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

Project Hanford Management Contractor for the
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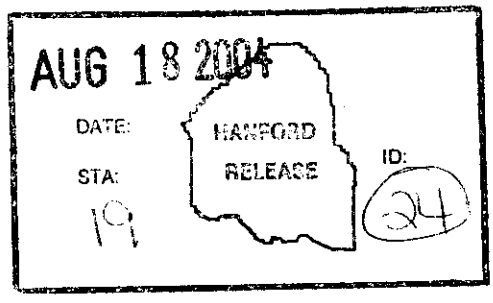

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Remedial Design Report and Remedial Action Work Plan Supplement:

K Basins Discharge Chute Grouting

HNF-20896, Revision 0

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ACRONYMS

ALARA	As Low As Reasonably Achievable
Ci	Curies
ERP	Environmental Restoration Project
ETF	Effluent Treatment Facility
ISS	Interim Safe Storage
MOU	Memorandum of Understanding
PCB	Polychlorinated Biphenyl
RAOs	Remedial Action Objectives
RDR/RAWP	Remedial Design Report / Remedial Action Work Plan
ROD	Record of Decision
SNF	Spent Nuclear Fuel

1.0 INTRODUCTION

This document identifies plans for the deactivation of the 105 K East and K West Discharge Chutes to supplement the remedial actions identified in the *Remedial Design Report / Remedial Action Work Plan (RDR/RAWP) for the K Basins Interim Remedial Action* (DOE-RL, 2001). The need for further definition of the 105 K Basins deactivation was anticipated in the *Record of Decision (ROD) for the K Basins Interim Remedial Action* (EPA, 1999a) and in the RDR/RAWP:

> "Deactivation is several years in the future and activities needed to complete deactivation have not been fully defined. This RDR/RAWP will be revised to describe activities when deactivation planning is complete."

This supplement to the current RDR/RAWP comprises one of several anticipated supplements to complete the deactivation planning process.

This deactivation design includes the grouting of each discharge chute, removal of water from the basin to accommodate water displaced by grout in the discharge chute, and water treatment followed by disposal at the Effluent Treatment Facility (ETF). Grouting will seal the discharge chute building penetration from the reactor to the K Basin at each location consistent with the selected remedy for deactivation in the *ROD for the K Basins Interim Remedial Action* and Interim Safe Storage (ISS) concepts used at other Hanford reactor sites. The action will initiate full-scale water removal from the basin to ETF consistent with the selected remedy for water. Grouting also encapsulates radiologically contaminated underwater debris, provides shielding, and reduces occupational exposure to workers at the basins.

This design supplement only addresses the aspects of deactivation that will isolate the basins from their adjacent reactor building, and the related future institutional controls. Details of the design are provided in Section 2.

1.1 Background - Discharge Chute Description

The K East and K West discharge chutes received spent nuclear fuel (SNF) directly from their respective reactor (Figure 1-1). The discharge chutes served as the underwater receiving area for SNF prior to transfer to the storage basins. Each discharge chute measures approximately 52.5 feet x 9.25 feet x 20.75 feet deep (Figure 1-2), with an opening, referred to as the trampoline, leading from the reactor side that measures approximately 40 feet long x 17 feet wide at the top, tapering down from the reactor side toward the discharge area. A low wall, referred to as the stub wall, extends along the long axis of the chute. The entire area contains approximately 108,000 gallons of water. The discharge chutes are constructed of concrete, consistent with the design of the basins as described in the RDR/RAWP. A formed concrete structure supports the trampoline, which is fabricated from steel plates welded together into a large sheet. The floor of the discharge chute between the stub wall and the trampoline is also lined with steel plating.

Both the K East and K West discharge chutes have been cleaned at various points during their use (Figures 1-3 and 1-4) and were coated with an epoxy sealant during prior basin refurbishment activities. Prior to receiving N Reactor fuel in 1981 the K West Basin, including the discharge chute, was cleaned, drained of water to enable personnel to access the area, repaired, and an epoxy sealant was applied. The K East discharge chute was cleaned, drained of water to enable personnel to access the area, and lined with epoxy during repair to the construction joint in 1979 (DOE-RL, 1995). In 1982 through 1984 SNF in the K East Basin underwent a sorting and segregation campaign that took place in the K East discharge chute. In preparation for a planned project to encapsulate K East Basin fuel in closed containers, which would take place in the discharge chute, the discharge chute was cleaned and a stainless steel shield cover

was installed over the construction joint. The shield cover was to offer further protection of the construction joint from the equipment and work activities associated with the planned encapsulation project.

In 1995 both the K West and K East discharge chutes were isolated from the storage basins in response to questions regarding the seismic integrity of the construction joint in the discharge chutes. At that time seismic evaluations postulated that the discharge chutes could crack from a seismic event and result in potential significant leakage of water from the entire basins, exposing SNF. Permanent steel isolation barriers were constructed between the discharge chutes and the storage basins to alleviate this concern. The K East discharge chute was cleaned of sludge and fuel as a prerequisite to this activity since materials remaining in the discharge chutes would be permanently isolated from the basins and to ensure that sludge would not be present in a quantity that would significantly impact the environment if a seismic event occurred. Fuel fragments were removed from the K East discharge chute during the cleaning. Debris (including equipment) was relocated either within the discharge chutes or to the storage basins. Debris remaining in the discharge chutes is permanently isolated from the basins.

Radiological dose rates in the K East discharge chute have been measured as follows: Average = ~5.08 R/hr, Maximum = 42.6 R/hr, Minimum = <0.1 R/hr (where the number of survey points = 67). The source of this radiation is primarily attributed to the migration of Cesium^{137} into the basin concrete prior to the concrete being sealed with epoxy (UNC, 1981).

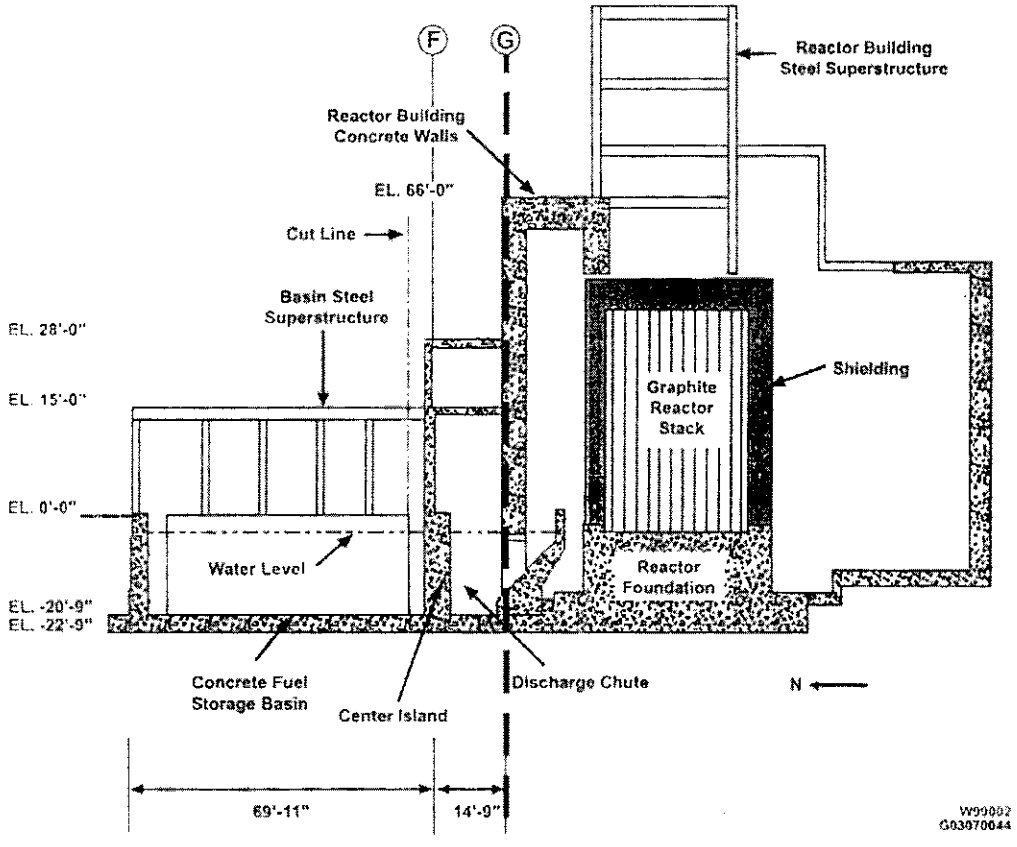

Figure 1-1. K Basin Profile

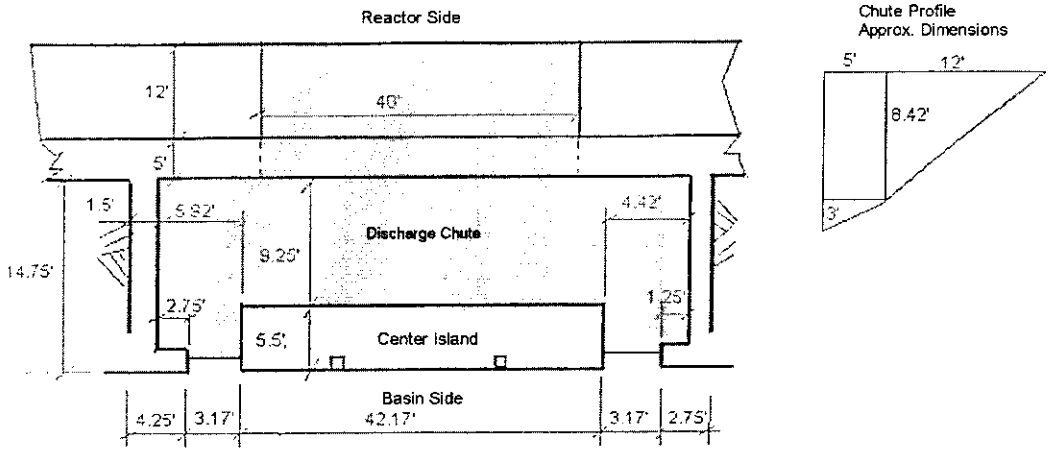

Figure 1-2. Discharge Chute – Plan

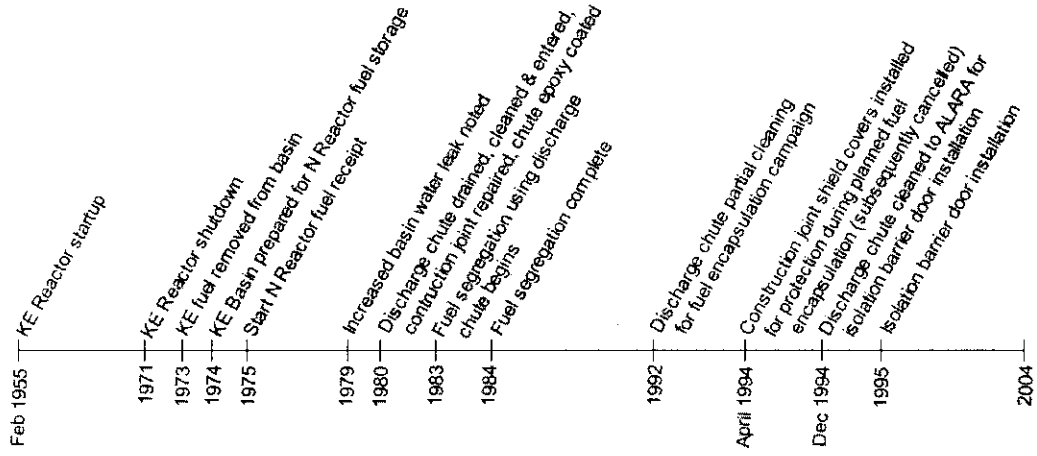

Figure 1-3. KE Discharge Chute Timeline

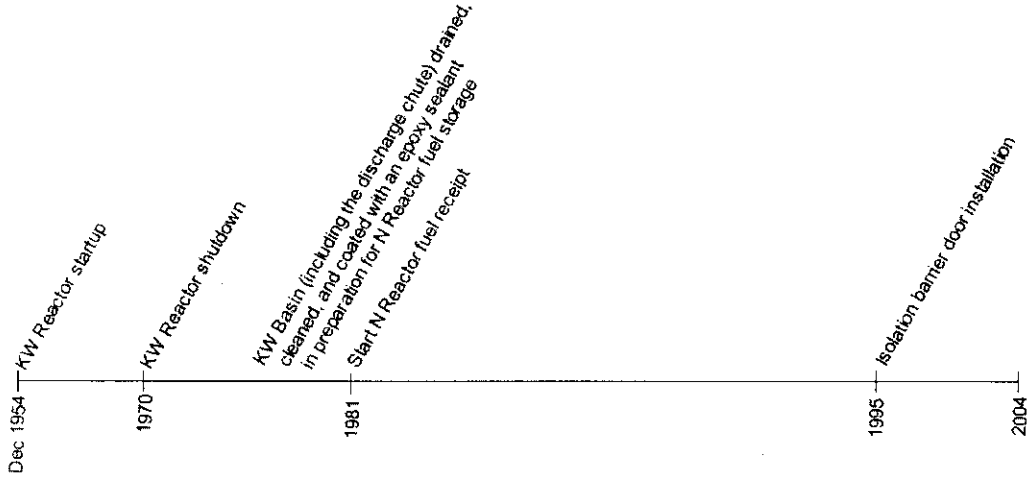

Figure 1-4. KW Discharge Chute Timeline

2.0 REMEDIAL DESIGN

The K East and K West discharge chute remedial design; grouting of the discharge chutes, meets the relevant Remedial Action Objectives (RAOs) of the K Basins ROD and remedial design in the RDR/RAWP, post deactivation transition plan criteria, ISS concepts, and end point criteria for this aspect of deactivation (Section 5.1). The design includes the following:

- documentation of SNF and sludge removal
- grouting of the discharge chutes to seal the penetration between the basins and reactors as an engineered control, to stabilize contamination and provide shielding to meet criteria for minimal surveillance and maintenance
- encapsulation of debris and equipment remaining in the discharge chutes to reduce occupational exposure to workers at the basins
- removal of water from the discharge chutes to the storage basins
- removal of water from the storage basins for treatment at ETF and disposal at a permitted soil column disposal site.

2.1 Spent Nuclear Fuel

SNF is not anticipated to be encountered in the discharge chutes. Underwater visual assessment of the KE discharge chute was performed during the 1995 cleaning and again during April and May of 2004 to document the current conditions of the KE discharge chute. No objects were identified that appeared to be SNF.

Underwater visual assessment of the current conditions of the KW discharge chute will be performed before grouting. Objects identified that appear to be SNF will be evaluated further using visual evaluations and radiation measurements, as necessary, to determine if the material is SNF. Material determined to be SNF will be collected and staged for removal. Documentation that SNF was not present in the KE or KW discharge chutes at the time of grouting will be included in the project closure documentation.

2.2 Sludge

Sediment (i.e., dirt/environmental matter) is present in both the K East and K West discharge chutes. The K East and K West discharge chutes were cleaned prior to receiving N Reactor fuel, as described in Section 1.1. The K East discharge chute was cleaned to remove SNF and sludge most recently in 1995 to meet As-Low-As-Reasonably Achievable (ALARA) criteria prior to installation of the isolation barrier doors. The isolation barrier doors were installed to separate the discharge chute basins from the storage basins, and since that time there have been no transfers of SNF or sludge to the discharge chutes. Further actions to clean the discharge chutes is not part of this remedial design. Documentation of prior cleaning activities to remove sludge will be included in the project closure documentation.

2.3 Water

To maintain personnel exposure ALARA and mitigate the potential airborne release of radionuclides, water will be left in the discharge chutes during grouting. Water displaced by grout will be removed from

the discharge chute to the storage basin. The water level in the K storage basins will be managed to accommodate influxes of water from the discharge chute. Once the grout pour reaches the bottom of the barrier that separates the basins from the reactor buildings, water in the reactor side of the discharge chute will be isolated. This water will be pumped to the storage basin as well.

Water will be removed from the basin through the existing water treatment system for disposal at ETF, as described in the RDR/RAWP. Water treatment systems will be operated during grout placement.

2.4 Debris

Debris in the discharge chutes was permanently isolated from the basins in 1995, and will be grouted in place for ALARA considerations. The debris inventory primarily includes items greater than 60 mm, although some smaller objects exist. The current debris inventory includes items such as steel racks/frames, tools, work table, filter skid, filter canisters, a fuel canister crusher, and miscellaneous items. Debris in the K East discharge chute, such as the fuel canister crusher is estimated to weigh up to 3,500 pounds. Debris items were either: 1) equipment used in fuel handling prior to the isolation barrier door installation; 2) equipment used in the discharge chute cleaning activities or during the isolation barrier installation; or 3) were introduced since the installation of the isolation barriers in 1995.

An inventory of debris describing characteristics, general location and estimates of radionuclides will be provided in the project closure documentation for use in future actions. Underwater debris characteristics will be documented using existing information. Insitu radiological contaminants on debris will be estimated using the accepted *Sampling and Analysis Plan for K Basin's Debris*, HNF-6495 (as modified, see Section 4.2.1 of this work plan) (FDH, 2001). Underwater debris remaining in the discharge chutes will not be rinsed and will be considered a polychlorinated biphenyl (PCB) remediation waste.

2.5 Deactivation

The discharge chutes will be grouted to seal the penetration between the basins and reactors as an engineered control, to stabilize contaminants, and to provide shielding to meet criteria for minimal surveillance and maintenance. Grouting will also encapsulate debris and equipment remaining in the discharge chutes and reduce the occupational exposure to workers since debris will not be removed.

Grout used to isolate the discharge chutes from the reactors will be tremmied[1] into the bottom of each discharge chute in several sequential pours. The process ensures that cement and aggregate are not separated during the placement process, and will be demonstrated at a location other than the K Basins before actual discharge chute grouting. By following this process, it is not believed to significantly alter the water clarity in the basins. Placement of grout in this manner maintains personnel exposures ALARA by leaving water in the discharge chute during the grouting operation. Grout will be poured in the basin and reactor sides of the discharge chute basin areas to a level adequate to physically isolate the K Reactor facilities from the K Basins. Grout used for this application shall be Portland cement type grout. Grout placement shall conform to the applicable requirements of American Concrete Institute standards.

Areas of the final grout pour and discharge chute concrete on both the basin and reactor sides that were exposed to basin water will be covered with a cap of grout.

2.6 Consistency with the *K Basins Interim Remedial Action ROD* and *RDR/RAWP*

The remedial design described herein supports the relevant RAOs of the K Basins, which include the following:

[1] Pumped via a pipe(s) from the bottom of the area being filled upwards.

- Reduce the potential for the future release of hazardous substances from the K Basins to the environment.
    - Remove hazardous substances from the K Basins near the Columbia River in a safe and timely manner.
    - Provide safe treatment, storage and final disposal of the SNF, sludge, water, and debris removed from the K Basins.
- Reduce occupational exposure to workers at the basins.

Selected remedies in the *ROD for the K Basins Interim Remedial Action* that address removal of water, debris, and deactivation, and the consistency of this action with the remedies are discussed below.

2.6.1 Selected Remedy for Water

The removal of water that is displaced by grouting is consistent with the selected remedy in the ROD. Basin water treatment systems will be operated during grouting. Water will be removed from the basins to accommodate water displaced by grout and will be treated and disposed of at ETF in accordance with ETF waste acceptance criteria.

2.6.2 Selected Remedy for Debris

The selected remedy for debris indicates that "debris will be removed from the K Basins, treated as appropriate, and disposed at the ERDF as approved by the U.S. Environmental Protection Agency."[2] The extent to which debris needs to be removed is defined in the RDR/RAWP (Section 2.4): "The extent of debris removal and management versus disposal in place will depend on completion of the interim remedial action and the transition criteria developed." The need for such flexibility was further recognized in the Memorandum of Understanding (MOU) (FDH, 1999) between the Environmental Restoration Project (ERP) and the SNF Project, as identified in the RDR/RAWP (Section 5.2). The MOU recognized that specific exclusions to the management of debris might be required: "Criteria 29 - Debris and water removed from the basins, sumps, and pits, except as specifically excluded by facility end point criteria." The discharge chute debris has been specifically excluded as identified in an amendment to the 1999 MOU (BHI, 2004).

The selected remedy also points out that the debris is regulated as a PCB remediation waste where it has contacted sludge. As a consequence, the remedy identifies that underwater debris removed from the basins will be drained of free-flowing liquid and rinsed with water to remove the majority of sludge, thereby removing it from further management as a Toxic Substance Control Act-regulated waste. Under this remedial design, debris will not be removed from the water but will be grouted in-place for ALARA considerations. The debris is radiologically contaminated and much debris has previously contacted sludge. Grouting will encapsulate the debris and contaminants. The debris will not be rinsed further [3] and free-flowing liquid will not be drained from debris, although precautions will be taken to minimize void spaces during grout installation. Consequently, small amounts of residual basin water may become entrapped in void spaces until such time that the water is removed by capillary action of the surrounding grout, and encapsulated debris will be considered a PCB remediation waste.

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[2] EPA, 1999a, Section 11.4.

[3] Underwater debris located in the K East discharge chute prior to installation of the isolation barrier doors was sparged and vacuumed when the discharge chute was cleaned (WHC, 1994).

2.6.3 Selected Remedy for Deactivation

Grouting the discharge chutes is consistent with actions specified in the ROD to seal building penetrations to prevent entry of animals, and stabilize contamination to prevent releases to the environment.

Details of deactivation were not fully defined in the RDR/RAWP, since at the time the RDR/RAWP was written, deactivation was several years in the future. This RDR/RAWP supplement further defines deactivation of equipment in the discharge chute and the discharge chute structure as follows:

Present Remedial Design	Change
Equipment that is not an integral part of the basin structures will be drained, removed, decontaminated as appropriate, packaged, and disposed of as debris.	Underwater equipment in the discharge chute will not be removed and will be encapsulated in grout as identified for debris.
The basin structure will be decontaminated to the extent required to meet criteria for minimal surveillance and maintenance set forth in the remedial design report and remedial action work plan, likely as an amendment.	The discharge chute will not be decontaminated. Grout will provide shielding to meet criteria for minimal surveillance and maintenance and institutional controls.

Stabilization of contamination via grouting of the discharge chutes is an interim action. These discharge chutes are subject to further remedial action under the *100 Area Remaining Sites Interim Action ROD* (EPA, 1999b). A future Comprehensive Environmental Response, Compensation, and Liability Act decision for interim safe storage of the reactors is anticipated, and that decision could apply to the discharge chutes.

2.6.4 Institutional Controls

Grouting the penetration from the discharge chute to the reactor provides an engineered control to prevent access to the reactor. Grouting of the discharge chutes does not impact the ability to meet the institutional control requirements identified in the ROD.

2.7 Consistency with Post Deactivation Transition Plans

Grouting the discharge chute is consistent with the MOU (FDH, 1999) as amended (BHI, 2004) between the ERP and the SNF Project. The amended MOU identifies new criteria specific to the discharge chutes and redefines the physical assets to be transitioned to the ERP. The criteria include:

- The discharge chutes will be grouted to provide isolation barriers to the reactor buildings and the K Basins.
- Prior to grout placement, the discharge chutes will be inspected to assure that no SNF remains.
- Any debris that remains will be inventoried and documented.

2.8 Consistency with the Interim Safe Storage Concepts

This action is also compatible with the ISS concepts employed at other Hanford reactor sites. ISS consists of the modifications to the reactor structure to ensure the reactor block is safely stored for a minimum of 75 years. Relevant components of ISS include:

- Containment of the core such that release of radioactive or other hazardous materials to the environment is not credible under normal design basis conditions for facility safe storage lifetime of 75 years.

- Sealing shield wall penetrations such that they have at least the same structural integrity of the existing walls, and prevent bird and animal intrusion.

Grouting of the discharge chute will seal a shield wall penetration (discharge chute) from the reactor to the basins and meet ISS modifications.

3.0 APPLICABLE RELEVANT AND APPROPRIATE REQUIREMENTS

This action is consistent with the applicable relevant and appropriate requirements identified in the K Basins RDR/RAWP.

4.0 REMEDIAL ACTION WORK PLAN

4.1 Project Schedule

Major elements of the discharge chute grouting and a schedule for the implementation of these elements is summarizes below.

Action	Date
Complete discharge chute management assessment	27 August 2004
Mobilize grout contractor	24 August 2004
Initiate first grout pour	31 August 2004
Complete final grout cap	30 November 2004

4.2 Planning and Documentation

4.2.1 Estimating Radionuclide Contaminants on Debris

This interim remedial action uses the current *Sampling and Analysis Plan for K Basin's Debris*, HNF-6495 (FDH, 2001) as the basis to estimate the concentrations of radionuclide contaminants on debris. Unwashed underwater debris contaminant values will be used in developing estimates of radionuclide concentrations. Since this design calls for the insitu evaluation of underwater debris and equipment, the weight of each debris or equipment item must be estimated to result in curie estimates. Weight will be estimated using historic design documents (when available), visual observations and estimates, industry information concerning materials of construction and accepted engineering practices.

5.0 PROJECT CLOSURE DOCUMENTATION

5.1 Discharge Chute End Point Criteria

End-point criteria for the discharge chutes consist of the following:

- No SNF
- Grouted discharge chute meets ISS concepts identified herein
- The final configuration of the grouted discharge chute will not prohibit characterization of soil underlying the discharge chute and reactor building for future remedial actions.

5.2 Project Closure Documentation

A final Project Closure Report summarizing the preparation and grouting of each discharge chute will be prepared. The report will include the following information for submittal as part of the Administrative Record:

- Documentation of the following historic actions to clean the discharge chutes:
  - Cleaning of the discharge chutes as part of repair to the construction joints
  - Cleaning of the discharge chutes in preparation for isolation barrier door installation
- Documentation of conditions prior to grouting:
  - Underwater video of each discharge chute prior to grouting
  - Debris and equipment (left in place):
    - Description of physical characteristics and location
    - Data identifying estimated curie content
  - Process knowledge documenting no SNF in the discharge chutes at the time of grouting
- Concrete floor and walls:
  - Radiological survey (prior to grouting)
- Estimate of radiological source term left in place
- Final grout specification
- Construction records associated with this activity.

6.0 REFERENCES

BHI, 2004, Letter, S.L. Feaster, BHI, to H. Hermanas, FDH, "Amendment to the Memorandum of Understanding for Turnover of K Basins," dated April 5, 2004, Bechtel Hanford, Inc., Richland, Washington.

DOE-RL, 1995, DOE/EIS-0245, *Final Environmental Impact Statement, Management of Spent Nuclear Fuel at the K Basins, at the Hanford Site,* U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 2001, DOE/RL-99-89, *Remedial Design Report and Remedial Action Work Plan for the K Basins Interim Remedial Action*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

EPA, 1999a, EPA/ROD/R10-99/059, *Record of Decision for the K Basins Interim Remedial Action*, U.S. Environmental Protection Agency, Richland, Washington.

EPA, 1999b, EPA/ROD/R10-99/039, *Interim Action Record Of Decision: 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,* U.S. Environmental Protection Agency, Richland, Washington.

FDH, 1999, Letter, R.G.Jones, FDH, to S.D.Liedle, BHI, "Transmittal of Spent Nuclear Fuel Project Memorandum of Understanding for Turnover of K Basins," FDH-9956486, dated October 6, 1999, Fluor Daniel Hanford, Inc., Richland, Washington.

FDH, 2001, *Sampling and Analysis Plan for K Basin's Debris,* HNF-6495, Rev. 1, Fluor Hanford, Richland, Washington.

UNC, 1981, UNI-1697, *KE Fuel Storage Basin Activity Mapping in Support of Exposure Reduction*, UNC Nuclear Industries, Richland, Washington.

WHC, 1994, 1K-94-01319W, *Discharge Chute Sludge and Debris Cleanup 105 KE*, RMIS Record Accession # D197139240