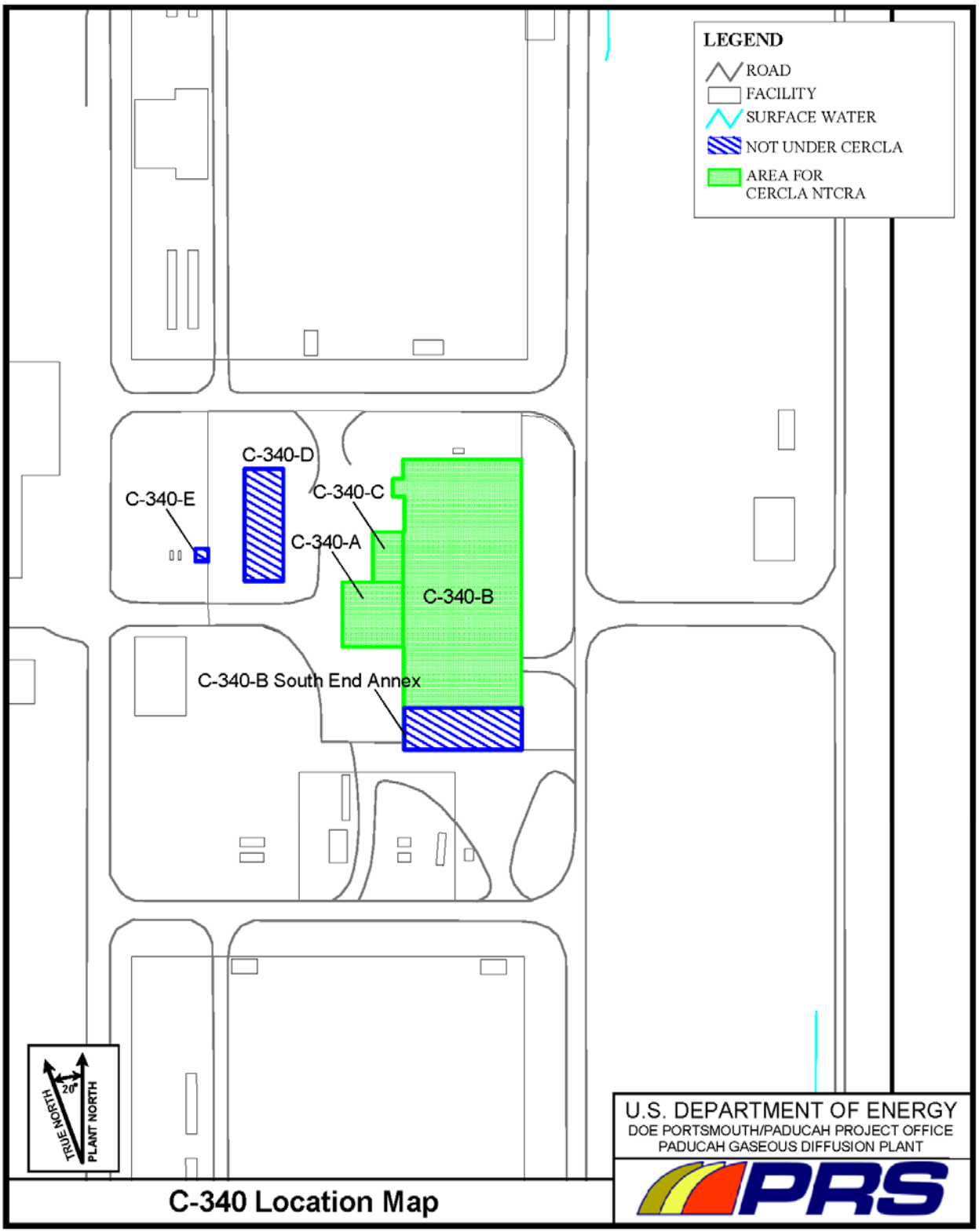

Figure 1. Location of the C-340 Complex Removal Areas

Figure 2. Exterior of the C-340 Complex

The C-340-B Metals Building houses reduction furnaces that converted some of the UF_4, 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 then was 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.

The radiological contamination in the C-340 Metals Reduction Plant Complex is comprised of surface contamination from the historical processes performed in the facility. Uranium currently present in the C-340 Metals Reduction Plant Complex exists as residual UF_4 powder, present in the facility as residual/leftover material in process equipment and uranium metal. The chemical hazards that are known to exist in the C-340 Metals Reduction Plant Complex include lead and/or other heavy metals and PCBs in paint; asbestos-containing materials in the transite siding; mercury; and metals-contaminated dust (potentially containing lead, arsenic or other heavy metals). The presence of contamination is known based on process knowledge and data from sample analyses. Small volumes of hazardous waste, such as paint chips or vacuum dust, may be generated during building demolition, and to the extent practicable, these waste streams will be segregated from the building debris and managed in accordance with applicable regulations.

2.2 REMOVAL ACTION SCOPE AND OBJECTIVES

Decommissioning of C-340 will entail demolishing and packaging the building structures, including any remaining piping and equipment. It also includes removing the corrugated asbestos siding transite on the structures and packaging it for disposition. The demolition will not involve removal of the groundlevel slabs and/or foundations. Sumps and pits will be backfilled with flowable fill or similar material and the slabs will

be decontaminated and a fixative will be applied. Wastes generated will be packaged and dispositioned in accordance with ARARs.

The following are the removal action objectives 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.

2.3 REMOVAL ACTION APPROACH

The decontamination and decommissioning (D&D) of the C-340 Complex will be compliant with ARARs and environment, safety, and health requirements. The DOE Integrated Safety Management System (ISMS) process will be utilized during the entire project. Decommissioning activities will be performed using work control documents, proper waste characterization, and appropriate management and disposition of waste to meet ARARs and Waste Acceptance Criteria (WAC) of the disposition facility.

The ongoing deactivation activities at the C-340 Complex have removed the contaminated loose materials. The process infrastructure will be removed prior to the initiation of the decommissioning activity described in this RAWP. It is anticipated that all accessible interior ACM will have been removed and dispositioned in accordance with applicable regulations and DOE policy.

Chemical- and/or radionuclide-containing systems (e.g., process piping) will have been emptied of residual material. Additionally, certain wastes, such as PCB capacitors, mercury switches, manometers, etc., will have been removed. The structural support systems and remaining infrastructure designated for structural demolition (i.e., floors, walls, residual piping, and equipment) will have been vacuumed and sealed to contain and minimize airborne releases during the demolition process.

Small volumes of hazardous waste, such as paint chips or vacuum dust, may be generated during building demolition, and to the extent practicable, these waste streams will be segregated from the building debris and managed in accordance with applicable regulations. The small amount of contaminants that may remain after deactivation is expected to include radiological contamination from uranium, PCBs in paint, small amounts of hazardous substances, and dust potentially containing lead. Any hazardous materials that may be present in nonprocess systems and become commingled with the demolition debris are expected to be in sufficiently low quantities that they would not require the building debris to be regulated as RCRA hazardous waste. The demolition debris will be characterized and is expected to consist of various types of waste such as LLW, PCB bulk product waste, and solid waste.

The decommissioning phase of this project, including the demolition of the building and remaining equipment and piping, will be accomplished in a manner consistent with ARARs. Sumps and pits will be backfilled with flowable fill or similar material, and slabs will be decontaminated or a fixative will be applied. Wastes generated during the decommissioning activities will be packaged and dispositioned.

To accomplish the project safely and on schedule, the following activities will be performed:

- Planning

- Hazard Analysis
- Hazard Mitigation/Controls
- Characterization
- Demolition
- Waste Material Disposition
- Demobilization

2.3.1 Planning

The decommissioning of the C-340 Complex will require a highly integrated approach to ensure compliance with all technical, environmental, and safety requirements. Planning for decommissioning the C-340 Complex will incorporate the ISMS process.

2.3.2 Hazard Analysis

Every D&D activity is subjected to an Activity Hazard Analysis (AHA) to ensure the safety of the operating personnel, the public, and the environment. Activity-specific AHAs and work packages are prepared for each activity. These work packages and AHAs are reviewed and approved by the appropriate technical managers, IH professionals, Health Physics professionals, Environment Safety and Health (ES&H) professionals, subject matter experts, and work force peers before any work is performed. These procedures have been, and continue to be, modified as new and improved methods of assessment and response are identified and new situations arise during the D&D activities.

Prior to initiating each activity, the field team will walk down the area to define and assess the hazards involved in performing the specific activity. The field team may include support from Health Physics professionals, ES&H technicians, technical team members, subject matter experts, field engineers and work force personnel.

Structural components will be evaluated to assess hazards related to the demolition process. Prior to initiating the decommissioning process, material and equipment will be inspected to identify physical hazards. Information relating to the physical condition of the equipment and structure will be obtained from available personnel who worked in the C-340 Complex. The hazard analysis will include identification of each potential hazard related to securing, dismantling, and removing each component. Hazardous energy sources, such as power connections and associated supply sources, will be de-energized and verified as such prior to dismantlement of the facility.

If hazards are identified, they will be assessed and included in the AHAs and work packages for the activity. These documents definitively establish the procedures that must be used for each activity; the hazards involved, and detailed methods to accomplish these activities. Each of the parties involved in the walkdown and subsequent assessment will review the work package prior to initiation of the work.

If additional characterization data is required to complete the hazard assessment, support from the field sampling and/or waste management groups will be requested. Activity-specific procedures and protocols have been developed and approved for collection, management and analysis of samples during the D&D activities. The results of this additional characterization will be integrated into the development of AHAs/work packages.

2.3.3 Hazard Mitigation and Controls

DOE has implemented ISMS that incorporates five core functions and is based on eight guiding principles. The objective of ISMS is to integrate safety and environmental protection into the planning and execution of all work activities. The term safety encompasses nuclear safety, industrial safety, industrial hygiene, occupational health, health physics, and environmental compliance. ISMS requirements flow down to DOE's prime contractor and their subcontractors and are included in the Health and Safety Plan (HASP) (Appendix C).

The five core functions of ISMS are as follows:

(1) Define scope of work
(2) Analyze hazards
(3) Develop and implement hazard controls
(4) Perform work within those controls
(5) Provide feedback for continuous improvement

Following are the eight guiding principles of ISMS:

(1) Line management responsibility for safety
(2) Clear roles and responsibilities
(3) Competence commensurate with responsibility
(4) Balanced priorities
(5) Identification of safety standards and requirements
(6) Hazard control tailored to work being performed
(7) Operations authorization
(8) Worker involvement

During implementation of this removal action, environmental impacts and worker safety will be controlled through various mechanisms including, but not limited to, work sequencing and work practices (such as proper personal protective equipment). Fugitive dust emissions will be mitigated by misting surfaces with water prior to dismantlement and applying fixative to surfaces prior to demolition. Use of water will be controlled in an effort to eliminate an additional waste stream.

Air monitoring in the areas around the structures will allow for identification and mitigation of airborne contamination. Asbestos-control procedures will be instituted during the removal of the ACMs. These procedures will be implemented in compliance with ARARs. ACMs will be managed in accordance with the ARARs from time of removal until they are appropriately disposed of in C-746-U Landfill or an approved off-site landfill.

Decontamination is required for large field equipment or equipment components that come in contact with contaminated material. Except for instances where field decontamination is appropriate, cleaning and decontamination of all equipment shall occur at a designated area (decontamination pad) on the site. Disassembly of equipment may be required for areas that are inaccessible (i.e., tracks, pumps, etc.). Decontamination shall be accomplished using brushes or pressure washers with appropriate solvents, and/or tap water and soap, if necessary, to remove particulate matter and surface films. All equipment will be surveyed for radiation contamination prior to release from the plant.

Erosion control structures will be erected to control surface drainage around the facility to minimize sediments in receiving streams. Stormwater containment structures will be constructed, where necessary, to

prevent off-site migration of potentially contaminated stormwater. The stormwater inlets will be protected by the installation of silt fences. Other sediment barriers and/or temporary stormwater control structures such as ditches or retention basins will be installed, as needed, to minimize excessive erosion and resulting sediment entering the receiving stream. These controls are similar to existing structures installed during the ongoing deactivation activities.

Hazardous Energy. Hazardous energy sources, such as steam and electrical power, will be identified and de-energized, air gapped, and marked during the deactivation process. Removal activities that could be affected by these sources will be initiated only after verifying that the energy sources have been isolated (i.e. Lock out/Tag out). All hazardous energy sources will be considered active until proven otherwise. Temporary energy sources installed to support decommissioning activities will be managed in the same manner as permanent sources.

Water. The decommissioning activities are not expected to generate significant wastewater volumes. The nature of the materials identified within the C-340 Complex would preclude the use of water to decontaminate the wastes generated. Water used to decontaminate personnel will be containerized, transported, and treated, if necessary, prior to discharge through an existing Kentucky Pollution Discharge Elimination System-permitted outfall. All identified floor drains in the C-340 Complex will be plugged to eliminate the uncontrolled discharge of water from the building. Shower water for personnel will be treated in the PGDP Sanitary Wastewater Collection Treatment System. Water used for dust control will be minimized.

Air. The C-340 decommissioning activities may generate airborne particulates that may be radiologically and/or chemically contaminated. The migration pathways for airborne emissions include vents, broken windows, wall penetrations, open doorways, and fugitive emissions when the structures are demolished. Mitigation measures will include, but are not limited to, water spray, vacuuming, and fixative application techniques for fugitive dust emissions.

Hazardous Materials. The systems left in place, following deactivation, may contain small quantities of hazardous substances. The levels are not expected to result in the building debris being characterized as a RCRA hazardous waste. Small volumes of hazardous waste such as paint chips or vacuum dust may be generated during building demolition. These waste streams will be segregated from the building debris and managed in accordance with ARARs. Most of the resulting waste from building demolition is expected to be LLW and/or PCB bulk product waste. ACM will be managed in accordance with ARARs.

Transite Removal. The only ACM expected to remain after the deactivation activites will be the transite siding on the exterior of the buildings. The hazards associated with the removal of transite include the fugitive ACM emissions from possible breakage of the transite panels and the lead in the “lead heads” of the screw fasteners that attach the panels to the buildings.

The panels will be removed by detaching the screws from the building. The lead-headed screws will be collected as they are removed and packaged for disposal in appropriately labeled containers. Plastic sheeting placed on the ground beneath the work area will prevent the loss of any lead-headed screws into the soils.

Transite siding will be placed on two 4-inch x 4-inch x 12-ft long wood posts and stacked approximately 2-ft high and double wrapped with 6-millimeter thick plastic sheeting and one layer of absorbent material for disposition. Misting with water will be utilized during the transite removal process to minimize airborne contamination. Care will be taken not to break or crush the transite panels during removal.

2.3.4 Characterization

Characterization is necessary to ensure a safe working environment, as well as to determine the proper disposition of materials from the project. The waste materials that will be generated during the decommissioning process will be sampled/analyzed to (1) determine the potential exposures to the workers and environment, (2) establish the levels of personal protection required, (3) establish disposal requirements, and (4) develop appropriate documentation for shipment of the material.

Characterization activities include physical sampling, evaluation of analytical results developed during the deactivation activities, development and application of process knowledge, and historic data research. The need to collect samples will be determined on a case-by-case basis based on the process knowledge of the facility components. Where necessary, sampling will be utilized to verify historical data and/or process knowledge.

Depending upon the characteristics of the waste material, it may be treated, as required, and dispositioned in compliance with ARARs, in addition to the WAC of the designated disposal facility. Characterization will be necessary to segregate the waste material in accordance with the compliance criteria of the disposition facilities. The activities will involve the application of process knowledge and/or sampling and analysis of the waste materials in accordance with sampling and analysis plans.

2.3.5 Demolition

Demolition of C-340 will be performed in accordance with the approach described in the Demolition Plan (Appendix A). Standard construction equipment will be used during demolition. A listing of typical equipment that may be used on the project is included in Table 3. Select contractor-developed procedures for work controls and implementation of decommissioning are listed in Appendix D. These procedures will be used during decommissioning activities. Specific task instructions addressing the hands-on demolition, waste packaging, and other support activities will be developed, reviewed, and approved by subject matter experts and experienced demolition personnel. These work instructions will be developed in accordance with the work control procedures listed in Appendix D.

The C-340 demolition will not involve removal of the groundlevel slabs, subslab penetrations, and/or foundations. The slabs that will remain after structural demolition will be inspected visually, surveyed, decontaminated as appropriate, and sealed to minimize the possibility of spreading contamination. It is anticipated that the appropriate decontamination method will include the application of a fixative/stabilizer coating(s) (such as latex paints, gums, or epoxy). Loose and scaling paint will be removed from the foundation and other hard surfaces to the extent the DOE deems practicable using available equipment and techniques. Subslab penetrations, such as basements, pits, and sumps will be backfilled to prevent accumulation of water and eliminate hazards to on-site personnel. Figure 3 depicts the slab design/construction of slab floors of the C-340 Complex following demolition.

2.3.6 Waste Material Disposition

Demolition of C-340 will generate different types of waste streams. The primary waste stream will be construction/demolition debris, which is expected to be categorized as LLW. This waste likely will be disposed of at an off-site commercial disposal facility or the Nevada Test Site. Solid waste will be disposed of on-site in C-746-U Landfill in accordance with the ARARs and the WAC.

Most waste generated during this action will be loaded directly into shipping containers in areas adjacent to the C-340 Complex. Staging areas, such as the C-759 Scrap Metal Staging Area or the C-760 North-South

Diversion Ditch Laydown Gravel Pad, will be used for storage of loaded containers prior to loading containers onto conveyances (railcars or trucks) for shipment. Existing waste storage facilities may be used, as appropriate, for staging and storage of waste (e.g., hazardous or PCB waste) prior to shipment for disposal. Wastewater will be transferred to temporary storage pending characterization and treatment. All waste storage locations will be located inside the DOE controlled area. All waste storage will adhere to the substantive waste storage requirements established in the ARARs.

Waste materials will be sorted and segregated on-site, size reduced, packaged, and/or staged for disposal in accordance with ARARs. Any required on-site treatment such as stabilization or dewatering will be conducted in accordance with ARARs. Waste material shipped off-site will be shipped in accordance with U.S. Department of Transportation (DOT) requirements. ACM will be managed as a separate waste stream in accordance with ARARs and disposed of in C-746-U Landfill or an approved off-site landfill in accordance with applicable regulations and WAC.

2.3.6.1 Waste material segregation and treatment

Waste materials will be separated into waste streams that conform to the WAC of the proposed disposal facility. The majority of this waste is expected to be LLW and ACM (from corrugated asbestos transite panels); however, small volumes of contaminated material, such as paint chips or vacuum dust potentially containing lead, and/or PCB bulk product waste, may be generated during building demolition. Where possible, these materials will be segregated from the building debris by vacuuming or other physical means and managed in accordance with ARARs.

Demolition debris will be staged at CERCLA storage areas in preparation for disposal. Where appropriate, some components may be size reduced to meet transportation or disposal criteria.

Materials removed from the C-340 Complex may require on-site or off-site treatment in order to comply with environmental regulatory requirements prior to disposal. If needed, on-site treatment activities may include dewatering, heavy metals stabilization, encapsulation of paint chips, or other methods. On-site treatment will be performed in accordance with ARARs. Off-site treatment activities will be in accordance with applicable regulations.

Table 3. Demolition Equipment

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

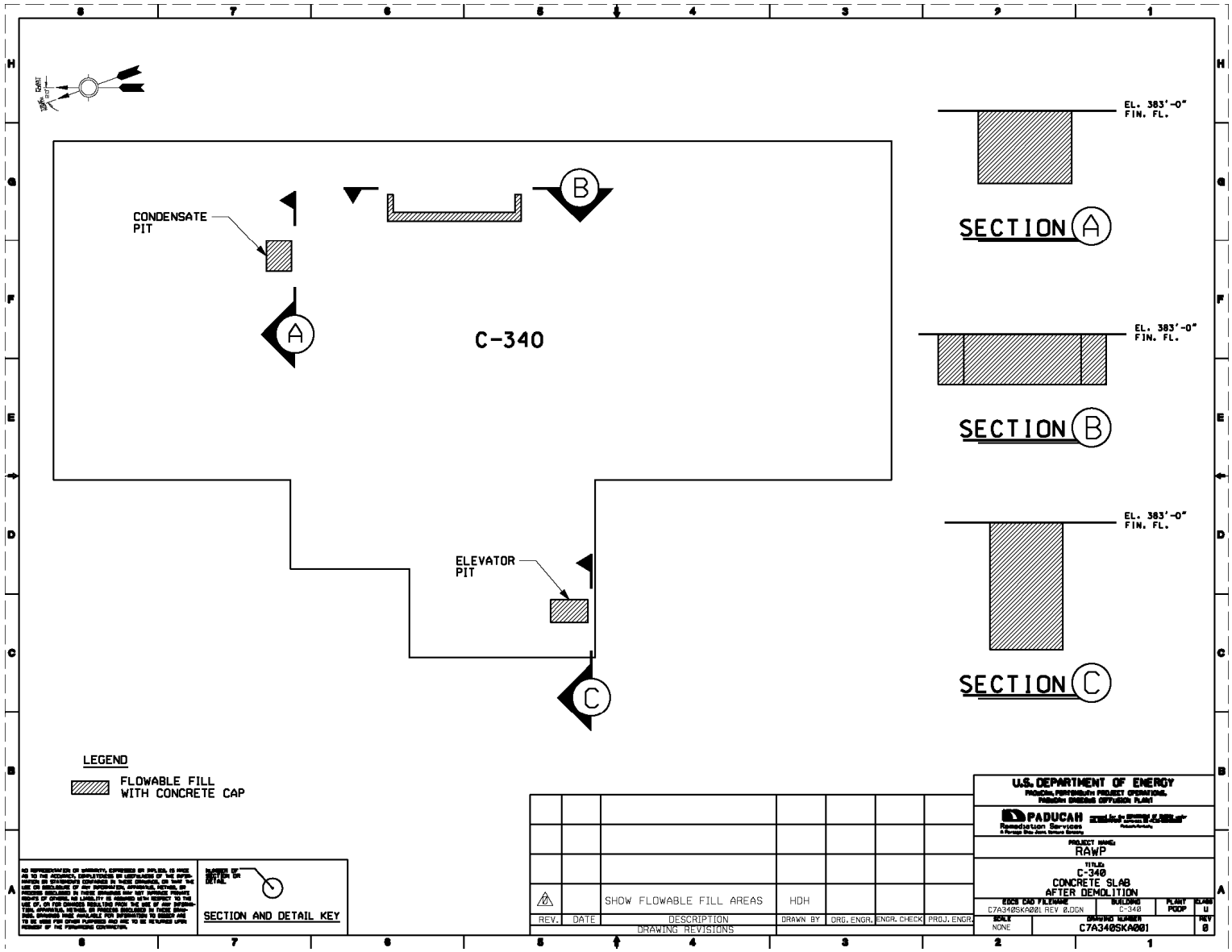

Figure 3. Configuration of the Slabs of the C-340 Complex

2.3.6.2 Waste packaging

The waste generated during D&D will be packaged for transportation and disposal. The waste packaging methods will be dictated by the waste sizes and configurations and selected transportation and disposal options. Waste volumes will be minimized by utilizing methods for component disassembly and size reduction. A variety of containers are available that would be appropriate for the various waste streams generated. Some examples of appropriate transportation packages include Sealand containers, intermodal containers, ST-90 boxes (B-25), steel drums, polyethylene drums, and railcar gondolas. All wastes generated during this project will be packaged in accordance with ARARs.

The waste streams may be described with one of the following DOT proper shipping names:

- Low Specific Activity
- Surface Contaminated Objects
- Hazardous Waste
- Solid/Liquid PCBs
- Solid/Liquid Asbestos
- Solid Waste

Wastes not meeting the above classifications will be evaluated on a case-by-case basis for proper classification and packaging.

2.3.6.3 Waste shipping

Wastes generated from this decommissioning activity may be transported by a variety of methods depending upon the characteristics of the waste and the disposal facility. Typically, the wastes designated for off-site disposal will be shipped in one of these:

- Intermodal containers on over-the-road trucks
- Intermodal containers on flatbed railcars
- Gondola railcars
- Semi dump trailers

Materials designated for disposal in the on-site landfill will be transported in roll-off bins, in tandem dump trucks, or similar conveyances.

Processed material destined for off-site shipment will be packaged in accordance with applicable DOT regulations and placed in a staging area pending transportation to the final treatment/disposal site. Transportation of waste material to the on-site landfill will be conducted in accordance with PGDP and DOE procedures.

Samples collected during the course of this project that must be shipped off-site will be shipped in accordance with applicable DOT regulations if transported by ground. Samples shipped by air are governed by applicable International Air Transport Association/International Civil Aviation Organization and DOT regulations. On-site transportation of samples will be conducted in accordance with PGDP and DOE procedures.

2.3.6.4 Waste disposal

Disposal options that will be considered for the wastes generated during D&D of the C-340 Complex are limited by the presence of radioisotopes at levels that exceed most industrial/sanitary landfills radioisotope limits. Three disposal alternatives are being evaluated as primary disposal options for the waste generated from the D&D activities. These include Nevada Test Site, an off-site commercial disposal facility, and on-site disposal of nonhazardous solid waste at the on-site C-746-U Landfill. Disposal at the on-site landfill will be consistent with WAC developed through an authorized limits evaluation and performance evaluation for the landfill. In the event that these facilities cannot accept certain wastes, other facilities may be evaluated.

2.3.7 Demobilization

Project demobilization includes completing assessments and documentation verifying that the activities described in this RAWP have been performed in a satisfactory manner, dismantlement of all site support equipment and materials, removal of all support equipment, and site restoration. The Removal Action Verification Plan, Appendix B, provides additional details regarding the verification and completion of the removal action objectives.

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3. PLANS AND WORK CONTROL DOCUMENTS

The following project-specific plans either have been or will be developed to ensure the proper execution of decommissioning the C-340 Complex and to ensure compliance with the AM and ARARs.

3.1 DEMOLITION PLAN

The Demolition Plan (Appendix A) includes the details of demolishing the C-340 Complex and is intended to serve as the design report.

3.2 DEMOLITION REMOVAL ACTION VERIFICATION PLANS

The Demolition Removal Action Verification Plan (Appendix B) identifies sampling and/or monitoring necessary to confirm that the groundlevel slabs and foundations have been left in a protective state that will prevent the migration of contaminants from the facility slabs after the facility structures has been demolished.

3.3 SAMPLING AND ANALYSIS PLANS

Sampling and Analysis Plans for the C-340 Complex will be developed for sampling and analyses of waste streams generated by this removal action. The plans will enable contaminants of concern to be identified, sampled, and analyzed. The plans will define the process for establishing sampling requirements for each activity and subactivity, selection of the proper sampling protocols, and communication of sampling for use in future activities.

3.4 PROJECT HEALTH AND SAFETY PLAN

A HASP outlining the necessary controls and requirements to protect worker health and safety has been prepared and is included in Appendix C. The HASP is consistent with the requirements of 29 *CFR* § 1910.120 and addresses the safety and health concerns for decommissioning the C-340 Complex. During implementation of the removal action, specific work instruction and hazard controls will be developed at the activity level for use by the personnel performing the work. The ISMS process will be used in preparation of these work instructions.

3.5 WASTE MANAGEMENT PLAN

Waste Management activities will be performed in accordance with the approved ARARs. The Paducah FFA does not have a specific requirement for the inclusion of the Waste Management Plan (WMP) in a RAWP, although it is not precluded. This Plan does not include a WMP due to the prescriptive nature of the ARARs relative to the waste management activities expected and the well-defined waste stream volume and characteristics expected to be generated for this removal action. Work instructions and procedures that incorporate and flow down the requirements of ARARs either are in place or will be developed for the field personnel to utilize when performing day to day operations.

3.6 QUALITY ASSURANCE PROJECT PLAN

The programmatic Quality Assurance Program Plan (PRS 2009) documents the processes and procedures that will be used to ensure that the analytical data of acceptable quality are used to make waste disposition decisions. It also explains other aspects of the Quality Assurance Program that are applicable to this project.

3.7 SPECIFIC WORK DOCUMENTS AND PLANS

Additional special condition documents including, but not limited to, work control documents, activity hazard analyses, and work permits also will be developed, as appropriate.

3.8 OTHER PLANS AND DOCUMENTS

It may be necessary to develop other plans and documents in addition to those identified previously. These may include, but are not limited to, the following:

- Security Plan
- Transportation Plan
- Procurement documents

4. PROJECT SCHEDULE

Table 4 provides key schedule elements and projected implementation dates for the decommissioning of the C-340 Complex. This schedule is based on present budget projections and continued funding by the American Recovery and Reinvestment Act.

Project schedules for completion of activities set forth herein are estimates provided for informational purposes only and are not considered to be enforceable elements of the removal action or this document. The enforceable milestones for performance of activities included as part of the removal action are set forth in the Site Management Plan (DOE 2009b). Any additional milestones, timetables, or deadlines for activities included as part of the removal action will be identified and established independent of this RAWP, in accordance with existing FFA protocols.

Table 4. Project Schedule for D&D of the C-340 Complex

Activity	Milestone[3]
Issue D2 AM to KY/EPA	May 2010
Issue D1 RAWP to KY/EPA	July 2010
Removal Action (Demolition) Start	January 2011
Complete Demolition	April 2011

[3] These are general planning dates for submittal of the CERCLA decision documents. Any extensions for reviewing documents, submitting comments, or responding to comments will impact the schedule. This schedule is included in this document for information purposes only and is not intended to establish enforceable schedules or milestones. Enforceable milestones, if any, will be established in the FFA or Site Management Plan and will be updated in accordance with Sections XXIX and/or XXXIX of the FFA.

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5. APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

In accordance with 40 *CFR* § 300.415(j), on-site removal actions conducted under CERCLA are required to meet ARARs to the extent practicable considering the urgency of the situation and the scope of the removal. DOE will comply with ARARs and to-be-considered (TBC) guidance as set forth in the EE/CA when conducting this removal action. The ARARs and TBC guidance are included in the AM for the C-340 and C-746-A Facilities and are incorporated in this RAWP by reference.

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6. REFERENCES

DOE and EPA (U. S. Environmental Protection Agency) 1995. *Policy on Decommissioning of Department of Energy Facilities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)*, Washington, DC, May.

DOE 2009a. "American Recovery and Reinvestment Act Projects—Regulatory Process for Resource Conservation and Recovery Act Reporting and Closure of Areas Containing Newly Discovered Hazardous Waste," correspondence from Reinhard Knerr, U. S. Department of Energy Paducah Site Lead, to Anthony R. Hatton, Director, Division of Waste Management, October 6.

DOE 2009b. *Site Management Plan, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, Annual Revision-FY 2009, DOE/LX/07-0185&D2/R1, U.S. Department of Energy, Paducah, KY, March 26.

DOE 2010a. *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.

DOE 2010b. *Action Memorandum for the C-340 Metals Reduction Plant Complex and the C-746-A East End Smelter Non-Time-Critical Removal Action at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/LX/07-0290&D1.

EPA 1998. *Federal Facility Agreement for the Paducah Gaseous Diffusion Plant*, DOE/OR/07-1707, U.S. Environmental Protection Agency, Atlanta, GA, February.

EPA 2009. "Response to Proposed Regulatory Path for Projects Under the American Recovery and Reinvestment Act at the Paducah Gaseous Diffusion Plant," U. S. Environmental Protection Agency, Atlanta, GA, correspondence from Franklin E. Hill, Director, Superfund Division, to William Murphie, Director, U. S. Department of Energy, Portsmouth/Paducah Project Office, Lexington, KY, July 1.

KDEP (Kentucky Department for Environmental Protection) 2009a. "Approval of the American Recovery and Reinvestment Act Projects – Regulatory Process for RCRA Reporting and Closure Areas Containing Newly Discovered Hazardous Waste," correspondence from April J. Webb, Manager, Hazardous Waste Branch, to Reinhard Knerr, U. S. Department of Energy Paducah Site lead, October 20.

KDEP 2009b. "Regulatory Framework for ARRA Work for C-340, C-410, and C-746-A EES," correspondence from April J. Webb, Manager of the Division of Waste Management, Kentucky Department for Environmental Protection, Frankfort, KY, to Reinhard Knerr, U. S. Department of Energy Site Lead, Paducah, KY, September 25.

PRS (Paducah Remediation Services) 2009. *Quality Assurance Program Plan for the Paducah Environmental Remediation Project Paducah, Kentucky*, PRS-CDL-0058/R4.

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APPENDIX A

DEMOLITION PLAN FOR THE C-340 COMPLEX

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C-340 COMPLEX DEMOLITION PLAN

The Demolition Plan defines the detailed activities required to remove the structures of C-340-A, C-340-B and C-340-C to the slabs and to decontaminate/stabilize the slabs and subsurface pits, trenches, and sumps for subsequent actions under the Soils and Slabs Operable Unit activities.

General

The C-340 Reduction and Metals Complex, also known as the metals plant, is a DOE facility consisting of five facility units (C-340-A Powder Building, C-340-B Metals Building, and C-340-C Slag Building.) The facility is inactive and was accepted to the decontamination and decommissioning (D&D) program in 1992. This Demolition Plan excludes concrete foundations which are being deferred to Soils and Slabs Operable Unit. This plan also excludes the removal of the ground floor concrete slabs.

The C-340 Complex is located in the east portion of Paducah Gaseous Diffusion Plant (PGDP) between Oklahoma and Nebraska Avenues, is approximately 280 ft long, 172 ft wide and 121 ft tall at the high roof. Hydrogen fluoride (HF) reactors, coreless electrical induction furnaces and numerous material handling/transfer, dust collection and support systems exist inside the complex.

The C-340 Metals Plant Complex consists of the following operations buildings/areas:

C-340-A Powder Building
C-340-B Metals Building
C-340-C Slag Building

C-340-A, C-340-B, and C-340-C are to be demolished as a CERCLA Non-Time Critical Removal Action and are included as a part of this RAWP.

Facility Description

The C-340 Complex is made up of five distinct facility units grouped in a general "T" configuration with a total floor area of 68,332 ft^2 (6,348 m^2). The three primary facility units are located within a single structure the C-340-A Powder Building (seven stories), the C-340-B Metals Building (single story with operating platforms), and the C-340-C Slag Building (four stories).

Contamination areas are located within C-340-A, -B, and -C. Access to the facility is restricted and requires special entry procedures. Facility Buildings A, B, C, and D are located within a security fence that represents the boundary of the facility. C-340-D, the Magnesium Storage Building, is connected to the main building by an enclosed drum conveyor system. The conveyor gallery is designated as part of C-340-D, and therefore not addressed in this plan.

The structure that contains C-340-A, C-340-B, and C-340-C has a steel beam framework with corrugated asbestos exterior wall paneling with some concrete block walls. The built-up roof is made of insulation, felt and tar and gravel layers. Metal decking supports the roofing material.

Auxiliary Systems

The C-340 Complex includes a number of auxiliary systems. The following is a listing of auxiliary systems which will be removed from service (Lock out/Tag out) and air gapped during the deactivation activities.

Water: The C-611 Water Plant and PGDP water system supplied potable water and cooling water.

Electricity: Large transformers provided electricity. The transformers were dismantled and disposed of during a PCB remedial action.

Heat: Steam-heated air units heated the entire Complex. Exhaust fans vented the air. Outside air entered through wall-mounted intake louvers with automatic dampers. Steam tracing, steam-heated air, as well as electrical resistance heated process piping.

Exhaust air: Air exhausted from the complex discharged through roof ventilation stacks.

Cooling: A chilled water unit cooled the plant control room, change house and lunchroom. Individual window-mounted air conditioners cooled office areas on the south side of C-340.

Lighting: Explosion-proof incandescent fixtures provided lighting in hazardous areas, with vapor-tight incandescent lighting used in other process areas. Fluorescent lighting lit office and shipping areas.

Refrigeration: Refrigeration systems recovered HF from the process. Condensers cooled by Freon™-22 transformed HF gas to liquid form. Three-stage compression liquefied the Freon™-22 refrigerant.

It is anticipated that all accessible interior asbestos-containing material will have been removed and any systems (e.g., process piping, equipment) containing chemical and/or radionuclides will have been emptied of residual material, to the extent practicable, during the deactivation activities. Additionally, certain wastes, such as polychlorinated biphenyl (PCB) capacitors, mercury switches, or manometers, etc., will have been removed. During the deactivation process the building surfaces and infrastructure (i.e., floors, walls, residual piping, and equipment) will be vacuumed and sealed to contain and minimize airborne releases.

The decommissioning phase of this project will be accomplished in a manner consistent with applicable or relevant and appropriate requirements. The buildings and remaining infrastructure will be removed, size reduced, packaged, and transported to a designated disposal location. The slab will be cleaned and coated with fixative. The subsurface pits, trenches, and sumps will be backfilled.

The small amounts of contaminants that may remain after deactivation are expected to include radiological contamination from uranium, PCBs in paint, and small amounts of hazardous substances that cannot be accessed for removal and dust potentially containing lead. Any hazardous material that may be present in non-process systems and become commingled with the demolition debris is expected to be in sufficiently low quantities that they would not require the building debris to be regulated as Resource Conservation and Recovery Act hazardous waste. The demolition debris will be characterized and is expected to consist of various types of waste such as low-level radiologically contaminated waste, PCB bulk product waste, and solid waste.

<u>Other Deactivation Activities:</u>

The following activities will be completed during the deactivation of the facility.

(1) All utilities will be isolated and air gapped.

(2) Grout plugs will be installed in all floor drains and sanitary sewer drains.

(3) C-340 west steam and condensate overhead pipe chase will be isolated and air gapped and removed.

(4) All process systems, ventilation and electrical equipment will be removed or stabilized.

(5) Exhaust stacks, exterior ventilation fans, ductwork and structures will be removed or properly stabilized for removal during demolition.

Building Demolition:

The demolition of the C-340 Complex will encompass a number of activities. The following delineates the primary activities associated with the demolition program. Each activity will be performed in accordance with an approved work package.

Site Activities:

Site Boundary—Site boundary fences will be installed to ensure that no unauthorized personnel enter the work zone during the demolition activity. Existing fences will be utilized where possible. Login sheets will be developed to verify that all site visitors have been recorded. All personnel entering the site will be checked to determine that they have proper training and identification.

Environmental Control—Environmental control structures such as silt fences, diversion ditches, and retention basins will be installed. Wastewater collection, transportation, storage, and treatment systems will be established. Processes for stormwater/wastewater management will be defined. Air monitoring equipment will be installed and calibrated.

Verification of Lock Out/Tag Out—All unnecessary energy sources (steam, electrical, pressurized water, etc.) should have been air gapped and/or "locked out/tagged out" during the deactivation. These systems will be checked and verified to have been rendered safe prior to commencing work.

Gross Decontamination—During the deactivation activities all surfaces inside building will have been vacuumed and swept to remove any gross contamination. The demolition activities will generate additional dust and minor debris that is not removed with the structural components. Vacuuming and other physical methods will be utilized to remove this material. Potentially contaminated materials will be physically segregated from "clean" material where practicable.

Stabilizing Airborne Contamination—Following the deactivation activities, all accessible interior surfaces will have been covered with a chemical fixative to prevent airborne contaminant migration**.** During demolition, potentially contaminated equipment and structural surfaces may be exposed. Chemical fixative will be reapplied to all interior surfaces that have been exposed during the demolition activities to prevent the generation of airborne contamination.

Demolition—These activities define the process of dismantlement, demolition, size reduction, segregation, packaging, and load out of equipment, structural components, work platforms, mezzanines, and pit covers from building interior, as well as, the removal of corrugated asbestos paneling transite. These activities will be accomplished with standard equipment and approved construction techniques.

The sequence and detailed activities associated with the demolition of C-340 A, B, and C are shown below. Work packages and Activity Hazard Assessments (AHAs) will be developed for each of the demolition activities as well as appropriate subactivities, as appropriate.

C-340-B Metals Building

(1) Perform gross decontamination
(2) Apply fixative as required
(3) Remove remaining equipment/platforms
(4) Clean pits
(5) Radcon/Environmental survey and release pits for backfill
(6) Backfill pits with flowable fill
(7) Remove doors, louvers and corrugated asbestos siding transite
(8) Air gap/sever roof and roof sheathing
(9) Demolish structure and roof simultaneously
(10) Demolish structure from north to south, east to west
(11) Sort, size, and package debris

C-340-C Slag Building

(1) Perform gross decontamination
(2) Apply fixative as required
(3) Remove remaining equipment/platforms
(4) Remove doors, louvers and corrugated asbestos siding transite
(5) Sever roof and roof sheathing along Powder Building
(6) Demolish structure and roof simultaneously
(7) Demolish from the top down north to south
(8) Sort, size, and package debris

C-340-A Powder Building

(1) Perform gross decontamination
(2) Apply fixative as required
(3) Remove remaining equipment/platforms
(4) Clean pits
(5) Radcon/Environmental survey and release pits for backfill
(6) Backfill pits with flowable fill
(7) Remove doors louvers and corrugated asbestos siding transite
(8) Demolish structure and roof simultaneously
(9) Demolish from the top down, east to west
(10) Sort, size and package debris

Stabilization of Slabs and Subsurface Structures—During deactivation, existing debris will have been removed from the pits, basements, and trenches in C-340 and fixative will have been applied to the walls and floors. Loose and scaling paint will be removed from the foundation and other hard surfaces to the extent the U.S. Department of Energy deems practicable using available equipment and techniques. These structures will be filled with flowable fill to create safe work areas for personnel and equipment and a fixative will be applied to the surface.

Any PCB spills that cannot be cleaned to levels prescribed by the applicable or relevant and appropriate requirements (ARARs) will be sealed and/or covered and left for subsequent action under the Soils and Slabs Operable Unit. Small areas of PCB-contaminated concrete may be scabbled if DOE determines that method is the most efficient way to address them.

Demobilization—The following activities will be performed during the demobilization from the C-340

Complex decommissioning project.

(1) Backfill truck wells with crushed stone
(2) Sort, size, and package debris
(3) Repair flowable fill surface
(4) Apply final fixative coating to exposed surfaces
(5) Install safety fencing
(6) Post warning signage
(7) Decontaminate rental equipment
(8) Perform Verification Sampling as applicable
(9) Repair or remove access roads
(10) Grade and seed, as needed
(11) Remove personnel and equipment from site
(12) Prepare Closure Document

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APPENDIX B

REMOVAL ACTION VERIFICATION PLAN FOR DECOMMISSIONING THE C-340 COMPLEX

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C-340 COMPLEX DEMOLITION
REMOVAL ACTION VERIFICATION PLAN

This Demolition Removal Action Verification Plan identifies sampling and/or monitoring that may be necessary to confirm that the ground level slabs of the C-340 Complex have been placed in a protective state that will prevent migration of contaminants from the slab after the buildings have been demolished. This will ensure that the removal action objectives have been met.

The criteria for determining success of the removal action include the following:

- Removal of the physical structures to the slabs; and

- Removal of the associated residual contaminants, which are expected to include
  — Radionuclides,
  — Polychlorinated biphenyls (PCBs),
  — Asbestos-containing materials, and
  — Residual metals contamination.

During structural demolition, specifically transite removal, the surfaces around the perimeter of the C-340 Complex will be protected from cross-contamination by lead-headed bolts that fasten transite to the structure, paint chips, and other debris through the use of physical barriers, such as plastic sheeting.

The slabs that remain after structural demolition will be inspected, visually surveyed, decontaminated, as appropriate, and sealed to minimize the possibility of spreading contamination. Loose and scaling paint will be removed from the foundation and other hard surfaces to the extent practicable using available equipment and techniques. Successful removal of paint chips will be verified by visual inspection of the slab and soils immediately adjacent to the slab.

Fixatives may be applied to prevent scaling paint and fugitive dust from being released to the environment. Loose material, such as paint chips, will be segregated from the primary waste streams to the extent possible by vacuuming or other physical means.

Any PCB spills that cannot be cleaned to levels prescribed by the applicable or relevant and appropriate requirements (ARARs) will be sealed and/or covered and left for subsequent action under the Soils and Slabs Operable Unit. Small areas of PCB-contaminated concrete may be scabbled if DOE determines that method is the most efficient way to address them.

Radionuclides

Radionuclides may be present on the slab due to the operations that took place when the facility was active. Following demolition, the slab will be surveyed to determine fixed and removal levels of radiological contamination. Swipe samples will be collected and analyzed in a fixed-base laboratory. If the survey indicates that only fixed contamination is present, the slab will be posted according to the requirements of 10 *CFR* § 835. Conversely, if the survey indicates that removable radiological contamination exists at levels exceeding those in Table B.1, the slab surface will be decontaminated by physical means, such as vacuuming or washing. Based on the results of a subsequent survey, the slab will be posted according to the requirements of 10 *CFR* § 835, Appendix D.

Table B.1. Removable Surface Contamination Limits

Radionuclide	Removable (disintegrations per minute)
Alpha emitters	200
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission)	1,000

Table B.2 lists the analytical parameters and test methods for radiological samples.

Table B.2. Radiological Sampling Parameters and Test Methods

Analytical Parameter	Test Method
Total U, U-234, U-238, Th-228, Th-230, Th-232, Pu-238, Pu-239, Pu-240, Np-237, Am-241, Mass of U-235, Activity of U-235, Weight Percent of U-235	Alpha Spectroscopy/Inductively Coupled Plasma Mass Spectrometry
Cs-134, Cs-137, Co-60, Th-234, K-40	Gamma Spectroscopy
Tc-99, Sr-90	Liquid Scintillation

Polychlorinated biphenyls

PCBs may be present at the slab of the demolished building either as paint chips that flaked off of equipment and/or structural elements or as PCB-contaminated concrete from spills onto the slab from overhead piping and equipment. Loose paint chips will be collected and characterized for PCBs as well as other contamination. Successful removal of paint chips will be verified by visual inspection of the slab and soils immediately adjacent to the slab.

Concrete that is suspected of being PCB-contaminated will be sampled with hexane wipes to determine the initial PCB concentration, decontaminated according to applicable requirements, and then posted, if necessary, in accordance with ARARs. The sampling locations will be determined based on process knowledge and/or visual inspection and evidence of staining.

Table B.3 lists the U.S. Environmental Protection Agency test methods for PCBs that may be used during the decommissioning activities.

Table B.3. PCB Analytical Test Methods

Analytical Parameter	Test Method
PCBs in paint	EPA SW-846-8082
PCB hexane wipe analysis	EPA SW-846-8082

Asbestos-containing materials

Asbestos may be present on the concrete slab from removal of the transite siding. Prior to structural demolition, the slab will be vacuumed using a vacuum with a HEPA filter to ensure that no loose asbestos fibers remain on the slab and are not dispersed during removal. The resulting waste will be sampled and characterized for appropriate disposal according to ARARs.

Table B.4 lists the analytical test methods for asbestos samples that may be obtained during the decommissioning activities.

Table B.4. Asbestos Test Method

Analytical Parameter	Test Method
Asbestos	NIOSH-9002

Residual metals contamination

Residual metals contamination may remain on the slab as contaminants in dust from demolition. The slab will be vacuumed, and the resulting waste will be characterized for metals contamination to determine its regulatory status and appropriate disposition.

Table B.5 lists the analytical parameters and U.S. Environmental Protection Agency test methods for samples requiring metal analysis that may be obtained during the decommissioning activities.

Table B.5. Metals Analytical Test Methods

Analytical Parameter	Test Method
TCLP Metals (except Mercury) plus Zn	EPA SW-846-6010
TCLP Metals—Mercury	EPA SW-846-7470
Total Metals (RCRA 8 plus Zn, Tl)	EPA SW-846-6020 EPA SW-846-6010
Total Metals—Mercury	EPA SW-846-7470/7471

TCLP = toxicity characteristic leaching procedure
Total metals include arsenic, barium, cadmium, chromium, lead, selenium, silver, beryllium, antimony, nickel, and zinc.
RCRA = Resource Conservation and Recovery Act

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APPENDIX C

HEALTH AND SAFETY PLAN FOR THE C-340 COMPLEX AT THE PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY

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CONTENTS

ACRONYMS

ACGIH	American Conference of Government Industrial Hygienists
AHA	Activity Hazard Assessment
AIHA	American Industrial Hygiene Association
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
CAAS	Critically Accident Alarm System
CFR	*Code of Federal Regulation*
CRZ	contamination reduction zone
DOE	U.S. Department of Energy
EMS	Environmental Management System
ES&H	Environment, Safety, and Health
EZ	exclusion zone
FS	field superintendent
H&S	health and safety
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSR	health and safety representative
ISMS	Integrated Safety Management System
NIOSH	National Institute for Occupational Safety and Health
OSHA	U.S. Occupational Safety and Health Administration
PEL	permissible exposure limit
PGDP	Paducah Gaseous Diffusion Plant
PM	project manager
PPE	personal protective equipment
PSS	plant shift superintendent
RADCON	radiological control
RCT	radiological control technician
RWP	radiological work permit
SZ	support zone
TLV	threshold limit value

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C.1 PURPOSE

This Health and Safety Plan (HASP) has been developed to delineate the general health and safety requirements associated with C-340 Complex Removal Action Work Plan and discuss the process of identifying potential hazards. Site-specific hazards and controls will be established for each activity and location prior to performing work. These hazards and controls will be documented in the form of Activity Hazard Assessments (AHAs), work packages, and procedures. Personnel assigned to this project will be familiar with the details of these work control documents prior to performing work in the affected areas.

C.2 INTEGRATED SAFETY MANAGEMENT

The C-340 Complex removal action will utilize the Paducah Remediation Services, LLC, corporate Integrated Safety Management System (ISMS), which integrates the Safety Management System, the Environmental Management System (EMS), and Quality Management System to ensure personnel and environmental safety and quality are integrated into management and work practices at all levels so that missions are accomplished while protecting the public, the workers, and the environment. The concepts of the ISMS/EMS will be utilized to provide a formal, organized process to ensure the safe performance of work. The ISMS/EMS Plan identifies the methodologies that will be used to address previously recognized hazards and how the hazards are mitigated using contractor-accepted Environment, Safety, and Health (ES&H) practices.

The core functions and guiding principles of ISMS/EMS will be implemented by incorporating the requirements of programs, policies, technical specifications, and procedures from the U.S. Department of Energy (DOE), U.S. Occupational Safety and Health Administration (OSHA), and the U.S. Environmental Protection Agency, as appropriate. Brief descriptions of the five ISMS/EMS core functions are defined in subsequent sections.

C.2.1 DEFINE SCOPE OF WORK

Defining and understanding the scope of work is the first critical step in successfully performing any specific activity in a safe and compliant manner. In accordance with ISMS protocols, at a minimum, key personnel from the project team will participate in the development of the approach to each activity. The activity managers will ensure that each team member understands the scope of work and the technical and safety issues involved and that all parties are in agreement on the scope and approach to complete the work.

C.2.2 ANALYZE HAZARDS

In the course of planning the work, key personnel from the project team will identify hazards including personnel safety and environmental risks associated with the performance of the work. Hazards may be identified and assessed by performing a site visit, reviewing lessons learned, and reviewing project plans or historical data. The hazard assessment process will be prescribed by the DOE prime contractor's procedures and policies.

Once the hazards have been identified and assessed, measures will be identified to minimize risks to workers, the public, and the environment. These measures will be described in the project-specific AHAs,

which serve to provide a control mechanism for all work activities. AHAs are detailed, activity-specific evaluations that address each step of the task and/or activity that will be performed. The AHA development process entails a detailed evaluation of each activity to identify specific activities or operations required to successfully complete the scope of work and define the potential chemical, environmental, physical, radiological, and/or biological hazards that may be encountered; the media and manner in which they may occur; and how they are to be recognized, mitigated, and controlled. Appropriate hazard controls may include engineering controls, administrative controls, and the use of personal protective equipment (PPE). The project health and safety personnel are responsible for the preparation, revision, and implementation of AHAs.

Applicable AHAs will be reviewed with the personnel who will perform the work. Participants in this review will sign and date the AHA to signify that they understand all hazards, controls, and requirements in the AHAs. Copies of the AHAs with appropriate signatures shall be maintained at the work location.

C.2.3 DEVELOP/IMPLEMENT CONTROLS

The primary mechanisms used to flowdown ISMS/EMS controls to the project team are project-specific plans and technical procedures. Other mechanisms include program/project management systems, employee training, communication, work site inspections, independent assessments, and audits. These mechanisms are communicated in the following:

- Pre-job meetings
- Orientations
- Training
- Plan-of-the-day/pre-job briefings
- AHAs
- Radiological work permits (RWP)

The plan of the day/pre-job briefing incorporates the principles of ISMS/EMS. The specific steps within ISMS/EMS are emphasized to each employee. It is stressed that no employee will be directed or forced to perform any activity that he/she believes is unsafe, puts his/her health at risk, or that could endanger the public or the environment. One of the key elements of ISMS/EMS is that all personnel are permitted to stop work or decline to perform an assigned activity because of a reasonable belief that the activity poses an imminent risk of death, serious physical harm, or other serious hazard to workers or the environment.

Employee involvement is emphasized in all training sessions, beginning with initial orientation training, and is periodically reinforced in refresher training, as applicable, and in ES&H briefings/meetings. Employees are encouraged to participate in the selection, development, and presentation of training/meeting topics and their full and constructive input is encouraged in all communication sessions.

C.2.4 PERFORM WORK

Upon approval to proceed, the project-specific plans will be implemented. The field superintendent will verify that all applicable plans, forms, and records are contained in the project files and accessible by approved personnel. Actions that will be taken during the performance of the work to incorporate ISMS/EMS principles include the following:

- Plan of the day/pre-job briefings
- Monthly project safety meetings

- ES&H oversight/inspections
- Safety inspections
- Equipment inspection
- Stop work authority

C.2.5 FEEDBACK/IMPROVEMENT

Feedback and improvement are accomplished through several channels, including ISMS/EMS audits, self-assessments, employee suggestions, lessons learned, and post-job briefings.

Project managers will encourage employees to submit any suggestions and constructive criticism that offer opportunities for improvement on the program. Project management will conduct periodic inspections and meetings with project personnel at the work site to discuss safety issues, environmental issues, and/or concerns, as well as other relevant topics.

During field activities, meetings and briefings will provide opportunities for project personnel to communicate the following:

- Lessons learned and any other topics relevant to the work performed
- How work steps/procedures could be modified to promote a safer working environment
- How communications could be improved within the project team
- Overall issues or concerns they may have regarding how the work was performed

C.3 FLOWDOWN TO SUBCONTRACTORS

The ISMS/EMS approach to ES&H ensures that project team members, including subcontractors, are aware of their roles, responsibilities, and authorities for worker/public safety and protection of the environment. All organizations will be responsible for compliance with the prime contractor's Worker Safety and Health Program, ISMS/EMS Program, Radiation Protection Program, and Quality Assurance Program. In addition, subcontract requirements will flow down to lower-tier subcontractors, as applicable. Project personnel will have the appropriate health and safety (H&S) training required in accordance with 29 *CFR* § 1910 and DOE standards, but they also will undergo site-specific pre-job training, including safety and environmental, to ensure that ES&H issues related to the activities to be performed or specific to the work site are clearly understood. Documentation of training will be reviewed prior to starting work.

C.4 SUSPENDING/STOPPING WORK

In accordance with 10 *CFR* § 851.20 and the DOE prime contractor's Worker Safety and Health Program and procedures, employees and subcontractors have suspend/stop-work authority. Individuals involved in any aspect of the project have the authority and responsibility to suspend or stop work if they believe that an activity poses an imminent risk to the H&S of the workers, the public, or to the environment. Concerns shall be brought to the attention of the field superintendent (FS) and health and safety representative (HSR), they will be evaluated by project management personnel, and actions will be taken to rectify or control the situation. In the case of imminent danger or emergency situations, team members should halt activities immediately and instruct other affected workers to pull back from the hazardous area. The FS

and/or HSR should be notified immediately; at that time, Management and/or emergency responders will be notified.

C.5 ISMS/EMS BRIEFINGS AND ORIENTATIONS

Plan of the day/pre-job briefings detailing the specific hazards of the work to be performed and safety precautions and procedures specific for the job shall be conducted by the FS and/or HSR at the beginning of each shift. During these briefings, work activities and the associated hazards (personnel safety and environmental risks) and mitigating controls will be discussed using activity-specific AHAs, project documents, and/or lessons learned.

Prior to performing work on the site, personnel shall be required to read, or be briefed, on the DOE prime contractor's Worker Safety and Health Program, applicable AHAs, the work package, and other applicable documents. This shall be documented as required reading, using acknowledgement forms or briefing sheets. Visitors also will be oriented to the applicable plans and potential hazards that they may encounter.

C.6 KEY PROJECT PERSONNEL AND RESPONSIBILITIES

One of the primary underlying principles of a successful project organization is the establishment of clearly defined roles and responsibilities and effective lines of communication among employees and the Prime Contractor, subcontractors, and other organizations involved in the project. Ensuring that personnel fully understand their roles and responsibilities and that they have a thorough understanding of the scope of work and other project requirements will provide the foundation for successful and safe completion of the project.

The roles and responsibilities of key field team members are briefly described as follows:

- The project manager (PM) oversees the implementation of the project plans and provides the resources for the project. The PM oversees the project plans and work activities while ensuring that operations are conducted in accordance with the DOE prime contractor's procedures, regulatory requirements, and Worker Safety and Health Program. He/she is responsible for coordinating and assigning resources needed for the project. The PM also performs management audits and inspections.

- The FS coordinates field activities and logistics and provides communication between the project team and other support groups. The FS also ensures that on-site personnel comply with the Worker Safety and Health Program, work packages, and applicable procedures.

- The quality assurance specialist provides support and oversight to the project to ensure that work is performed in accordance with the work package and other applicable plans and procedures. The quality assurance specialist performs audits, surveillance, and assessments. He/she participates or takes the lead in accident/incident prevention investigations.

- The HSR provides H&S support and oversight to the project to ensure that work is being performed safely and in accordance with the AHAs, Worker Safety and Health Program, applicable regulations, 10 *CFR* § 851, DOE directives, and applicable plans and procedures. The HSR participates in the development of AHAs.

- The radiological control (RADCON) group provides support and guidance to the project and assists the FS and HSR with implementation of RADCONs and as low as reasonably achievable (ALARA) principles. The RADCON technician (RCT) observes the work area before/during activities for radiological hazard and authorizes entry into and exit from the radiological work area.

- Environmental compliance organization provides environmental support and oversight to the project to ensure that the planning and fieldwork is being performed properly and in accordance with all applicable regulations, DOE directives, and relevant plans and procedures.

- The waste management coordinator provides waste management support to the project to coordinate waste containers and removal of waste from the worksite, while complying with the Worker Safety and Health Program, as well as ES&H and work control requirements.

- Field Technical Staff/Subcontractors–Heavy equipment operators, maintenance mechanics, waste operators, and electricians perform work as specified in work packages, adhering to the Worker Safety and Health Program, HASP, RWPs, project procedures, and AHAs. Key field personnel also participate in the identification of the hazards and development of the work controls to be utilized during the work.

C.7 SITE CONTROL

C.7.1 WORK SITE CONTROL ZONES

Work zones will be utilized to control access. These areas will be controlled by the FS, HSR, and/or RCT to minimize the number of individuals potentially exposed to site hazards and to ensure that individuals who enter follow the required procedures. The following is a description of the different types of zones that may be established at the site.

C.7.2 EXCLUSION ZONE

The exclusion zone (EZ) is the immediate area around the removal action activity where there is potential for personal exposure to hazardous materials. The exclusion zone will be marked and entry and exit points will be established to regulate movement of personnel and equipment to reduce the potential of the spread of contamination. This is the zone that encompasses the areas where demolition activities occur. It also includes the areas where the demolition debris is segregated, size reduced, and packaged for transport to disposal.

C.7.3 CONTAMINATION REDUCTION ZONE

The contamination reduction zone (CRZ) is the transition area between the EZ and construction zone or support zone. This area will provide a buffer area to reduce the probability that contamination will leave the EZ. The CRZ is designed for the following activities:

- Decontamination of equipment and workers;
- Staging of emergency response equipment and supplies (e.g., first-aid, fire equipment);
- Waste characterization, segregation, packaging and preparation; and
- Worker rest area.

The CRZ is designed to reduce the possibility of the clean area becoming contaminated by site hazards. The degree of contamination in the CRZ decreases as the distance from the contaminants increases.

C.7.4 CONSTRUCTION ZONE

The construction zone is the area outside of potential contamination, but still encompasses work activities and possible hazards associated with fieldwork activities. Entry into this area is controlled and the area clearly marked with barrier tape, rope, or flagging.

C.7.5 SUPPORT ZONE

The support zone (SZ) is the outermost area of the site. This area is uncontaminated where workers provide operational and administrative support. The SZ is clean and will not be entered by contaminated equipment or personnel, unless properly controlled or except under emergency or evacuation conditions.

C.7.6 SITE COMMUNICATIONS

Paducah Gaseous Diffusion Plant (PGDP) plant radios, plant phones, and cell phones will be used for on-site and off-site communication. Project personnel will be trained in the use of plant radios and emergency numbers. Hand signals also may be utilized; these will be covered with project personnel if necessary.

C.7.7 AUTHORIZATION TO ENTER

Personnel shall adhere to site entry and control procedures identified in the RWP, AHAs, and this HASP; personnel must wear the appropriate PPE and enter the work area only after receiving permission of the FS, HSR, and/or RCT. The FS (or designee) will verify that the appropriate training and briefing requirements are met prior to entry.

As a requirement for work on this project, workers entering the EZ or CRZ will be required to take the appropriate level of Hazardous Waste Operations and Emergency Response (HAZWOPER) training. This training must cover the requirements in 29 *CFR* § 1910.120, HAZWOPER. As applicable, workers must receive annual 8-hour refresher training and 1- or 3-day on-site supervision under a trained, experienced supervisor. The FS shall receive additional 8-hour training in hazardous waste operations supervision. Workers and visitors entering the EZ or CRZ will be briefed on the provisions of this HASP and will be required to sign the HASP Acknowledgment Form. Workers entering radiological posted work areas also will be required to complete Radworker II training.

C.7.8 VISITORS

Site visitors (persons not involved in routine site work activities) shall abide by the following:

- Visitors shall be instructed to stay outside of the EZ and CRZ and remain within the SZ during the extent of their stay.

- Visitors requesting to observe work conducted in the EZ must wear appropriate PPE prior to entry into that zone.

- Visitors who request to enter the EZ must produce evidence that they have medical clearance and appropriate HAZWOPER training that is up-to-date.

- Visitors also must have received the required training for the activities being performed and entry must be approved by the FS, HSR and/or RCT.

C.8 PERSONAL PROTECTIVE EQUIPMENT

When engineering controls are not feasible, when the administrative controls in place are not adequate, or when otherwise indicated (such as for ALARA), PPE will be specified by the AHA and/or RWP. At a minimum, personnel performing work in work zones may be required to wear the following standard safety apparel:

- Hard hats meeting the requirements of American National Standards Institute (ANSI) Z89.1, as prescribed in 29 *CFR* § 1910.135, *Head Protection*. Hard hats will be worn with the suspension properly installed. Hard hats will not be damaged, painted, or deformed.

- Safety glasses with firm side shields will meet the requirements of ANSI Z87.1, as prescribed in 29 *CFR* § 1910.133, *Eye and Face Protection*. Prescription glasses also will meet the ANSI standard and be provided with fixed or firm clip-on side shields. Cover glasses used over prescription glasses will be permitted. Safety glasses will be worn in any area where construction activities are taking place. Face shields will not be worn in lieu of safety glasses.

- Sturdy safety toed work shoes or boots meeting the requirements of ANSI Z41, as prescribed in 29 *CFR* § 1910.136, *Foot Protection*, shall be worn.

C.8.1 ACTIVITY-SPECIFIC LEVELS OF PROTECTION

The levels of personal PPE will be determined by an assessment of the potential hazards posed by the activity to be performed and will be identified in the activity-specific AHAs and RWPs. Typically, the highest hazard levels are to be expected in the EZ; therefore, the level of PPE designated for work in the EZ would be expected to be the highest level designated for an activity. Work conducted in the CRZ may vary. Generally the level of PPE used in the CRZ is one level below that designated for the EZ.

C.8.2 RESPIRATORY PROTECTION

Respiratory protection requirements will be determined by air monitoring and survey results. Personnel required to wear respiratory protection will be trained and quantitatively fit-tested prior to use of the respirator, as prescribed in accordance with DOE prime contractor procedure. Personnel required to wear respirators will inspect their respirators before and after each use and any deficiencies will be reported to the FS or HSR immediately. Respirators will be properly stored in a bag in a clean, dry environment and routinely cleaned. Damaged respirators shall not be used.

C.9 MEDICAL SURVEILLANCE

The medical surveillance program provides for baseline, annual, and termination medical examinations for employees in accordance with 29 *CFR* § 1910.120, HAZWOPER. Employees who may be exposed to hazardous conditions may be required to be trained and fitted for respiratory protection in accordance with 29 *CFR* § 1910.134. Each employee who is or may be exposed to hazardous substances or health hazards at or above the permissible exposure limit (PEL) for 30 days or more per year and each employee who wears a respirator for 30 days or more per year will receive a medical examination before assignment, approximately 12 months later, and at termination of employment or at reassignment. Employees who develop signs or symptoms indicating overexposure or are injured or exposed above the PEL in an emergency situation will be examined medically as soon as possible following the incident.

Personnel performing HAZWOPER activities on this project must complete an annual HAZWOPER physical. The examining physician will document each worker's fitness for work. In addition, the physician will ensure personnel are capable of wearing a respirator through medical examination and conducting a pulmonary function test.

Radiation workers, working under an RWP, may be required to submit a baseline bioassay, periodic bioassay during the project, and exit bioassay at the end of the project.

C.9.1 EXPOSURE MONITORING

Air monitoring shall be used to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection needed on-site.

C.9.2 ROUTINE AIR MONITORING REQUIREMENTS

Air monitoring will be performed during the following activities:

- Intrusive activities such as building demolition and utility removal;
- Activities where there is a potential for exposure to heavy metals, asbestos-containing materials, silica dust; and
- Personnel filling, handling and transporting waste containers that contain potentially contaminated material.

C.9.3 INDUSTRIAL HYGIENE MONITORING

Industrial hygiene monitoring and sampling will be performed by assigned project H&S support personnel. Monitoring will use direct-reading instruments, air-sampling equipment, environmental-monitoring equipment, and assessment techniques, as determined appropriate by the H&S group based on professional judgment and in accordance with OSHA, National Institute for Occupational Safety and Health (NIOSH), and American Conference of Government Industrial Hygienists (ACGIH).

Personnel sampling will be conducted to assess the potential exposure to individual employees and to ensure that the proper level of PPE has been selected for the assigned activity. Samples will be collected

in the employee's breathing zone using personnel sampling pumps and the appropriate collection media. For activities with the potential for exposure to significantly elevated chemical concentration, it is expected that the sampling frequency will increase.

If direct reading instruments indicate levels of vapors or particulates that exceed the action level for over 15 minutes in the work area, then personnel sampling will be initiated immediately. Sampling will be conducted, at a minimum, on the worker with the highest expected exposure. Monitoring will continue until levels recorded by direct reading instruments return below the action level.

Once initiated, sampling will always continue for a period long enough to collect a volume of air sufficient to allow the laboratory to achieve an analytical detection limit no greater than one-half the OSHA PEL or ACGIH threshold limit value (TLV), whichever is the more stringent of the two. The samples will be collected in accordance with the approved NIOSH or OSHA methodology and analyzed for the appropriate contaminant(s) of concern. All personnel exposure samples shall be analyzed by a laboratory accredited by American Industrial Hygiene Association (AIHA) in accordance with the appropriate NIOSH or OSHA methodology.

C.9.4 RADIOLOGICAL MONITORING

RADCON will perform personnel air monitoring during work in contamination areas and potentially at the boundary. Scanning of equipment and personnel will also be performed to minimize the possibility of the spread of contamination. Personnel working on the project also will be monitored through Dosimetry and required to wear a dosimeter when working in radiological zones and submit bioassays as required.

C.10 EMERGENCY RESPONSE

C.10.1 RESPONSIBILITIES

The PM, FS, and HSR are responsible for the project emergency management program and ensuring that the appropriate emergency response equipment is readily available at the work site and in proper working order.

In the event of an emergency, all site personnel shall follow the requirements and provisions of the PGDP Emergency Management Plan. Emergency response shall be provided by the PGDP emergency response organization. The HSR will be in charge of personnel accountability during emergency activities. All personnel working on-site will be trained to recognize and report emergencies to the HSR or the FS. The HSR or FS will be responsible for notifying the PGDP emergency response organization.

The PGDP emergency response organization will be contacted for emergency response to all medical emergencies, fires, spills, or other emergencies. The plant shift superintendent (PSS) will coordinate 24-hour emergency response coverage. The requirements of this section will be communicated to site workers. Any new hazards or changes in the plan also will be communicated to site workers.

The DOE on-scene coordinator will provide oversight on an ongoing basis for emergency management/recovery activities.

C.10.2 REPORTING AN EMERGENCY

C.10.2.1 Discovery

The person who discovers an emergency shall immediately report it to the FS & HSR. If properly trained, he/she may attempt to establish control. Designated project personnel shall maintain a radio, telephone, or other reliable means of notifying emergency response personnel and the PSS.

C.10.2.2 Emergency Contacts

- **Fire:** Fire alarm pull box, plant telephone Bell System 333, or plant radio channel 16
- **Medical:** Plant telephone Bell System 333 or plant radio channel 16
- **Security:** Plant telephone Bell System 6246 or plant radio channel 16
- **PSS:** Plant telephone Bell System 6211 or plant radio channel 16

If using a cell phone: 270-441-6333 for emergency, for NON-emergency use 270-441-6211.

C.10.3 INITIAL EMERGENCY RESPONSE

When an emergency occurs, the HSR or FS will assume responsibility for the management of the scene and the protection of the personnel. Personnel are to be evacuated from the immediate danger area, as appropriate. Depending on the degree of emergency, RADCON controls may need to be adhered to during the emergency. For personnel injury or illness, there will be at least one person with current training in first aid and cardiopulmonary resuscitation present on-site during all field activities. This individual will provide minor first aid until other emergency personnel arrive and assume emergency response duties or it is determined to transport the injured to the hospital or medical provider.

C.10.4 PADUCAH GASEOUS DIFFUSION PLANT ALARMS

The alarms can be heard by calling 6161 on a Bell phone. These include the following:

Radiation Emergency/Criticality Accident Alarm System (CAAS):	Continuous blast on a high-pitched air whistle or electronic horn **ACTION**: Evacuate area immediately and stay away from affected building, Report to an assigned plant assembly point.
Attack Warning/Tornado Warning:	Intermittent 2-second blast on plant horns **ACTION:** Take cover.
Evacuate Signal:	Continuous blast on plant horns **ACTION:** Evacuate building.
Plant Emergency:	Hi-Lo Tones **ACTION:** Listen to plant public address system/radio for instructions.

Cascade Buildings:	Three blasts on building horns or howlers **ACTION:** Call area control room.
Other Buildings:	One 10-second blast on building horns or sirens **ACTION:** Follow local emergency procedures.

During field activities all personnel must participate in all PGDP accountability/assembly drills. For accountability, all on-site project personnel must report to the appropriate assembly station, as directed within the AHAs. The FS, HSR, or designee will be responsible for accounting for all field personnel (including sub-tier subcontractor personnel) and reporting any unaccounted-for personnel to the emergency coordinator.

C.10.5 REPORTING A SPILL

When a spill is discovered, personnel will the report the occurrence to the FS or HSR, who will immediately contact the PSS, environmental compliance, and the PM and convey as much information as possible (e.g., material involved, estimated quantity spilled/affected, location, affected personnel, other hazardous conditions).

C.10.6 PROTECTIVE ACTIONS FOR SPILL

An effort will be made to stop the release and contain the spill using materials in the on-site spill response kit, only if it is safe to do so and if no unprotected exposures occur. A telephone contact list containing emergency notification phone numbers will be located at the job site.

In the event that personnel are exposed to hazardous chemicals or radioactive materials, appropriate emergency response action will be taken to remove the contaminated clothing. An emergency shower and eyewash station will be used to flush exposed skin and eyes, respectively. This emergency equipment will be maintained in a readily accessible location adjacent to the active work area.

If an acute exposure to airborne chemicals occurs or is suspected and the affected personnel are unable to escape the work zone, the FS or HSR immediately will contact the PSS for assistance. Rescue operations will not be performed unless the rescuers are dressed in the appropriate protective equipment.

Project managers will be responsible for ensuring all spills of hazardous materials are cleaned up properly and disposed of, including any material generated from the spill unless the spill or release is major and requires response by the PGDP Emergency Response team.

The FS or HSR has the following responsibilities:

- Ensure that spill containment is performed safely;
- Provide all known information to the PSS to ensure proper response;
- Ensure that decontamination measures for exposed personnel are conducted safely and promptly;

- Ensure that, if personnel are exposed to airborne chemicals and are unable to escape the work zone, rescue is not attempted unless rescue personnel are dressed in the appropriate protective equipment; and

- Notify environmental compliance for spill reporting and cleanup requirements.

C.11. TEMPERATURE EXTREMES

Ambient temperatures may pose a threat to project personnel; however, the combination of PPE worn in the work zone and ventilation conditions may indicate the need to monitor personnel for heat or cold tolerance and signs of heat or cold stress. Workers will be evaluated prior to beginning operations and assessed as conditions warrant during and after work in PPE. Personnel who are not required to wear PPE are not immune to the potential hazards of heat- or cold-related disorders or conditions and, therefore, may be included in the monitoring program.

C.12. DECONTAMINATION

Contamination of personnel, equipment, and/or material can occur from contact with radiological and/or hazardous material. When decontamination is required, appropriate procedures shall be followed to ensure effective decontamination is achieved and to minimize generation of mixed waste.

The overall objectives of decontamination are as follows:

- Determine and implement the decontamination methods for personnel and equipment that are effective for the specific hazardous/radioactive substance(s) present;

- Ensure the decontamination procedure itself does not pose any additional safety or health hazard;

- Provide pertinent information on the locations and layouts of decontamination stations and equipment; and

- Establish procedures for the collection, storage, and disposal of clothing and equipment that have not been decontaminated completely.

It is assumed that the majority of contamination concerns from the C-340 Complex will be radiological. Disposable PPE and one-time-use items may undergo radiological surveys prior to release for disposal as nonradioactive waste. Reusable equipment may be required to undergo a radiological survey prior to release from a radiological area. If hazardous waste is encountered, IS and RADCON will assist project management in determining additional methods of decontamination. If clothing or equipment is contaminated with both radiological and hazardous material, mixed waste may be generated. All wastes generated during decontamination will be characterized, stored, and disposed of according to applicable or relevant and appropriate requirements. In an effort to reduce waste, consideration shall be given during the planning process on effective ways or methods to minimize the production of trash, PPE waste, etc.

C.13. TRAINING MATRIX

Employees assigned to the C-340 Complex must be trained according to contract and HASP requirements. The minimum training requirements listed in Table C.1 apply to all personnel who perform work in the C-340 Complex.

Table C.1. Training Matrix for the C-340 Complex D&D Project

REQUIRED TRAINING FOR ENTRY INTO C-340 COMPLEX
GET
RAD Worker II
C-340 Complex Health and Safety Plan Required Reading
Asbestos Awareness, for workers not performing abatement
Asbestos Worker with current 8 hour refresher for workers performing abatement
Asbestos Contractor/Supervisor and current 8 hour refresher for abatement supervisors
PCB Awareness
Temperature Extremes
Lead Awareness
Baseline Bioassay
Hearing Conservation
HAZWOPER 40 hour
HAZWOPER 8 hour Supervisor, for Supervisors and Managers
Current HAZWOPER 8 hour refresher
Current HAZWOPER medical physical examination
Respirator Training/Medical Certification

During the progression of work planning, training needs may be identified that are over and above the minimum requirements. If this is the case, the appropriate training will be provided prior to initiating the work activity.

The front line supervisor shall verify employee training status prior to the start of work.

Subcontractors must submit documentation of training to the training manager prior to entering the work site. If an individual is delinquent in any of the required training, entry into C-340 will not be permitted.

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APPENDIX D

LIST OF PROCEDURES

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This appendix includes a non-exhaustive list of DOE contractor procedures used in the decommissioning process. Development of these procedures included input from various functional groups (e.g. Safety and Health, Engineering, Quality Assurance, Project Management, Facility Management, Radiological Control, Work Controls, Training, Environmental Compliance, Waste Certification Officials, Transportation Compliance, Nuclear Safety, Waste Disposition and members of the craft). These procedures may be revised or deleted without update to this Appendix.

- PRS-ENM-0015 R0 *Asbestos Waste Sampling*
- PRS-ENM-0017 R0AC1 *Paint Chip Sampling*
- PRS-ENM-0018 R0FC1 *Sampling Containerized Waste*
- PRS-ENM-2002 R0 *Sampling of Structural Elements and Miscellaneous Surfaces*
- PRS-ESH-1008 R0 *Facility Hazard Assessment*
- PRS-ESH-2010 R1 *Hazard Assessment*
- PRS-ESH-2020 R0FC1 *Hot Work*
- PRS-ESH-5138 R0 *Confined Space Program*
- PRS-ESH-5201 R0 *Asbestos and Other Fibrous Materials*
- PRS-FCD-1010 R0 *Equipment Decontamination and Fixative Application*
- PRS-FCD-2701 R0FC1 *Large Equipment Decontamination*
- PRS-RAD-0301 R0 *Radiological Characterization Data*
- PRS-RAD-0501 R0 *Posting and Labeling Policy for the Paducah Environmental Remediation Project*
- PRS-RAD-1101 R1 *Radiation Exposure Limits*
- PRS-RAD-1107 R1 *Workplace Air Monitoring for Radioactivity*
- PRS-RAD-1109 R1 *Radioactive Contamination Control and Monitoring*
- PRS-RAD-1110 R1 *Radiation Surveys*
- PRS-RAD-1112 R0 *Air Sample Collection, Analysis, and Documentation*
- PRS-RAD-1113 R0 *Handling of Samples Potentially Contaminated with Hazardous Material*
- PRS-RAD-1118R1 *Use and Maintenance of Non-Fissile HEPA Filter-Equipped Vacuum Cleaners*
- PRS-RAD-1119 R1 *Operation and Maintenance of Negative Air Machines*

- PRS-WCE-0012 R2 *Hoisting and Rigging Operations*
- PRS-WCE-0020 R6 *Work Planning*
- PRS-WCE-0021 R4AC1 *Work Execution*
- PRS-WSD-0019 R2 *On-Site Transfer and Movement of Waste Containers and Other Support Equipment*
- PRS-WSD-0022 R3 *Waste Water Accumulation, Storage Treatment, and Disposal*
- PRS-WSD-0437 R5 *Waste Characterization and Profiling*
- PRS-WSD-3015 R6 *Waste Packaging*
- PRS-WSD-3028 R5 *Off-Site Shipping*
- PRS-WSD-9503 R0AC1 *Off-Site Sample Shipping*