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Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

JAN 18 2008

08-KBC-0013

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EDMC

Mr. N. Ceto, Program Manager
Office of Environmental Cleanup
Hanford Project Office
U.S. Environmental Protection Agency
309 Bradley Blvd., Suite 115
Richland, Washington 99352

Dear Mr. Ceto:

105-K WEST BASIN QUALIFIED PROCESS TO ACHIEVE TRI-PARTY AGREEMENT MILESTONE M-34-35-B - COMPLETE FINAL PASS CLEANUP, KBC-35765, REVISION 0, DRAFT B

The purpose of this letter is to transmit the 105-K West Basin Qualified Process to Achieve Tri-Party Agreement Milestone M-34-35-B – Complete Final Pass Cleanup, KBC-35765, Revision 0, Draft B for the U.S. Environmental Protection Agency's (EPA) review and approval. Comments received from EPA have been incorporated.

The U.S. Department of Energy, Richland Operations Office requests EPA approval within 45 days of receipt of this letter. Following approval, the document will be released as Revision 0 and submitted to the Administrative Record for the 100-KR-2 Operable Unit.

If you have any questions, please contact me, or your staff may contact, Matt McCormick, Acting Federal Project Director for K Basin Closure, on (509) 373-9971.

Sincerely,

David A. Brockman
Manager

KBC:EBD

Attachment

cc: See Page 2

cc w/attach:
G. Bohnee, NPT
L. Buck, Wanapum
L. E. Gadbois, EPA
S. Harris, CTUIR
J. A. Hedges, Ecology
R. Jim, YN
S. L. Leckband, HAB
K. Niles, ODOE
Administrative Record m-34-35-B
Environmental Portal

cc w/o attach:
M. W. Peres, FFS
R. E. Piippo, FHI
J. G. Vance, FFS

KBC-35765
Revision 0
DRAFT B

105-K West Basin Qualified Process To Achieve TPA Milestone M-34-35b - Complete Final Pass Cleanup

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

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

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Richland, Washington

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KBC-35765
Revision 0
DRAFT B

105-K West Basin Qualified Process To Achieve TPA Milestone M-34-35b - Complete Final Pass Cleanup

J. E. Sailer
XRON

Date Published
November 2007

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Assistant Secretary for Environmental Management

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Release Approval Date

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TABLE OF CONTENTS

ACRONYMS

CCTV	Closed circuit television
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE-RL	U.S. Department of Energy, Richland Operations Office
EPA	Environmental Protection Agency
FH	Fluor Hanford
FRS	Fuel Retrieval System
HIH	Hose-in-Hose
IPSS	Immersion Pail Support Structure
IWTS	Integrated water treatment system
IXM	Ion exchange modules
KBC	K Basin Closure
KOP	Knock-out-pot
MCO	Multi-Canister Overpack
MLS	Multi-Canister Overpack Loading System Shuttle
NLOP	North Loadout Pit
QA	Quality Assurance
QAE/I	Quality Assurance Engineers/Inspectors
QAPP	Quality Assurance Project Plan
RDR/RAWP	Remedial Design Report / Remedial Action Work Plan
SLOP	South Loadout Pit
STC	Shielded Transfer Cask
TPA	Tri-Party Agreement

DEFINITIONS

Accessible Areas of the basin or pits are considered areas 1) not occupied by operational equipment or large debris (described in Section 1.3), and 2) areas adjacent to operational equipment, large debris or basin structural features where vacuums can reach.

Bulk Sludge Containerization: Bulk sludge containerization means that a first pass with a vacuum has been completed to remove large amounts of sludge; racks, and debris have been removed from the area; additional vacuuming has been completed, as necessary, to expose the concrete surface of the basin less any redeposition of sludge that is suspended in the basin water; and debris has been washed to remove sludge from internal spaces and visible surface sludge. (TPA Change M-34-05-04, January 9, 2006)

Debris: Debris is defined as anything (e.g., equipment and material) that is over 0.25 inch in largest dimension, is not used for current or planned operations or maintenance activity, and is not fuel. *Debris* includes such items as empty fuel canisters, old equipment, hand tools, and miscellaneous irradiated and non-irradiated items.

End Point Criteria: Defined conditions that must exist before deactivation and the overall K Basin Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) interim remedial action can be considered complete (DOE-RL, 2001).

Extent Practicable: To the extent capable of being done, effected, or put into practice, with the available means.

Found Fuel: Found fuel refers to any fuel that is not "canistered fuel" currently tracked and managed as special nuclear material and is "found" during K Basins work.

Fuel: Fuel is defined as all *spent nuclear fuel* that is greater than 0.25 inches in diameter (derived from WHC-SD-SNF-SP-005). For purposes of differentiating *fuel* from *sludge* and *debris*, any material that will pass through a screen with 0.25-inch openings is defined as sludge (HNF-SD-TI-015, Volume 2, Sludge, Section 3.0). This definition applies to all K Basins remediation activities.

Qualified Process: As used in this context; a process approved by the U.S. Department of Energy, Richland Operations Office (DOE-RL) and the Environmental Protection Agency (EPA) used to remove sludge from the K West Basin floor, pits, and debris external surfaces to meet completion criteria established for TPA Milestone M-34-35b.

Redeposited Sludge: Sludge that accumulates on the basin or pit floor or other underwater surfaces after the final pass sludge removal. This includes sludge that may be suspended in basin water.

Remote Method: Remote visual inspection methods include use of visual aids such as cameras and video equipment or other suitable instruments. Remote methods will be typically used in the inspections described herein.
Residual Sludge: Sludge that remains on the basin or pit floor with the completion of the final pass sludge removal.

Sludge: Sludge is any material in the K Basins water that will pass through a screen with 0.25 inch (0.64 cm) openings. Sludge on the floor and in the pits is a mix of fuel corrosion products (including metallic uranium, and fission and activation products), small fuel fragments, iron and aluminum oxide, concrete grit, sand, dirt, operational debris, and biological debris.

Visual Comparator: A device used to measure *redeposited sludge* (see definition) on the basin floor by visual means. Current examples include a series of stepped disks, plates, or machined increments with different diameters or dimensions. The critical characteristics are flatness and height. Specifications for two types of comparators to be used are identified in Attachment B.

1.0 INTRODUCTION

1.1 QUALIFIED PROCESS PLAN ORGANIZATION

This qualified process plan is organized into six sections as described below.

Section 1.0: Identifies the purpose of this plan and provides background of the project.

Section 2.0: Identifies the *completion criteria* developed for cleaning the K West Basin to meet TPA Milestone M-34-35b.

Section 3.0: Discusses the qualified processes for final pass sludge vacuuming used during *final pass clean up* and installation of visual comparators.

Section 4.0: Provides an overview of the *final pass clean up* and describes the implementation of the final pass vacuuming and inspection processes used to achieve the *completion criteria*.

Section 5.0: Describes the placement of visual comparators in the basin for use in future monitoring of sludge redeposition.

Section 6.0: The Quality Assurance Project Plan (QAPP) describes quality processes employed in this project, identifies the project roles and responsibilities, training, and records management.

Section 7.0: Identifies references in this document.

1.2 PURPOSE AND SCOPE

Remedial actions at the K West Basin are taking place under the *Remedial Design Report / Remedial Action Work Plan (RDR/RAWP) for the K Basins Interim Remedial Action* (DOE-RL, 2001) and approved RDR/RAWP changes. This document identifies the criteria and process used to remove sludge from the 105-KW Basin (Operable Unit 100-KR-2, Site 100-K-42) to achieve the Hanford Tri-Party Agreement (TPA) Milestone M-34-35b – *Complete final pass clean up*. Prior to "final pass cleanup" bulk sludge containerization was completed per TPA Milestone M-34-35a.

Final pass clean up is not intended to achieve end point criteria for sludge removal identified in the *End Point Criteria for the K Basins Interim Remedial Action* (FH, 2005a). Rather, *final pass clean up* considers the on-going mission of the K West Basin and is intended to remove sludge to the extent practicable from accessible areas of the basin floor and pump it into containers. As described in TPA Change M-34-04-01, containerization provides additional environmental protection until sludge is retrieved for treatment and disposal. *Final pass clean up* as used herein is not intended to mean there will be no future retrieval of sludge from the floor and pits of the K West Basin (e.g., that which is currently inaccessible or additional sludge deposited by future activities).

1.3 BACKGROUND

The K West Reactor initiated operations in 1954 and was permanently shut down in February 1970. After reactor operations terminated, basin facilities were taken out of service and maintained in a wet lay-up condition. K West Basin was modified to provide for storage and handling of the N Reactor fuel inventory and reactivated in February 1981. Modifications included installation of a sand filter and ion exchange modules (IXMs) to treat basin water and coating of the basin floor, walls and associated pits with an epoxy sealant. Fuel was received at the K West Basins from N Reactor during the period of 1981 to 1989. Operators encapsulated the fuel as soon as fuel canisters were received from N Reactor and lessons learned at K East Basin were employed at K West to maintain the basin relatively free of sludge except for the accumulation of dirt, operational debris, and biological debris. Floor areas of the K West Basin were clean prior to installation of processing equipment in the late 1990s (i.e., fuel transfer system, settler tanks, integrated water treatment system, fuel handling, and Multi-Canister Overpack [MCO] loading components) and the six sludge containers in 2005.

From the period of December 2000 until October 2004, spent fuel stored in the K West Basin was removed to interim dry storage. During this period spent fuel stored in the K East Basin was transferred to the K West Basin for washing and repackaging and was also removed from the K West Basin. Coarse and fine sludge removed during the fuel washing operation was collected in knockout pots (KOPs) and settler tanks, respectively, in the K West Basin during this operation. Fuel processing in the K West west bay generated sludge around the fuel processing tables. Sludge was also generated in the K West east bay during canister cleaning operations. Approximately 1.5 cubic meters of sludge was estimated to exist in the K West Basin outside of the K West North Loadout Pit (NLOP). Sand filter backwash generated the majority of sludge in the K West NLOP, an estimated 3.6 cubic meters (FH, 2006).

Since the removal of spent fuel from the K Basins, remedial actions have focused on the removal of debris and sludge from the K East Basin, transfer of that sludge to containers located in the K West Basin via the hose-in-hose (HIH) transfer system and the performance of remedial actions at the K West Basin. These have included grouting of the discharge chute area of the K West Basin, receipt of found fuel from the K East Basin, bulk sludge containerization, and continuing debris removal. HIH sludge transfer operations resulted in deposition of a relatively fine coat of light sludge on the K West basin floors. A nominal 5 cubic meters of sludge was estimated to exist in K West prior to sludge collection efforts. The K West Basin was much cleaner than the K East Basin based on sludge volumes.

Bulk sludge containerization activities in the K West Basin involved vacuuming and/or sparging the accessible areas of the basin floor and pits to remove the majority of sludge and expose the concrete floor of the basin to the extent practicable. At this time, debris was washed of visible sludge using one or more different processes. The process included flowing water through a strainer basket filled with debris, directly vacuuming over the surface of the debris, or flushing debris with internal voids to the extent practicable.

Since completion of HIH sludge transfer from the K East Basin to containers in the K West Basin and K West bulk sludge containerization, activities at the K West Basin have focused on the performance of *final pass clean up*. Completion of *final pass clean up* will remove

accessible sludge from the basin to minimize the threat to the environment during the period of continuing K West Basin operational activities. Continuing operational activities in the K West Basin after final pass clean up includes:

- Providing safe interim storage of sludge in accumulation containers, KOPs, and settler tanks until treatment facilities are completed and the sludge is removed from the K West Basin;
- Storage of collected found fuel from K West and found fuel transferred from K East until removal from the basin;
- Operation of the basin integrated water treatment system (IWTS), skimmer system, and recirculation system to maintain water clarity;
- Identification and retrieval of found fuel from the K West Basin floor;
- Sorting and removal of debris;
- Sampling of sludge for characterization purposes; and
- Clean up vacuuming of sludge as part of any future response actions.

In fiscal year 2008 field activities are also being performed to support development of a conceptual design to direct grout the container sludge which includes provisions for the retrieval and transfer of sludge from the containers to a solidification process.

The basin skimmer system uses a back washable sand filter to remove particulates from the water followed by treatment through an IXM. The sand filter is backwashed to the NLOP when a predetermined differential pressure is measured across the sand filter. The backwash is collected in the NLOP where the solids are allowed to settle as sludge. The sand filter will continue to be operated based on conditions encountered in the basin until the system is deactivated in the future.

1.3.1 Description of Sludge

The K Basins sludge consists of a radioactive mix of fuel corrosion products (including fission and activation product nuclides), small fuel fragments, iron and aluminum oxides, concrete grit, sand, dirt, and operational and biological debris (FH, 2006). Portions of the sludge that originated in the spent fuel storage canisters accumulated in the KOP, settler tanks, and components of the IWTS that maintained the K West Basin water clarity during the process of cleaning and repacking the spent fuel. The remaining sludge that was distributed on the K East and K West Basin floors and pits is being consolidated in containers at the K West Basin for interim storage prior to treatment. As a result of the sludge generation and consolidation processes, there are three sludge streams: KOP sludge, settler tank sludge, and containerized sludge.

A nominal 5 cubic meters of sludge was estimated to exist on the floor of the K West Basin (including the pits) prior to sludge collection efforts.

Sludge found on the basin floor or other underwater surfaces after final pass clean up is referred to as either residual sludge or redeposited sludge. Residual sludge is sludge that remains on the basin or pit floor on completion of the final pass clean up. This sludge is characteristic of sludge collected during bulk sludge containerization and final pass clean up but is not considered practicable to remove at this time based on accessibility and equipment currently in use. Redeposited sludge is a less dense, readily mobilized sludge that has accumulated on the basin or pit floor as small particles settle out of the basin water during or after the final pass clean up.

1.4 K WEST BASIN CONFIGURATION

The K West Basin is an operational basin that provides services and equipment for the continuing K Basins interim remedial action. Operational equipment includes sludge vacuuming and delivery systems; six sludge accumulation containers (SCS-CON-210 through SCS-CON-260); IWTS components including KOPs and settler tanks; found fuel and debris sorting and storage locations; and fuel processing and packaging equipment. Three sludge accumulation containers are situated in each of the center and east bays of the basin (Figure 1-1). The east and center bays also include sludge metering assemblies, booster pumps, skimmer skid assemblies, and out of service KOPs. In the west bay are located the in-service KOP and strainers, the IWTS underwater pumps and pump stands, storage racks, and operational equipment for sorting debris and found fuel. All bays contain hoses that are routed between all the components located in the bays and pits.

The K West Basin floor includes small debris from operational activities. These include Grafoil (i.e., flexible graphite seal material) fragments, small debris inadvertently dropped in the basin, and small debris from operations.

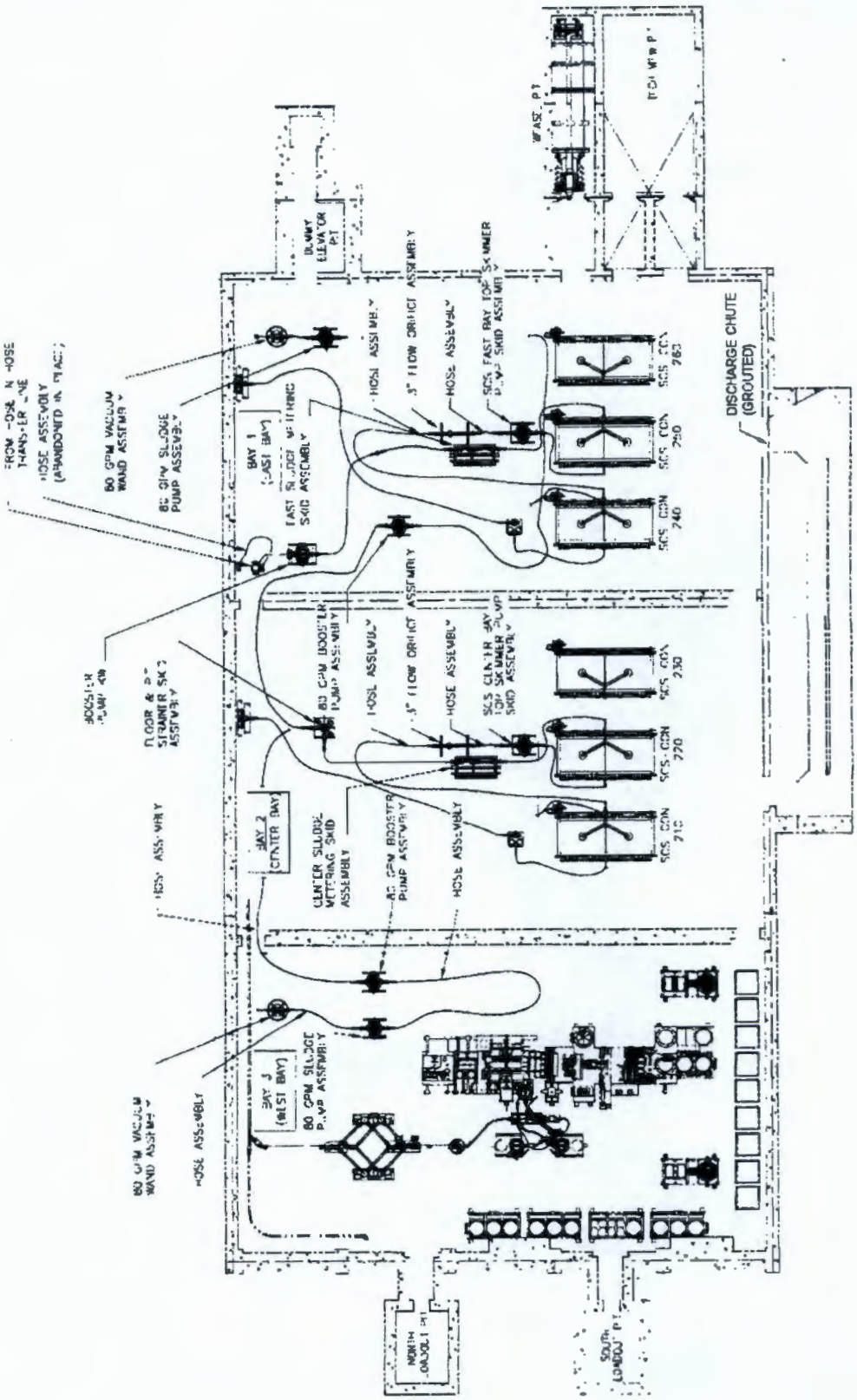

Figure 1-1. K West Basin Equipment Configuration

The K West Basin includes five pits that house equipment used during basin operations and during the remedial action. The presence of the equipment restricts the ability to access the areas for *final pass clean up*. These pits will be remediated in the future as systems are deactivated and removed as necessary to meet Basin end point criteria. A discussion of each of the pits is provided below:

- ***North Loadout Pit:*** The NLOP will continue to receive backwashes from the sand filter. As described in Section 1.2, backwashes will be allowed to settle as sludge. Debris within the NLOP was removed after bulk sludge containerization. Additional *final pass clean up* activities will not be performed in the NLOP based on the continuing NLOP sludge management mission.

- ***South Loadout Pit (SLOP):*** The SLOP contains the Immersion Pail Support Structure (IPSS) (Figure 1-2). The area is currently inaccessible for sparging or vacuuming as this system is still in use. The IPSS consists of a two-section steel frame. One section rests on and is pinned to the top of the other. The IPSS is approximately 27 foot high. The IPSS is secured in the SLOP by manually operated jacks, static alignment blocks, and the existing guide rails. The corner columns of the IPSS act as guide rails to guide the immersion pail as it is raised and lowered in the IPSS. Manually operated locking pin assemblies are mounted to the top of each IPSS corner column to secure the immersion pail in the raised position. The locking pins are designed to be locked in the inserted or retracted position. The IPSS has a 48-inch by 56-inch base plate that connects and supports the corner columns. Special augment feet are used to distribute the load to the floor during normal and off-normal conditions. The IPSS base plate supports the immersion pail when it is in the lowered position.

- ***South Loadout Pit Transfer Channel:*** The SLOP transfer channel contains the MCO Loading System Shuttle (MLS). The SLOP transfer channel is currently inaccessible for vacuuming and accessible to only limited sparging as this system is still in use. The MLS shuttle is used to move MCO baskets from the Fuel Retrieval System (FRS) MCO basket queue, through the SLOP transfer channel, to the MCO basket unload position just east of the IPSS. This process is shown in the elevation view of the MLS in Figure 1-3.

- ***Dummy Elevator Pit:*** The Dummy Elevator Pit contains the Shielded Transfer Cask (STC) Lift Platform. The area is accessible for sparging and vacuuming of sludge. The STC lift platform and upper rail assembly is shown in Figure 1-4. An elevation view of the STC lift platform with an open STC in place is shown in Figure 1-5. It is composed of structural members, a platform, and four jack screw and nut assemblies that support the lift platform. The STC lift platform is hung from the lift platform support structure so that the jack screws are kept in tension.

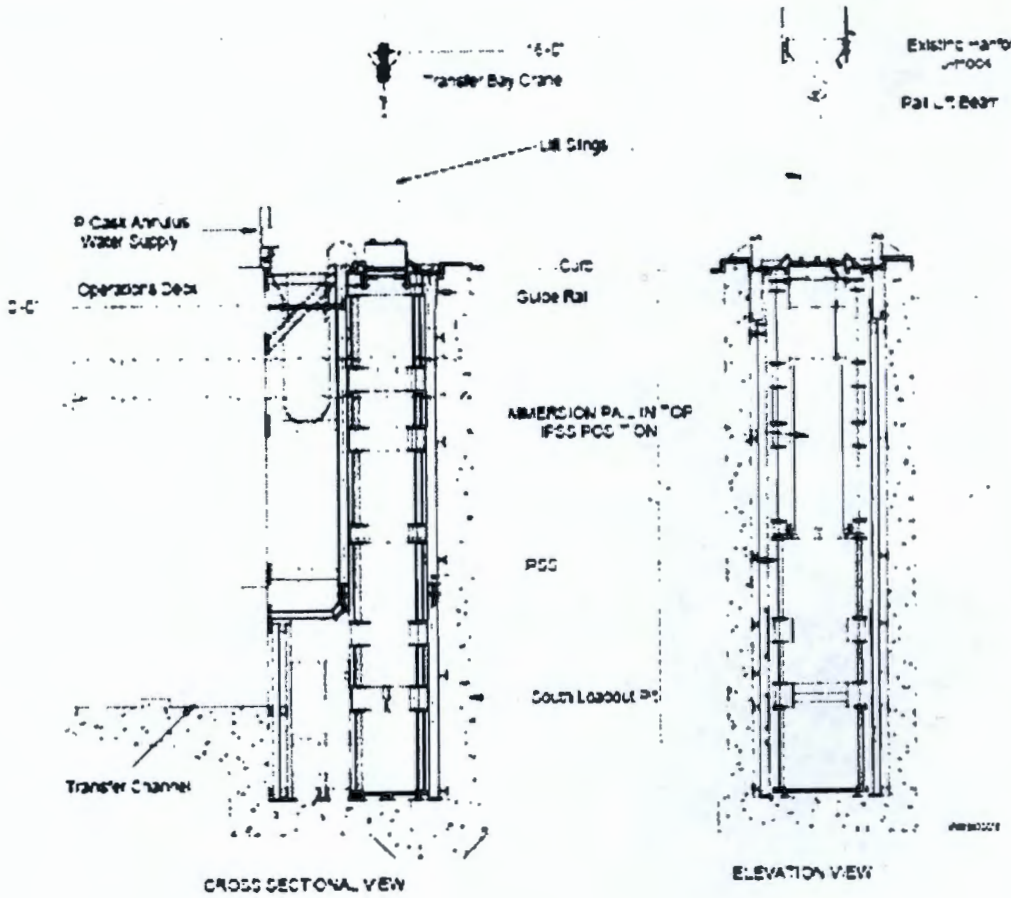

Figure 1-2. Cask Loadout System Elevation View

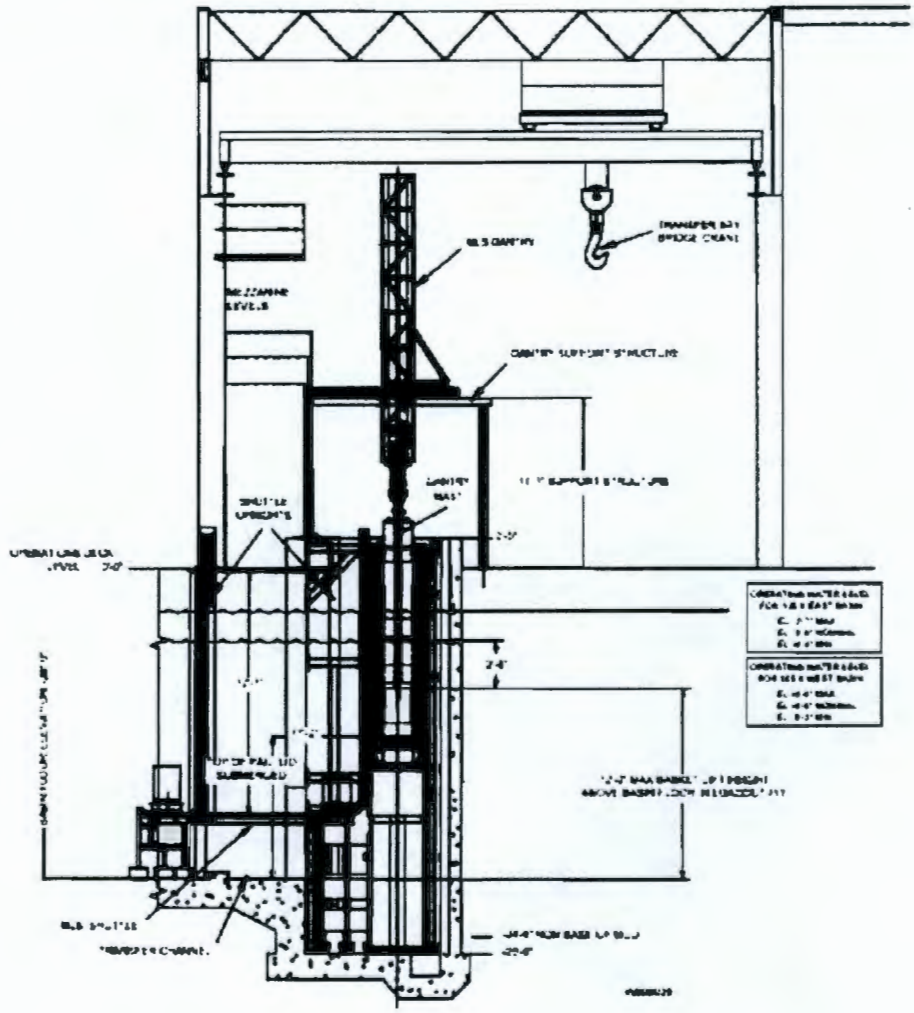

Figure 1-3. Multi-Canister Overpack Loading System Shuttle

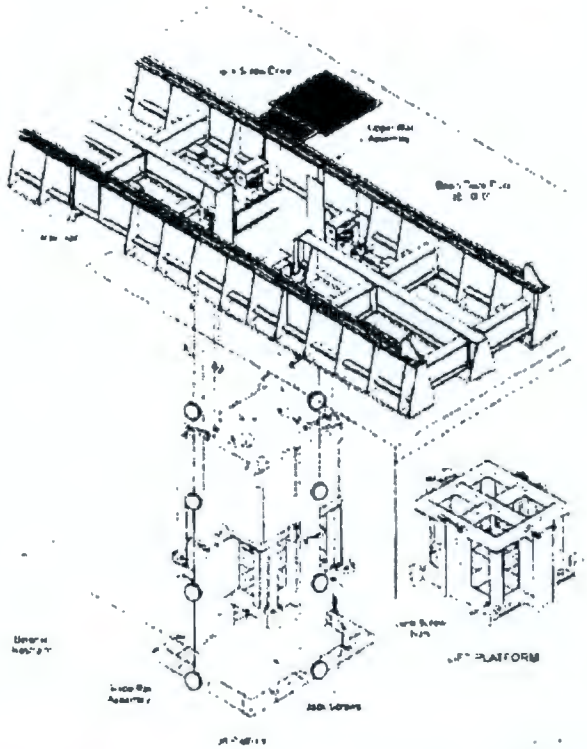

Figure 1-4. Shielded Transfer Cask Lift Platforms and Upper Rail Assembly

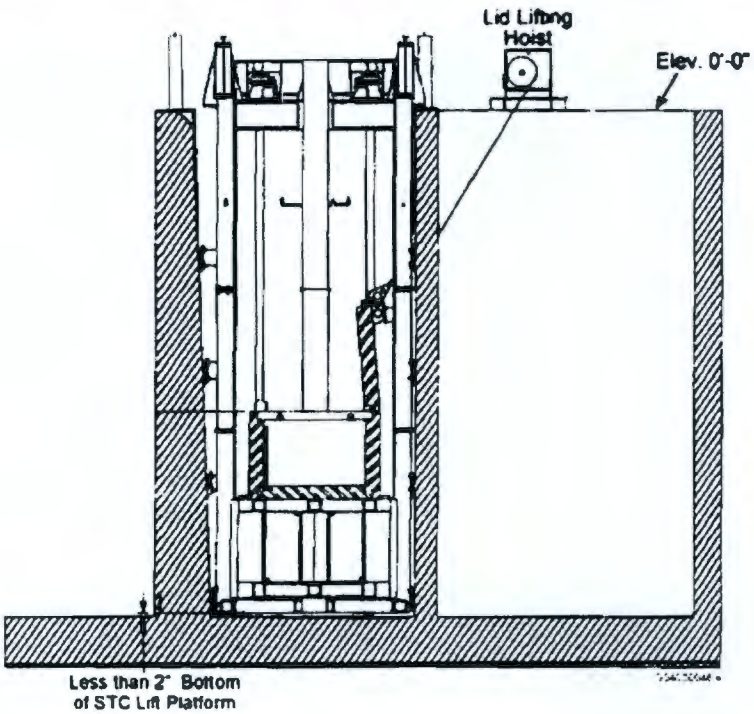

Figure 1-5. Shielded Transfer Cask Lift Platform Elevation View

- ***Weasel Pit:*** The Weasel Pit contains the particulate settlers, also referred to as the settler tanks (Figure 1-6). This area is currently inaccessible for sparging or vacuuming except at the west end as this system is still in use. The particulate settlers are pressure vessels and consist of an array of 20-inch diameter, schedule 10 stainless steel pipes that are 16 feet long. The array is configured as two side-by-side stacks of five pipes that are 6 inches apart horizontally and vertically. A manifold is provided to evenly divide flow among the ten pipes. Each settler has a high-point vent manifolded together with other settler vents and discharged through an air-water combination valve beneath the water surface. The settler tubes are supported by tube sheet supports.

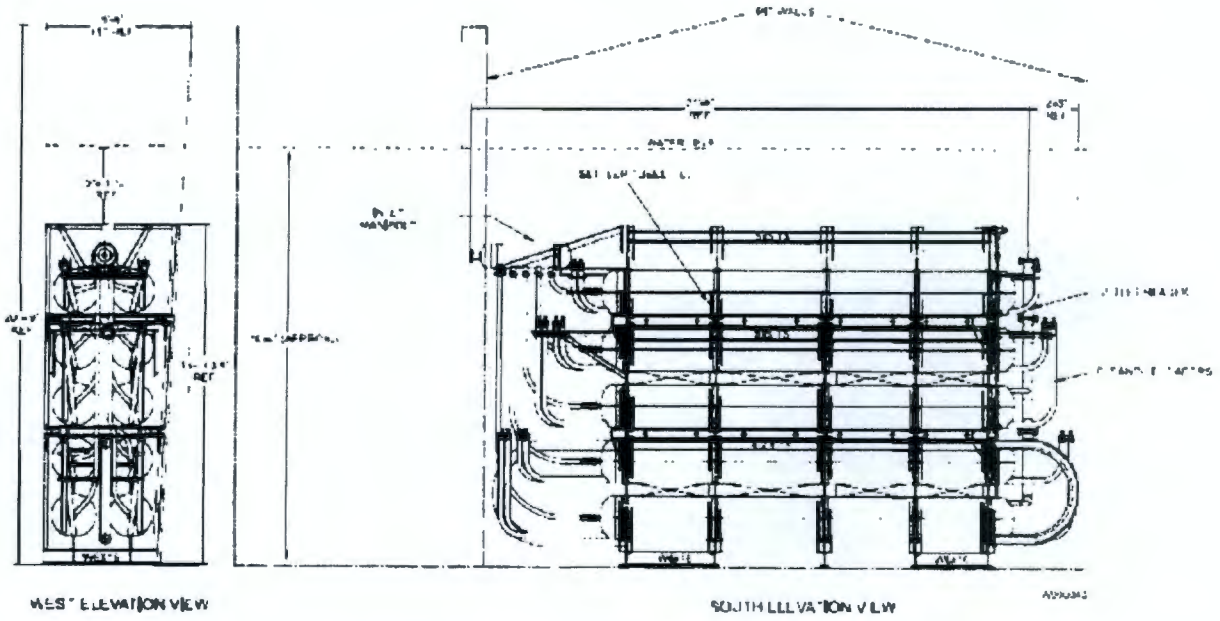

Figure 1-6. Weasel Pit Particulate Settlers

- ***Tech View Pit (Cartridge filter pit):*** The Tech View Pit contains two cartridge filter vessels, piping, and structural framework (Figure 1-7). This area is currently inaccessible for vacuuming. The Tech View Pit North and South Entry Pits are accessible for vacuuming.

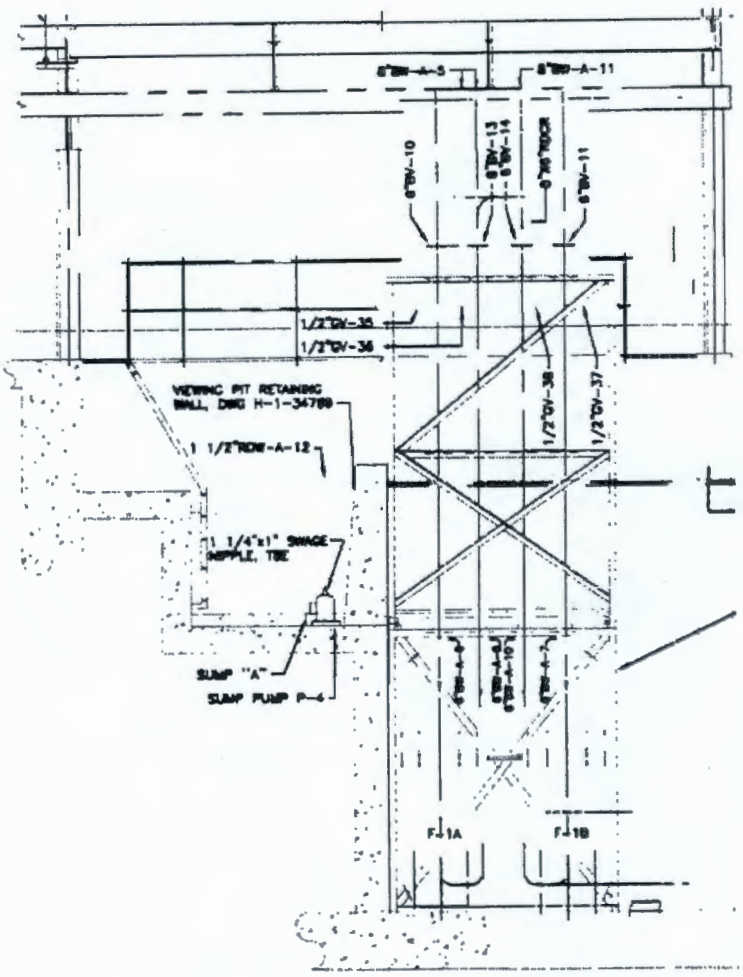

Figure 1-7. Tech View Pit

Based on the continuing operations, the configuration of existing equipment in the bays and pits will vary until the current mission is completed and the basin is deactivated and removed. Additional equipment may be installed to support sludge sampling and management in the future. Sludge retrieval systems will be left in place for potential future use in collecting currently inaccessible sludge or additional sludge that is deposited by future activities.

2.0 COMPLETION CRITERIA

TPA Milestone M-34-35 – *Containerize K West Sludge* was instituted within a more comprehensive change request to store sludge in engineered containers in the K West Basin to provide additional environmental protection until sludge retrieval for treatment and disposal. The milestone was revised in 2006 to reflect two interim milestones; bulk sludge containerization and final pass clean up. Milestone M-34-35a – *All K West Bulk Sludge is placed in containers* included vacuuming bulk sludge from accessible areas of the K West Basin floor and pits to the engineered containers in the K West Basin. The milestone was met in July 2007. Milestone M-34-35b – *Complete final pass clean up* represents the continuation of sludge removal from accessible areas of the K West Basin using a more thorough vacuuming process that includes relocation of most movable items from the areas subject to cleaning. While the intent of the *final pass clean up* is to remove as much sludge as practicable to provide additional environmental protection until sludge retrieval for treatment and disposal, it is recognized that equipment used in the continuing operations restrict the scope of the final pass vacuuming. Similarly, it is recognized that the continued generation of sludge from the backwashing of the sand filter to the NLOP makes it unnecessary to perform *final pass clean up* of the NLOP at this time.

Based on these parameters, the following completion criteria are established to guide the *final pass clean up* to achieve TPA Milestone M-34-35b:

Sludge will be vacuumed from *accessible areas*[1] of the basin and pits, excluding the NLOP, to the extent practicable to achieve the following visual conditions:

- Areas of the basin floor that are free of small debris will contain only negligible amounts of residual sludge;
- Areas of the basin floor that are covered with small debris (i.e., such as small debris piles containing Grafoil) will produce only negligible evidence of residual sludge on disturbance (e.g., clouds when physically disturbed or mobilization of material through a 0.25 inch screen using a vacuum);

Redeposited sludge, which is visibly less dense than residual sludge and may be found in areas previously vacuumed or inspected, will be minimized considering the equipment performance and continuing mission.

[1] See definition of *accessible areas*.

3.0 QUALIFIED PROCESSES

The remedial design describing the system to perform the K West Basin *final pass clean up* sludge containerization process is described in the remedial design description of this process (DOE-RL, 2004; TPA-CN-158, TPA-CN-198),

The "completion criteria" as used in context of completing final pass sludge containerization in the 105-K West Basin is defined in Section 2 of this document.

Parts of the 105-K West Basin Qualified Process have been described as similar to that used in the 105-K East Basin. Those attributes of the *105-K East Basin Qualified Process to Achieve End Point Criteria*, KBC-24721, Rev 0, as described in Section 3, "Process Description" of that document, which "are" and "are not" not carried forward into the 105-K West Basin Qualified Process are delineated in Table 1.

Visual comparators and the visual measurement process described herein were qualified by a process that was demonstrated to RL and EPA (FH, 2006b) as valid measurement devices and techniques for estimating redeposited sludge volumes in the K East Basin as described in Attachment C of the *105-K East Qualified Process to Achieve End Point Criteria* (FH, 2005b). These qualified measurement devices will be installed in the K West Basin during *final pass clean up* to estimate redeposited sludge in the future. Placement of visual comparators will be performed as part of the cleanup soon after areas are cleaned and documented clean via video, but future measurements of redeposited sludge and any response actions initiated as a result of redeposited sludge are subsequent actions to the final pass cleanup process.

Table 1

Similarity Assessment between
105 K East Basin Qualified Process for Demonstrating End Point Criteria
vs.
105 K West Basin Qualified Process to Achieve TPA Milestone M-34-35b

Process Description [2]	What is Similar	What is not Similar
Bulk Sludge Containerization and Removal Bulk Sludge Containerization	Sludge is vacuumed into containers.	Number and location of containers. No Hard pan would likely be encountered. Found fuel would not be removed now.
Bulk Sludge Removal		Bulk sludge is not removed from

Process Description [2]	What is Similar	What is not Similar
		the 105 K West Basin.
Underwater Debris Cleaning, Removal and Relocation	Debris will be removed or relocated to gain access to the floor. Debris identified as potentially found fuel will be evaluated to determine if it is found fuel and if so will be segregated.	Debris remaining in the basin will not be inventoried. Found fuel would not be removed now. Debris that is not suitable for grouting in situ will not be removed from the basin. Debris that will remain in the basin that may have sludge within the void spaces will not be disassembled or size reduced but were flushed during bulk containerization. Debris to be removed as part of demolition of the K West Basin will not be identified at this time. Aluminum or activated metal will not be purposely segregated. Relocation of underwater debris will not be tracked. Operating equipment (e.g. IWTS, FRS) will not be removed or relocated to access underlying areas of the basin floor.
Final Vacuuming, Visual Comparator Installation and Inspection	Final vacuuming of each bay and adjoining pits to the extent practicable. Remaining sludge volume will be estimated. Inspections will be performed and video taped of 100% of the accessible areas of the basin floor and pits.	The K West NLOP will not be vacuumed as the Sand Filter is still operable and backwashes into the NLOP. Operating equipment (e.g. IWTS, FRS) will not be removed or relocated to access underlying areas of the basin floor. There is no target residual or resettled sludge thickness. Visual comparator locations will

Process Description [2]	What is Similar	What is not Similar
	Fuel found during final pass vacuuming will be segregated. After an area is cleaned visual comparators will be placed at locations on the basin floor to measure sludge redeposition. The volume of residual sludge remaining on the floor of the basin and its pits will be estimated.	not be randomly pre-selected but selected based on equipment layout and experience at K East Basin. No waste calculations will be prepared to demonstrate K West Basin demolition waste matrix will meet ERDF WAC.
Inspections for Found Fuel	Fuel found during final pass vacuuming will be segregated.	Areas which are currently inaccessible due to operating equipment will be inspected later. No declaration that all fuel has been found and removed from K West Basin will be made.
Inspections of Underwater Debris		Debris will not be inspected to confirm end point criteria for underwater debris has been met.
Weasel Pit and Tech View Pit Inspections		No sludge containers are located in the Weasel Pit or Tech View Pit of the K West Basin, however, the Settler Tanks associated with the IWTS are located in the Weasel Pit and preclude final pass vacuuming at this time. Accessible areas of the Tech View Pit were bulk vacuumed. Based on the results of bulk vacuuming, this area of the basin floor has been cleaned well enough that "final pass" cleanup is not necessary.

[2] Section 3.0 of KBC-24721, Rev. 0,

4.0 FINAL PASS CLEAN UP

4.1 OVERVIEW

Final pass clean up employs a sludge vacuuming system and process similar to that used in the K East Basin. Sections of the basin are methodically vacuumed while being viewed with remote video equipment. Upon completing *final pass clean up* in an area, the basin floor and any debris, if present, will be examined by Operations. Inspections shall be conducted of 100% of the accessible basin floor and pit areas. Inspections shall be recorded covering 100% of the area on still camera or video at the time sludge removal determinations are made except where interferences prohibit floor examination. Inspections are documented using the *K West Basin Floor Inspection Form* (Attachment A). If Operations determine that sludge has been removed to the extent practicable and the area meets the completion criteria established in Section 2.0, then the *final pass clean up* will be considered complete in the inspection area. K Basins Closure (KBC) Project Waste Services personnel will estimate the volume of residual sludge that remains within the inspection area and document the information on the *K West Basin Floor Inspection Form* (Attachment A). While the volume of residual sludge is not relevant to achieving the *completion criteria*, it is collected at this time as baseline information for future remedial actions.

In some cases, bulk sludge containerization may have cleaned the floor well enough that *final pass clean up* is not necessary to achieve the *completion criteria.* In these circumstances, inspections and videotaping shall be conducted of 100% of the accessible basin floor or pit areas. Operations will document the inspection and KBC Project Waste Services will estimate residual sludge in the inspection area as described in this plan.

After an area has successfully been inspected, visual comparators will be installed at the locations described in Attachment B. Visual comparators are being placed in the basin at this time to provide a basis for future monitoring of sludge redeposition in the K West Basin during continuing operations. Based on the continuing K West Basin operations, comparators may be moved or become obstructed after achieving TPA Milestone M-34-35b, and other portable sludge measuring devices may be used in the future.

4.2 FINAL PASS VACUUMING AND INSPECTION PROCESS

Final pass vacuuming and inspections will include the following:

1. Areas of the basin that undergo final vacuuming shall be tracked by cubicle number or other location system and recorded on the *K West Basin Floor Inspection Form*, Attachment A.

2. Operations will vacuum accessible areas of each bay and the adjoining pits to the extent practicable.

3. Operations shall inspect 100% of the accessible basin floor and pit areas to determine if the area has been vacuumed to the extent practicable and achieves the *completion criteria* described in Section 2.0. Where direct visual appearance of the floor is not conclusive, other methods to indicate the floor condition, such as the use of a basin tool to tap or scrape the floor should be used where possible to clearly demonstrate the extent (or absence) of residual sludge. In instances where small debris is present on the basin floor, methods may include using the vacuum or other tool to agitate small debris and to assure small debris is free of residual sludge to the extent practicable.

4. Inspections shall be recorded covering 100% of the area on still camera or video at the time sludge removal determinations are made except where interferences prohibit floor examination. Inspections shall be documented using the *K West Basin Floor Inspection Form* (Attachment A). Video taken during final pass vacuuming may be used or additional video may be taken.

Note: Video tape recordings shall be labeled with the date, time, location, and supervisor name at the time the video tape(s) recording is generated. Audio recording may be included as much as practical to provide the reviewer with as much information as possible (location, direction, object identification, etc.)

5. Once it has been established that sludge has been removed to the extent practicable by Operations, KBC Project Waste Services shall estimate the volume of residual sludge in each inspection area and document the results on the *K West Basin Floor Inspection Form* (Attachment A).

Note: If Operations determines that sludge was removed from an area to the extent practicable during bulk containerization and that the *completion criteria* are met, additional vacuuming may not be warranted. In those instances, inspection of the area shall be performed and documented, and the volume of residual sludge shall be estimated as described above.

6. After satisfactory inspection of a work area by Operations, visual comparators will be placed as described in Section 5.0.

5.0 VISUAL COMPARATOR INSTALLATION

The below will be performed as part of placement of visual comparators in the K West Basin.

Placement of visual comparators will be performed as part of the cleanup soon after areas are cleaned and documented clean via video, but future measurements of redeposited sludge and any response actions initiated as a result of redeposited sludge are subsequent actions to the final pass cleanup process.

1. QAE&I personnel shall inspect visual comparators prior to installation as described in Section 6.3.

2. Operations shall install visual comparators at the locations specified in Attachment B after satisfactory inspection of a section of the basin floor or pit identified to contain a visual comparator. The type (Type 1 or 2) of comparator to be placed at each location is specified in Attachment B.

3. Operations shall videotape the installation of all visual comparators.

4. Quality Assurance Engineers/Inspectors (QAE/I) shall record the type of comparator(s) (i.e., Type 1 or Type 2), the identification number, the location of the comparator placement in the designated area, and the date and time of placement on the *Visual Comparator Inspection Form,* Attachment C. If the comparator cannot be located as specified, locate the comparator as close as possible and document the actual location.

5. Upon placement of visual comparators, QAE/I shall inspect each comparator to verify that the visual comparator was not damaged during placement.

6.0 QUALITY ASSURANCE PROJECT PLAN

The purpose of this Quality Assurance Project Plan (QAPP) is to provide guidance to QAE/I, Operations, and KBC Project Waste Services personnel and 1) identify the project roles and responsibilities, 2) identify orientation and training to ensure the scope of the activities to meet *Completion Criteria* are understood, 3) identify project requirements relevant to quality inspections and documentation, and 4) identify document and record management practices to be used for this project.

Inspections of the K West Basin to verify that the process has achieved the *Completion Criteria* (Section 2.0) include:

- Operations inspections of the accessible areas of the basin floor and pits to verify that sludge has been removed to the extent practicable to meet the *completion criteria* (Section 2.0).

In addition to the inspections used to achieve *completion criteria*, quality assurance inspections of visual comparators will be performed to ensure the quality of data collected from comparators in future measurements of redeposited sludge. These inspections include:

- Inspections of visual comparators prior to installation to ensure they meet specification (Attachment C); and
- Inspections of visual comparators for correct placement and damage at the time of installation in the basin.

This QAPP applies to QAE/I, Operations, and KBC Project Waste Services personnel that perform work identified in this plan.

6.1 ORGANIZATION, ROLES AND RESPONSIBILITIES

Project organization, roles and responsibilities are identified below. To the extent practicable these roles and responsibilities have been reflected in the context of this document. In general:

- Sludge *final pass clean up* shall be performed by Operations.
- Observations, examinations, and inspections for residual sludge on floor surfaces and debris shall be performed by Operations.
- KBC Project Waste Services shall estimate the volume of residual sludge after notification by Operations that sludge has been removed from an inspection area to the extent practicable.
- Visual comparator inspections shall be performed by QAE/I qualified and certified as Level II inspectors.

6.2 QUALIFICATIONS AND TRAINING

QAE/I shall meet the qualification requirements identified in Section 6.3 of this QAPP. Inspections that are identified as being performed by Operations personnel or sludge estimating tasks performed by KBC Project Waste Services do not require specialized training in accordance with the Fluor Hanford (FH) Quality Assurance (QA) program. These personnel shall be trained in accordance with established Administrative and Operations procedures which are also a part of the FH QA program.

The contents of this plan shall be communicated to personnel supervising the work through required reading, training, or orientation and to personnel performing the work during pre-work briefings.

6.3 REQUIREMENTS

- Observations and inspections for residual sludge on floor surfaces and debris external surfaces shall be documented as described in Section 4.2.
- Visual comparator inspections shall be performed by personnel qualified and certified as Level ll inspectors satisfying the fundamentals of the FH quality assurance program.
- The remote inspection process qualified during the K East Basin final pass clean up (FH, 2005b) shall be used except that visual acuity measures used at the K East Basin will not be implemented.
- Remote visual comparator inspections shall include personnel qualified and certified as Level II Basic inspectors per the FH quality assurance program.
- Visual comparators shall have the height/thickness dimension and flatness inspected and documented prior to installation in the basin by Level II inspection personnel per the FH quality assurance program.
- Visual comparators shall not be placed in an area until Operations identifies that the area has been cleaned to the extent practicable and meets *completion criteria* (Section 2.0).
- Visual comparators shall be placed at the locations identified in Attachment B. If the comparator can not be located as specified, the comparator shall be located as close as possible to the predetermined location. Placements of comparators shall be documented on the *Visual Comparator Inspection Form* (Attachment C).
- Photographs or videos shall be taken at the time visual comparators are installed in the basin. The pictures or video shall be identified as to location and the date and time recorded.
- Correction of non-conformances shall be in accordance with quality processes and work instructions per the FH quality assurance program.

6.4 EQUIPMENT

- Type 1 and 2 Visual comparators as described in Attachment B.
- Closed circuit television (CCTV) camera with light.
- Poles/rods used for supporting the CCTV equipment shall be of suitable lengths to extend to the basin and pit floors.

6.5 DOCUMENTATION AND RECORDS

Documentation, records, and visual recordings shall be maintained in accordance with a records management program meeting the requirements of the FH quality assurance program. The organization responsible for generating the visual or inspection information shall be responsible for ensuring that the information is managed accordingly. Records include completed floor inspection forms, photographs or videos, records of visual comparator acceptance inspections, and completed visual comparator inspection forms. Inspection forms, photographs and videos shall be traceable to the location and include date and time of observation or inspection.

Copies of completed and verified forms identified in this plan, or equivalent forms used to document sludge inspections and visual comparator placement and measurements shall be provided to KBC Project Waste Services and Environmental Protection.

7.0 REFERENCES

DOE-RL, 2001, DOE/RL-99-89, Rev. 1, *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.

DOE-RL, 2004, K Basin Interim Remedial Action Design Change - Hose-in-Hose Transfer and K West Sludge Consolidation Containers, RL Letter 04-AMCP-0398, EPA Approval Letter, L. E. Gadbois (EPA) to L. D. Earley (RL), dated August 9, 2004.

TPA Change Notice, K West Basin Sludge Vacuuming, TPA-CN-158, dated September 14, 2006.

TPA Change Notice, Hose-In-Hose Transfer and K West Sludge Consolidation Containers, TPA-CN-198, dated December 11, 2007.

FH, 2005a, *End Point Criteria for the K Basins Interim Remedial Action*, HNF-20632, Rev. 0, Fluor Hanford, Richland, Washington.

FH, 2005b, *105-K East Basin Qualified Process for Achieving End Point Criteria*, KBC-24721, Fluor Hanford, Richland, Washington.

FH, 2005c, *Sampling and Analysis Plan for K Basin's Debris*, HNF-6495, Rev. 2A, Fluor Hanford, Richland, Washington.

FH, 2006a, *Spent Nuclear Fuel Project Technical Databook*, HNF-SD-SNF-TI-015, Volume 2 Sludge, Revision 13, January 2006, Fluor Hanford, Richland, Washington.

FH, 2006b, Job Control System Work Package, *1K-06-05870, 105KE – Demonstrate Final Pass Vacuuming Qualifed Process*

ATTACHMENT A

K West Basin Floor Inspection Form (Page 1 of 2)

Location and Conditions	
1. Date:	**2. Location:**
3. Inspection area size: (ft^2) _____	
4. Video/Still Photo: ☐ Video ☐ Still photo	**5. Video or film identification:** (number or other)
6. Visibility: **a.** ☐ Yes ☐ No Was the entire floor area within the location described above visually inspected for residual sludge? (If No, explain why and the limits of the inspection. [e.g., immovable object]) **b.** ☐ Yes ☐ No Were remote devises, e.g. underwater lights and TV camera needed to perform the inspection of the basin floor?	

Sludge Inspection – Final Vacuuming
7. Extent Practicable: **a.** ☐ Yes ☐ No Was the area vacuumed to the extent practicable? (If No, inform manager.)
Operations Field Work Supervisor: _____ _____ _____ Name (Print): Signature: Date:

ATTACHMENT A

K West Basin Floor Inspection Form (Page 2 of 2)

Date (from page 1):	Location (from page 1):

Sludge Inspection – Final Vacuuming (Continued)

8. Floor residues:

a. ☐ Yes ☐ No Were visible sludge residues present? (If No, go to question 9.)

b. ☐ Yes ☐ No Were residues present in a measurable amount? (for example hard pan or sludge in inaccessible areas) (If No, go to question 9.) (If yes, identify the number of areas [c.] and provide vertical and horizontal extent of residues in the inspection area [d.] and total volume [e.].) (If more than three areas of residue exist in an inspection area, attach additional sheets.)

c. Number of areas with sludge residues? _____

d. Residues estimated area (inches): (to be prepared by Waste Services)

Length: _____ x Width: _____ x Depth: _____ = Volume: _____ in^3
Length: _____ x Width: _____ x Depth: _____ = Volume: _____ in^3
Length: _____ x Width: _____ x Depth: _____ = Volume: _____ in^3

e. Total estimated residue volume: (measurements or estimates) _____ in^3

f. Sludge residue location(s):

g. Method used to determine residual amount (reference points, measuring tool etc).

9. Debris residues:

a. ☐ Yes ☐ No Is debris present in the inspection area?

b. ☐ Yes ☐ No Are the debris external surfaces clean of visible sludge? (If No, estimate the volume of sludge residues on debris or re-clean.)

c. Estimated volume of sludge (to be prepared by Waste Services): _____

Waste Services: (signature for measurements, calculations and information in items 8.d., 8.e. and 9.c.)

_____ _____ _____

Name: (Print) Signature: Date:

ATTACHMENT B

Visual Comparator Specifications, Numbers and Locations

General

Based on experience with the use of visual comparators in the K East Basin, a biased sampling approach to the location and number of visual comparators will be used rather than a random sampling approach. The approach includes the use of both Type 1 and Type 2 visual comparators in each bay. Fifteen visual comparators will be installed in this approach versus the fourteen specified at the K East Basin.

Visual Comparator Specification

Type 1 and Type 2 visual comparators shall be the same as used in the K East Basin and qualified as an effective measurement device. Visual comparators specified are made of a series of stepped disks, plates or machined increments with different diameters or dimensions.

- The thickness of a Type 1 visual comparator will be: step one shall be 0.030 inches, step two shall be 0.050 inches, and step three shall be 0.075 (or similar).
- The thickness of a Type 2 visual comparator will be: step one will be 0.10 inches, step two will be 0.125 inches and step 3 will be 0.15 inches (or similar). Tolerance shall be + 0.000 - 0.003 inches.

The flat or land between the step shall be 0.80 inches with a tolerance of ±0.06 inches for each flat or land. The comparators shall be flat with a tolerance of ± 0.004 inches. Each comparator shall be numbered.

Location and number

Figure 1-1 shows a layout of equipment on the floor of the K West Basin. Future operations include fuel washing and removal activities in the west bay, and potential sludge sampling, transfers, and retrieval out of containers in the center and east bays including the pits.

Five visual comparator plates shall be installed in each bay represented by four Type 1 comparators and one Type 2 comparator plate. Type 1 comparator plates shall be placed at a location in each quadrant of the bay. Locations selected shall be away from channels so as not to be in the way of material movement through the channels or areas likely to be disturbed by future operations. The Type 2 comparator shall be placed in approximately the center of each bay.

The placement of visual comparators in this configuration will provide a method to estimate redeposited sludge in the future. Other methods to measure localized sludge deposition may be developed following completion of TPA milestone M-34-35b – *Complete final pass clean up.*

ATTACHMENT C

Visual Comparator Inspection Form

1. Visual Comparator: No.: _____ Location: _____	**2. Date/Time:** Date: _____ Time: _____ AM PM (circle)
3. Video/Still Photo: ☐ Video ☐ Still Photo	**4. Video or photo identification:** (number or other)

5. Comparator Inspection:

Type 1 Comparator: ☐ Yes ☐ No **Visual Comparator No.:** _____

Type 2 Comparator: ☐ Yes ☐ No **Visual Comparator No.:** _____

6. Comments: (Note any adverse condition observed of the installed comparator, if any.)

Quality Assurance:

Name (Print):	Signature:	Date:
_____	_____	_____