Remedial Design and Remedial Action Work Plan for the K Basins Interim Remedial Action: 105-K West Basin Deactivation

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY | Richland Operations Office
P.O. Box 550
Richland, Washington 99352

Approved for Public Release:
Further Dissemination Unlimited
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Date Published
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Signature Sheet

Signature sheet for the Remedial Design and Remedial Action Work Plan for the K Basins Interim Remedial Action: 105-K West Basin Deactivation at the U.S. Department of Energy’s Hanford Site. This action is conducted by the U.S. Department of Energy with the approval of the U.S. Environmental Protection Agency.

[Signature]

Thomas K. Teynor
Federal Project Director for the River Corridor
U.S. Department of Energy, Richland Operations Office

3/17/2011
Date
Signature Sheet

Signature sheet for the Remedial Design and Remedial Action Work Plan for the K Basins Interim Remedial Action: 105-K West Basin Deactivation at the U.S. Department of Energy’s Hanford Site. This action is conducted by the U.S. Department of Energy with the approval of the U.S. Environmental Protection Agency.

Rod A. Lobos
Project Manager
Region 10
U.S. Environmental Protection Agency

3-17-2011
Date
Executive Summary

This work plan describes the remedial design and remedial action activities for deactivating the 105-K West (105-KW) Basin (100-KR-2 Operable Unit, Site 100-K-43). The scope is a portion of the remedial activities being performed at the K Basins. The remedial action activities addressed by this work plan include the following:

- Removing most below-water debris and preparing remaining below-water debris for grouting.
- Retrieving filter media from the basin water filtration systems as well as from the engineered container (EC) retrieval and transfer system decant water filters. The media will either go to direct loadout in a sludge transport and storage container (STSC) or to ECs for loadout in STSCs for transport to T Plant for temporary storage.
- Applying grout to the basin and pit floors, and applying a fixative to below-water concrete surfaces.
- Draining basin water through a temporary water treatment system and transporting to the Effluent Treatment Facility for treatment and disposal at the state-approved land disposal site.
- Draining fluids from mechanical systems and isolating drains.
- De-energizing and/or disconnecting existing support systems, as appropriate.

This remedial design/remedial action work plan (RD/RAWP) provides details of the 105-KW Basin and its associated contaminants, design and regulatory requirements, remediation tasks, project organization, schedules, and cost estimates. The remediation is being performed to implement the decision established in the Interim Remedial Action Record of Decision for the 100-KR-2 Operable Unit K Basins, Hanford Site, Benton County, Washington (EPA/ROD/R10-99/059), commonly referred to as the K Basins Interim Action Record of Decision (ROD). The Amendment to the Record of Decision for the U.S. Department of Energy Hanford Site 100 K Area K Basins Interim Remedial
Action (EPA et al, 2005),\(^2\) commonly referred to as the K Basins Interim Action ROD Amendment, modified the remedy for managing sludge and debris. The K Basins Interim Action ROD Amendment recognized that some debris will remain in the 105-KW Basin and will be encased in grout to be removed as part of the demolition and removal of the basin structure. Upon completion of the deactivation scope under this RD/RAWP, the Basin will be ready for demolition activities to commence.

This RD/RAWP in conjunction with the 105-KW Basin demolition RD/RAWP (DOE/RL-2010-53)\(^3\) satisfies one of the elements identified in Tri-Party Agreement (TPA) Milestone M-016-140 (Ecology et al, 1989a)\(^4\) for the submittal of RD/RAWPs for 100-K Area RODs. Table ES-1 presents a summary of the TPA Milestone M-016-140.

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### Table ES-1. Milestone M-016-140 (RD/RAWP Requirements)

**Submit Revised RD/RA Work Plans for 100-K Area RODs as Primary Document(s) per HFFACO 11.6 with New Proposed Milestones Including for the Following:**

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<thead>
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<th>Current Milestone Deliverable</th>
<th>Required Milestone Elements</th>
<th>Document Number</th>
</tr>
</thead>
</table>
| ☑                            | Complete removal of the K West Basin | DOE/RL-2010-52 (Deactivation)  
|                               |                             | DOE/RL-2010-53 (Demolition)  
| ☐                            | Complete removal of all sludge (includes container, settler tank sludge) from K West Basins except knock out pot contents | DOE/RL-2010-63  
| ☐                            | Complete removal of knock out pot contents | DOE/RL-2010-63  
| ☐                            | Complete treatment and packaging of first container of TRU sludge waste certifiable for disposal at WIPP | DOE/RL-2011-15  
| ☐                            | Complete treatment and packaging of sludge for disposal at WIPP | DOE/RL-2011-15  
| ☐                            | Begin 105-KW reactor interim safe storage | DOE/RL-2005-26, including TPA-CN-432  
| ☐                            | Complete 105-KW reactor interim safe storage | DOE/RL-2005-26, including TPA-CN-432  
| ☐                            | Initiate soil remediation under K West Basin | DOE/RL-96-17, including TPA-CN-320 and TPA-CN-433  
| ☐                            | Complete all interim response actions at the 100-K Area | DOE/RL-96-17, including TPA-CN-320 and TPA-CN-433  

**Sources:**

Contents

1 Introduction ....................................................................................................................................... 1
  1.1 Purpose ...................................................................................................................................... 1
  1.2 Scope ......................................................................................................................................... 1
  1.3 Site Description and Background .............................................................................................. 3
    1.3.1 Physical Setting .............................................................................................................. 3
    1.3.2 Nature and Extent of Contamination ............................................................................. 9

2 Basis for Remedial Action ................................................................................................................ 9
  2.1 Selected Remedy ....................................................................................................................... 9
  2.2 Remedial Action Objectives ...................................................................................................... 9
  2.3 End-Point Criteria .................................................................................................................... 10
    2.3.1 Below-Water Debris .................................................................................................... 10
    2.3.2 Water ............................................................................................................................ 11
    2.3.3 Deactivation ................................................................................................................. 11
  2.4 Remedial Action Goals ......................................................................................................... 11
  2.5 Applicable or Relevant and Appropriate Requirement Compliance ....................................... 12

3 Remedial Design Approach ............................................................................................................ 21
  3.1 Design Basis ............................................................................................................................ 21
  3.2 Design Summary ...................................................................................................................... 21
    3.2.1 Debris ........................................................................................................................... 22
    3.2.2 Grouting ....................................................................................................................... 22
    3.2.3 Water Removal and Transfer ....................................................................................... 23
    3.2.4 Remaining Deactivation Activities ............................................................................... 23

4 Remedial Action Management and Approach ............................................................................. 30
  4.1 Project Team ............................................................................................................................. 30
  4.2 Change Management ............................................................................................................... 30
  4.3 Remedial Action Work Tasks .................................................................................................. 31
    4.3.1 Access Controls ........................................................................................................... 31
    4.3.2 Construction .................................................................................................................. 31
    4.3.3 Radiological Survey ..................................................................................................... 36
    4.3.4 Planning Documentation .............................................................................................. 37
    4.3.5 Verification .................................................................................................................. 37

5 Environmental Management and Controls .................................................................................. 37
  5.1 Air Emissions .......................................................................................................................... 37
    5.1.1 Criteria/Toxic Air Emissions ....................................................................................... 37
  5.2 Waste Management .............................................................................................................. 38
5.3 Cultural/Ecological Resources
5.4 Safety and Health Program
5.5 Quality Assurance Program

6 Remedial Action Completion
6.1 End-Point Criteria
6.2 Project Completion Documentation

7 Milestones, Cost, and Schedule
7.1 Milestones
7.2 Cost and Schedule

8 References

Figures

Figure 1. 105-KW Basin Interim Remedial Action Scope
Figure 2. Site Map
Figure 3. The 105-KW Basin in the 100-K Area of the Hanford Site Adjacent to the Columbia River
Figure 4. Aerial View of the 100-K Area (1966; 42216-4CN 051066)
Figure 5. 100-K Area Water Table Map, March 2007
Figure 6. 105-KW Basin General Layout
Figure 7. 105-KW Basin Below-Water Configuration
Figure 8. Water Removal System Configuration
Figure 9. IWTS Settler System
Figure 10. Engineered Container for Sludge Storage

Tables

Table 1. Milestone M-016-140 (RD/RAWP Requirements)
Table 2. ARARs or TBCs for K Basins Interim Remedial Action
Table 3. Filter Media Volumes
Table 3. Summary of Relevant Tri-Party Agreement Milestones
Table 4. Estimated Cost and Schedule
## Terms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>105-KE</td>
<td>105-K East</td>
</tr>
<tr>
<td>105-KW</td>
<td>105-K West</td>
</tr>
<tr>
<td>ACM</td>
<td>asbestos-containing material</td>
</tr>
<tr>
<td>ALARA</td>
<td>as low as reasonably achievable</td>
</tr>
<tr>
<td>ALARACT</td>
<td>as low as reasonably achievable control technology</td>
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<td>ARAR</td>
<td>applicable or relevant and appropriate requirement</td>
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<td>CERCLA</td>
<td><em>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</em></td>
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<td>engineered container</td>
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<td>Engineered Container Retrieval and Transfer System</td>
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<td>Environmental Restoration Disposal Facility</td>
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<td>Effluent Treatment Facility</td>
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<tr>
<td>HASP</td>
<td>health and safety plan</td>
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<td>high-efficiency particulate air</td>
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<td>IXM</td>
<td>ion exchange module</td>
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<td>IWTS</td>
<td>Integrated Water Treatment System</td>
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<td>KOP</td>
<td>knock out pot</td>
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<td>NESHAP</td>
<td>National Emission Standards for Hazardous Air Pollutants</td>
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<td>NLOP</td>
<td>North Loadout Pit</td>
</tr>
<tr>
<td>OU</td>
<td>operable unit</td>
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<tr>
<td>PCB</td>
<td>polychlorinated biphenyl</td>
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<td>RACM</td>
<td>regulated asbestos-containing material</td>
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<td>RACT</td>
<td>reasonably available control technology</td>
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<tr>
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<td>RAWP</td>
<td>remedial action work plan</td>
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<tr>
<td>RD</td>
<td>remedial design</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>---------</td>
<td>--------------------------------------------------</td>
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<tr>
<td>ROD</td>
<td>record of decision</td>
</tr>
<tr>
<td>RQ</td>
<td>reportable quantity</td>
</tr>
<tr>
<td>RWP</td>
<td>radiological work permit</td>
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<tr>
<td>SALDS</td>
<td>state-approved land disposal site</td>
</tr>
<tr>
<td>SAP</td>
<td>sampling and analysis plan</td>
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<tr>
<td>SNF</td>
<td>spent nuclear fuel</td>
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<td>STSC</td>
<td>sludge transport and storage container</td>
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<tr>
<td>T-BACT</td>
<td>Best Available Control Technology for Toxics</td>
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<tr>
<td>TBC</td>
<td>to be considered</td>
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<tr>
<td>TPA</td>
<td>Tri-Party Agreement</td>
</tr>
<tr>
<td>Tri-Party Agreement</td>
<td>Hanford Federal Facility Agreement and Consent Order</td>
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<td>TRU</td>
<td>transuranic</td>
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<tr>
<td>WACr</td>
<td>Waste Acceptance Criteria</td>
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1 Introduction

This remedial design/remedial action work plan (RD/RAWP) provides details of the 105-K West (105-KW) Basin and its associated contaminants, design and regulatory requirements, remediation tasks, project organization, schedules, and cost estimates for deactivating the 105-KW Basin (100-KR-2 Operable Unit [OU], Site 100-K-43). The remediation is being performed to implement the decision established in the Interim Remedial Action Record of Decision for the 100-KR-2 Operable Unit K Basins, Hanford Site, Benton County, Washington (EPA/ROD/R10-99/059) (K Basins Interim Action Record of Decision [ROD]) and the Amendment to the Record of Decision for the U.S. Department of Energy Hanford Site 100 K Area K Basins Interim Remedial Action (EPA et al, 2005) (K Basins Interim Action ROD Amendment).

1.1 Purpose

This RD/RAWP describes how the selected remedy will be designed and implemented to meet the relevant remedial action objectives (RAOs) identified in the K Basins Interim Action ROD (EPA/ROD/R10-99/059). The selected remedy components addressed herein include: (1) managing below-water basin debris; (2) retrieving filter media; (3) applying grout to the basin floor, pits, and debris; (4) draining basin water; and (5) deactivating basin support systems (e.g., electric, heat, water). This design prepares the 105-KW Basin for near-term demolition and disposal.

This RD/RAWP in conjunction with the 105-KW Basin demolition RD/RAWP (DOE/RL-2010-53) satisfies one of the elements identified in Tri-Party Agreement (TPA) Milestone M-016-140 (Ecology et al, 1989a, Hanford Federal Facility Agreement and Consent Order, also known as the Tri-Party Agreement) for the submittal of RD/RAWPs for 100-K Area RODs. Table 1 presents a summary of RD/RAWP requirements under TPA Milestone M-016-140.

1.2 Scope

This RD/RAWP addresses the remedial actions to be implemented to deactivate the 105-KW Basin, which will allow for subsequent demolition. The deactivation scope that will satisfy the End Point Criteria for the K Basins Interim Remedial Action (HNF-20632) for deactivation consists of the following:

- Removing most below-water debris and preparing remaining below-water debris for grouting.
- Retrieving filter media from the basin water filtration systems as well as from the engineered container (EC) retrieval and transfer system decant water filters. The media will either go to direct loadout in a sludge transport and storage container (STSC) or to ECs for loadout in STSCs for transport of STSCs to T Plant for temporary storage.
- Applying grout to the basin and pit floors, and applying a fixative to below-water concrete surfaces.
- Draining basin water through a temporary water treatment system and transporting to the Effluent Treatment Facility (ETF) for treatment and disposal at the state-approved land disposal site (SALDS).
- Draining fluids from mechanical systems and isolating drains.
- De-energizing and/or disconnecting existing support systems, as appropriate.

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</table>

Sources:
105-KW Basin Deactivation is a part of the larger Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) response action for the K Basins Interim Action ROD (EPA/ROD/R10-99/059). Figure 1 identifies the deactivation activities presented in this RD/RAWP, along with their relationship to the overall remedial action. The majority of the deactivation activities will commence upon completion of activities to satisfy some of the end-point criteria for sludge removal (HNF-20632) including the following:

- **Sludge has been removed from the floor and pits of the basin to the maximum extent practicable in accord with a qualified process approved by DOE-RL and EPA for management as low-level or TRU waste.**

- **Sludge has been removed to the extent that residues on the floor or in debris, and within other matrices has been estimated and documented to demonstrate that the basin demolition waste streams satisfy the ERDF WACr.**

- **KOP material has undergone separation in accordance with an approved RDR/RAWP to yield and remove a KOP product material for management as SNF and other sludge for management as low-level or TRU waste, consistent with the Record of Decision.**

- **Some deactivation activities such as debris removal and draining fluids from systems, can commence prior to completion of sludge removal (DOE/RL-2010-63, DOE/RL-2010-63, 2011, Remedial Design/Remedial Action Work Plan for the K Basins Interim Remedial Action: Removal of K Basins Sludge from the River Corridor to the Central Plateau and Removal of the Knock Out Pot Contents from the K Basins) scope. Upon completion of deactivation scope under this RD/RAWP, the basin will be ready for demolition activities to commence.**

### 1.3 Site Description and Background

The 105-KW Basin is located in the northern part of the U.S. Department of Energy (DOE) Hanford 100 Area, Hanford Site, Benton County, Washington, adjacent to the Columbia River (Figure 2). The basin received spent nuclear fuel (SNF) from the 105-K East (105-KE) Basin, N Reactor Basin, and from the cleanup of 100 Area burial grounds. The rectangular concrete basin is approximately 38 m (125 ft) long and 20 m (67 ft) wide and adjoins the reactor building (Figure 3). The basin is filled with approximately 5 m (16 ft) of water to provide radiation shielding for facility workers and to minimize the release of radioactive particles to the atmosphere. The K Basins Interim Action ROD (EPA/ROD/R10-99/059) provides a detailed description of the background of the K Basins.

#### 1.3.1 Physical Setting

Background information on the Hanford Site, the 100 Area, and the 105-KW Basin is included in the Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan Addendum 2: 100-KR-1, 100-KR-2, and 100-KR-4 Operable Units (DOE/RL-2008-46-ADD2) and the K Basins Interim Action ROD (EPA/ROD/R10-99/059). This RD/RAWP provides a brief summary.

The Hanford Site lies in a sediment-filled basin on the Columbia Plateau in southeastern Washington (Figure 2). The 100 Area is located in the northern portion of the Hanford Site, along the southern shore of the Columbia River. Between 1943 and 1963, nine plutonium production reactors were built to produce special nuclear materials for national defense activities. The 100-K Area includes two of these reactors, 105-KE and 105-KW, and covers an area of approximately 3.1 km² (1.2 mi²) (Figure 4).
Figure 1. 105-KW Basin Interim Remedial Action Scope
Figure 2. Site Map

Figure 3. The 105-KW Basin in the 100-K Area of the Hanford Site Adjacent to the Columbia River
The 100-K Area is situated on a relatively flat and level terracing near the Columbia River with elevations generally between 120 and 150 m (394 and 492 ft) above mean sea level. Except near the river, the 100-K Area is characterized by low relief and gentle slopes. The 100-K Area had been extensively disturbed and graded during reactor construction in the 1950s through present-day waste site remedial activities. Topography changes are greatest near the river where surface elevations drop to approximately 116 m (380 ft).

Groundwater is found beneath the Hanford Site in an upper, primarily unconfined aquifer system and in deeper, confined aquifers within basalt. The Columbia River is the primary discharge area for both the unconfined and confined aquifers. The unconfined aquifer in the 100 Area occurs in the Ringold Formation. Groundwater in the unconfined aquifer flows from areas where the water table is higher (east of the 100-K Area reactors) to areas where it is lower (the Columbia River). Flows are typically perpendicular to the shoreline, with a minor component of along-shore flow. Since 1997, groundwater flow has been influenced by treated water injection activities (which cause water table mounding) and groundwater extraction activities (which lower water levels locally) (Figure 5). Post-operation groundwater flow moves radially away from treatment system injection wells (DOE/RL-2008-01, Hanford Site Groundwater Monitoring for Fiscal Year 2007). Columbia River stage fluctuations also impact the groundwater movement patterns, water levels, and discharge rates to the river. A long-term trend of groundwater levels following river stage fluctuations is apparent for most wells.
The Hanford Site is characterized by a semiarid, shrub-steppe climate in the driest and warmest portion of the Columbia Basin. Surface winds blow predominantly from the northwest during winter and summer and from the southwest in the spring and fall. Average monthly wind speeds are lowest during the winter, averaging 10 km/h (6 mi/h) and highest during the summer, averaging 15 km/h (9 mi/h). The monthly average temperature ranges from a low of -0.24°C (31.7 °F) in January to a high of 24.6°C (76.3°F) in July. Annual precipitation measurements typically range from approximately 8.7 to 28.8 cm (3.4 to 11.3 in.). Most precipitation occurs during late fall and winter, with more than one-half of the annual amount occurring from November through February. Winter monthly average snowfall ranges from 0.8 to 13.5 cm (0.3 to 5.3 in.).
1.3.2 Nature and Extent of Contamination

Contamination in the 105-KW Basin includes a radioactive mix of fuel corrosion products, small fuel fragments, iron and aluminum oxides, concrete grit, sand, dirt, polychlorinated biphenyl (PCBs), and operational and biological debris. Operational data suggest there has been historical leakage from the 105-KW Basin; however, no evidence from monitoring data suggests that water loss from the 105-KW Basin has impacted area groundwater.

2 Basis for Remedial Action

This chapter provides a brief description of the selected remedy, RAOs, and applicable or relevant and appropriate requirements (ARARs) for the work covered under this RD/RAWP.

2.1 Selected Remedy

The K Basins Interim Action ROD (EPA/ROD/R10-99/059) requires SNF, sludge, water, and debris be removed from the K Basins and placed in storage pending future treatment. The K Basins Interim Action ROD Amendment (EPA et al, 2005) eliminated the extended storage of untreated sludge, required sludge be treated for disposal, and required treated sludge be delivered to a national repository for disposal. The K Basins Interim Action ROD Amendment (EPA et al, 2005) also authorized leaving debris in the basins to be encased in grout and removed as part of the basin structure demolition. Calculations will be performed, as necessary, to verify that waste material will satisfy Environmental Restoration Disposal Facility (ERDF) waste acceptance criteria. This RD/RAWP addresses the work necessary to accomplish the following:

- Removing most below-water debris and preparing remaining below-water debris for grouting.
- Retrieving filter media from the basin water filtration systems as well as from the EC retrieval and transfer system decant water filters. The media will either go to direct loadout in an STSC or to ECs for loadout in STSCs for transport of STSCs to T Plant for temporary storage.
- Applying grout to the basin and pit floors, and applying a fixative to below-water concrete surfaces.
- Draining basin water through a temporary water treatment system and transporting to the ETF for treatment and disposal at the SALDS.
- Draining fluids from mechanical systems and isolating drains.
- De-energizing and/or disconnecting existing support systems, as appropriate.

Completing the basin deactivation work scope prepares the basin for subsequent demolition and removal under the Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington (EPA/ROD/R10-99/039), commonly referred to as the 100 Area Remaining Sites ROD.

2.2 Remedial Action Objectives

Achieving the RAOs applicable to this RD/RAWP, as presented in the K Basins Interim Remedial Action ROD and amendment (EPA/ROD/R10-99/059; EPA et al, 2005), will be as follows:

- Reduce the potential for future releases of hazardous substances from the K Basins to the environment.
- Remove hazardous substances from the K Basins near the Columbia River in a safe and timely manner.
- Provide for safe treatment, storage, and final disposition of the water, and debris removed from the K Basins.

This RAO will be met in part by removing debris, applying grout to debris and residual sludge left in the basin, and removing the basin water. Basin water will be filtered and transferred to the ETF for treatment and disposal to the SALDs. Grouted debris and residual sludge will be removed during subsequent demolition of the basin, as addressed in DOE/RL-2010-53, Remedial Design and Remedial Action Work Plan for the 100 Area Remaining Sites Interim Remedial Action: 105-K West Basin Demolition and Removal.

- Reduce occupational radiation exposure to workers at the basins.

This RAO will be met through a DOE-approved radiation protection program that implements the requirements of 10 CFR 835, “Occupational Radiation Protection” and through implementation of as low as reasonably achievable (ALARA) measures.

### 2.3 End-Point Criteria

The end-point criteria identified in HNF-20632 relative to the scope of activities addressed in this RD/RAWP are as follows:

#### 2.3.1 Below-Water Debris

1. A visual examination will be performed to identify those types of debris that must be removed and disposed separately (e.g., materials prohibited from being disposed at the ERDF). These materials will be removed, treated as appropriate, and transferred to disposal or storage facilities in the 200 Area. Debris that would designate as a dangerous waste and cannot be treated by macroencapsulation, washing, and so forth, which would allow this type of debris to be treated in situ and grouted, will be removed, treated as appropriate, and transferred to disposal or storage facilities in the 200 Area.

2. Debris that will remain in the basin for removal during basin demolition has undergone a process to remove sludge to the maximum extent practicable and to the extent necessary that sludge residues on or in the debris do not result in a waste form that exceeds the ERDF WACr, as determined according to an approved SAP.

3. Debris that could contain sludge in its internal volume:
   a. Has been sectioned to expose its internal volume such that sludge removal can be conducted to the maximum extent practicable.
   b. Has undergone internal flushing to remove the sludge inventory to the maximum extent practicable.
   c. Since the basin will not transition to a period of surveillance and maintenance prior to demolition, but will transition directly to demolition, debris will be left in those cases where it is impractical to remove it, providing it has been accounted for such that the sludge residues on the floor, on or in debris, and within other matrices grouted in the basin (e.g., debris containers) do not result in the basin
or debris containers in the basin to exceed the ERDF WACr as determined according to an approved SAP and final ERDF-compliant calculation.

d. A small population of debris items that with potential to contain sludge hold up will be provided to EPA with the holdup estimated and be included in the final ERDF-compliant calculation demonstrating a negligible contribution to the overall sludge residual.

4. Debris that will be grouted below water for removal during basin demolition has been oriented or sectioned such that free liquids (basin water) in void spaces are displaced by grout.

5. Debris that will be left below water for removal during basin demolition has been inventoried, characterized, and its location mapped.

6. Below-water debris made of aluminum and considered for below-water grouting will be evaluated for the potential to generate unacceptable levels of hydrogen and will be prepared appropriately for encapsulation in grout or removed and transferred to disposal or storage facilities in the 200 Area.

High-dose items may be left behind in the basin in containers, and void spaces filled with grout, as an ALARA measure to protect future demolition workers and the public from dose and contamination during removal of these items during basin demolition.

2.3.2 Water

The conditions that must exist to consider that the K Basins interim remedial action is complete with respect to water removal are:

1. Water has been removed from the basin to the extent that only residual amounts of water that cannot be readily pumped remain.

2. Water removed from the basin has been transferred to the ETF for disposal as described in the RDR/RAWP for the K Basins Interim Remedial Action.

2.3.3 Deactivation

The conditions that must exist to consider that the K Basins interim remedial action is complete with respect to basin deactivation are:

1. The end-point criteria for fuel removal, sludge removal, debris removal, and water removal have been met.

2. Building interior surfaces are decontaminated or shielded to dose rates that meet ARARs and ALARA requirements, and where necessary fixatives have been applied to control airborne contamination.

3. Support systems such as electrical, heating, ventilation, air conditioning, water supply, and monitoring that are not required for future environmental compliance or personnel safety purposes will be de-energized.

2.4 Remedial Action Goals

Remedial action goals are not applicable to work performed under this RD/RAWP. End-point criteria for the 105-KW deactivation activities contained in this RD/RAWP are identified in HNF-20632.
2.5 Applicable or Relevant and Appropriate Requirement Compliance

The “National Oil and Hazardous Substances Pollution Contingency Plan” (40 CFR 300), the K Basins Interim Action ROD (EPA/ROD/R10-99/059), and the K Basins Interim Action ROD Amendment (EPA et al, 2005) require that the remedial actions described in this RD/RAWP comply with federal and state ARARs and to be considereds (TBCs). This section discusses which ARARs and TBCs apply to the scope of this RD/RAWP and how those ARARs and TBCs will be met during the associated work.

Table 2 identifies specific regulatory sections that are ARAR or TBC to this work, with corresponding explanatory text.

<table>
<thead>
<tr>
<th>Citation</th>
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<th>Means of Implementation</th>
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<tbody>
<tr>
<td>“Designation, Reportable Quantities, and Notification” (40 CFR 302)</td>
<td>ARAR</td>
<td>These requirements apply to new releases of CERCLA hazardous substances that occur or are discovered. Determinations under 40 CFR 302 are based on the identification of any release that exceeds the regulatory reportable quantity (RQ) for a listed hazardous substance.</td>
<td>The substantive requirements of 40 CFR 302 for determining RQs will be applied to any new release that is identified. DOE and EPA project managers will be notified if a new release occurs or is discovered during the work. This is an action-specific requirement.</td>
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<tr>
<td>Regulations pursuant to the Toxic Substances Control Act (TSCA), 15 USC 2601 et seq.</td>
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<tr>
<td>“Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions” (40 CFR 761) “Applicability” (40 CFR 761.50(b)1, 2, 3, 4, and 7; 40 CFR 761.50(c) “Disposal Requirements” (40 CFR 761.60(a),(b), and (c)) “PCB Remediation Waste” (40 CFR 761.61) “PCB Bulk Product Waste” (40 CFR 761.62) “Decontamination Standards and Procedures” (40 CFR 761.79)</td>
<td>ARAR</td>
<td>These regulations apply to the storage and disposal of PCB wastes including liquid PCB wastes, PCB items, PCB remediation waste, PCB bulk product wastes, and PCB/ radioactive wastes at concentrations equal to or greater than 50 ppm. These regulations also provide options for decontamination of materials contaminated with PCBs.</td>
<td>Some materials and/or debris addressed under this remedial action could include various forms of PCB wastes, including, but not limited to, PCB items, PCB liquids, PCB articles, PCB remediation waste, and/or containers that would be managed in accordance with the substantive requirements of these standards if encountered and/or generated during the remedial action. The substantive provisions of this regulation apply to sludge and debris that will be removed from the basin. This is a chemical-specific requirement.</td>
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</table>
Table 2. ARARs or TBCs for K Basins Interim Remedial Action

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<tr>
<td>Regulations pursuant to the <em>Clean Air Act of 1977, 42 USC 7401</em>, et seq.</td>
<td>ARAR</td>
<td>This regulation sets limits for radionuclide emissions, which cannot exceed those amounts that would cause any member of the public to receive an effective dose equivalent of 10 mrem/yr or greater. Emissions shall be monitored per 40 CFR 61.93.</td>
<td>Some activities under this remedial action could potentially contain radioactive constituents. Potential emissions from work under the non-time-critical removal action would be performed in accordance with substantive provisions of this standard. This is an action-specific requirement.</td>
</tr>
<tr>
<td>“National Emission Standards for Hazardous Air Pollutants” (40 CFR 61)</td>
<td>ARAR</td>
<td>These standards apply to demolition activities, including the removal of RACM. The standards of 40 CFR 61.145(a)(1) and (2) are used to determine when the requirements of 40 CFR 61.145(c) apply to demolition activities. The standards of 40 CFR 61.150 are used to control asbestos emissions during collecting, processing, packaging, and transporting of any asbestos-containing waste material.</td>
<td>Some work under the remedial action could involve materials that contain asbestos. The substantive provisions of 40 CFR 61.145(c) will be followed in accordance with 40 CFR 61.145(a)(1) and (2) for demolishing structures that contain RACM under this remedial action. The substantive provisions of 40 CFR 61.150 would be met during activities that involve collecting, processing, packaging, and transporting asbestos-containing waste material under the remedial action. This is an action-specific requirement.</td>
</tr>
<tr>
<td>“Standard for Demolition and Renovation” (40 CFR 61.145)</td>
<td>ARAR</td>
<td>The dose limits considered relevant and appropriate are the doses to an individual member of the public that cannot exceed 0.1 mrem/yr (100 mrem/year) total effective dose equivalent, and the 2 mrem/hr from external sources in an unrestricted area.</td>
<td>DOE performs a comprehensive sitewide environmental monitoring program at the Hanford Site. This is an action-specific requirement.</td>
</tr>
<tr>
<td>“Standard for Waste Disposal for Manufacturing, Fabricating, Demolition, Renovation, and Spraying Operations” (40 CFR 61.150)</td>
<td>ARAR</td>
<td>The dose limits considered relevant and appropriate are the doses to an individual member of the public that cannot exceed 0.1 mrem/yr (100 mrem/year) total effective dose equivalent, and the 2 mrem/hr from external sources in an unrestricted area.</td>
<td>DOE performs a comprehensive sitewide environmental monitoring program at the Hanford Site. This is an action-specific requirement.</td>
</tr>
<tr>
<td>Atomic Energy Act, 42 USC 2011, et seq.</td>
<td>ARAR</td>
<td>The dose limits considered relevant and appropriate are the doses to an individual member of the public that cannot exceed 0.1 mrem/yr (100 mrem/year) total effective dose equivalent, and the 2 mrem/hr from external sources in an unrestricted area.</td>
<td>DOE performs a comprehensive sitewide environmental monitoring program at the Hanford Site. This is an action-specific requirement.</td>
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<tr>
<td>“Licensing Requirements for Land Disposal of Radioactive Waste” (10 CFR 61)</td>
<td>ARAR</td>
<td>This standard provides for licensing for land disposal of radioactive wastes by the Nuclear Regulatory Commission.</td>
<td>The substantive provisions of the general prohibition on near-surface disposal of greater-than-Class C radioactive waste and the general performance objectives of 10 CFR 61.40, “General Requirement,” are relevant and appropriate to this work. This is an action-specific requirement.</td>
</tr>
<tr>
<td>“Environmental Radiation Protection Standards for Nuclear Power Operations” (40 CFR 190)</td>
<td>ARAR</td>
<td>The dose standards considered relevant and appropriate are the public dose limit of 25 mrem/year to the whole body, 75 mrem/year to the thyroid, and 25 mrem/year to any other organ.</td>
<td>DOE performs a comprehensive sitewide environmental monitoring program at the Hanford Site. This is an action-specific requirement.</td>
</tr>
<tr>
<td>“Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes” (40 CFR 191)</td>
<td>ARAR</td>
<td>These standards apply to facilities used for disposal of SNF, high-level, and TRU wastes. Onsite disposal at the Hanford Site of TRU and high-level waste is prohibited.</td>
<td>TRU waste will be sent to 200 Area Waste Management facilities for temporary storage pending treatment and packaging for disposal. This remedial action does not involve onsite disposal of SNF, high-level, or TRU waste. This is a chemical-specific requirement.</td>
</tr>
<tr>
<td>“Occupational Radiation Protection” (10 CFR 835)</td>
<td>ARAR</td>
<td>This regulation is applicable to all activities undertaken by the K Basins Interim Remedial Action.</td>
<td>A DOE-approved radiation protection program is in place that implements the requirements of 10 CFR 835 and describes how radiological design reviews are to be performed, to ensure that the DOE requirements for radiological design are incorporated into the designs for new facilities and equipment, and modifications of existing facilities and equipment. This is an action-specific requirement.</td>
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<td><strong>Hazardous Materials Transportation Act, 49 USC 1801-1813</strong></td>
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<tr>
<td>“General Information, Regulations, and Definitions” (49 CFR 171)</td>
<td>ARAR</td>
<td>This regulation is applicable to any offsite transportation of potentially hazardous material, including samples and waste generated by the K Basins Interim Remedial Action.</td>
<td>Residual sludge contained in filter media will eventually be shipped offsite. Samples shipped offsite will conform with work processes designed to satisfy the transportation requirements. The substantive standards of these regulations will apply to wastes packaged for transport from the 105-KW Basin to other locations. This is a chemical-specific requirement.</td>
</tr>
<tr>
<td><strong>Endangered Species Act of 1973</strong> (16 USC 1531, et seq., subsection 16 USC 1536(c))</td>
<td>ARAR</td>
<td>These laws and implementing regulations prohibit actions by federal agencies that are likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification or critical habitat.</td>
<td>The remedial action will be implemented at a location where such species could be encountered during the work. Substantive requirements of this act are potentially applicable if threatened or endangered species are identified in areas where the response action will occur. If the work is within critical habitat or buffer zones surrounding threatened or endangered species, mitigation measures must be taken to protect the resource in accordance with substantive requirements of these laws and regulations. This is a location-specific requirement.</td>
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<td><strong>National Historic Preservation Act of 1966</strong> (16 USC 470, Section 106)</td>
<td>ARAR</td>
<td>The National Historic Preservation Act of 1966 requires that historic properties be appropriately considered in planning federal initiatives and actions. These laws also require federal agencies to consider the impacts of their undertaking on cultural properties through identification, evaluation, and mitigation processes, and consultation with interested parties.</td>
<td>Based on past identification of cultural and historic sites at the Hanford Site, these types of sites could be encountered during the remedial action. The substantive requirements of this act are potentially applicable to and would comply with actions that might disturb these types of sites. A historic review has been performed to identify items and properties of historic interest (Prendergast, 2004, “Cultural Resources Review of Ground Disturbing Activities Associated with the Decontamination, Decommissioning and Demolition of Spent Nuclear Fuel Facilities at 100K, Hanford Site, Richland, Washington [HCRC No. 2003-100-021]”). This is a location-specific requirement.</td>
</tr>
<tr>
<td><strong>Archeological and Historic Preservation Act of 1974</strong> (16 USC 469a-1 – 469a-2(d))</td>
<td>ARAR</td>
<td>These laws apply to activities that could cause the loss of any archaeological or historic data. This act mandates preservation of the data and does not require protection of the actual site.</td>
<td>Based on past identification of archeological and historic sites at the Hanford Site, the substantive requirements of this Act are potentially applicable for actions that might disturb these sites. A cultural resource review has been performed to identify sites of cultural value (Prendergast, 2004, “Cultural Resources Review of Ground Disturbing Activities Associated with the Decontamination, Decommissioning and Demolition of Spent Nuclear Fuel Facilities at 100K, Hanford Site, Richland, Washington [HCRC No. 2003-100-021]”). This is a location-specific requirement.</td>
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<td><strong>Hanford Reach Study Act</strong>  (Public Law 100-605)</td>
<td>ARAR</td>
<td>This law required an analysis of protection alternatives for the Hanford Reach.</td>
<td>Based on the fact that the remedial action takes place near the Columbia River and requires minimizing and providing mitigation for direct and adverse impacts on the river, the substantive requirements of this act are potentially applicable to the work.</td>
</tr>
<tr>
<td><strong>Resource Conservation and Recovery Act, 42 USC 6901, et seq.</strong></td>
<td>ARAR</td>
<td>These standards provide for the treatment of dangerous wastes that will be land disposed.</td>
<td>The substantive provisions of this regulation will be applicable to dangerous and/or mixed wastes that may be generated during this work, if such wastes will be land-disposed. This is an action-specific requirement.</td>
</tr>
<tr>
<td><strong>Regulations pursuant to the Washington Clean Air Act, RCW 70.94</strong></td>
<td>ARAR</td>
<td>These regulations establish the monitoring, testing, and quality assurance requirements for radioactive air emissions from major sources. These regulations also include requirements for continuous sampling and provide for periodic (grab samples) in cases where continuous sampling is not practical and radionuclide emission rates are relatively constant. These regulations also provide the means by which alternative effluent flow rate measurement procedures or site selection and sample extraction procedures may be used, as approved by the lead agency. These regulations also establish requirements to monitor nonpoint and fugitive emissions of radioactive material.</td>
<td>There is a potential for generating fugitive, diffuse, and/or point source emissions during this remedial action. Requirements limiting emissions, emission controls, and emission monitoring apply. The methods that will be used to control radioactive emissions are described in this RD/RAWP. Fugitive and point source emissions from the 105-KW Basin will be monitored in accordance with substantive requirements. This is an action-specific requirement.</td>
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<tr>
<td>Regulations pursuant to the <em>Hazardous Waste Management Act</em>, RCW 70.105</td>
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<tr>
<td>“Dangerous Waste Regulations,” “Identifying Solid Waste” (WAC 173-303-016)</td>
<td>ARAR</td>
<td>This regulation applies for determining which materials are and are not solid waste. This determination is used to establish which wastes are subject to the designation procedures of WAC 173-303-070(3), “Designation of Dangerous Waste.” Wastes that are newly generated during the work will be subject to the substantive provisions of this regulation to determine what portion, if any, is subject to the procedures of WAC 173-303-070(3). This is an action-specific requirement.</td>
<td></td>
</tr>
<tr>
<td>“Designation of Dangerous Waste” (WAC 173-303-070(3))</td>
<td>ARAR</td>
<td>This regulation applies for the evaluation of solid wastes to determine if such wastes are designated as dangerous or mixed waste. Solid wastes that are designated as dangerous or mixed wastes are subject to the management and disposal standards of WAC 173-303, “Dangerous Waste Regulations.” The nonradioactive component of wastes that are newly generated from the work will be evaluated according to the substantive provisions of this regulation. Wastes that are determined to designate as dangerous or mixed wastes will be managed in accordance with the requirements of WAC 173-303 upon transfer to the receiving facility. Currently, the nonradioactive component of sludge is not designated as a dangerous waste under WAC 173-303. New waste streams that designate and that are not treated prior to transport to remove dangerous waste characteristics would be managed as radioactive mixed wastes at the receiving facility. This is an action-specific requirement.</td>
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</tr>
<tr>
<td>“Land Disposal Restrictions” (WAC 173-303-140(4))</td>
<td>ARAR</td>
<td>This regulation establishes state standards for land disposal of dangerous waste and incorporates by reference the federal land disposal restrictions of 40 CFR 268 that are applicable to solid waste designated as dangerous or mixed waste in accordance with WAC 173-303-070(3). Dangerous and/or mixed wastes that are newly generated during the work will be treated to meet land disposal restrictions if destined for land disposal. This is an action-specific requirement.</td>
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<tr>
<td>“Requirements for Generators of Dangerous Waste” (WAC 173-303-170(3))</td>
<td>ARAR</td>
<td>This regulation establishes standards for the temporary management of wastes that are designated as dangerous or mixed waste. WAC 173-303-170(3) includes by reference the substantive provisions of both the satellite accumulation standards for management in containers under WAC 173-303-630, “Use and Management of Containers,” and under WAC 173-303-640, “Tank Systems.”</td>
<td>Dangerous and/or mixed wastes that are newly generated during the work will be treated to meet land disposal restrictions if destined for land disposal. This is an action-specific requirement.</td>
</tr>
<tr>
<td>“Ambient Air Quality Standards and Emission Limits for Radionuclides,” “General Standards for Maximum Permissible Emissions” (WAC 173-480-050)</td>
<td>ARAR</td>
<td>This regulation establishes general standards for all radionuclide emission units and requires emission units to meet WAC 246-247, requiring every reasonable effort to maintain radioactive materials in effluents to unrestricted areas, ALARA. The regulation indicates that control equipment for the facilities operating under ALARA shall be defined as RACT and ALARACT. This regulation applies for determining compliance with radioactive emission standards. Compliance with the public dose standard is determined by calculating exposure at the point of maximum annual air concentration in a location in which the public may be located in an unrestricted area.</td>
<td>The potential for fugitive and diffuse emissions due to deactivation and transfer activities will require efforts to minimize these emissions. Fugitive and diffuse emissions resulting from activities under this remedial action will be performed in substantive compliance with the public dose standard during the work. This is an action-specific requirement.</td>
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<tr>
<td>“General Regulations for Air Pollution Sources” (WAC 173-400)</td>
<td>ARAR</td>
<td>These laws and regulations require all sources of air contaminants to meet standards for visible emissions, fallout, fugitive emissions, odors, emissions detrimental to persons or property, sulfur dioxide, concealment and masking, and fugitive dust. Requires use of RACT.</td>
<td>The potential exists for fugitive emissions during performance of the remedial action. Substantive requirements of the general standards for control of fugitive emissions would be applied, as appropriate, to minimize the generation of fugitive dust that occurs during building modification and material transfer activities. This is an action-specific requirement.</td>
</tr>
<tr>
<td>“General Standards for Maximum Emissions” (WAC 173-400-040(3) and (8))</td>
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<tr>
<td>“Requirements for New Sources in Attainment or Unclassifiable Areas” (WAC 173-400-113)</td>
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<tr>
<td>“Controls for New Sources of Toxic Air Pollutants” (WAC 173-460)</td>
<td>ARAR</td>
<td>These regulations apply for determination of de minimis emission values and for establishment of control technology, as appropriate, for new or modified toxic air pollutant sources likely to increase toxic air pollutant emissions. Requires T-BACT for regulated emissions of toxic air pollutants and demonstration that emissions of toxic air pollutant will not endanger human health or safety.</td>
<td>It is not expected that work done under the response action will trigger standards for T-BACT. However, substantive requirements of these regulations potentially would be applicable if treatment technologies are used that emit toxic air emissions. This is an action-specific requirement.</td>
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<tr>
<td>“Applicability” (WAC 173-460-030)</td>
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<td>“Control Technology Requirements” (WAC 173-460-060)</td>
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<td>“Ambient Impact Requirement” (WAC 173-460-070)</td>
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<tr>
<td>“Table of ASIL, SQER and de Minimis Emission Values” (WAC 173-460-150)</td>
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<tr>
<td>“Radiation Protection of the Public and the Environment,” 10 CFR 834, proposed at 58 FR 16268</td>
<td>TBC</td>
<td>This proposed rule included public dose limits of 100 mrem/year total effective dose equivalent.</td>
<td>These public dose limits are to be considered as limits for activities undertaken as part of the remedial action. Note that these TBC standards are the same standards as enforceable Nuclear Regulatory Commission and state ARARs identified in this section.</td>
</tr>
<tr>
<td>Environmental Restoration Disposal Facility Waste Acceptance Criteria (WCH-191)</td>
<td>TBC</td>
<td>This document establishes waste acceptance criteria for the ERDF.</td>
<td>Waste destined to the ERDF shall be shown to conform to the waste acceptance criteria.</td>
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<tr>
<td>Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant (DOE/WIPP-02-3122)</td>
<td>TBC</td>
<td>This document establishes waste acceptance criteria for WIPP.</td>
<td>Waste destined to WIPP must be shown to conform to the waste acceptance criteria.</td>
</tr>
<tr>
<td>Remote Handled TRU Characterization Program Implementation Plan (DOE/WIPP-02-3214)</td>
<td>TBC</td>
<td>This document establishes accepted means of characterization of RH TRU waste.</td>
<td>Waste destined for WIPP must be characterized in accordance with this Transuranic Waste Characterization Program Implementation Plan for WIPP.</td>
</tr>
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3 Remedial Design Approach

This chapter provides the design basis for work under this RD/RAWP.

3.1 Design Basis

Debris and water removal, grouting, and support system deactivation will prepare the basin for subsequent demolition and removal. The design basis for the deactivation work scope includes:

- Removing most below-water debris and preparing remaining below-water debris for grouting.
- Retrieving filter media from the basin water filtration systems as well as from the EC retrieval and transfer system decant water filters. The media will either go to direct loadout in an STSC or to ECs for loadout in STSCs for transport of STSCs to T Plant, or other approved facility, for temporary storage.
- Applying grout to the basin and pit floors, and applying a fixative to below-water concrete surfaces.
- Draining basin water through a temporary water treatment system and transporting to the ETF for treatment and disposal at the SALDS.
- Draining fluids from mechanical systems and isolating drains.
- De-energizing and/or disconnecting existing support systems, as appropriate.

Mechanical systems such as the temporary water treatment system sand filter vessels, settler vessels, and support systems will be managed as debris (following their deactivation) based on their waste characteristics. Design aspects similar to those used in deactivating the 105-KE Basin (DOE/RL-2007-41, Remedial Design Report and Remedial Action Work Plan for the K Basins Interim Remedial Action: 105-K East Basin Deactivation) will be utilized as appropriate for efficiency. In addition, lessons learned during the 105-KE Basin deactivation have been considered in planning the 105-KW Basin deactivation.

3.2 Design Summary

This section presents the design for the scope of work defined in Section 1.2.
3.2.1 Debris
Debris removed from the basin will be characterized according to the Sampling and Analysis Plan (SAP) for K Basins Debris (HNF-6495) and disposed at the ERDF or sent to another approved 200 Area facility, providing waste disposal requirements are met. The above-water debris includes three Integrated Water Treatment System Sand/Garnet Filters and vessels; one Basin Water Skimmer System Sand Filter vessels as shown in Figure 6; and two Engineered Container Retrieval and Transfer System (ECRTS) Decant Water Sand Filter vessels that will be located in the 105-KW Basin Annex. The media from these filter vessels will be dispositioned separately from the actual vessels and disposed to an approved facility.

Below-water debris, as shown in Figure 7, will be retrieved, rinsed, and packaged at 105-KW, and then disposed at the ERDF or grouted and left in the basin for removal and disposal during basin demolition. The location of grouted debris and other large debris items remaining will be documented for use during 105-KW Basin demolition. Calculations will be performed, as necessary, to verify that waste material will satisfy ERDF waste acceptance criteria.

3.2.2 Grouting
Grout will be added to the basin to a depth of approximately 0.3 m (1 ft). Since the North Load Out Pit (NLOP) and South Load Out Pit are approximately 1.5 m (5 ft) deeper than the basin floor, each of these pits will receive approximately 1.8 m (6 ft) of grout.

When grout is placed on the 105-KW floor and pits, it will encapsulate small debris and provide some degree of contamination control of residual sludge while rubblizing the basin during demolition. For large debris items remaining in the basin, void spaces will be filled with grout, as necessary to support demolition of the large debris as part of the basin substructure. Grout was shown to fully encapsulate simulated sludge and debris in testing performed during the remedial design (D&D-27456, Testing Performed to Verify Full Encapsulation of Sludge and Debris during Grout Placement). To maintain personnel exposure ALARA, water will be left in the basin and pits during grouting. Water will be removed from the basin as necessary to accommodate the addition of grout. Water removed from the basin will be transferred to the ETF. Grout will be added using grout lances that will extend underwater in the basin near the floor. The grout will be a lightweight high slump, highly flowable concrete to ensure encapsulation to the extent practical of the residual sludge and to fill void spaces in debris. The grout will be an American Society for Testing and Materials C-150 Type I/II low-alkali Portland cement with a minimum compressive strength of 1,000 psi. Methods and experience in placement of grout underwater have been previously demonstrated through the process of grouting the 105-KE and 105-KW Basin discharge chutes and 105-KE Basin floor. Grout used will have a density of 100 to 120 lb/ft³. Grout placement will conform to the appropriate American Concrete Institute requirements (ACI 301, Specifications for Structural Concrete for Buildings) and the following:

- ACI 211.1-91, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
- ACI 211.2-98, Standard Practice for Selecting Proportions for Structural Lightweight Concrete
- ACI 229R-99, Controlled Low-Strength Materials
- ACI 304R-00, Guide for Measuring, Mixing, Transporting, and Placing Concrete
- ACI 304.2R-96, Placing Concrete by Pumping Methods
Basin water may become cloudy during grouting and will be re-circulated through a filter and ion exchange module (IXM) to filter the particulates and remove dissolved radionuclides. Basin water pH is anticipated to rise during grouting. Basin water pH will be adjusted as necessary by adding chemicals or using IXMs.

The above water filter vessels and their shielded enclosure will be grouted as necessary to fix contamination, reduce radiation dose rates, fill the void spaces to satisfy ERDF waste acceptance criteria, and displace any free standing water.

3.2.3 Water Removal and Transfer

Water will be removed from the 105-KW Basin for transport to the ETF by tanker truck. Basin water will be sampled per KBC-27149, *Sampling and Analysis Plan for 105-K East and West Basins Wastewater*. Water in the basin currently provides shielding from sludge, pieces of SNF, radioactively contaminated basin concrete surfaces, and debris. The water also controls the spread of contamination by keeping the basin surfaces and residual sludge wet. The dewatering operation will be performed from a remote location outside the basin based on the radiation dose levels anticipated as the result of removing the basin water.

Two sumps will be installed in the basin to facilitate removal of water. Each sump will be fitted with a submersible pump. Piping from one pump will be configured to enable water to be routed to the existing skimmer system IXM prior to a filter bank (5 micron) and tanker loading station or be routed directly to the filter bank and tanker loading station. Piping from the second pump will be routed directly to a filter bank (5 micron) and tanker loading station. A loading station with a temporary weather enclosure will be constructed adjacent to the 105-KW Basin to simultaneously accommodate up to two tanker trucks. Each system used to deliver water to the tanker loading station will be fitted with flow control, an emergency stop button, and a sampling station. Drip pans will be placed beneath tanker connections during loading operations, which will be monitored. Tanker purge air from filling operations and passive vents installed on the system piping will be filtered through a high-efficiency particulate air (HEPA)-type filter prior to release to the environment. Figure 8 shows a diagram depicting the typical configuration.

Water misting or fixatives will be used in the basin as needed during the dewatering operation to minimize airborne radionuclide releases from exposed basin concrete surfaces. Upon completion of basin dewatering, a fixative will be applied remotely to the below-water basin surfaces and debris to minimize the generation of airborne contamination.

Several inches of water may remain above the grouted floor in some areas of the basin due to floor irregularities and pumping capabilities. The amount of residual water will be minimized through the use of sumps and self-leveling grout that will be placed on the basin floor prior to water removal.

3.2.4 Remaining Deactivation Activities

Deactivation activities include removing hazardous substances from equipment and decontaminating to the extent necessary to support removal and disposal, or future demolition with the basin. This includes removing and disposing filter media as well as the IXMs used for water treatment during the final stages of deactivation; retrieval of sludge collected in the settler tanks following initial retrieval and transfer to EC-230; removing asbestos; grouting basin floor and pits; and applying fixatives to contaminated surfaces as necessary for basin demolition. In addition, the ECs that had once stored sludge will also be dispositioned.
Figure 6. 105-KW Basin General Layout
Figure 7. 105-KW Basin Below-Water Configuration
Hazardous substances will be removed from equipment and systems after they are no longer needed to support basin activities. Radioactive and mixed wastes will be evaluated for treatment and disposal at the ERDF or other U.S. Environmental Protection Agency (EPA)-approved facilities in the 200 Area, or offsite.

3.2.4.1 Asbestos-Containing Material

The interior of the 105-KW Basin building will be inspected by a licensed inspector for the presence of asbestos before commencement of demolition or renovation activities to determine the types and quantities of asbestos present. The basin transite roof and wall panels contain asbestos. Regulated
asbestos-containing material (ACM) identified in the building interior or on equipment that will be disturbed by this work scope will be removed, packaged, and disposed at the ERDF in accordance with ARARs.

Removal and disposal of asbestos and ACM will be performed to the extent practicable, in accordance with the substantive provisions of the Clean Air Act (40 CFR 61, “National Emission Standards for Hazardous Air Pollutants,” Subpart M “National Emission Standard for Asbestos”), which require special precautions to control airborne emissions of asbestos fibers during asbestos removal activities. Class II asbestos (e.g., transite siding) may be left in place during demolition.

In situations where regulated asbestos-containing material (RACM) is inaccessible, or where its removal is impractical or infeasible prior to demolition (e.g., removal would pose significant worker safety issues), emission controls similar to those addressed by EPA’s Alternative Asbestos Control Method, EPA/600/R-08/094, “Comparison of the Alternative Asbestos Control Method and the NESHAP Method from Demolition of Asbestos-Containing Buildings,” will be used. Notification to EPA will be provided prior to implementation of this alternative method. Notification may be in the form of email and will provide pertinent information such as an estimate of potential ACM that will remain prior to demolition and planned asbestos control methods. Controls such as the following will be implemented by incorporation into the work document:

- An accredited asbestos building inspector will perform a comprehensive inspection of the building/structure to be demolished.
- An estimate of the potential ACM that may reside in place will be provided.
- A competent worker trained in asbestos regulations will provide oversight during active asbestos demolition activities.
- Materials to be demolished with RACM remaining will be thoroughly and adequately wetted with amended water (water to which a surfactant has been added) prior to demolition, during demolition, and during debris handling and loading. To the extent feasible, cavity areas and interstitial spaces will be wetted. A high-tack chemical fixative or sealant may be used to reduce the potential for fiber and dust generation during the demolition process. Additionally, fixative or sealant will be used on demolition debris that will remain undisturbed for greater than 24 hours.
- Breakage of ACM will be minimized, to the extent practical, and ACM debris generated during that day will be containerized for disposal.
- The “National Emission Standards for Hazardous Air Pollutants” (NESHAP; 40 CFR 61) asbestos standard of no visible emissions from RACM or ACM.
- In the event of inclement weather that will impede the ability to adequately wet the material, demolition activities will be delayed or halted.
- Worker protection requirements will be followed. Personal protection equipment will either be disposed of as RACM or decontaminated in accordance with the Occupational Safety and Health Administration practices.
- Potentially contaminated water will be controlled during demolition. Impervious surfaces will be thoroughly washed with water following completion of the asbestos-related activities.
• Upon the removal of demolition debris, bare soil within the asbestos-related demolition area will be excavated to a minimum depth of 7.62 cm (3 in.) or until no debris is found. If berms or other runoff controls were used to contain water, they will be removed and disposed of as potentially ACM.

### 3.2.4.2 Filter Media Disposition

Water in the 105-KW Basin is normally circulated through closed-loop treatment systems with the water being returned to the basin following treatment. The 105-KW Basin water treatment systems include the Primary Recirculating Water System, the Skimmer Water Treatment System, and the Integrated Water Treatment System (IWTS). The IWTS draws water from 2.4 m (8 ft) deep in the basin and treats basin water through a four-stage system consisting of strainers, settler tanks, sand and garnet filter vessels, and IXMs. The sand and garnet filters are backwashed to the settler tanks. The skimmer systems use a sand filter to remove particulates from the water, followed by treatment through IXMs. The sand filter is backwashed to the NLOP when a predetermined differential pressure is measured across the sand filter.

The ECRTS contains two sand and garnet filters, which filter the particulates out of the water stream being returned to the basin from decanting the water in the STSC after the sludge has settled out. The sand and garnet filters backwash into a STSC.

The Skimmer Water Treatment System sand filter will continue to be operated based on conditions encountered in the basin until the system is reconfigured to support basin water removal. The sand filter will be taken out of commission prior to grouting the basin and pits.

The volumes of the various filter media are shown in Table 3.

<table>
<thead>
<tr>
<th>System</th>
<th>Number of Filter Vessels</th>
<th>Total Volume of Filter Media (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skimmer Water Treatment System Sand Filter</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Integrated Water Treatment System Sand and Garnet Filter</td>
<td>3</td>
<td>6.9</td>
</tr>
<tr>
<td>Sludge Transfer and Retrieval System Sand and Garnet Filter</td>
<td>2</td>
<td>0.6</td>
</tr>
</tbody>
</table>

The filter media will likely be a transuranic (TRU) waste based on process knowledge and will be retrieved to the extent practicable, packaged in STSCs, and transported to T Plant for temporary storage.

### 3.2.4.3 Filter Vessels, Settler Tanks, and Engineered Container Disposition

After the removal of the filter media, the filter vessels, which are not in the basin pool, will be filled with grout as necessary to provide shielding and void space filling. The settler tanks, which are under water in the basin pool, will remain as debris in the basin (Figure 9). The sludge added to the settler tanks (from operations such as KOP sludge pretreatment and KOP sludge processing that occur subsequent to the initial retrieval from the settler tanks and transfer to EC-230) will be assessed to determine if a second retrieval is necessary. This sludge will be generated from such operations as processing the last SNF, knock out pot (KOP) pre-treatment, and KOP processing. These settler tanks will be filled with grout following the second retrieval of sludge using existing inlet and outlet connections. This will provide shielding and complete void space filling in preparation for removal and disposal during basin demolition.
The ECs, as shown in Figure 10, will have their top two sections removed and placed on the basin floor as a prerequisite to retrieval of sludge from the containers. This activity is part of preparation for retrieval of sludge from the ECs and transfer to the STSC. These top two sections and the remaining sections that will be left intact will be coated with a fixative following basin dewatering to control the dispersal of any residual contamination. They will be left in place for removal during the course of basin demolition. Calculations will be performed, as necessary, to verify that the waste material will satisfy ERDF waste acceptance criteria.

3.2.4.4 Support System Disposition

Support systems such as electrical, heating, ventilation, and air conditioning, drains, and water supply will be de-energized, disconnected, or reconfigured for subsequent demolition. Existing emission monitoring systems will remain in service as long as the basin roof exhaust fans remain operable. Operation of the roof exhaust fans will cease prior to basin dewatering.

4 Remedial Action Management and Approach

This chapter describes the work elements and management approach associated with implementation of the planned work under this RD/RAWP.

4.1 Project Team

The term “project team” includes the individuals working to accomplish the remedial action. Accordingly, the project team includes the lead regulatory agency (EPA), DOE, and the remediation contractor. The DOE remedial project manager will also serve as the primary interface for all routine contact between the lead regulatory agency and the remediation contractor. The project organization is described in DOE and contractor Project Execution Plans.

- **Lead Regulatory Agency (EPA)**—EPA is the lead regulatory agency for CERCLA remediation activities at the Hanford Site, as described in the TPA (Ecology et al, 1989a), and will provide oversight for the work identified in this RD/RAWP.
- **Remedial Project Manager (DOE)**—DOE is the government agency responsible for the remedial actions throughout the Hanford Site. DOE also assigns remedial project managers to each main area and tasks involved with remediation activities. The remedial project manager is responsible for managing their assigned activities, which include scope, budget, schedule, and contracts.
- **Remediation Contractor**—The remediation contractor is responsible for implementing the work, including providing document preparation, field and support activities, qualified engineers, and other experts.

4.2 Change Management

Implementing the interim remedial action may require changes in the requirements set forth in the K Basins Interim Action ROD (EPA/ROD/R10-99/059) and/or K Basins Interim Action ROD Amendment (EPA et al, 2005) if unexpected wastes and/or site conditions are encountered. Three types of changes in the remedial action that could necessitate changes to the requirements in the ROD include the following:

- A fundamental change is a change that does not meet the requirements set forth in the ROD or that incorporates remedial activities not defined in the scope of the ROD.
• A **significant change** generally involves a change to a component of a remedy that does not fundamentally alter the overall cleanup approach. All significant changes will be addressed in an explanation of significant difference.

• A **minor change** is a change that will not have a significant impact on the scope, performance, or cost of the remedy. These minor changes should be documented in the appropriate post-decision project file (for example, through interoffice memoranda or logbooks). Minor changes will not impact the requirements of the ROD or the functional requirements.

In accordance with the TPA Action Plan (Ecology et al, 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*), Section 9.3, minor changes to approved plans including this RD/RAWP that do not qualify as “minor field changes” can be made using the TPA Change Notice process, as appropriate.

### 4.3 Remedial Action Work Tasks

Remedial action work elements identify the primary steps and controls to implement the remedial design. Remedial action work elements identify access controls, procurement/testing, construction, planning documentation, and reporting associated with deactivation of the 105-KW Basin.

#### 4.3.1 Access Controls

The 100-K Area is located on the Hanford Site, which is a controlled access site. The 100-K Area has existing fencing that establishes an access control boundary to the entire site. The 105-KW access controls to the building used during operations will be modified during this remedial action. Temporary access controls to the building during operations will be used to restrict access into work areas as necessary. Access to work areas outside the 105-KW Basin will be controlled using fencing and warning signs.

#### 4.3.2 Construction

The following sections outline key activities associated with construction-related work.

##### 4.3.2.1 Pre-Mobilization

Prior to mobilization for each work task, documentation to support the work control for that task will be prepared. Job safety analyses, radiological work permits (RWPs), ALARA reviews, operational procedures, and other work control forms will be prepared for major aspects of the work, as appropriate.

##### 4.3.2.2 Mobilization and Site Preparation

Mobilization and site preparation activities may be required for deploying equipment to support the deactivation of the 105-KW Basin. These activities may include:

- Erecting an onsite concrete batch plant to mix grout
- Erecting and removing fencing
- Constructing a temporary water-loading station
- Constructing one or more temporary concrete wash water collection basins
- Installing several trailers to accommodate personnel previously located within the 105-KW Basin

Each activity may require mobilizing equipment, minor site grading, and/or adding base material, installing temporary barriers and signs, and erecting temporary equipment.

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2 The final decision to use a concrete batch plant is yet to be determined.
Figure 10. Engineered Container for Sludge Storage
4.3.2.3 Construction and Operation of Concrete Batch Plant

Grouting the 105-KW Basin floor, pits, and left-in-place debris will be performed using a mixture of grout and fly ash mixed in a temporary concrete batch plant. Grout will be delivered from the exterior of the basin building via hoses to grout lances positioned within the basin, pits, debris, and/or debris containers. Grout washout will be transported to a designated site in the 100 Area.

The concrete batch plant is anticipated to process approximately 130 tons of cement and 360 tons of fly ash to grout the basin. The plant is anticipated to operate intermittently over a period of approximately 1 month. The operation of the temporary concrete batch plant will be monitored to meet the general standards for control of visible emissions, not to exceed 20 percent opacity. Monitoring visible emissions from the batch plant bag-house(s) will be accomplished using EPA Method 22, *Visual Determination of Fugitive Emissions from Material Sources and Smoke Emissions from Flares*. EPA Method 22 does not require that the opacity of emissions be determined. Rather, the procedure requires only the determination of whether visible emissions occur over a 3-minute period. If visible emissions are observed in excess of that identified in EPA Method 22, the affected equipment will be shut down and the problem corrected. Fugitive emissions from material handling at the batch plant will be periodically monitored by operations personnel following EPA Method 22 guidelines.

4.3.2.4 Control of Air Emissions

Portable and temporary diesel-fueled engines and/or generators may be used that are EPA Tier 2 or 3 certified. Operation of diesel-fueled engines and/or generators would be expected to emit small quantities of sulfur dioxide, nitrogen dioxide, particulates, and other pollutants to the atmosphere that are typical of similar-sized construction projects. These releases would not be expected to cause any air quality standards to be exceeded because low sulfur diesel fuel will be used as best available control technology for toxics. Idling of diesel engines will be minimized to the extent practicable.

Activities included within the scope of the RD/RAWP will generate point source and diffuse/fugitive emissions. Controls of these emissions are addressed in the air monitoring plan CHPRC-01296, “Air Monitoring Plan for the 105-KW Basin Deactivation and Demolition.” These controls may include suppression techniques such as wetting, grouting, application of fixatives, and the use of HEPA-Type equivalent filtration.

Radiological air emissions associated with activities under this work plan will be addressed in the DOE and EPA approved air monitoring plan (CHPRC-01296).

4.3.2.5 Decontamination of Tools and Equipment

After completing work activities within the contaminated areas, tools and equipment will be decontaminated as necessary for re-use, or will be packaged for disposal. This work will be followed closely by demolition and removal of the 105-KW Basin; tools and equipment that may be used during demolition activities will not be decontaminated.

4.3.2.6 Demobilization

On completion of the interim remedial action work elements addressed by this RD/RAWP debris and wastes generated will be packaged for transport and/or disposal. Temporary access controls to the 105-KW Basin will be maintained as appropriate.

4.3.3 Radiological Survey

A radiological survey of the 105-KW Basin will be performed to the extent necessary to support basin removal. Below-water basin radiological surveys will be performed to support concrete surface
characterization, debris characterization, and dose modeling. These records will be available for use during basin demolition, as necessary.

4.3.4 Planning Documentation
SAPs used in this project will be developed using the Guidance for the Data Quality Objectives Process (EPA/600/R-96/055) and will address quality assurance (QA) in accordance with EPA Requirements for Quality Assurance Project Plans (EPA/240/B-01/003). SAPs will be developed or revised for use in the data collection to support characterization of wastes and debris to be removed from the 105-KW Basin and the below-water concrete surfaces. New SAPs and revisions to existing SAPs are subject to review and approval by DOE and EPA.

4.3.4.1 Institutional Control Plan
DOE has developed DOE/RL-2001-41, Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions, which integrates the sitewide requirements and further specifies additional requirements for specific locations identified in the RODs. Institutional controls will be implemented as described in the sitewide plan for the 100-KR-2 OU.

4.3.4.2 Spill Minimization and Response Program
Hazardous materials handled and used (e.g., diesel fuel for equipment) and wastes generated during work under this RD/RAWP will be stored and handled in a safe manner to minimize the potential for spills. Any spills of such hazardous substances will be responded to in a manner consistent with existing contractor procedures for spill response. Notifications for release of hazardous substance(s) into the environment will be performed in compliance with 40 CFR 302, “Designation, Reportable Quantities, and Notification.”

4.3.5 Verification
DOE and EPA will perform final verification and provide concurrence that end-point criteria for work performed in accordance with this RD/RAWP have been met. Verification and information demonstrating the achievement of end-point criteria will be documented in a project completion report (Section 6.2).

5 Environmental Management and Controls
This chapter describes environmental management approaches and controls to be implemented under this RD/RAWP.

5.1 Air Emissions
Airborne emissions associated with this removal action will be minimized by the use of appropriate work controls. Airborne releases of contaminants during the removal action will be controlled in accordance with DOE radiological control and substantive air pollution control standards in order to maintain emissions of air pollutants at the Hanford Site to ALARA levels.

Radiological air emissions associated with activities under this work plan will be addressed in the DOE and EPA approved air monitoring plan (CHPRC-01296).

5.1.1 Criteria/Toxic Air Emissions
No criteria/toxic air pollutants exceeding acceptable levels are anticipated for activities performed under this work plan. Any emissions from the use of portable and temporary diesel engines are addressed in Section 4.3.2.4. Idling of diesel engines will be minimized to the extent practicable.
5.2 Waste Management

SNF-9430, Waste Management Plan for the K Basins Interim Remedial Action, will be used for work under this RD/RAWP. The plan identifies the substantive waste management requirements and the strategy for their implementation and the anticipated waste types.

5.3 Cultural/Ecological Resources

Cultural and historic reviews have been performed to identify properties that may be eligible for listing on the National Register of Historic Places. The 105-KW Building, including the fuel storage basin, is a “contributing property with no individual documentation required” (DOE/RL-97-02, National Register of Historic Places Multiple Property Documentation Form—Historic, Archaeological and Traditional Cultural Properties of the Hanford Site, Washington). This phase of the K Basins remedial action has no impact on cultural or historic properties, nor will any ground-disturbing activities take place in areas that have not been disturbed in past construction activities associated with the K Basins. Therefore, artifacts are not anticipated to be found. Ecological and resource reviews are performed periodically based on an assessment of remedial actions occurring at the 100-K Area. No planned activities are taking place under this project in previously undisturbed areas. Systems and structures planned under this work scope are designed pursuant to ARARs to protect the environment. The processes planned under this action do not discharge effluents to the Columbia River.

5.4 Safety and Health Program

A health and safety plan (HASP) that addresses the scope of work identified in this RD/RAWP has been prepared and is maintained by the project (HNF-4747, K Basins Interim Remedial Action Health and Safety Plan). The HASP addresses chemical, radiological, and physical hazards, and specifies the controls and requirements for work activities. Access and work activities are controlled in accordance with approved work packages, as required by established internal work requirements and processes. The HASP addresses the health and safety hazards of each phase of site operation and includes the requirements for hazardous waste operations and/or construction activities (29 CFR 1910.120, “Occupational Safety and Health Standards,” “Hazardous Waste Operations and Emergency Response”). As part of the work package development, a job or activity hazard analysis will be written to identify the hazards associated with specific tasks in addition to the HASP.

In addition to the HASP, in accordance with contractor-level procedures and programs, RWP's will be prepared, as needed, for work in areas with potential radiological hazards. The RWP extends the Radiological Protection Program to the specific work site or operation. All personnel assigned to the project and all work site visitors will strictly adhere to the provisions identified in the HASP and RWP. Before work and before each new activity begins, a pre-job briefing will be held with the involved workers. This briefing will include reviews of hazards that could be encountered and the associated requirements. Throughout an activity, daily briefings could be held, as well as special briefings prior to major work activities.

5.5 Quality Assurance Program

Quality assurance is implemented in accordance with contractor-approved internal work requirements and processes, which, in turn, implement DOE O 414.1C, Quality Assurance, and 10 CFR 830, “Nuclear Safety Management,” Subpart A, “Quality Assurance Requirements” and the Hanford Analytical Services Quality Assurance Requirements Documents (HASQARD) (DOE/RL-96-68). Applicable SAPs also include the quality requirements applicable to work performed using a graded approach.
6 Remedial Action Completion

Completion of the 105-KW Basin deactivation activities identified in this RD/RAWP will be achieved by meeting the end-point criteria specific to this work scope.

6.1 End-Point Criteria

The end-point criteria described in HNF-20632 that are applicable to deactivation of the 105-KW Basin are identified in Section 2.3. The qualified process that describes the plan by which work will be performed to satisfy the end-point criteria is identified in DOE/RL-2010-107, 105-KW Basin Qualified Process and Plan to Satisfy End-Point Criteria (Fuel, Sludge, and Below-Water Debris).

6.2 Project Completion Documentation

Project completion documentation will be prepared to document the completion of the scope covered by this work plan. The report will describe achievement of the RAOs identified in Section 2.2 and describe the activities performed to meet the end-point criteria identified in Section 2.3.

7 Milestones, Cost, and Schedule

7.1 Milestones

The M-016-140 Milestone was negotiated in 2008 to promote integration of the K Basins Sludge Treatment Project (STP) with 100-K Area closure activities. Modifications to the TPA milestone schedule relevant to activities described in this RD/RAWP are presented in Table 3.

Table 3. Summary of Relevant Tri-Party Agreement Milestones

<table>
<thead>
<tr>
<th>Milestone No.</th>
<th>Description</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-016-179</td>
<td>Complete deactivation of 105-KW Fuel Storage Basin</td>
<td>September 30, 2017</td>
</tr>
</tbody>
</table>

7.2 Cost and Schedule

The estimated costs and schedule for deactivation activities described in this RD/RAWP are presented in Table 4.

Table 4. Estimated Cost and Schedule

<table>
<thead>
<tr>
<th></th>
<th>FY 15</th>
<th>FY16</th>
<th>FY17</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deactivation Activities</td>
<td>$11,650</td>
<td>$3,840</td>
<td>$965</td>
<td>$16,455</td>
</tr>
</tbody>
</table>

Note: dollar amounts are shown in thousands.
8 References


61.40, “General Requirement.”


Subpart A, “Quality Assurance Requirements.”


16 USC 1536(c), “Interagency Cooperation,” “Biological Assessment,” *United States Code*. Available at: [http://www4.law.cornell.edu/uscode/16/usc_sec_16_00001536----000-.html](http://www4.law.cornell.edu/uscode/16/usc_sec_16_00001536----000-.html).


6.301, “Applicant Requirements.”

6.302, “Responsible Official Requirements.”

61.92, “Standard.”
61.93, “Emission Monitoring and Test Procedures.”
61, Subpart H, “National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities.”
61, Subpart M, “National Emission Standard for Asbestos.”


761.50, “Applicability.”
761.60, “Disposal Requirements.”
761.61, PCB Remediation Waste.”
761.62, “PCB Bulk Product Waste.”
761.79, “Decontamination Standards and Procedures.”


ACI 211.2-98, 1998, Standard Practice for Selecting Proportions for Structural Lightweight Concrete, American Concrete Institute, Farmington Hills, Michigan.

ACI 229R-99, 1999, Controlled Low-Strength Materials, American Concrete Institute, Farmington Hills, Michigan.

ACI 301, 1984, Specifications for Structural Concrete for Buildings, American Concrete Institute, Farmington Hills, Michigan.

ACI 304R-00, 2000, Guide for Measuring, Mixing, Transporting, and Placing Concrete, American Concrete Institute, Farmington Hills, Michigan.

ACI 304.2R-96, 1996, Placing Concrete by Pumping Methods, American Concrete Institute, Farmington Hills, Michigan.


303-016, “Identifying Solid Waste.”
303-070, “Designation of Dangerous Waste.”
303-140, “Land Disposal Restrictions.”
303-170, “Requirements for Generators of Dangerous Waste.”
303-630, “Use and Management of Containers.”
303-640, “Tank Systems.”


400-040, “General Standards for Maximum Emissions.”


460-030, “Applicability.”
460-060, “Control Technology Requirements.”
460-070, “Ambient Impact Requirement.”
460-150, “Table of ASIL, SQER and de Minimis Emission Values.”


480-050, “General Standards for Maximum Permissible Emissions.”

480-070, “Emission Monitoring and Compliance Procedures.”


247-040, “General Standards.”