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ACTION MEMORANDUM FOR THE NON-TIME-CRITICAL REMOVAL ACTION FOR THE 105-KE AND 105-KW REACTOR FACILITIES AND ANCILLARY FACILITIES

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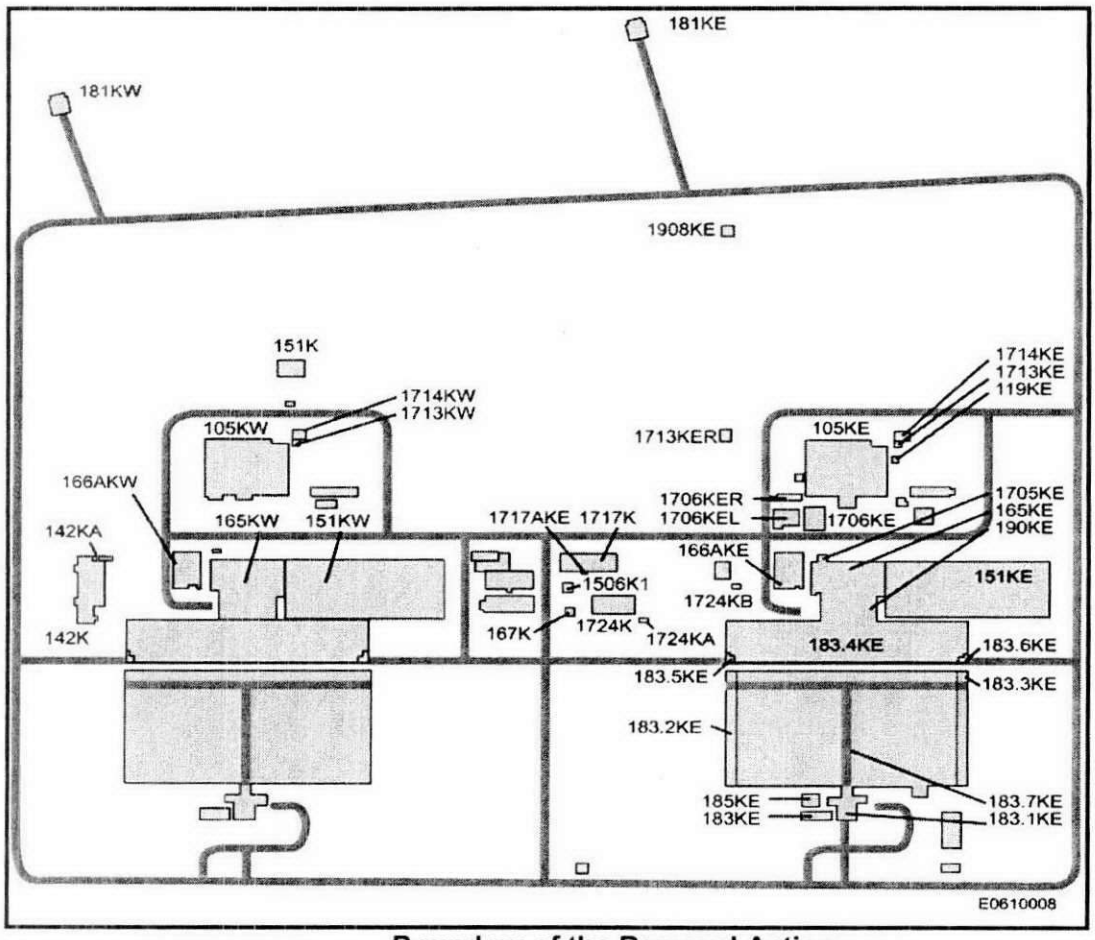
1.0 PURPOSE

The purpose of this action memorandum is to document approval of the non-time-critical removal action described herein for the remaining buildings and structures, including the 105-K East (KE) and 105-K West (KW) Reactor Buildings, located in the 100-K Area of the Hanford Site (Figure 1).

Figure 1. Map of 100-K Area.



Boundary of the Removal Action

Notes:

- Shaded areas show "Building Footprint Areas." A safe storage enclosure will be constructed over buildings 105-KE and 105-KW; all other structures will be removed.
- The entire 100-K Area is the "CERCLA On-Site Area." Some miscellaneous items are not identified by number on the map (e.g., stacks, cargo/storage containers and units, mobile office trailers, pipe and water tunnels, and guard towers and fences).

The removal action to be implemented for the remaining buildings and structures at the K Area is outlined in the *Engineering Evaluation/Cost Analysis for the 105-KE and 105-KW Reactor Facilities and Ancillary Facilities* (DOE-RL 2005a), that was prepared by the U.S. Department of Energy (DOE). (This is the second engineering evaluation/cost analysis (EE/CA) prepared for disposition of facilities in the 100-K Area. The *Engineering Evaluation/Cost Analysis for the 100-K Area Ancillary Facilities* (DOE-RL 2004) addressed 27 support buildings in the 100-K Area. That EE/CA recommended deactivation followed by demolition of each building as the preferred alternative for disposition of the facilities.)

The preferred alternative identified in the EE/CA for the 105-KE and 105-KW Reactors and Ancillary Facilities was Interim Safe Storage (ISS) of the reactors followed by long-term surveillance and maintenance (S&M) and deactivation, decontamination, decommissioning, and demolition (D4) of the ancillary facilities and portions of the 105-KE and 105-KW Reactor Facilities. This alternative is consistent with the previous evaluations for the 105-C, 105-D, 105-DR, 105-F, and 105-H Reactors as well as the previous evaluation for other facilities at 100-K. This alternative was recommended based on its overall ability to protect human health and the environment and its effectiveness in maintaining protection for both the short and long-term. The alternative would also reduce the potential for a release to the environment by reducing the inventory of contaminants. This alternative protects human health and the environment, protects workers, and provides an end state that is consistent with future cleanup actions and commitments of the *Hanford Federal Facility Agreement and Consent Order* (herein referred to as the Tri-Party Agreement) (Ecology et al. 1989).

Waste generated from the removal action that meets Environmental Restoration Disposal Facility (ERDF) waste acceptance criteria will be disposed at ERDF.

This removal action minimizes the potential for a release of hazardous substances[1] to the environment from the facilities (listed in Appendix A) that could adversely impact human health and the environment; is protective of the site personnel and the environment; and contributes to the efficient performance of any remedial actions, including any future subsurface soil remediation and reactor block removal. The action includes D4 of the reactor building up to the shield walls that surround the reactor block, the construction of a safe storage enclosure (SSE), and S&M. This alternative also provides D4 of the ancillary facilities and portions of the 105-KE and 105-KW Reactor Facilities, which consist of immediate deactivation and any required decontamination of the facilities followed by demolition and associated waste disposal of the contaminated debris.

A 30-day public comment and review period for the subject EE/CA was held from June 19, 2006 through July 19, 2006. The comment period was used to evaluate removal action alternatives for the remaining facilities presented in the EE/CA as well as the facility-specific information available in the Administrative Record. Most of the comments received supported implementation of this action. The comments and responses are provided in Appendix B.

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[1] "Hazardous substances" means those substances defined by the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, Section 101(14), and includes both radioactive and chemical substances.

2.0 SITE CONDITIONS AND BACKGROUND

Over 100 facilities, containers, and mobile offices are located within the 100-K Area. Many of these are empty, while others are used to support cleanout of the 105-KE and 105-KW fuel storage basins (K Basins) or landlord activities for the 100-K Area. The schedule for completion of cleanup of these other 100-K Area sites, such as at the K Basins, affects the schedule for the work under this action memorandum. Years of reactor operations and support activities in the 100-K Area have left the facilities contaminated or potentially contaminated. ("Potentially contaminated" defines structures that have not yet been fully characterized, but because of their history or proximity to process related structures and/or adjacent waste sites are anticipated to be contaminated with radiological contamination in inaccessible portions of the structure, likely due to biological vectors, such as rodents, birds, and insects.)

An EE/CA was conducted to evaluate alternatives and recommend an approach for addressing hazardous substances at the 105-KE and 105-KW Reactor Facilities and below-grade structures and remaining ancillary facilities (subsequently referred to as facilities[2]). Excluded from this analysis were the fuel storage basins and the final disposition of the reactor blocks. It was assumed that after preparation for interim safe storage, the reactor blocks will remain in a safe storage mode, consistent with the current anticipated time frame for decommissioning of the eight other surplus Hanford Site reactors, which is expected to be complete by 2068. The remediation of the fuel storage basins will be completed in accordance with the *K-Basins Interim Action Record of Decision* (ROD) (EPA 1999b) and 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* (commonly referred to as the Remaining Sites ROD) (EPA 1999a). Close coordination among these multiple programs will be required to ensure the ISS effort does not preclude or interfere with the efforts to remove the basin structures and associated contaminated soil.

All of the remaining ancillary facilities at the 100-K Area not currently addressed under another *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) action are also addressed in this action memorandum. These facilities are currently inactive or will be deactivated when the K Basin Closure Project is complete, and the U.S. Department of Energy (DOE), Richland Operations Office (RL) has determined there is no further use for them.

The soil adjacent to or underlying some of the facilities may be contaminated. Where there is previous knowledge of such contamination, the soil has already been identified as a separate waste site and will be remediated under the authority of CERCLA remedial actions under the 100-KR-1 and 100-KR-2 Operable Units (OUs) RODs. If extensive contamination associated with the adjacent or underlying soil is identified in the future, it will be identified as a new waste site and addressed under the 100-KR-I/I00-KR-2 OU remediation process or other soil remediation activity (i.e., the Remaining Sites ROD [EPA 1999a]).

Any other facilities and foundations within the geographical boundary (i.e., man-made items built or placed in the area) of the removal action (Figure 1) that are discovered and are not addressed by the 100-KR-1 and 100 KR-2 OU RODs, the previous ancillary facilities removal

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[2] The term "facility" is used generically to encompass all the contaminated structures, facilities, piping, ducting, etc., associated with the building.

action (DOE-RL 2004), or other soil remediation activity (i.e., the Remaining Sites ROD [EPA 1999a]) may be "plugged-in" to the selected removal action if the facility is found to be contaminated with hazardous substances and poses a substantial threat of release to the environment and provided they are sufficiently similar to the sites addressed by the EE/CA such that additional analysis of removal alternatives would not be necessary or appropriate. Approvals for implementing this plug-in approach for such facilities and foundations will be obtained from the U. S. Environmental Protection Agency (EPA).

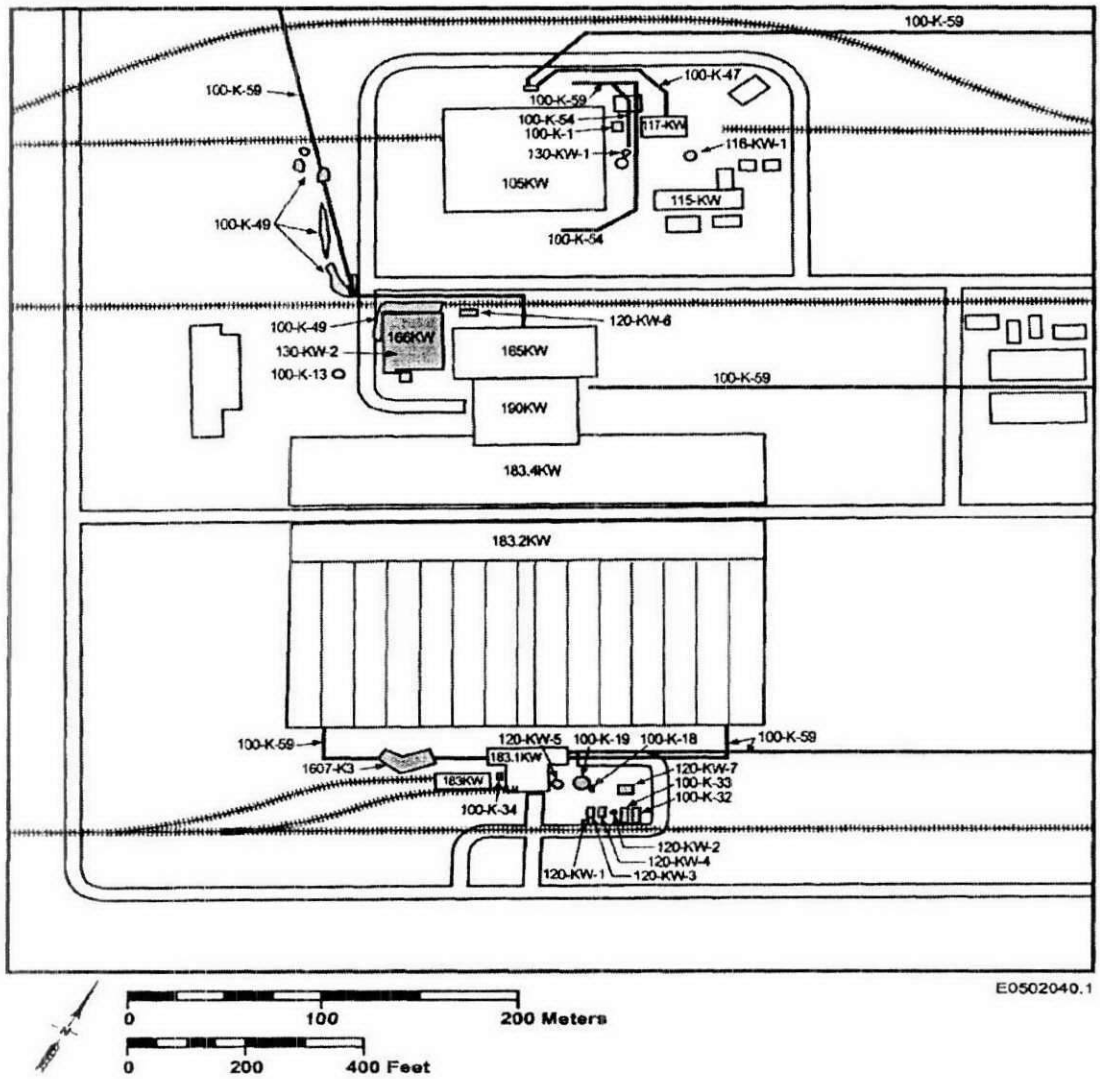
Subsurface structures and remediation of soils already identified as waste sites and covered under existing 100-KR-1 and 100-KR-2 OU RODs are excluded from this action memorandum. (These "potentially impacted waste sites" are shown in Figures 2 and 3.) However, where the existing waste site is to be fully removed in the building footprint or layback, the remediation of these waste sites may be completed in conjunction with this removal action in accordance with the EPA-approved removal action work plan (RAWP) and verified to meet the cleanup requirements of the applicable ROD. Unanticipated contaminated soil found during and/or remaining after structure removal may be identified as a new waste site. Relatively small contamination areas may be remediated/removed along with removal of structures identified in this action memorandum. In the event that large volumes of contaminated soil are encountered, other soil contamination sites are adversely affected by D4 activities, utilities of active facilities are impacted, or removal of contaminated soil inhibits D4 activities, the removal of contaminated soils or structure (i.e., slab, below-grade structure) may be deferred to future remedial action with approval of the EPA. The sites will be stabilized in a manner that will not hinder future remediation, and will be cleaned up in accordance with the Remaining Sites ROD (EPA 1999a).

2.1 BACKGROUND

The Hanford Site is a 1,517-km^2 (586-mi^2) federal facility located in southeastern Washington State, along the Columbia River and operated by the DOE. From 1943 to 1990, the primary mission of the Hanford Site was the production of nuclear materials for national defense. The 100 Area is the site of nine now-retired nuclear reactors and associated support facilities that were constructed and operated to produce weapons-grade plutonium. Past operations, disposal practices, spills, and unplanned releases resulted in contamination of the facility structures, underlying soil, and underlying groundwater in the 100 Area. Consequently, in November 1989, the 100 Area was one of four areas of the Hanford Site that was placed on the EPA's National Priorities List under CERCLA, as amended by the *Superfund Amendments and Reauthorization Act of 1986*.

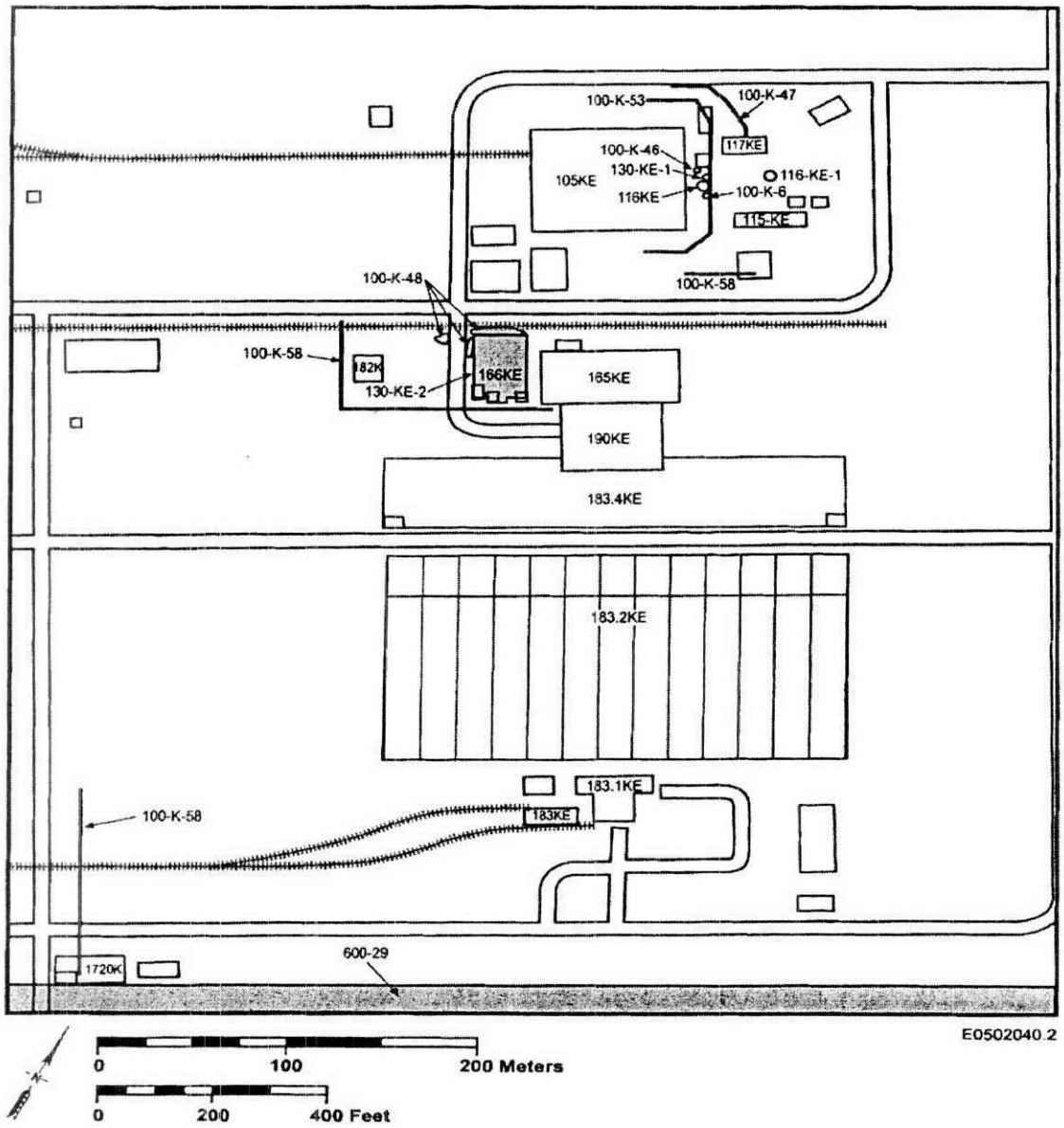
The 100-K Area is the portion of the 100 Area that contains the 105-KE and 105-KW Reactor Buildings and supporting facilities (Figure 1). The area is subdivided into three OUs to address cleanup of the soil and groundwater contamination that resulted from past operations. The 100-KR-1 and 100-KR-2 OUs encompass soil waste sites such as liquid waste disposal sites and solid waste burial grounds and contaminated buildings and structures. The 100-KR-4 OU addresses groundwater contamination underlying the 100-K Area. Geographically, the buildings addressed in this action memorandum are co-located with the 100-KR-1 and 100-KR-2 OU waste sites identified in the Tri-Party Agreement (Ecology et al. 1989). The scope and role of other CERCLA cleanup actions in the 100-K Area, and their relationship to this removal action, are summarized in the following subsections.

Figure 2. Location of Potentially Impacted Waste Sites in the Western Portion of the 100-K Area.



Note: "Potentially impacted waste sites" are remedial action waste sites that are in the immediate vicinity of removal action facilities within this action memorandum. Potentially impacted waste sites may be remediated as a consequence of the field actions occurring under this action memorandum. Completion of those remedial actions will be documented as directed by the remedial action records of decision.

Figure 3. Location of Potentially Impacted Waste Sites in the Eastern Portion of the 100-K Area.



2.1.1 Waste Site and Soil Cleanup

Approximately 50 waste sites with a range of radioactive and nonradioactive contaminants have been identified in the 100-K Area as part of the 100-KR-1 and 100-KR-2 OUs. Remediation of these "potentially impacted waste sites" (see Figures 2 and 3) is currently being conducted under the following three CERCLA interim action RODs:

- The *Amendment to the Interim Action Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units* (EPA 1997) addresses liquid effluent disposal sites, including those in the 100-K Area.

- 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* (commonly referred to as the Remaining Sites ROD) (EPA 1999a) addresses remediation of additional liquid and miscellaneous waste disposal sites.

- The *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units Hanford Site (100 Area Burial Grounds), Hanford Site, Benton County, Washington* (commonly referred to as the 100 Area Burial Grounds ROD) (EPA 2000a) addresses remediation of burial grounds.

The selected remedial action specified in these RODs includes removal of contaminated soil and debris, treatment (as necessary to meet disposal facility acceptance criteria), and disposal in ERDF, the Waste Isolation Pilot Plant, or other disposal facilities approved by EPA. This remedial action is commonly referred to as remove, treat, and dispose.

Remediation of waste sites in the 100-K Area is underway. The proximity of some waste sites to facilities in the scope of this action memorandum may require specific scheduling and coordination between the waste site and facility remediation programs. (Any 100-KR-1 or 100-KR-2 OU waste sites that are present beneath and/or adjacent to facilities included in this action memorandum are identified in the Table A-1 and Figures 2 and 3.)

Some of the facilities included in the Action Memorandum are known to have limited soil contamination immediately adjacent to or beneath the facility and that contaminated soil will be removed as part of this removal action. Some facilities are known to be adjacent to or over known waste sites. Those waste sites will be remediated in accordance with the associated ROD. While performing this removal action significant soil contamination may be discovered. Such a discovery site will be identified as a new waste site and will be remediated in accord with the existing Remaining Sites ROD (EPA 1999a) which provides for the addition of discovery sites.

2.1.2 Groundwater Cleanup

Chromium is the primary groundwater contaminant underlying the 100-K Area (100-KR-4 OU). Remediation of the chromium is being conducted under the *Interim Action Record of Decision for the 100-HR-3 and 100-KR-4 Operable Units at the Hanford Site, Benton County, Washington* (EPA 1996). As required by the 100-HR-3 and 100-KR-4 ROD, a full-scale pump-and-treat system was constructed in the 100-K Area with the objective of removing hexavalent chromium via ion-exchange technology. The treated groundwater is reinjected upgradient in the 100-K Area. The system has been operating since 1997. No specific impacts on

100-K Area facilities' remediation are anticipated, other than nominal coordination of field activities. The demolition of the pump-and-treat system will not be performed as part of this removal action.

2.1.3 100-K Area Fuel Storage Basins Cleanout

The 105-KE and 105-KW fuel storage basins (K Basins), located respectively adjacent to the 105-KE and 105-KW Reactor Facilities, had been the storage locations for the spent nuclear fuel since the 1970s. The basins contain contaminated sludge, water, debris, and some spent fuel and fuel fragments that are being found in the sludge. The basins are included in the 100-KR-2 OU. The K Basins themselves are not within the scope of this action memorandum. As stated above, the disposition of the fuel storage basins will be completed in accordance with the K Basins Interim Action ROD (EPA 1999b) and the Remaining Sites ROD (EPA 1999a). The RODs require the DOE to remove the spent nuclear fuel, sludge, water, and debris from the basins and then deactivate the basins. The sequence and schedule for these actions is governed by Tri-Party Agreement Milestone M-34-00A.

Construction of the KE and KW Reactor areas began in 1952 as part of the "Project X" expansion program. Completion of the reactors was accomplished in 27 months from beginning to end. Startup of the reactors began in 1955. Operations were discontinued in 1970 for the KW Reactor and in 1971 for the KE Reactor. Most of the support buildings were deactivated with the shutdown of the reactors, with the exception of the fuel storage basins, the alum tanks adjacent to the 183.1-KE Building, research and development conducted in the 1706-KE Building, one pump-house, one water treatment facility, and septic tanks and drain fields used for sanitary waste remained in service in support of the fuel storage activities.

Since the 1980s, a portion of the 100-K Area infrastructure has been kept operational to support the storage and remediation of spent fuel in the K Basins. While the vast majority of the fuel has been removed, some of these buildings and systems remain active to support the final spent fuel removal, sludge removal and deactivation of the basins. As these activities are completed, the remaining facilities and systems will be released for D4 in accordance with this action memorandum.

2.1.4 Contribution to Long-Term Remedial Action

Public access to the Hanford Site, including the 100-K Area, is currently restricted. Current land use in the 100-K Area consists of environmental cleanup activities and the removal of materials from the storage basins, and eventual removal of the basin structures. Adjacent to and north of the 100-K Area, the Columbia River is accessible to the public for recreational use (e.g., boating and sport fishing). The river segment located north of the 100-K Area (referred to as the Hanford Reach) received National Monument status in 2000 (65 FR 37253).

The *Final Comprehensive Land Use Plan Environmental Impact Statement* (DOE 1999) identifies the probable future land use for the 100 Areas as preservation/ conservation. The CERCLA cleanup standards selected for response actions throughout the 100 Area in the past have been based on a rural-residential exposure scenario. Removal actions resulting from this Action Memorandum will contribute to the efficient performance of any anticipated long-term remedial actions. Removal actions will either attain the cleanup standards set forth in the existing 100-KR-1 and 100-KR-2 RODs and documented as directed in the RODs, or additional cleanup work beyond the removal action will be performed under the RODs. The deferral of work from the removal action to a remedial action is outlined in this action memorandum such

as at the end of Section 2.1.1 and will be explained in the RAWP. The land use recommended herein must be consistent with the previous remedial action to be taken in the area in accordance with "National Oil and Hazardous Substance Pollution Prevention Contingency Plan" (NCP) (40 *Code of Federal Regulations* [CFR] 300.415[b][2]) requirements. The river islands and approximate quarter-mile buffer zone constitute the Hanford Reach National Monument created by Presidential Proclamation 7319 (65 FR 37253), which states that the 100 Areas will not be developed for residential or commercial use in order to protect the area's cultural and natural resources. The majority of the 100-K Area facilities are not within the quarter-mile buffer zone.

2.2 FACILITY DESCRIPTION

The facilities addressed in this action memorandum include the 105-KE and 105-KW Reactors and a combination of support facilities, storage buildings, shops, and offices located in the 100-K Area. Spread of contamination from the facilities (e.g., animal intrusion, facility deterioration) can result in further contamination of the underlying soils. Appendix A contains a list of the facilities within the scope of this removal action and remedial action 100-KR-1 or 100-KR-2 OU waste sites that are present beneath and/or adjacent to the facilities.

One of the facilities, the 1706-KE Building, has a small area that is called the "1706-KE Waste Treatment System," which is regulated as a treatment, storage, and disposal (TSD) unit under the *Resource Conservation and Recovery Act of 1976* (RCRA). This TSD unit is composed of several major components including an accumulation tank, an ion-exchange column, an evaporator unit, a condensate collection tank, and a high-efficiency particulate air (HEPA) filtration unit. The 1706-KE Building will be remediated under the authority of the Remaining Sites ROD (EPA 1999a) as provided by the *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision* (EPA 2004). However, the removal, treatment (as necessary), and disposal of all equipment and potentially contaminated structural components directly related to the 1706-KE Waste Treatment System will be carried out as authorized within the scope of this action memorandum. Under the Tri-Party Agreement, DOE must satisfy closure requirements for the TSD unit, and therefore, will submit a RCRA closure plan to Ecology for approval to ensure that RCRA closure requirements are met.

Figure 1 shows the location of the ancillary facilities in the 100-K Area. A brief description and history of each facility can be found in the EE/CA (DOE-RL 2005). Figure 2 shows the location of potentially impacted adjacent waste sites for the facilities located in the western portion of 100-K Area. Figure 3 shows the location of potentially impacted adjacent waste sites for the facilities located in the eastern portion of 100-K Area.

2.3 SOURCE, NATURE, AND EXTENT OF CONTAMINATION

The 100-K Area ancillary facilities addressed in this action memorandum are contaminated with CERCLA 101(14) hazardous substances used or generated during the plutonium production operations including radiological contamination that could be spread through transport (e.g., birds, rodents) or as a result of facility deterioration. To help identify hazardous substances, several sources of information were used, including characterization data, historical operations, process knowledge, and knowledge of the construction materials.

The source of contamination at each facility depends on the specific operations conducted at the facility. In general, contamination at the facilities addressed in this action memorandum resulted from activities associated with the operation of two single-pass, water-cooled reactors that were used to produce weapons-grade plutonium. The 100-K Area facilities provided treated water, backup power and steam, material storage and distribution, and maintenance support during construction, operation, and deactivation of the reactors. Radiological, hazardous, and biohazards material contamination may be associated with these facilities. DOE has determined that deterioration of these facilities may represent a substantial threat of a release of a hazardous substance.

To the extent practicable, hazardous substances (including bulk chemicals that are no longer in use) have been, or will be, removed from the facilities during routine operations and S&M. However, residual contamination remains or will remain on facility surfaces (including the roof), in piping and ductwork. In general, the primary contaminants of concern include the following radionuclides:

- Americium-241
- Cesium-137
- Cobalt-60
- Strontium-90
- Tritium
- Plutonium.

At most of the facilities, the activities of individual isotopes are not currently known but will be determined, as needed, through data quality objective directed sampling and analysis tasks before disposal.

CERCLA removal authority (DOE and EPA 1995) is being used to respond to the contamination within these facilities which has released or poses a substantial threat of release to the environment. Contamination is due to radioactive and nonradioactive hazardous chemicals. The contaminated facilities are known to contain hazardous materials as part of their construction materials. The waste generated from the removal action will be managed in accordance with the hazardous waste requirements associated with both the contamination and the structural hazardous materials.

The facilities are also expected to contain one or more of the nonradioactive hazardous substances known to be present in most Hanford Site facilities as either contaminants resulting from facility operations or as components of structural materials. These may include the following:

- Friable and nonfriable forms of asbestos
- Lead
- Chromium
- Polychlorinated biphenyls (PCBs)
- Mercury (in switches, gauges, and thermometers)
- Refrigerants (Freon)
- Petroleum products
- Water treatment chemicals
- Lubricants

- Corrosives
- HEPA filter media
- Sodium-vapor and mercury-vapor lighting.

Appendix A contains a summary of the major contaminants and general levels of contamination for each of the facilities in the scope of this action.

Characterization will be conducted as part of the removal action activities in accordance with approved sampling and analysis plans. The characterization information will be used to support waste designation, which may include nondestructive assay, and to determine if the removal action objectives have been met.

Characterization data will also be used to determine whether any contamination remaining after facility removal should be identified as a waste site to then be incorporated into the 100-KR-1 and 100-KR-2 OUs for subsequent remedial action. The concentrations of contaminants will be determined, as needed, through data quality objective directed sampling and analysis tasks before disposal.

2.4 THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT

The reactors and ancillary facilities addressed in this action memorandum are contaminated or potentially contaminated with radioactive and/or nonradioactive hazardous substances. After further characterization, facilities determined to not be contaminated with CERCLA hazardous substances will be addressed outside of this action.

The risks associated with the radioactive and nonradioactive hazardous substances have not been quantified in detail, in part because of limited characterization data. The following discussion provides a qualitative discussion of the risks.

The major contaminants of concern at the facilities addressed in this action memorandum are radionuclides, which when above acceptable levels are known to be carcinogenic or hazardous to human health and the environment. Many of the facilities may contain low levels of radiological contamination as surface contamination. Where characterization data exist, potentia1 exposure to workers and the public from radionuclide contamination that could be released to the environment from the facilities exceeds the upper end of the CERCLA risk range that can be approximated by a dose rate of 15 mrem/yr above background. For instance, a dose rate of 65 mrem/hr was measured near the 115-KW condensate drainlines.

Hazardous substances, including asbestos insulation, heavy metals (such as mercury in switches and lead shielding), and PCBs in building materials, are also present in the facilities. The four most commonly encountered hazardous substances in the facilities include asbestos, PCBs in fluids and paint, lead in building materials and paint, and elemental mercury found in switches, instrumentation, and drains.

A security fence currently surrounds the majority of the area to limit unauthorized entrance of site personnel. In addition, the area requires a DOE badge for entry, and the individual facilities are locked and require special entry approval. As long as the DOE retains control of the 100-K Area, these access controls may prevent direct contact with and exposure to the hazardous materials. However, access controls will not prevent deterioration of the facilities or

reduce the threat of release of radiological and hazardous substances to the environment over the long-term. Radiological and hazardous substances could be released directly to the environment through a breach in a pipe, containment wall, roof, or other physical control as the facilities age and deteriorate. Radiological and hazardous substances could also be released to the environment indirectly through animal intrusion into the contaminated structures and systems. Historically, intrusion and spread of contamination by rodents, insects, birds, and other organisms has been difficult to control and prevent.

However, as the facilities continue to age and deteriorate, the threat of potential release of radioactive and nonradioactive hazardous substances from facility deterioration and animal intrusion increases, and it becomes more difficult to prevent releases to the environment. The S&M activities required to prevent releases of the hazardous substances may increase the risk of potential exposure to personnel. Also, potential releases from associated waste sites pose a significant risk to human health and the environment. Removal of the facilities addressed in this action memorandum is needed, in some instances, to facilitate remediation of adjacent or underlying waste sites.

2.5 OTHER ACTIONS TO DATE OR PLANNED

Some of the facilities within the scope of this removal action are already deactivated or partially deactivated. Facility deactivation involves removal or isolation of loose physical, chemical, or radiological hazards. These facilities are currently undergoing S&M which will continue until the start of the D4 or ISS work. Some additional facilities are still in use by other projects. The facilities still in use will be shutdown when no longer needed to support the K Basin Closure or the Groundwater Remediation Project work and be moved to the D4 process under this removal action. Approvals for moving such facilities and foundations from operational status to the D4 process will be obtained from the EPA.

As noted in Section 2.1.1, approximately 50 waste sites with a range of radioactive and nonradioactive contaminants have been identified in the 100-K Area as part of the 100-KR-1 and 100-KR-2 OUs. Remediation of these sites is being conducted under three CERCLA interim action RODs.

3.0 THREATS TO HUMAN HEALTH OR THE ENVIRONMENT

Conditions persist wherein threats to the public health or the environment exist.

The NCP (40 CFR 300.415[d]) establishes factors to be considered in determining the appropriateness of a removal action. Those factors include the following:

- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants. Hazardous substances, including radionuclides, are present or could be present within the equipment and structures. These substances pose an increasing substantial threat of release to the environment, including humans and ecological receptors as the facilities continue to deteriorate with age. As contamination becomes exposed and as structural integrity is compromised, the potential

direct exposure (i.e., inhalation of contaminated dust and debris, direct contact with contaminated debris) of nearby personnel and the environment, and exposure to the public through airborne radioactive contaminants increases. In addition, the S&M activities required to maintain confinement of the building and additional structures increasingly pose a potential exposure to the environment.

- Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released. The potential for wind or precipitation-related releases of hazardous substances within the facilities is substantial and increases as the facilities continue to deteriorate with age.

- Hazardous substances or pollutants or contamination in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release. Hazardous substances, including radioactive substances, are contained within the pipes and vessels of many of the facilities addressed in this action memorandum and may contaminate additional areas or facilities. These substances pose a threat of accidental release that may result from animal intrusion, deterioration, or severe weather conditions.

The external radiation, inhalation, and ingestion risks to the site workers, the public, and ecological receptors associated with substantial risk of releases of contamination justify a non-time-critical removal action.

4.0 ENDANGERMENT DETERMINATION

The selected response action is necessary to protect the public health or welfare or the environment from the actual or threatened releases of hazardous substances, including radioactive substances from the facilities into the environment. CERCLA removal authority (DOE and EPA 1995) is being used to respond to the contamination within these facilities which has released or poses a substantial threat of release to the environment.

5.0 PROPOSED ACTIONS AND ESTIMATED COSTS

Proposed actions and estimated costs are presented in the following sections.

5.1 PROPOSED ACTION

The EE/CA was prepared to develop and evaluate removal action alternatives for the remaining 100-K Area ancillary facilities noted in Appendix A. The scope of this removal action is the facilities and, in some cases, soil contamination in the immediate vicinity of the facility. Some soil remediation may be performed in conjunction with D4 work as described in Section 2.0.

The primary purpose of the EE/CA was to evaluate and develop the removal alternatives for the 105-KE and 105-KW Reactor Buildings (excluding the reactor blocks) and the remaining

ancillary facilities (described in Appendix A). The facilities contain radioactive and nonradioactive hazardous substances, either as contamination or as structural components. The contaminants and risks posed by these remaining facilities were described in Section 2.0.

The removal action alternatives evaluated in the 105-KE and 105-KW Reactor Facilities and Ancillary Facilities EE/CA (DOE-RL 2005) were evaluated against the removal action objectives. Specific removal action objectives identified in the EE/CA for this removal action are the following:

- Protect human receptors from exposure to contaminants above acceptable exposure levels within facility structures
- Control the migration of contaminants from the facilities into the environment
- Facilitate and, to the extent practicable, be consistent with anticipated remedial actions within the 100-K Area OUs
- Prevent adverse impacts to cultural resources and nesting migratory birds
- Achieve applicable or relevant and appropriate requirements (ARARs) to the fullest extent practicable
- Safely treat, as appropriate, and dispose of waste streams generated by the removal action
- Take no action that will preclude the eventual final disposition of the 105-KE and 105-KW Reactor blocks.

Based on these considerations, the following three removal action alternatives were identified:

- Alternative I: No action, except current DOE Hanford Site access and institutional controls.
- Alternative II: ISS of the 105-KE and 105-KW Reactors followed by long-term S&M with site institutional controls and D4 of the ancillary facilities and portions of the 105-KE and 105-KW Reactor Facilities.

  This alternative includes immediate D4 and ISS.

- Alternative III: Long-term S&M with site institutional controls followed by D4 of the ancillary facilities and the 105-KE and 105-KW Reactor Facilities.

  This alternative includes S&M for the ancillary facilities until 2018 and until 2060 for both reactors. The S&M is followed by D4 of all facilities and reactor block removal.

5.1.1 Alternative I: No Action

Under the no action alternative, neither D4 activity nor ISS activities would be performed, and current S&M activities would be discontinued. Hanford Site access controls would be maintained to help warn of hazards and to control worker and public access to the facilities. No other specific controls would be established for the facilities covered by this EE/CA. Because

the facilities would not be decontaminated and no action would be taken to stop the facilities from deteriorating, there would be an increased threat and likelihood for a release of hazardous substances, potentially exposing workers, the public, or the environment. In addition, the no action alternative would impede remedial action progress for the 100-KR-1/100-KR-2 OU waste sites located in the geographical area. There is no cost associated with the no action alternative.

5.1.2 Alternative II: ISS of the 105-KE and 105-KW Reactors followed by long-term S&M, and D4 of Ancillary Facilities and portions of the 105-KE and 105-KW reactor buildings

Alternative II would consist of D4 of portions of the two reactor buildings (up to the reactor shield walls) and all of the remaining ancillary facilities, implementing ISS for the 105-KE and 105-KW Reactors, and associated waste disposal. Also included in this alternative is the construction of an SSE over the reactor block that would prevent advanced structural deterioration and potential release of radionuclide or other hazardous substances to the environment, followed by long-term S&M of the 105-KE and 105-KW Reactor Facilities with the Hanford Site institutional controls prescribed in the Remaining Sites ROD (EPA 1999a)." The goal of the ISS is to ensure that the SSE structure provides durable, long-term storage and safe access for interim inspections for the duration of the ISS period, through 2068, during which the reactor block for 105-KE and 105-KW would be prepared for transportation and transported to the 200 Area Plateau for disposal, as determined in the *Final Environmental Impact Statement, Decommissioning of Eight Surplus Production Reactors at the Hanford Site* (DOE 1992). Until the start of work within this alternative, the facilities will remain in the present S&M mode.

Demolition would apply to the ancillary facilities and portions of the 105-KE and 105-KW Reactor Facilities and may be preceded by dismantling building components, such as severing and removing ductwork or selectively removing a wall or structure. Demolition generally means large-scale destruction using heavy equipment (e.g., excavator with a hoe-ram, shears, and concrete pulverizer), explosives, or other industrial methods. Demolition of the facilities would consist of removing all above-grade structures. In some cases, it would also involve removing portions of the below-grade structures and underlying soil, as described in Section 2.3. The first phase of demolition at the 105-KE and 105-KW Reactor Facilities would involve removing the reactor support areas and any associated foundations outside the reactor shield walls, whether at grade or subsurface. Below-grade structures would be removed to a minimum of 0.9 m (3 ft) below surrounding grade. The second phase of reactor demolition would involve removing selected equipment, materials, and structural components from inside the reactor shield walls to prepare for the SSE.

The existing reactor shield walls would be used as the primary enclosure for safe storage. Upon removal of the applicable components from inside the SSE and D4 of the reactor support areas surrounding the shield wall, a roof would be constructed (as required) to enclose the top of the reactor block and adjacent rooms. The roof would consist of structural steel and metal roof decking. The shield walls have supported the roof in earlier SSE structures, and the KE and KW designs are expected to be similar. Openings between the new roof and top of the shield walls would be closed with wall panel siding similar to that of the new roof. Openings and penetrations within the shield walls would be closed i.e., large and small openings or penetrations would be sealed by concrete pourbacks or steel plates, as appropriate.

A single-door entry into each SSE would be provided to limit and control access and would be welded shut. Necessary ventilation ducting would be installed inside the SSE that would be

connected to an external portable exhaust unit prior to entry for maintenance activities. A remote monitoring system would be installed inside the reactor enclosure so that key parameters could be monitored between S&M entries. The final configuration of the building would feature the existing shield walls as the exterior of the building, a single-entry door that would be used for inspections, and a metal roof with similar siding. The equipment associated with the monitoring and electrical power and lighting would be installed in a utility room located outside of the SSE so that entry into the SSE would not be necessary to service this equipment.

As summarized in Table 5-1, the estimated cost of implementing Alternative II for buildings included in the scope of the EE/CA is $80.5 million. The cost estimates for Alternative II are provided in Table 5-1 in both the nondiscounted (2006 dollars) and discounted (present-worth) dollars. Discounting of the estimated costs was conducted in accordance with Sections 4 and 5 of the EPA guidance in *A Guide to Developing and Documenting Cost Estimates During Feasibility Study* (EPA 2000b). A discount rate of 3.1% was used as noted in Appendix C of *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs* (OMB 1992). All D4 and ISS actions were discounted over a 6-year period to reflect the expected project duration of 2006 to 2012. The long-term S&M costs for the SSE were discounted over a 48-year period to reflect the S&M from the end of ISS work until the start of reactor block removal.

Table 5-1. Cost Summary.

Cost Elements	Nondiscounted Alternative II	Discounted Alternative II	Nondiscounted Alternative III	Discounted Alternative III
All S&M - to include reactor buildings (with roof replacements) and all ancillary facilities	N/A	N/A	$ 13,924,695	$ 9,108,969
D4 of ancillary facilities	$ 34,687,941	$ 31,214,984	$ 34,687,941	$ 24,047,755
D4 of 105-KE and 105-KW without SSE	N/A	N/A	$ 25,157,349	$ 4,838,346
D4 of 105-KE and 105-KW with SSE	$ 33,461,609	$ 30,111,447	N/A	N/A
Long-term S&M of SSE	$ 1,440,000	$ 665,405	N/A	N/A
D4 waste from 105-KE and 105-KW	$ 2,080,142	$ 1,871,878	$ 2,080,142	$ 400,060
D4 waste from ancillary facilities	$ 8,832,920	$ 7,948,568	$ 8,832,920	$ 6,123,508
Alternative Totals	$ 80,502,612	$ 71,812,282	$ 84,683,047	$ 44,518,638

D4 = deactivation, decontamination, decommissioning, and demolition
N/A = not applicable
S&M = surveillance and maintenance
SSE = safe storage enclosure

5.1.3 Alternative III: Long-Term S&M followed by D4 of Ancillary Facilities and the 105-KE and 105-KW Reactor Facilities

Alternative III would consist of long-term S&M (including Hanford Site institutional controls) of ancillary facilities and the 105-KE and 105-KW Reactor Facilities, followed by D4 prior to 2068 when the transport and disposal for the 105-KE and 105-KW Reactor blocks to the 200 Area Plateau will occur. In accordance with Tri-Party Agreement Milestone M-16-00, S&M would be conducted for the ancillary facilities until 2018 at which time the D4 phase would be started for

these structures. This would allow adequate time for completion of D4 and remedial action by 2024, as required by the M-16-00 Milestone. Other M-16 and M-93 Milestones, notably the M-16-00A and M-16-53 Milestones, would require additional negotiation with the Tri-Parties to modify these existing commitments. The 105-KE and 105-KW Reactor Facilities, however, would be in an S&M program through 2060, after which D4 would be implemented and completed by 2068. The D4 phase of this alternative would be the same as described in Alternative II, except for preparation for ISS. After the S&M period (to conclude in 2017), the ancillary facilities would be demolished and subsurface contamination would be managed as described in Alternative II. The 105-KE and 105-KW Reactor Facilities would be left in a condition to immediately implement final disposition of the reactor block to the 200 Area Plateau in accordance with prior decisions made under the *National Environmental Policy Act of 1969* (NEPA). The SSE structure would not be constructed under this alternative.

The S&M measures would include routine radiological and hazard monitoring of the facilities, safety inspections, and periodic confirmatory measurements of ventilation systems, as required. The S&M activities would be tailored to the specific condition of each facility. Activities would be balanced to reduce hazards to workers while reducing the potential for releases of contaminants. Major repairs such as re-roofing and shoring structural components would be necessary for the 105-KE and 105-KW Reactor Facilities prior to D4 activities. These major repairs would be required to ensure the integrity of the facilities, which are necessary to contain contaminants within the structures. It is anticipated that a new roof would be required for the reactor building at least twice during the S&M period, as the type of roofs currently used typically have a 20-year life. Other major repairs would be performed at the reactor facilities during their corresponding S&M periods on an as-needed basis.

As facilities age and deteriorate, typically S&M must become more aggressive and would involve increased frequency of required activities and a higher level of worker protection, which would increase cost. As cost increases, long-term S&M would become less viable. As the facilities continue to age and S&M is necessarily more aggressive, it may not be cost-effective to prolong the S&M period for the 105-KE and 105-KW Reactor Facilities through 2060. D4 of the reactor facilities may be required sooner to ensure that releases would not occur. Without an increasingly aggressive S&M program, the threats of releases to the environment would increase. Conversely, an aggressive S&M program would require workers to enter facilities more often, and workers may be required to perform more invasive procedures to maintain the facilities, which would increase the potential for exposure to workers. Additionally, personal protection requirements to maintain the more aggressive program continually increase, which would add to the cost.

A variety of waste streams would be generated in the performance of S&M that would be characterized, packaged, and disposed. Waste that meets the ERDF waste acceptance criteria would be disposed at the ERDF, and other wastes would be managed to comply with identified ARARs.

As summarized in Table 5-1, the estimated cost of implementing Alternative III for buildings included in the scope of the EE/CA is $84.7 million with present work costs of $44.5 million.

5.2 WASTE MANAGEMENT CONSIDERATIONS FOR ALTERNATIVES

Alternatives II and III would each generate waste that requires disposal at appropriate disposal sites, thus waste management would be a common element for these alternatives. The majority

of the contaminated debris likely will designate as low-level waste (LLW); however, quantities of mixed waste, dangerous waste, and transuranic (TRU) waste might be generated. Waste management ARARs are discussed in Section 5.3.

Contaminated waste for which no reuse, recycle, or decontamination options are identified would be assigned an appropriate waste designation (e.g., solid, asbestos, PCB, radioactive, dangerous, or mixed). Most of the contaminated waste generated during implementation of these alternatives would be disposed at the Hanford Site at the ERDF near the 200 West Area. The ERDF is the preferred waste disposal option because the ERDF is an engineered facility that provides a high degree of protection to human health and the environment, and previous EE/CAs for other Hanford Site facilities have shown that this disposal option is more cost effective than disposal at other disposal sites.

Construction of the ERDF was authorized by the *Record of Decision for the Environmental Restoration Disposal Facility* (EPA 1995). The ERDF is designed to meet RCRA minimum technological requirements for landfills, including standards for a double liner, a leachate collection system, leak detection, and a final cover.

In 1996, an ESD (Ecology et al. 1996) clarified the eligibility of waste generated during Hanford Site cleanup activities for ERDF disposal. In accordance with the explanation of significant difference, any low-level waste, mixed waste, or hazardous/dangerous waste generated as a result of CERCLA or RCRA cleanup actions (e.g., D4, RCRA past-practice, and investigation-derived wastes) is eligible for ERDF disposal, provided that appropriate CERCLA decision documents are in place and that the waste meets *Environmental Restoration Disposal Facility Waste Acceptance Criteria* (BHI 2002). The waste that would be generated under these alternative CERCLA removal actions falls within the definition of waste eligible for disposal at the ERDF.

It should be noted that the scope of work covered in this removal action is for facilities and waste contaminated with hazardous substances. The DOE will disposition materials encountered during implementation of the selected removal action that are not contaminated with hazardous substances under non-CERCLA authority and therefore not eligible for disposal at ERDF.

While most waste generated during the removal action is anticipated to meet ERDF waste acceptance criteria, some waste may require treatment to meet ERDF waste acceptance criteria or RCRA land disposal restrictions. The type of treatment and the location of treatment would be conducted in accordance with the EPA-approved RAWP. In most cases, the type of treatment anticipated would consist of solidification/stabilization techniques such as macro-encapsulation or grouting. Specifically, this includes low-level radioactive and nonradioactive waste.

Liquid waste containing levels of radioactive and/or nonradioactive hazardous substances meeting the 200 Area Effluent Treatment Facility (ETF) waste acceptance criteria would typically be transferred to the ETF and treated to meet ETF waste discharge criteria. Liquids that do not meet ETF waste acceptance criteria would be treated to meet land disposal restrictions and either disposed at the ERDF (if ERDF waste acceptance criteria are met) or stored at the Central Waste Complex (CWC) or another approved storage facility, subject to final disposition under CERCLA. Secondary waste generated from ETF treatment would either be disposed at ERDF (if ERDF waste acceptance criteria are met) or stored at CWC or another approved storage facility, subject to final disposition under this CERCLA removal action.

Management of the waste at these units would be in accordance with applicable requirements, including any permit requirements. The CWC and ETF have existing off-site acceptability determinations from EPA.

Uncontaminated water (e.g., nonradioactive and nonhazardous) could be used for dust suppression.

If TRU waste is encountered, it would be placed in interim storage at the Waste Receiving and Processing Facility Module 1 (WRAP) or the CWC, subject to final disposition under this CERCLA removal action. Transuranic waste will ultimately be shipped offsite to the Waste Isolation Pilot Plant (WIPP) in accordance with the RAWP and the schedule established for completing remedial actions no later than September 30, 2024. Management of the waste at these units would be in accordance with applicable requirements, including any permit requirements.

Of the above Hanford Site disposal options, only the ERDF is considered to be "onsite" for management and/or disposal of waste from removal actions proposed in this document[3]. There is no requirement to obtain a permit to manage or dispose of CERCLA waste at the 100-KE/KW reactors or the associated ancillary facilities, or at the ERDF. It is expected that the great majority of the waste generated during the removal action can be disposed onsite at the ERDF. For waste that must be disposed of elsewhere, the EPA will make a determination in accordance with 40 CFR 300.440 as to the acceptability of the proposed site for receiving this CERCLA removal action waste. The EPA has already made this determination for the WIPP disposal of TRU waste. Residuals from an offsite treatment of waste originating from facilities addressed by Action Memorandum can be disposed at ERDF providing the treatment residuals meet the ERDF waste acceptance criteria.

5.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND OTHER CRITERIA, ADVISORIES, OR GUIDANCE TO BE CONSIDERED

40 CFR Part 300.415(j) requires that removal actions attain ARARs, to the extent practicable, considering exigencies of the situation. When requirements are identified, a determination must be made as to whether those requirements are applicable or relevant and appropriate. A requirement is applicable if it specifically addresses a hazardous substance, pollutant or contaminant, remedial action, location or other circumstance at the site. If not applicable, a

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[3] CERCLA Section 104(d)(4) states that, where two or more noncontiguous facilities are reasonably related on the basis of geography, or on the basis of the threat or potential threat to the public health or welfare or the environment, the President may, at his discretion, treat these facilities as one for the purpose of this section. The preamble of the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300) clarifies the stated EPA interpretation that when noncontiguous facilities are reasonably close to one another, and wastes at these sites are compatible for a selected treatment or disposal approach, CERCLA Section 104(d)(4) allows the lead agency to treat these related facilities as one site for response purposes and, therefore, allows the lead agency to manage waste transferred between such noncontiguous facilities without having to obtain a permit. Therefore, the 100 Area NPL site and the ERDF are considered to be onsite for response purposes under this removal action. It should be noted that the scope of work covered in this removal action is for facilities and waste contaminated with hazardous substances. The DOE will disposition materials encountered during implementation of the selected removal action that are not contaminated with hazardous substances under non-CERCLA authority, and therefore not eligible for disposal at ERDF.

requirement may nevertheless be relevant and appropriate if it addresses problems or situations sufficiently similar to the problems or situations encountered and their use is well suited to the site.

ARARs for on-site actions include only substantive requirements of environmental standards. ARARs do not include administrative requirements, including requirements to obtain any federal, state, or local permits (40 CFR 300.400[e] and 42 U.S.C. 9621[e]).

To-be-considered (TBC) information is nonpromulgated advisories, criteria, or guidance issued by federal or state governments that is not legally binding and does not have the status of ARARs. As appropriate, TBC information should be considered in determining the removal action necessary for protection of human health and the environment. Requirements drawn from TBC information may be included in the selected alternative.

Because the alternatives would result primarily in waste generation and potential for air emissions, the key ARARs identified for the alternatives considered include waste management standards, standards controlling releases to the environment, and standards for protection of natural resources and worker safety and health standards[4]. The ARARs are discussed generally in the following sections. Off site management would require compliance with all applicable, substantive, and administrative requirements.

5.3.1 Waste Management Standards

A variety of waste streams would be generated under the proposed removal action alternatives. It is anticipated that most of the waste will designate as LLW. However, quantities of TRU waste, dangerous or mixed waste, PCB waste, and asbestos-containing material also could be generated. The great majority of the waste will be in a solid form. However, some aqueous solutions might be generated.

Waste designated as LLW that meets ERDF waste acceptance criteria (BHI 2002) would be disposed at the ERDF, which is engineered to meet relevant and appropriate performance standards under 10 CFR 61. If TRU waste is encountered, it would be placed in interim storage at WRAP or the CWC and shipped offsite to WIPP in accordance with the WIPP waste acceptance criteria.

The identification, storage, treatment, and disposal of the hazardous waste component of mixed waste generated during the removal action would be subject to the substantive provisions of RCRA. In Washington State, RCRA is largely implemented through *Washington Administrative Code* (WAC) 173-303, which is an EPA-authorized state program to implement most elements of the RCRA program. The substantive portions of the dangerous waste standards for generation, treatment, disposal, and storage are applicable to the management of any dangerous or mixed waste generated under this action. Treatment standards for dangerous or mixed waste subject to RCRA land disposal restrictions are specified in WAC 173-303-140, which incorporates 40 CFR 268 by reference. Waste that does not qualify for disposal in ERDF

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[4] Worker safety and health standards such as standards promulgated under OSHA are not environmental standards per se and therefore not potential ARARs. Instead, compliance with applicable safety and health regulations is required external to the CERCLA ARAR process. However, due to the nature and importance of these standards, a discussion of the safety and health requirements are included in this Action Memo.

will be disposed of at an off site facility approved by EPA in accordance with 40 CFR 300.440, and will be performed in accordance with the EPA-approved RAWP.

Waste designated as dangerous or mixed waste would be treated as appropriate to meet land disposal restrictions and ERDF acceptance criteria, and disposed at ERDF. ERDF is engineered to meet minimum RCRA technological requirements for landfills, including standards for double liner, a leachate collection system, leak detection, monitoring, and a final cover. All applicable packaging and pre-transportation requirements for dangerous and mixed waste generated under this action would be identified and implemented before movement of any waste.

Some of the aqueous waste designated as LLW, dangerous, or mixed waste may be transported to ETF for treatment and disposal. ETF is a RCRA-permitted facility authorized to treat aqueous waste streams generated on the Hanford Site and dispose of these streams at a designated state-approved land disposal facility. Such treatment would be conducted in accordance with ETF permits and all other applicable requirements, and in accordance with the EPA-approved RAWP.

The management and disposal of PCB waste are subject to the *Toxic Substances Control Act of 1976* (TSCA) and regulations at 40 CFR 761. The TSCA regulations contain specific provisions for PCB waste, including PCB waste that contains a radioactive component. PCBs are also considered underlying hazardous constituents under RCRA and thus could be subject to WAC 173-303 and 40 CFR 268 requirements for wastes that also designate as hazardous/dangerous or mixed wastes.

Waste designated as PCB remediation waste likely would be disposed at the ERDF. All waste suspected to contain PCBs would be evaluated to determine whether the waste meets ERDF acceptance criteria. Any PCB waste that does not meet ERDF acceptance criteria would be retained and managed at a PCB storage area meeting the requirements of TSCA storage until disposed of at an appropriate disposal facility, in accordance with the EPA-approved RAWP. Offsite treatment and/or disposal would require an offsite acceptability determination from EPA in accordance with 40 CFR 300.440, with notification to Ecology.

The removal and disposal of asbestos and asbestos-containing material (ACM) are regulated under the *Clean Air Act of 1977* (as implemented by 40 CFR 61, Subpart M). The 40 CFR 61 requirements applicable to this removal action are contained in 40 CFR 61.145(a), 40 CFR 61.145(c), and 40 CFR 61.150. These regulations also specify handling, packaging, and disposal requirements for regulated sources having the potential to emit asbestos. Substantive requirements of these standards are applicable because this removal action includes abatement of asbestos-containing materials. Asbestos and asbestos-containing material would be removed, packaged as appropriate, and disposed at ERDF.

Subpart F of 40 CFR 82 is applicable for the recovery, recycling, and reclamation of ozone depleting substances from refrigeration equipment that is present at the facilities subject to this removal action. The substantive requirements of Subpart F will apply to actions being taken on the CERLCA site. The substantive and administrative requirements are also applicable when performing recovery, recycling, reclamation, or disposal actions at offsite facilities. As with any other waste, offsite treatment and/or disposal would require an offsite acceptability determination from EPA in accordance with 40 CFR 300.440.

The *Hazardous Materials Transportation Act of 1974* as implemented via the "U.S. Department of Transportation Requirements for the Transportation of Hazardous Materials) (49 CFR 100 through 179), governs the transportation of potentially hazardous materials, including samples and waste. These requirements would have to be met where applicable for any wastes or contaminated samples that would be shipped from the 100-K Area in commerce and over public roads.

This removal action will be performed in compliance with all waste management ARARs. All waste streams will be evaluated, designated, and managed in compliance with the ARAR requirements. Before disposal, waste will be managed in a protective manner to prevent releases to the environment or unnecessary exposure to personnel. Details on how compliance with ARARs will be achieved during implementation of the removal action will be contained in the EPA-approved RAWP.

5.3.2 Standards Controlling Emissions to the Environment

The proposed removal action alternatives would have the potential to generate both radioactive and nonradioactive airborne emissions.

The federal *Clean Air Act* and the "Washington Clean Air Act" (*Revised Code of Washington* [RCW] Chapter 70.94) regulate both criteria, toxic and radioactive airborne emissions. Implementing regulations found in 40 CFR 61.92 set limits for emission of radionuclides. Radionuclide emissions cannot exceed those amounts that would cause any member of the public to receive an effective dose equivalent of 10 mrem/yr. This requirement is applicable because there is the potential to emit radionuclides to unrestricted areas from the removal action. WAC 173-480-070 requires verification of compliance with this standard.

Radioactive air emissions are to be controlled through the use of best available radionuclide control technology (WAC 246-247-040[3]) or as low as reasonable control technology (WAC 246-247-030-040[4]). Emissions of radionuclides are to be measured for point sources (40 CFR 61.93) and for non-point sources (WAC 246-247-075[8]). Measurement techniques may include, but are not limited to, sampling, calculation, or smears for identifying emissions, and will be outlined in the EPA-approved RAWP. The substantive requirements of these regulations are applicable because fugitive, diffuse, and point source emissions of radionuclides to the ambient air may result from activities performed during the removal action.

WAC 173-400 and 173-460 establish requirements for emissions of criteria/toxic air pollutants. The primary source of emissions resulting from this removal action would be fugitive particulate matter. Requirements applicable to this removal action are contained in WAC 173-400-040(3) and (8). These regulations require that reasonable precautions be taken to (1) prevent the release of air contaminants associated with fugitive emissions resulting from materials handling, demolition or other operations, and (2) prevent fugitive dust from becoming airborne from fugitive sources of emissions.

WAC 173-460 would be applicable to removal actions that require the use of a treatment technology that emits toxic air pollutants. Treatment of some waste may be required to meet the ERDF waste acceptance criteria. In most cases, the type of treatment anticipated would consist of solidification/stabilization techniques such as macro-encapsulation or grouting, and WAC 173-460 would not be considered an ARAR because it would not result in the emission of toxic air pollutants. No treatment requirements have been identified at this time that would be required to meet the substantive applicable requirements of WAC 173-460. However, if

unknowns are encountered, that require more aggressive on-site treatment, resulting in the emission of toxic air pollutants, the substantive requirements of WAC 173-460-030, WAC 173-460-060, and WAC 173-460-070 would be satisfied if the requirements are applicable, or relevant and appropriate, as specified in the EPA approved RAWP.

Conditions and limitations for the control and monitoring of radioactive and/or nonradioactive emissions from 1706KE, 1724-K, and 142-K Cold Vacuum Drying Facility are currently incorporated into the *Hanford Site Air Operating Permit*. The substantive requirements from the regulations cited above will be incorporated into the RAWP for this removal action[5]. The removal action is subject to ARARs and not permits or administrative requirements from the regulations cited above.

5.3.3 Standards for Protection of Cultural, Natural, and Historical Resources

Requirements associated with archeological remains, human remains, historical artifacts, endangered species, and migratory birds are presented in the following subsections.

5.3.3.1 Archeological Materials. The *Archeological and Historic Preservation Act of 1974* provides for the preservation of historical and archeological data (including artifacts) that might be irreparably lost or destroyed as the result of a proposed action. Although the removal action will occur in previously disturbed areas and the discovery of artifacts is unlikely, this law would be applicable to any significant artifacts that may be discovered.

5.3.3.2 Human Remains. The *Native American Graves Protection and Repatriation Act of 1990* (as implemented by 43 CFR 10) requires agencies to consult and notify culturally affiliated tribes when Native American human remains are inadvertently discovered during project activities and to seek ways to protect or repatriate the human remains. It is unlikely that work proposed in this removal action would inadvertently uncover human remains. If human remains were encountered, however, the procedures documented in the *Hanford Cultural Resource Management Plan* (DOE-RL 2003a) would be followed to satisfy substantive requirements.

5.3.3.3 Historical Artifacts. The *National Historic Preservation Act of 1966* (as implemented by 36 CFR 800) requires Federal agencies to evaluate historic properties for *National Register of Historic Places* (NPS 1988) eligibility, and to mitigate adverse effects of Federal activities on any site eligible for listing in the Register. Prior to initiating a project on the Hanford Site, a cultural resource review is required to ensure that impacts to cultural resources are avoided where possible or mitigated as necessary. A cultural resources review will be performed prior to scheduled demolitions of the facilities addressed in this action memorandum in compliance with the requirements of the *National Historic Preservation Act of 1966* (NHPA) (16 U.S.C. 470) to verify or update the actions discussed in the following paragraph. The baseline assumption is that buildings will not be preserved in place or relocated for preservation.

With respect to historic properties, the *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan* (DOE-RL 1998) documents that six of the facilities included in the scope of the removal action are eligible for listing in the National Register of Historic Places (Register) as contributing properties within the Hanford Site Manhattan Project and Cold War Era Historic District (105-KW, 181-KW, 1706-KE, 1706-KER, 1717-K, and 1908-KE) as noted in

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[5] Pursuant to section 121(e)(1) of CERCLA, the permit does not apply to CERCLA removal action conducted entirely on site.

Table A-1. Under this treatment plan, the operational history and/or significant engineering achievements of these eligible properties was documented on either Expanded Historic Property Inventory Forms or standard Historic Property Inventory Forms. The contribution these structures made to the Cold War is described in Section 3 ("Reactor Operations") of Chapter 2 of the *History of the Plutonium Production Facilities at the Hanford Site Historic District, 1943-1990,* (DOE-RL 2002. Also in compliance with the treatment plan, walkthroughs to identify artifacts that may have interpretive or educational value as exhibits within local, state, or national museums have been conducted for these structures. Seven artifacts were located within 105-KW and nine were located in 1706-KE/KER. Five of these artifacts have been retrieved and transferred to the Columbia River Exhibition of History, Science, and Technology (curator for the DOE Hanford Site Manhattan Project and Cold War Era Collection), eight have been photographed and documented in place, and the remaining three were re-evaluated and deleted from consideration for retention or photo-documentation. Therefore all physical effects to these eligible properties, up to and including demolition, have been mitigated. No additional actions are required.

5.3.3.4 Endangered Species and Migratory Birds. The *Endangered Species Act of 1973* and WAC 232-012-297 require the conservation of critical habitat on which endangered or threatened species depend and prohibit activities that threaten the continued existence of listed species or destruction of critical habitat. The *Migratory Bird Treaty Act of 1918* (16 U.S.C. 703 et seq.) makes it illegal to remove, capture, or kill any migratory bird or any part of nests or the eggs of any such birds. Although threatened, endangered, and migratory species are known to be present in the areas surrounding the 100-K Area (PNNL 2005), no adverse impacts on protected species or critical habitat resulting from implementation of either alternative would be anticipated because the removal action would be limited to areas highly disturbed from past and present industrial operations. The potential for impacts to biological resources is typically greater at borrow sites because they are located in otherwise undisturbed areas. Activity specific ecological reviews will be conducted in compliance with *Ecological Compliance Assessment Management Plan* (DOE-RL 2006) to identify any potentially adverse impacts to species of concern as identified in the *Hanford Site Biological Resources Management Plan* (DOE-RL 2001) prior to beginning fieldwork. Species of concern include Federal and State threatened and endangered species as well as migratory birds and Washington State priority species. If impacts to federal threatened or endangered species or their habitats are anticipated, consultation as prescribed under Section 7 of the ESA will be initiated. If impacts to other species or habitats of concern are anticipated, mitigation will be prescribed to reduce or prevent the impacts in accordance with the *Hanford Site Biological Resources Mitigation Strategy* (DOE-RL 2003b).

5.3.3.5 Standards for Controlling Stormwater Discharges. The 100-K Reactor area has a stormwater collection system that discharges to the Columbia River via a National Pollutant Discharge Elimination System (NPDES)permit under authority of Section 402 of the Clean Water Act, as implemented through regulations under 40 CFR Part 122. In accordance with the *CERCLA Compliance With Other Laws Manual* (EPA 1988), and in particular the Clean Water Act, such off-site stormwater discharges are subject to the NPDES permit. Because CERCLA ARARs are for on-site activities, the laws and regulations which apply to this stormwater discharge are not ARARs for this removal action.

5.3.3.6 Floodplains and Wetlands. The "Compliance with Floodplain/Wetlands Environmental Review Requirements" (10 CFR 1022) mandates that actions performed within a floodplain be conducted in a manner that avoids adverse effects, minimizes potential harm, and restores and

preserves natural and beneficial uses. Some of the buildings in the 100-K Area are located within the Columbia River floodplain and must comply with these requirements.

5.3.4 Worker Safety and Health Standards

Worker safety and health requirements are not ARARs under CERCLA, but may be independently applicable. These standards, however, must be followed in accordance with DOE requirements during the course of the removal action. The DOE radiation protection standards, limits, and program requirements for protecting workers from ionizing radiation are specified in "Occupational Radiation Protection" (10 CFR 835). The rule also requires that measures be taken to maintain radiation exposures as low as reasonably achievable. In addition, the DOE must meet Occupational Safety and Health Administration requirements for worker protection (e.g., 29 CFR 1910 and 29 CFR 1926), national consensus standards, and DOE orders. Exposure limits, personnel protection requirements, and decontamination methods for hazardous chemical are established by 29 CFR 1910. Identification and mitigation of physical hazards posed by a facility including (but not limited to) confined spaces, falling hazards, fire, and electrical shock are also required. 29 CFR 1926 provides requirements for worker safety during construction activities. The applicable DOE orders require analysis of hazards posed by work activities and identification of controls necessary to work safely.

Under either alternative, radiological and physical hazards would be identified and analyzed prior to the start of field activities, and appropriate measures for mitigation would be addressed in a task-specific health and safety plan. A combination of personal protective equipment, personnel training, and administrative controls (e.g., limiting time in, and distance from, radiation zones) would be used to ensure that the requirements for worker protection are met. Individual monitoring would be performed, as necessary, to verify compliance with the requirements.

5.4 ESTIMATED COSTS

The following is a summary of estimated costs for Alternatives II and III considered in the EE/CA (DOE-RL 2005a). The near-term costs for implementing the no action alternative are negligible as no new costs are expected for such things as security, radiological surveys, or maintenance activities; therefore, costs of the no action alternative are not included. Consistent with guidance established by the EPA and the U.S. Office of Management and Budget (OMB) Circular A-94 (OMB 1992), present-worth analysis is included for comparing costs of cleanup alternatives under the CERCLA program (EPA 1993).

The cost estimates for Alternative II are provided in Table 5-1 in both the nondiscounted (2006 dollars) and discounted (present-worth) dollars. Discounting of the estimated costs was conducted in accordance with Sections 4 and 5 of the EPA guidance in *A Guide to Developing and Documenting Cost Estimates during Feasibility Study* (EPA 2000b). A discount rate of 3.1% was used as noted in Appendix C of *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs* (OMB 1992). All D4 and ISS actions were discounted over a 6-year period to reflect the expected project duration of 2006 to 2012. The long-term S&M costs for the SSE were discounted over a 48-year period to reflect the S&M from the end of ISS work until the expected start of reactor block removal.

The costs to implement Alternative III were estimated on an annual basis in 2006 dollars and then summarized for the S&M period (up to 2018) for the ancillary facilities and up to 2060 for the 105-KE and 105-KW Reactor Facilities. Costs have not been factored into the estimate to

account for the increased resource demands on the S&M program that would be required over time, nor have costs associated with increased worker protection measures been included. Aside from the estimates for roof replacement and associated waste disposal costs that would be required on the reactors every 20 years, costs associated with other potential major repairs have not been included in the estimate because of the unknown frequency and magnitude of the required repairs.

The reactor costs are shown as a composite of the various subelements estimated for those buildings. While the estimates for all the buildings listed include these subelement costs, they are only shown for the reactors.

The S&M costs for the two reactor buildings was estimated and discounted over a 54-year period to reflect the S&M until the expected start of reactor block removal. Roof replacement and waste disposal was estimated and discounted for application in 2026 and 2046. Reactor D4 costs were discounted until 2060 to reflect the expected start of D4/block removal. S&M for ancillary facilities was estimated and discounted over a 12-year period until the start of D4 in 2018. The D4 work scope was discounted over a 6-year period to reflect the expected project duration of 2018 to 2024.

5.5 PROJECT SCHEDULE

The 100-K Area ISS, long-term S&M, and D4 removal action is scheduled to begin in 2007 or when the facilities are released for D4 by the other projects with completion of the removal action by December 31, 2012, as governed by the associated Tri-Party Agreement milestones shown in Table 5-2.

Table 5-2. Tri-Party Agreement Milestones for the 100-KE and 100-KW Reactor Facilities and Ancillary Facilities. (2 Pages)

Milestone	Description	Due Date
M-016-00	Complete remedial actions for all non-tank farm operable units	9/30/2024
M-016-00A	Complete all interim response actions for the 100 Areas	12/31/2012
M-016-52	Initiate response actions for the remaining waste sites for the 100K Area including closure of the 1706-KE waste treatment system in accordance with Section 5.5 of the Agreement Action Plan	7/31/2009
M-016-53	Complete the interim response actions for the 100-K Area	12/31/2012
M-93-00	Complete final disposition of all 100 Area surplus production reactor buildings	To be determined
M-093-22	Complete 105-KE and 105-KW Reactor ISS	9/30/2011

ISS = interim safe storage
KE = K East
KW = K West

The RAWP, which will include an implementation schedule, air monitoring and waste management plans, and a sampling and analysis plan will be submitted to EPA within 180 days

from EPA's concurrence on the Action Memorandum for review and approval and will be implemented as written and approved.

6.0 EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Severe weather can create facility conditions amenable to radiological releases to the environment, and long-term aging of engineered controls can lead to eventual failure. Additionally, failure to remove certain facilities precludes cost-effective remediation of underlying or adjacent waste sites in accordance with the Remaining Sites ROD. These conditions could result in releases to the environment. This may cause a threat to human health and the environment by direct exposure to nearby personnel and the environment and exposure to the public through airborne radioactive contaminants.

7.0 OUTSTANDING POLICY ISSUES

There are no outstanding policy issues for this removal action.

8.0 SELECTED ALTERNATIVE

The selected alternative for the 105-KE and 105-KW Reactor Facilities and the remaining ancillary facilities included in the scope of this action memorandum is Alternative II as described in this Action Memorandum: ISS of the 105-KE and 105-KW Reactors followed by long-term S&M, and D4 of the ancillary facilities and portions of the 105-KE and 105-KW Reactor Facilities. This alternative includes deactivation where needed, demolition of the buildings, removal of contaminated waste/demolition debris, and disposal of the material at the ERDF or another approved facility and is consistent with the remedial action to be taken per 40 CFR 300.415(b)(5)(ii). This alternative also requires maintaining the Hanford Site institutional controls prescribed in the Remaining Sites ROD (EPA 1999a) during the long-term S&M of the SSE. This alternative also results in the use of geological materials from existing borrow sites/pits as required to backfill and recontour areas where contaminated soils or structures have been removed.

Alternative II is selected based on its ability to provide protection to human health and the environment and its effectiveness in maintaining that protection in both the short term and the long-term. The alternative removes the threat of release of radiological and nonradiological hazardous substances to the environment resulting from facility deterioration or animal intrusion, and reduces potential exposure to personnel caused by continued S&M of aging facilities. In addition, Alternative II contributes to the efficient performance of long-term remedial actions for the 100-KR-1 and 100-KR-2 OUs.

This action memorandum represents the selected removal action for buildings located in the 100-K Area of the Hanford Site and identified in table A-1 of Appendix A, and was developed in accordance with CERCLA, as amended, and is consistent with the NCP. This decision is based on the information provided in the Administrative Record for this project.

9.0 REFERENCES

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10 CFR 835, "Occupational Radiation Protection," *Code of Federal Regulations*, as amended.

10 CFR 1022, "Compliance with Floodplain/Wetlands Environmental Review Requirements," *Code of Federal Regulations*, as amended.

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Signature sheet for the Action Memorandum for the Removal Action for the 105-KE and 105-KW Reactor Facilities and the 100 K Area Ancillary Facilities, between the U.S. Environmental Protection Agency and the U.S. Department of Energy

Joe R. Franco, Assistant Manager
for the River Corridor
Richland Operations Office
U.S. Department of Energy

1/4/07
Date

Concurrence sheet for the Action Memorandum for the Removal Action for the 105-KE and 105-KW Reactor Facilities and Ancillary Facilities, between the U.S. Environmental Protection Agency and the U.S. Department of Energy

Nick Ceto

4 JAN 2007

Nick Ceto, Hanford Project Manager
U.S. Environmental Protection Agency

Date

APPENDIX A

SCOPE OF ACTION MEMORANDUM FOR THE 105-KE AND 105-KW REACTOR FACILITIES AND ANCILLARY FACILITIES

A.1 INTRODUCTION

Table A-1 provides a listing of the facilities within the scope of this action memorandum. Since the 1980s, a portion of the 100-K Area infrastructure has been kept operational to support the storage and remediation of spent fuel in the 105-KE and 105-KW Basins (K Basins). While most of the fuel has been removed, some of these buildings and systems remain active to support the final spent fuel and sludge removal and deactivation of the basins. As these activities are completed, the remaining facilities and systems will be released for removal actions in accordance with this action memorandum.

The EE/CA provides more detailed tables that include facility name, number, location, size, construction, operational and process history, and waste characterization.

Table A-1. 100-K Area Interim Safe Storage Reactor Facilities and Ancillary Facilities. (5 Pages)

Building No.	Building Name	WIDS Sites Potentially Impacted by D4 and ISS[d]	Addressed in AM?	Radiological Status	Other Contamination
100-K Area ISS Reactor Facilities[a]					
105-KE	Reactor Building	118-KE-1 130-KE-1 100-K-3 UPR-100-K-1 100-K-69 100-K-42 100-K-56 100-K-70 100-K-68 100-K-47 100-K-53 100-K-71 116-KE-3 100-K-62 132-KE-1 100-K-6 100-K-46	Yes	RC	UHCM
105-KW	Reactor Building	118-KW-1 130-KW-1 132-KW-1 100-K-43 100-K-75 100-K-74 100-K-72 116-KW-2 100-K-73 100-K-59 100-K-47 100-K-55 100-K-54 100-K-61 100-K-1	Yes	RC	UHCM
100-K Area ISS Ancillary Facilities[a, b,c]					
105-KE	Water Tunnels	None	Yes		UWTC
105-KW	Water Tunnels	None	Yes		UWTC
119-KE	Exhaust Air Sample Building	100-K-46 130-KE-1 132-KE-1	Yes	RC	UHCM
142-K	CVDF	None	Yes	RC	
142-KA	CVDF Generator Building	None	Yes	RC	
1506-K1	Fiber Optics Computer Hut	None	Yes	PRC	
151-K	Switching Station	None	Yes		UHCM, PCB leaks and spills

Table A-1. 100-K Area Interim Safe Storage Reactor Facilities and Ancillary Facilities. (5 Pages)

Building No.	Building Name	WIDS Sites Potentially Impacted by D4 and ISS[d]	Addressed in AM?	Radiological Status	Other Contamination
151-KE	Substation 230-KV	None	Yes		UHCM, PCB leaks and spills
151-KW	Substation 230-KV	None	Yes		UHCM, PCB leaks and spills
1605-K	Guard Towers and Fences, to include poles, lines and above-grade utility piping	None	Yes	RC	UHCM
165-KE	Power Control Building	100-K-67 120-KE-8 130-KE-2 100-K-48 100-K-5	Yes		Chemical, PCB leaks and spills
165-KW	Power Control Building	100-K-66 120-KW-6 130-KW-2	Yes		Chemical, PCB leaks and spills
166A-KE	Oil Storage Facility Valvehouse	130-KE-2	Yes		Chemical, UHCM
166A-KW	Oil Storage Facility Valvehouse	130-KW-2	Yes		Chemical, UHCM
167-K/167-KE	Crosstie Tunnel Building	None	Yes		UWTC
1705-KE	Effluent Water Treatment Pilot Plant	120-KE-8 100-K-5 100-K-58 100-K-47	Yes	RC	Chemical, Biohazards
1706-KE	Water Studies Semi-Works Building	100-K-3 100-K-4 100-K-36 100-K-37 100-K-38 100-K-52 116-KE-2 116-KE-6A 116-KE-6B 116-KE-6C 116-KE-6D	Yes	RC	Chemical, UHCM
1706-KEL	Development Laboratory	None	Yes	RC	Chemical, UHCM
1706-KER	Waste Studies Recirculation Building	116-KE-2	Yes	RC	Chemical, UHCM
1713-KE	Shop Building	None	Yes	RC	UHCM
1713-KER	Warehouse	None	Yes	RC	UHCM
1713-KW	Warehouse	None	Yes	RC	UHCM

Table A-1. 100-K Area Interim Safe Storage Reactor Facilities and Ancillary Facilities. (5 Pages)

Building No.	Building Name	WIDS Sites Potentially Impacted by D4 and ISS[d]	Addressed in AM?	Radiological Status	Other Contamination
1714-KE	Oil and Paint Storage Shed	100-K-53	Yes		Chemical, UHCM
1714-KW	Warehouse	100-K-54	Yes	RC	UHCM
1717-AKE	Fan House	None	Yes		Chemical, UHCM
1717-K	Maintenance/Transportation Shop	130-K-1 130-K-2	Yes		Chemical, UHCM
1724-K	Maintenance Shop	None	Yes		Chemical, UHCM
1724-KA	Equipment Shed	None	Yes		Chemical, UHCM
1724-KB	Gas Bottle Storage Building	None	Yes		Chemical, UHCM
181-KE	River Pump House	100-K-64	Yes		UHCM, Asbestos
181-KW	River Pump House	100-K-63	Yes		UHCM, Asbestos
183.1-KE	Headhouse	100-K-58 120-KE-4 100-K-35 120-KE-5 100-K-27 120-KE-6 120-KE-25 120-KE-9 120-KE-1 126-KE-2 120-KE-2 126-KE-3 120-KE-3	Yes		Chemical, UHCM
183.2-KE	Basins/ Sedimentation	None	Yes		Chemical, UHCM
183.3-KE	Basin/Filters	None	Yes		Chemical, UHCM
183.4-KE	Reservoir and Clearwells	None	Yes		Chemical, UHCM
183.5-KE	Lime Feeder Building	None	Yes		Chemical, UHCM
183.6-KE	Lime Feeder Building	None	Yes		Chemical, UHCM
183.7-KE	Pipe Tunnel	None	Yes		Chemical, UHCM
183-K	Pipe Tunnels	None	Yes		Chemical, UHCM
183-KE	Chlorine Vault	Same as 183.1-KE above	Yes		Chemical, UHCM
185-K	Potable Water Treatment Plant	None	Yes		Chemical

Table A-1. 100-K Area Interim Safe Storage Reactor Facilities and Ancillary Facilities. (5 Pages)

Building No.	Building Name	WIDS Sites Potentially Impacted by D4 and ISS[d]	Addressed in AM?	Radiological Status	Other Contamination
1908-KE	Effluent Water Monitoring Station	100-K-47 100-K-60	Yes	RC	UHCM
190-KE	Main Pump House	100-K-67	Yes		Chemical, UHCM
296-K105	Air Sparging Vent 105-KW Basin	None	Yes	RC	UHCM
296-K142	CVDF Main Stack	None	Yes	RC	Chemical
CC1K0035 CC1K0036 CC1K0037 CC1K0176 CC1K0177 CC1K0178 CC1K0179 CC1K0180 CC1K0181 CC1K0182 CC1K0236	Cargo Containers	None	Yes	RC	UHCM
HS0028 HS0080 HS0081	Storage Containers	None	Yes		Chemical
KA-CW-01	CERCLA Storage Unit	None	Yes		Chemical

Table A-1. 100-K Area Interim Safe Storage Reactor Facilities and Ancillary Facilities. (5 Pages)

Building No.	Building Name	WIDS Sites Potentially Impacted by D4 and ISS[d]	Addressed in AM?	Radiological Status	Other Contamination
MO-048	Mobile Offices	None	Yes	PRC	UHCM
MO-054					
MO-060					
MO-101					
MO-102					
MO-236					
MO-237					
MO-293					
MO-323					
MO-382					
MO-401					
MO-402					
MO-442					
MO-495					
MO-500					
MO-506					
MO-507					
MO-907					
MO-917					
MO-928					
MO-955					
MO-969					

[a] Addressed by the *Engineering Evaluation/Cost Analysis for the 105-KE and 100-KW Reactor Facilities and Ancillary Facilities* (DOE-RL 2005a).
[b] These facilities were not addressed in the Removal *Action Work Plan for the 100-K Area Ancillary Facilities* (DOE-RL 2005b). All of these facilities will be addressed in the work plan for this removal action.
[c] Cargo containers that have radiological contamination, storage containers, a CERCLA storage unit that has chemical contamination, and Mobile Offices that have potential radiological contamination that are listed and others that may be located in the 100-K Area are included.
[d] "Potentially impacted waste sites" are remedial action waste sites that are in the immediate vicinity of removal action facilities within this action memorandum. Potentially impacted waste sites may be remediated as a consequence of the field actions occurring under this action memorandum. Completion of those remedial actions will be documented as directed by the remedial action RODs.

AM = action memorandum
D4 = deactivation, decontamination, decommissioning, and demolition
EE/CA = engineering evaluation/cost analysis
ISS = interim safe storage
RC = Radiological contamination
PRC = Potential radiological contamination
UHCM = Unquantified hazardous construction materials
UPR = unplanned release
UWTC = Unquantified water treatment chemicals
WIDS = Waste Information Data System

APPENDIX B

SUMMARY OF RESPONSES TO PUBLIC COMMENTS ON THE ENGINEERING EVALUATION/COST ANALYSIS FOR THE 105-KE AND 105-KW REACTOR FACILITIES AND ANCILLARY FACILITIES

Comments on DOE/RL-2005-86, Engineering Evaluation/Cost Analysis for the 105-KE and 105-KW Reactor Facilities and Ancillary Facilities
RESPONSIVENESS SUMMARY

Introduction

This responsiveness summary was prepared in accordance with the requirements of 40 CFR 300.820. The purpose of this responsiveness summary is to summarize and respond to public comments on the *Engineering Evaluation/Cost Analysis for the 105-KE and 105-KW Reactor Facilities and Ancillary Facilities*, DOE/RL-2005-86 (EE/CA), that was prepared by the U.S. Department of Energy (DOE).

The EE/CA, issued on June 14, 2006, evaluated alternatives for the non-time-critical removal action for the remaining buildings and structures, including the 105-K East (KE) and 105-K West (KW) Reactor Buildings, located in the 100-K Area of the Hanford Site. The preferred alternative identified in the EE/CA for the 105-KE and 105-KW Reactors and Ancillary Facilities was Interim Safe Storage (ISS) of the reactors followed by long-term surveillance and maintenance (S&M) and deactivation, decontamination, decommissioning, and demolition (D4) of the ancillary facilities and portions of the 105-KE and 105-KW Reactor Facilities.

Community Involvement

A public notice was placed in the *Tri-City Herald* on June 18, 2006, announcing the availability of the EE/CA and Administrative Record, and the start of the public comment period. A public comment period was held from June 19 through July 18, 2006. The fact sheet stated that a public meeting would be conducted if requested. No requests were received for a public meeting, therefore, no public meeting was held.

Comments and Responses

Three sets of comments were received from the public. The comments, along with responses from DOE and the U. S. Environmental Protection Agency (EPA), are presented below.

Commenter 1 -- Oregon

1. **Comment:** We support the proposed action to demolish and remove the facilities and cocoon the reactors, with the following important changes.

   Response:

   The agencies appreciate the time you have taken to review this document and provide your comments.

2. **Comment:** We have previously cautioned DOE about grouting the pick-up chutes - and particularly at K East - and that the dominant release of the fission products, uranium and plutonium from the site had occurred through the seam at the bottom of this chute. Prior to cocooning the reactor it is essential that this plug be removed, that the seam be excavated, and the leaked waste retrieved. We have further cautioned DOE that none of the costs of the removal of this monolith should weigh in the decisions associated with cleanup of these leaked wastes.

   Response:

   There are multiple programs and decision documents involved in the full clean-up of some of these facilities. In addition to this EE/CA for the Reactor and Ancillary Facilities, the K Basins Interim Action ROD addresses removal of the contents of the K Basins and the disposition of the K Basins themselves will be completed in accordance with the Remaining Sites Record of Decision (ROD). Thus, clean-up of the leaked wastes is not within the scope of this EE/CA. In accord with the Remaining Sites ROD, the soil beneath the basins including beneath the seam in the pick-up chute would be considered in the deep zone (greater than 15 feet depth below ground surface) and would be cleaned up to standards that are protective of groundwater and the Columbia River. This removal action won't interfere with the ROD work.

3. **Comment:** The EE/CA needs to be revised to make it clear to the contractor that the concrete installed in the pickup chute, the basin structure, and the leaked waste are all to be removed and/or exhumed prior to cocooning of the reactor structures.

   Response:

   It should be noted that the discharge chute was cleaned prior to adding the clean concrete "plug" and may not require removal to clean-up the leaked wastes. The basin structure will be removed in accordance with the Remaining Sites ROD. Also see the response to comment #2.

4. **Comment:** This will require extensive coordination with other program elements to ensure that the investigation of the fate of these and similar adjacent wastes are fully characterized and remediated prior to back-filling these areas and cocooning the reactor structures. The need for these actions is stated in Section 4.2.3. The discussion needs to be expanded and made explicit in this regard.

Response:

The agencies agree that close integration among the multiple programs and activities will be necessary to ensure that the ISS effort will contribute to the efficient performance of any remedial action. Also see the response to comment #2.

5. **Comment:** The contaminants of concern (COC) list in section 2.2.1 needs to be expanded to include the full suite of COC's for the 100-K Area, including but not limited to uranium isotopes, thorium, and carbon-14 as radioactive COC's; and uranium and thorium as toxic heavy metals. Uranium is the dominant COC for the 100-K Area. Both basins exhibit elevated levels of other mobile or volatile fission products that create surface contamination control problems. These need to be included as well.

   Response:

   As stated in Section 2.2.1 of the EE/CA, "the activities of individual isotopes are not currently known but will be determined, as needed, through data quality objective directed sampling and analysis tasks before disposal." It was also noted that the list was not intended to be all-inclusive ("In general, the primary contaminants of concern include the following radionuclides:"). The latest list of radioactive COCs does include those suggested.

6. **Comment:** During reactor operations, a variety of gases were blended and used to cool and protect the graphite core blocks. These gases became contaminated with carbon-14. The cover gases were scrubbed and disposed of by injection in wells immediately adjacent to the basins. Because carbon is a critical component of all living things, is highly mobile in the environment, and has a long half-life, it is essential that these sites be fully characterized and the carbon-14 be removed and remediated prior to completion of the EE/CA.

   Response:

   The commenter is correct that carbon-14 is a contaminant of concern that needs to be addressed in sampling and analysis plans and the appropriate removal or remedial action. Clean-up of the wells adjacent to the basins and the K Basins themselves will be in accordance with the Remaining Sites Record of Decision. Thus, clean-up of the wells is not within the scope of this EE/CA. Also, please see the responses to comments #2 and #5.

7. **Comment:** Section 3.0 remedial action objectives should be expanded to include protection of other potentially impacted biological resources, including bats and other creatures that may attempt to use the facilities during the course of these actions.

   Response:

   The need to protect biological resources (such as maternity bat roosts) was addressed in the action memo in section 5.3.3.4, Endangered Species and Migratory Birds.

8. **Comment:** Figure 4-4 is helpful, but does not clearly indicate whether the basins themselves are to be removed. The shading of the basin structure is different from other

areas with no clear indication of what that means. This should be clarified to state that the basins will be removed.

Response:

Please see the response to comment number 2.

9. **Comment:** In Section 5.4.3.1 on Natural Resources details a list of "mitigating" actions. These are not mitigating actions. The word "mitigate" should be changed to "minimize" in this instance.

Response:

Under the Council of Environmental Quality regulations (40 CFR 1508.20), the term "mitigation" is a broad term that includes a variety of actions: (a) Avoiding the impact altogether by not taking a certain action or parts of an action; (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (e) Compensating for the impact by replacing or providing substitute resources or environments. The "mitigation" measures cited in section 5.4.3.1 of the EE/CA included some of these elements. However, the term "minimize" has been used, where appropriate, within this Action Memorandum to distinguish minimization actions from other types of mitigation efforts.

The comment is correct and the term "minimize" has been used in this action memo.

10. **Comment:** Section 5.4.7 on Irreversible and Irretrievable (I and I) commitment of resources is inappropriately over broad and needs to be reduced to the commitments of fuel and materials needed to accomplish the actions, and the borrow materials used to back fill the site. An EE/CA is an inappropriate place to make claims or decisions on I and I beyond simple consumables. Further, the impacts and mitigations for ERDF are already fully covered in the decision documents for that facility and should not be restated here, other than referring the reader to those decisions. Decisions on residual contamination that may remain in the soil and groundwater are beyond the scope of the EE/CA and need to be removed. To accomplish these changes, we recommend deleting the first two paragraphs of this section, striking the word "also" in the first sentence of the third paragraph, and removing the entire last sentence in the third paragraph.

Response:

The commenter is correct in noting that decisions on residual contamination in soil and groundwater is beyond the scope of the EE/CA. It was not the intent of the EE/CA to identify the presence of this contamination as a commitment of resources. The commenter is also correct in noting that ERDF impacts are covered in other decision documents; however, the impacts were included in the EE/CA for completeness sake and for members of the public who may not be aware of the previous determinations relating to commitment of resources at ERDF. This alternative also results in the use of geological materials from existing borrow sites/pits as required to backfill and recontour areas where contaminated soils or structures have been removed.

Commenter 2 -- Idaho

1. **Comment:** ERWM agrees that the selected alternative, Alternative II, is most appropriate of the three alternatives presented. This includes Interim Safe Storage (ISS) of KE and KW reactor blocks, followed by long-term surveillance and maintenance in conjunction with institutional controls for the duration of the ISS period until the reactor blocks are prepared and transported to the 200 Area for disposal. Alternative II, as we understand it, also includes deactivation, decontamination, decommissioning, and demolition of portions of the reactors plus the ancillary facilities.

   Response:

   The agencies appreciate the time you have taken to review this document and provide your comments. Please also note that removal of the reactor blocks is not included in this action memorandum. It is an expected future action as determined in a previous NEPA ROD. This action memorandum contributes to the efficient performance of that future action.

2. **Comment:** We are concerned, however, that the K-basins, which are part of the reactor building structures, are covered by the Remaining Sites ROD and thus are not part of this EE/CA. This concern centers around integration of efforts conducted on behalf of both the Remaining Sites ROD and the EE/CA for 105-KE and 105-KW Reactors.

   Response:

   By referencing the K Basins Interim Action Record of Decision (ROD) and the Remaining Sites ROD in the EE/CA, the intent was to identify the need for the integration that would be required between these actions. Tri-Party Agreement milestone M-016-57 requires DOE to initiate soil remediation at the K East Basin within one month after completing removal of the K East Basin structure.

3. **Comment:** ERWM is aware of the history of leaks from K-East basin to the underlying soil. When the floor of the basin was leaking, it was covered with sludge, known to be highly radioactive and to contain great quantities of transuranic isotopes. It is imperative that the contaminants which have leaked from the basins and the associated discharge chute are located and retrieved in conjunction with the ISS of the reactor.

   Response:

   The disposition of the K Basins will be completed in accordance with the Remaining Sites ROD and, thus, are not within the scope of this EE/CA. The remaining sites ROD requires that the soil beneath the basins be remediated to protect future use of the site as well as protect groundwater from contaminants that could leach from the vadose zone. Soil from beneath the construction joint in the fuel discharge chute is believed to be contaminated and is subject to the remove-treat-dispose remedy specified in the remaining sites ROD.

4. **Comment:** The EE/CA contains the following troubling clause in the final paragraph of Section 1.1, Purpose and Scope: "In the event that large volumes of contaminated soil are encountered, other soil contamination sites are adversely affected by D4 activities, utilities of active facilities are impacted, or removal of contaminated soil inhibits D4 activities, the action memorandum may provide that removal of contaminated soils or

structure (i.e., slab, below-grade structure) may be deferred to future remedial action with approval of the EPA." ERWM maintains that the K-East basin contaminant issue has been adequately identified by DOE and EPA. It is clearly a threat to the groundwater and the river. Soil remediation should be coordinated with the ISS of 105-KE Reactor, and as such this soil contamination should not be "deferred to future remedial action with the approval of the EPA".

Response:

The intent of this clause in the EE/CA was to provide a mechanism for dealing with newly discovered contaminated soil that would be beyond the scope of the building deactivation, decontamination, decommissioning, and demolition (D4) efforts envisioned by this EE/CA and to allow deferral to a more appropriate remedial action document. As noted in the response to comment #3, the contaminated soil under and around the K Basins will be removed in accordance with the Remaining Sites ROD.

5. **Comment:** Sections 2.1.4 and 5.4.3.2 – Cultural Resources: The EE/CA indicates a cultural resources review will be performed in compliance with the requirements of NHPA and DOE/RL 1996 (programmatic agreement). Our ERWM Hanford cultural resource personnel anticipate reviewing this report when it is completed. If cultural resources are encountered, the NPT-ERWM expects to be consulted to determine appropriate actions for mitigation, resource documentation, or recovery.

   Response:

   You will be consulted by DOE to determine appropriate actions for mitigation, resource documentation, or recovery if cultural resources are encountered during the cultural resources review. The ERWM Hanford cultural resource personnel will be provided with the review when it is completed by DOE. It should be noted that the proposed removal action would occur in previously disturbed areas; therefore, the likelihood of encountering cultural resources during the removal action would be low. However, as noted in 5.4.3.2, "if cultural resources are encountered, the State Historic Preservation Office and Native American tribes would be consulted to determine appropriate actions for mitigation, resource documentation, or recovery."

6. **Comment:** Section 3.0 – Removal Action Objectives: Bullet 2 – In order to encompass the value to protect the environment and do no further harm, this bullet should read "Prevent the migration of contaminants...", rather than "Control the migration of contaminants..."

   Response:

   The commenter is correct that the regulatory language from CERCLA states an objective is to "mitigate or prevent the substantial threat of a release," rather than "control." The intent of the phrase in the EE/CA was to indicate the special precautions that would be taken during the removal action to ensure contaminants are controlled. At the end of the removal action, soils are either certified as meeting the cleanup requirements contained in the remaining sites ROD or stabilized and addressed as a remedial activity.

Commenter 3 -- Richland, WA

1. **Comment:** The one major cost element not considered in this and in the previous Interim Records of Decision for the other old reactors is the cost of final removal and disposal for the stored blocks in the somewhat distant future. While these final costs are essentially the same for any of the alternatives considered for near-term action, the magnitude of those future costs may be the elephant in the living room when considering the total cost for removal and disposal of the reactor blocks. DOE will have to come up with the funding for those deferred costs when the time comes, and those costs will not be trivial. It might be well to revisit the analyses presented in the EIS for the Surplus Production Reactors, to see whether the selected disposal alternative is still the better choice.

   Response:

   The agencies appreciate the time you have taken to review this document and provide your comments. It is true that the costs to perform the final action on the reactors, after ISS and long-term S&M, are not included in this EE/CA, and costs could be very large. The regulatory paths for making final disposition decisions for the reactors are still being evaluated.

2. **Comment:** While the cost analysis results were presented in great detail, there are no bases presented to show how those costs were derived. I would have thought that there would be a lot of data available from those reactors already put into interim safe storage to illustrate what those actual costs were and how these costs for the K-Reactors were actually estimated. Furthermore, there are no references to documentation of the costs for placing the older reactor blocks into interim safe storage. There are no detailed discussions or references to such detailed analyses of the work required. As a result, the numbers are interesting but there is no basis for confidence in the cost numbers presented.

   Response:

   The estimated costs are based on the actual costs for performing interim safe storage at five of Hanford's surplus reactors over the past 7 years and information obtained during facility walk downs and review of drawings. The requested information is provided in the Surplus Reactor Final Disposition Engineering Evaluation (DOE/RL-2005-45) which was placed in the Hanford site administrative record in September 2005 (available at www2.hanford.gov/arpir/common/findpage.cfm?AKey=DA00913933 and made available for public review along with the EE/CA. The engineering evaluation reviews the original assumptions and information contained in the Surplus Production Reactors Final Environmental Impact Statement (EIS) and ROD, including cost estimates and radiological inventories. A status of the DOE's progress to date implementing ISS for the surplus reactors and cost estimates for completion of ISS for all nine surplus reactors (including N Reactor) is presented. The applicable cost estimates and dose estimates presented in the Final EIS are updated to reflect current values and estimates.

3. **Comment:** In addition to the lack of any detailed descriptions of the physical actions required to complete placement of the reactor blocks into safe storage, there is no description or discussion of the radiation doses associated with the remedial actions postulated in this EE/CA. Again, I would have thought that there would be ample data from the previous cleanup/safe storage operations at the older reactors to provide bases

for reasonable estimates for the K-Reactors. The data from those earlier actions should be documented somewhere, and those documents should be referenced in this report.

Response:

As noted in the response to comment #2, the requested information is provided in the Surplus Reactor Final Disposition Engineering Evaluation (DOE/RL-2005-45) which was made available for public review with the EE/CA as part of the administrative record.

4. **Comment:** In general, the evaluations of the CERCLA criteria presented in Chapter 5 are not evaluations at all. Instead, they are generalized arguments unsupported by any evidence. If actual evidence were presented for comparison, the conclusions drawn might very well be different. For example, what are the expected cumulative radiation doses to workers from now until start of the final removal and disposal of the reactor blocks for both alternatives?

   Response:

   The evidence requested is provided in the Surplus Reactor Final Disposition Engineering Evaluation (DOE/RL-2005-45). Please also note the response to comment number 2. The EE/CA contained summaries of this information.

5. **Comment:** I found references to the Interim Action Record of Decision for the older production reactors, but did not see any references to any analyses supporting those decisions. If they exist, they should also be referenced in this document.

   Response:

   The supporting analysis for the Interim Action Record of Decision for the older production reactors is provided in DOE/EIS-0119F, Final Environmental Impact Statement, Decommissioning of Eight Surplus Production Reactors at the Hanford Site, December 1992, which can be found in the administrative record (see http://www2.hanford.gov/arpir/common/findpage.cfm?AKey=D196136488).

6. **Comment:** Table ES-1, footnote D4, last term should be demolition, not decommissioning.

   Response:

   Comment noted.

7. **Comment:** Table 4-4: the capitalization of the terms in the footnotes D4 and S&S is inconsistent with all of the other similar footnotes on similar tables.

   Response:

   Comment noted.