Tri-Party Agreement

Change Notice for Modifying Approved Documents/ Workplans
In Accordance with the Tri-Party Agreement Action Plan,
Section 9.0, *Documentation and Records*

Change Number	Document Submitted Under Tri-Party Agreement Milestone	Date:
TPA-CN-238	_____	**November 17, 2008**

Document Number and Title:	Date Document Last Issued:
Remedial Design Report and Remedial Action Work Plan for the K Basins Interim Remedial Action, DOE/RL-99-89, Revision 1	December 2001
"Approval Request for K Basin Interim Remedial Action Design Changes for Hose-in-Hose Transfers and K West Sludge Consolidation Containers", Keith A. Klein, DOE-RL to Nicholas Ceto, U.S. EPA, 04-AMCP-0398, 5 August 2004,	August 2004

Originator:	Phone:
D. J. Watson / E.G. Erpenbeck	373-3250 / 376-8032

Roger A. Quintero and _____ agree that the proposed change is considered minor and
DOE **Lead Regulatory Agency**

modifies an approved workplan/document and will be processed in accordance with the Tri-Party Agreement Action Plan, Section 9.0, *Documentation and Records*, by use of a change notice versus a revision to the document..

Description of Change:
This change notice describes a change in the process for containerization of sludge in the 105-K West (KW) Basin. It consists of a new system from that described in the documents referenced above.

This change notice describes the design details for the removal of sludge previously collected in the KW Basin Integrated Water Treatment System (IWTS) settler tanks to an existing empty container (SCS-CON-230) in the KW Basin. The settler tank sludge will be retrieved and containerized as described in the attached design change description (Attachment A).

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Justification and Impacts of Change:

The retrieval of the sludge from the settler tanks to SCS-CON-230 is necessary to facilitate settler tank sludge sampling and future sludge removal from the basin. This remedial design change does not involve any waivers to any Applicable or Relevant and Appropriate Requirements (ARARs) and to-be-considered materials (TBCs) contained in the 1999 CERCLA ROD or 2005 CERCLA ROD amendment.

Approvals:

Roger A Quintero DOE Project Manager	12/3/08 Date	X Approved	__ Disapproved	
Larry Gadlow Lead Regulatory Project Manager	12-5-08 Date	X Approved	__ Disapproved	

Once all the above steps have been completed, the originator sends a copy of the signed change notice to the FH TPAI organization (H8-12), the Administrative Record (H6-08) (refer to TPA Action Plan, Section 9.3), lead regulatory agency, affected Hanford contractor, DOE Project Manager, project/contractor Document Custodian, and others as appropriate. Maintain the original Change Notice per approved Records Management procedures.

OU-100-KR-2

Attachment A

To TPA Change Notice 238

Settler Tank Sludge Retrieval and Containerization System

1.0 INTRODUCTION

The general design for sludge retrieval and removal from the 105-K West (KW) Basin is described in the *Remedial Design Report and Remedial Action Work Plan (RDR/RAWP) for the K Basins Interim Remedial Action* (DOE/RL, 2001), Section 2.2, *Sludge*. The design for the consolidation of sludge from the KE basin and KW basin into under water containers in the KW basin was described in greater detail in a 2004 remedial design change (DOE, 2004) approved by the EPA (EPA, 2004). This remedial design change notice describes details of the design of the Settler Tank Retrieval System (STRS) that will relocate sludge previously collected in the KW Basin Integrated Water Treatment System (IWTS) settler tanks to a more readily accessible container in the basin. The relocation is necessary to facilitate settler tank sludge sampling and future sludge removal from the basin.

2.0 BACKGROUND

The KW Basin IWTS includes knock-out pots, strainers and settler tanks that were used to collect particulate material generated during the spent nuclear fuel washing process. Coarse particulate material (<0.25 inches > ~ 600 microns) washed from the fuel was collected in strainers and knock-out pots. Fine particulate material (< ~600 microns) was collected in settler tanks located downstream of the knock-out pots and strainers. Water directed to the settler tanks traversed the tanks at low flow rates, allowing fines to settle out before advancing to garnet filters. The fine particulate material that accumulated in these tanks is referred to as settler tank sludge. The volume of sludge in the settler tanks is estimated to be approximately 5 cubic meters.

The settler tanks are an array of 10 tanks, oriented 5 high by 2 across, 20 inches in diameter and 16 feet long. The tanks are located underwater in the Weasel Pit at the East end of the basin. Figure 1-1 depicts an isometric view of the settler tanks and associated piping.

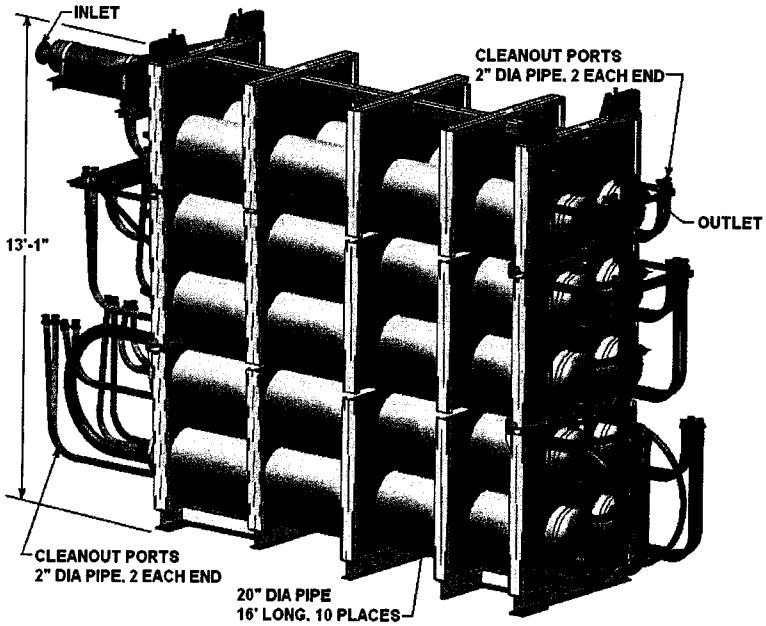


Figure 1-1 IWTS Settler Tanks

3.0 REMEDIAL DESIGN CHANGE DESCRIPTION

The purpose of the Settler Tank Retrieval System (STRS) is to retrieve sludge from the settler tanks to an empty container (SCS-CON-230) currently located in the KW Basin. This section describes the design, installation and operation of the STRS. Operation of the STRS includes bulk retrieval, final pass retrieval and verification of sludge removal from the settler tanks. In addition, system back flushing is described. The design does not address the removal and disposal of the STRS equipment or the settler tanks once empty. Equipment may be reused in future remedial actions or will be managed as debris as described in the *RDR/RAWP for the K Basins Interim Remedial Action.* The settler tank disposition will be addressed in a future deactivation remedial design for the KW Basin.

3.1 REMEDIAL DESIGN

In general the STRS uses the suction pressure of a retrieval pump to vacuum sludge from the settler tanks and transfers the material to tank SCS-CON-230. An air-operated diaphragm retrieval pump provides the motive force to transport the material in a slurry stream. The slurry will be routed from the retrieval pump through an instrument skid, which provides a performance monitoring capability, to SCS-CON-230. SCS-CON-230 will be fitted with filters to minimize the carryover of solids to the basin while sludge is being pumped into the container.

The major subsystems of the STRS include: a Retrieval Subsystem and a Filtration Subsystem as described in the following sections. The major components of the STRS as installed in the KW Basin are depicted in Figure 3-1.

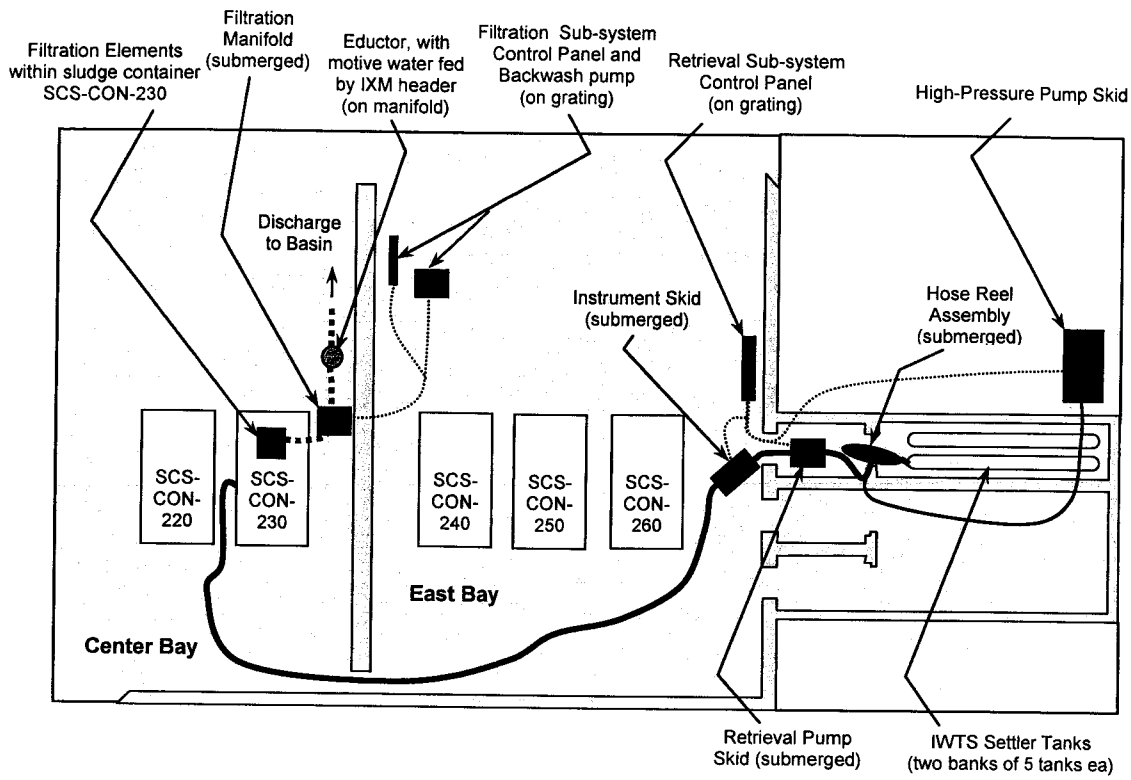


Figure 3-1 IWTS Settler Tank Retrieval System Layout

3.1.1 Retrieval Subsystem

The STRS removes sludge from each of the settler tanks, one at a time, by inserting a suction/dilution/sparging head (i.e., Retrieval Head Subassembly) into the tank through one of the existing settler tank clean-out ports. Clean-out ports are located at both ends of each tank, consisting of 2" piping (Figure 1-1).

The Retrieval Subsystem is made up of the Retrieval Head Subassembly; Hose Reel Assembly; High Pressure Pump Skid; Retrieval Pump, Instrument Skid; and Retrieval Subsystem Control Panel.

The Retrieval Head Subassembly is serviced by coaxial hoses: the inner hose conveys dilution/sparging water to the Head; the outer hose conveys retrieved slurry away from the Head to the receiving tank (SCS-CON-230). The spray head configuration of this assembly is commonly used in the sewer/pipeline cleanout industries. The suction head configuration of this assembly is similar to the "end effectors" which have been in wide and successful use in the K Basin Closure Project sludge containerization efforts and consists of a screened intake with ¼" openings over a cylindrical surface, connected to the coaxial suction hose. Figure 3-2 depicts the general configuration of the Retrieval Head Assembly.

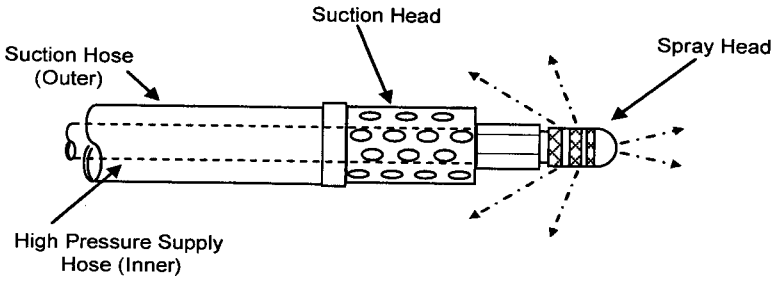


Figure 3-2 Conceptual Retrieval Head Assembly

Management of the coaxial hoses interconnected to the Retrieval Head Assembly is accomplished by a Hose Reel Assembly that hangs suspended underwater near the clean-out port being serviced (Figure 3-3). The hoses are managed from above water on top of the grating by the operator. The two coaxial hoses contained on this reel interconnect:

- the outer hose connection of the Retrieval Head Assembly with the suction port of the Retrieval Pump, conveying slurry to SCS-CON-230, via the Instrument Skid, and
- the inner hose connection of the Retrieval Head Assembly with the discharge of the High-Pressure Pump Skid, located above the basin deck grating.

The Hose Reel Assembly includes a hand-wheel located above the basin grating, which enables operators to control the movement of the interconnected Retrieval Head Assembly into and out of the settler tank. The Head and hoses are payed out into the clean-out-port and settler tank by operator assist (using a long-pole tool) and/or by discharging high-pressure dilution/sparging water through backward-directed holes in the Retrieval Head Assembly (Figure 3-2). The hand-wheel is used by the operator to limit the distance the Head is extended into the tank by either of these means. Figure 3-4 depicts a prototype Hose Reel Assembly configuration.

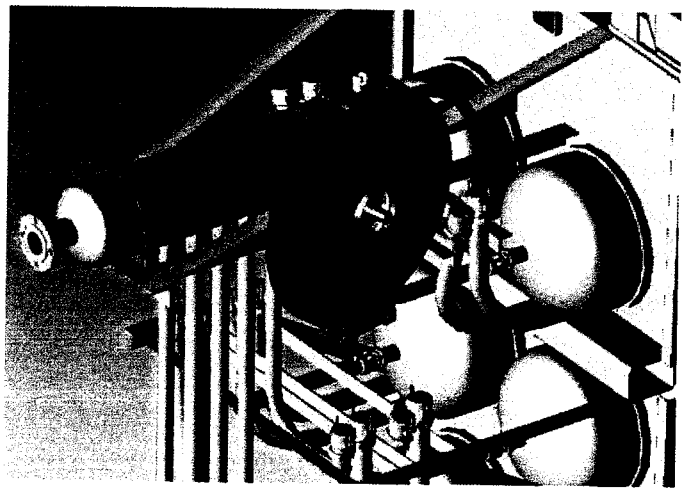


Figure 3-3 Hose Reel Assembly Interface with Settler Tank

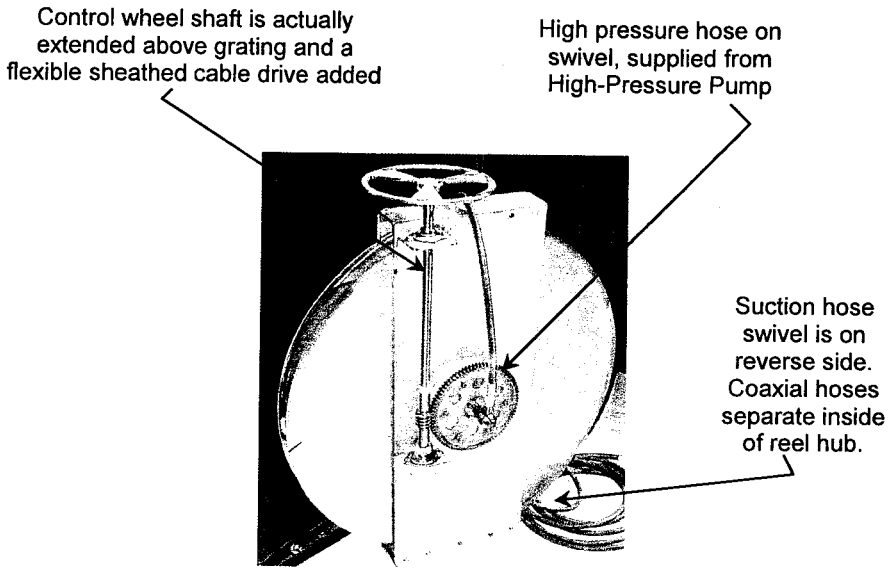


Figure 3-4 Prototype Hose Reel Assembly

The High-Pressure Pump (HPP) Skid supplies water from the KW Basin Ion Exchange Module (IXM) System to the Retrieval Head Assembly. Water discharged from the HPP Skid through the Retrieval Head Assembly is used to thrust the Head and hose into the settler tank, sparge material in the tank mobilizing it for retrieval, and to dilute the resulting slurry to facilitate its transfer through the Retrieval Pump. The HPP Skid has two modes of flow that can be selected by the operator; one mode where the high-pressure pump is bypassed and water is discharged into the retrieval system at the pressure supplied from the interconnected header and at a low flow rate, and a second mode where an electrically-powered high-pressure pump discharges at a moderately high operating pressure and higher flow. A switch at the Control Panel allows operators to select one of two preset HP pump speeds; a low speed for sparging material that is easily lifted into suspension, and a high speed for thrusting the hose into the tank and/or more vigorous sparging of compacted material.

An air-operated diaphragm Retrieval Pump provides the motive force to transport the retrieved sludge in a slurry stream to SCS-CON-230. Air exhausted from the pump is discharged above the water surface though an exhaust hose. The discharge point is directed down towards the water surface to mitigate the potential for airborne contamination within the KW Basin. A HEPA Exhaust Unit will be positioned so as to sweep the air volume around the exhaust point, providing the means to filter exhaust air in the event it is contaminated by a breach in the Retrieval Pump diaphragm(s).

The Instrument Skid is fitted with sensors to monitor the retrieval process. A flow meter provides operators with an indication of the slurry flow rate being generated by the Retrieval Pump. A percent solids meter indicates the amount of solids being conveyed by the system and is the primary measure of retrieval effectiveness. A radiological dose rate meter is also provided to indicate the activity of the material being retrieved.

The Retrieval Subsystem Control Panel interconnects with the Instrument Skid, the High Pressure Pump Skid, and the Retrieval Pump. It is the primary operator interface and includes instrument displays, controls for triggering high-pressure water flow to the Retrieval Head Assembly, valves for control of flush water and Retrieval Pump air supply, and other operator

interface elements. The Retrieval Subsystem Control Panel is sited on the KW Basin deck grating. The hand-wheel which controls Hose Reel Assembly movement is fixed in close proximity to the Retrieval Subsystem Control Panel. A schematic of the Retrieval Subsystem is depicted in Figure 3-5.

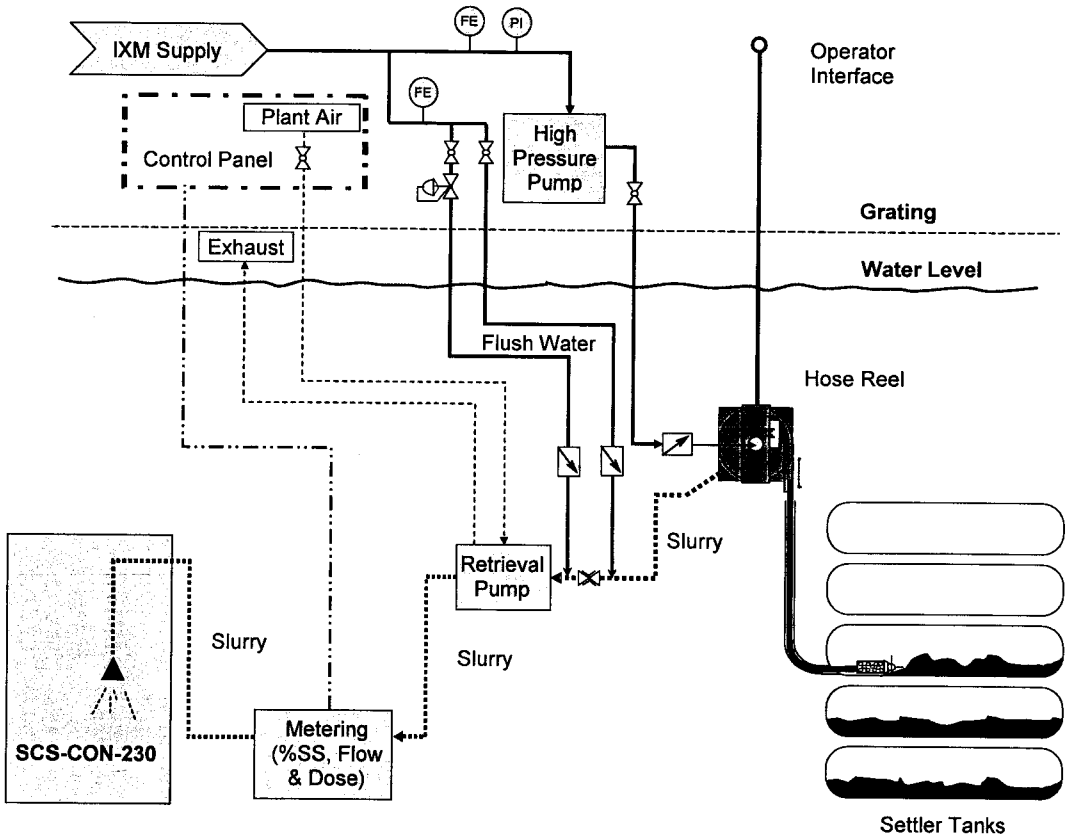
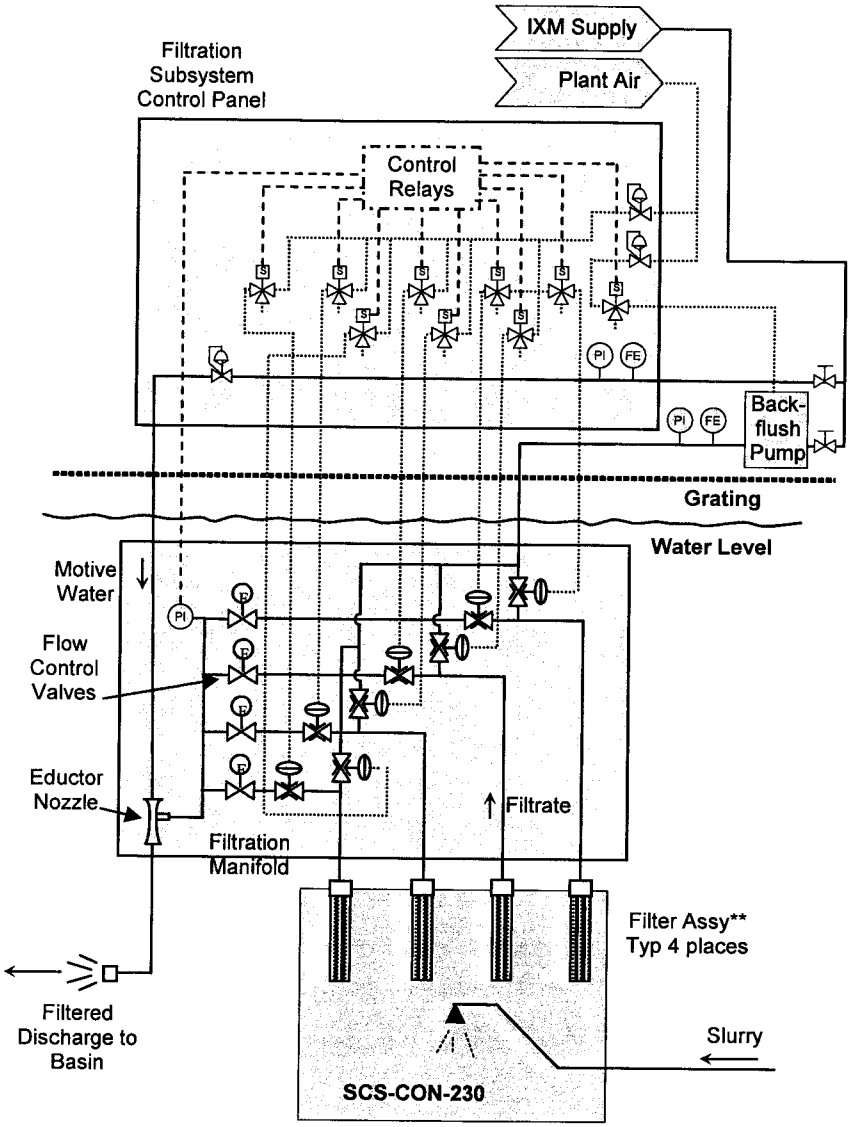


Figure 3-5 Retrieval Subassembly Process Schematic

3.1.2 Filtration Subsystem

A Filtration Subsystem is incorporated in the STRS design to minimize carry-over of suspended sludge from the receiving tank (SCS-CON-230) into the KW Basin. The subsystem removes water from SCS-CON-230 through multiple filter elements inserted through the top of the tank. Suction pressure to draw water through the filter elements is provided by an eductor, with motive water provided from the IXM header. Filtered water is removed at a rate greater than or equal to the incoming sludge-laden stream, creating a negative flow into the sludge tank. The filtered water is discharged into the KW Basin. A schematic of the Filtration Subsystem is depicted in Figure 3-6.



** Each Filter Assy includes (3) filter elements

Figure 3-6 Filtration Subsystem Schematic

Four filter element assemblies are inserted into the top of SCS-CON-230. Each assembly consists of three individual filter elements, approximately 2" in diameter by 36" long, resulting in a total of twelve elements installed in the tank. Each element consists primarily of pleated stainless steel fabric with a mesh sized for particulates down to 5 microns.

The Filtration Subsystem captures the filtered sludge inside SCS-CON-230. Provisions are included to back-flush the filter elements using an air-operated diaphragm pump mounted on a Backwash Pump Skid. When eductor suction pressure falls below a preset value (indicating blinding of the Subsystem's filter elements), the backwash pump is started and provides pulses of IXM water to each filter element assembly sequentially. One filter element assembly is flushed at a time, so that filtration is continuous. Material backflushed from each filter element falls back into the tank.

3.2 INSTALLATION OF SYSTEM COMPONENTS

The main system components installed underwater in the KW Basin include the Retrieval Pump, the Instrument Skid, the Hose Reel Assembly with attached Retrieval Head Assembly, Filtration Manifold with eductor, Filter Element Assemblies, and hose assemblies which interconnect these components. The Retrieval Pump Skid and Instrument Skid will rest on the basin floor, while the Hose Reel Assembly is suspended from overhead rigging. Filter Element Assemblies rest on framework on the top of SCS-CON-230. The Filtration Manifold hangs beside SCS-CON-230 from the framework. Hoses are installed to interconnect these components with the selected settler tank, receiving tank SCS-CON-230, and submerged Filtration Subsystem components. Tools needed for installation are limited to standard basin pole tools, hoists, and chain-falls. The entire STRS is a 'temporary/portable' installation and uses available basin electrical services and IXM water.

3.3 RETRIEVAL OPERATIONS

3.3.1 Bulk retrieval

Figure 3-7 depicts the expected configuration of sludge and Retrieval Head Assembly during bulk sludge retrieval. Bulk retrieval from each settler tank is initiated by manually advancing the Retrieval Head Assembly using a long-pole tool. The coaxial hose and Retrieval Head are deployed at a slow rate during this phase. An increase in the solids content detected by monitoring the percent solids meter output is interpreted as indicating that the Head has reached the "pile" of sludge. The Head is then withdrawn slightly and sparging is used to mobilize the face of the sludge pile, where it is drawn into the suction port of the Head.

When the operator detects that the solids content of the slurry stream is falling off (by monitoring the percent solids meter output, through radiological monitoring, or other method), pulses of high-pressure water may be used to move the Head forward. This may include assistance from operators working with long-pole tools. Thereafter the process repeats itself along the length of the tank to remove the bulk of sludge in each tank.

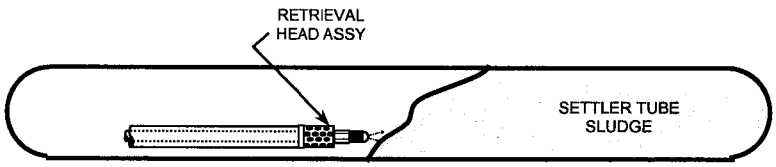


Figure 3-7 Bulk Retrieval Approach

The Retrieval Pump suction flow range for general system operations is approximately 15 - 17 gallons per minute (gpm). Pump operation is verified by monitoring system flow at the Retrieval Subsystem Control Panel. Slurry is retrieved from the settler tanks at an estimated nominal slurry concentration of 3 to 8 percent solids by volume. The actual concentration of solids is only used as an indicator of successful sludge transport.

The nominal flows of high-pressure water discharged from the Retrieval Head Assembly are approximately 5 gpm (at "low" HP pump speed), 14 gpm (at "high" HP pump speed), and 1-2 gpm in bypass mode. The "high" HP pump speed flow provides forward thrust to move the Head

down the length of the settler tank. This movement is to be resisted by the Hose Reel Assembly, enabling the operator to allow the Head to pull itself down the tank. System performance is monitored at the Retrieval Subsystem Control Panel.

3.3.2 Final Pass Retrieval

After bulk retrieval, the operating method transitions to remove the residual material that may remain. In this "final pass" method, quick bursts of high pressure water "sweep" the material toward the Retrieval Head Assembly followed by a period of suction without movement. Working this process from the far end of the tank toward the clean-out port, repeated multiple times, results in cleaning of the tank to the extent practicable.

3.3.3 Verification of Completion

Once the sludge has been retrieved from the settler tanks to the extent of the capability of the STRS, the emptied settler tanks will be examined using a borescope connected to a video and recorder to document the examination. An estimate of the amount of residual material contained within the settler tanks and their associated clean-out ports will be prepared for use in settler tank disposition planning based on the video evidence captured of the post-retrieval borescope examination.

If a significant volume of residual sludge is observed during borescope examination, additional sparging and vacuuming using the STRS may be necessary.

3.3.4 Flushing

The STRS includes a flushing capability. The STRS is started on clear water before slurry is introduced. At shutdown, or as necessary in response to off-normal conditions, flush water is introduced to clear residual material from the Retrieval Head Assembly, Hose Reel Assembly, Retrieval Pump, and interconnecting hoses. Flush water under regulated pressure is provided by the existing IXM System in KW Basin. Flush water is directed to key points in the system by the operation of flush valves incorporated in the Retrieval Subsystem Control Panel.

In the event of an overloaded discharge line, the Retrieval Pump will stall. Similarly, if the suction line to the pump becomes obstructed to the extent its Net Positive Suction Head Available is insufficient, flow will stop. These are not damaging conditions for a pump of this design, provided the regulated air supply pressure supplied to the pump is limited to the pressure rating of the pump housing. Operators can detect these conditions by monitoring system flow at the Retrieval Subsystem Control Panel, and/or by the change in noise made by air exhausting from the pump. Flushing at the pump suction port is the method for recovery from these loss-of-flow conditions.

Back-flow prevention in the form of check valves are included in flush piping to prevent the potential for backflow of water into the IXM water supply or above-grating piping elements.

4.0 COMPLIANCE WITH ARARS AND TBC MATERIAL

This remedial design change does not involve any waivers to any Applicable or Relevant and Appropriate Requirements (ARARs) and to-be-considered materials (TBCs) contained in the 1999 CERCLA ROD or 2005 CERCLA ROD amendment..

5.0 REFERENCES

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.

DOE, 2004, 04-AMCP-0398, Keith A. Klein, DOE-RL to Nicholas Ceto, U.S. EPA, *Approval Request for K Basin Interim Remedial Action Design Changes for Hose-in-Hose Transfers and K West Sludge Consolidation Containers*, U.S. Department of Energy, Richland Operations Office, Richland, Washington, 5 August 2004.

EPA, 2004, Larry Gadbois, U.S. EPA to Larry Earley, DOE-RL, EPA Approval of "*Approval Request for K Basin Interim Remedial Action Design Changes for Hose-in-Hose Transfers and K West Sludge Consolidation Containers*," U.S. EPA Region 10 Hanford Project Office, Richland, Washington, 9 August 2004.