



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

0082578

JUN 24 2009

09-AMRC-0140

Ms. J. A. Hedges, Program Manager
Nuclear Waste Program
State of Washington
Department of Ecology
3100 Port of Benton Blvd.
Richland, Washington 99354

Dear Ms. Hedges:

**SUBMITTAL OF REVISED DANGEROUS WASTE CLOSURE/POSTCLOSURE PLAN FOR
THE 1706-KE WASTE TREATMENT SYSTEM FOR THE STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY (ECOLOGY) APPROVAL**

The attached Dangerous Waste Closure Plan for the 1706-KE Waste Treatment System is being submitted to Ecology for approval.

The U.S. Department of Energy, Richland Operations Office (RL), Ecology, and the U.S. Environmental Protection Agency (EPA) have reviewed the document (Rev 0), and have agreed on the disposition of the comments. This document (Rev 1) incorporates the resolution of those comments and is now ready for approval.

If you have questions, please contact me or your staff may contact Ellen Dagan, of my staff, on (509) 376-3811.

Sincerely,

Thomas K. Teynor, Federal Project Director
for the K Basins Closure Project

AMRC:EBD

Attachment

cc w/attach:

G. P. Davis, Ecology

R. A. Lobos, EPA

J. A. Vanni, Ecology

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TSD-LT-1-3)

Hanford Facility Dangerous Waste Closure/Postclosure Plan for the 1706-KE Waste Treatment System

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



**United States
Department of Energy**
P.O. Box 550
Richland, Washington 99352

Approved for Public Release
Further Dissemination Unlimited

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Date Published
June 2009

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



**United States
Department of Energy**
P.O. Box 550
Richland, Washington 99352

J. D. Asndal 06/09/2009
Release Approval Date

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Executive Summary

This closure plan addresses the closure of a waste treatment system located in the 100-K Area of the Hanford Site. The 1706-KE Waste Treatment System is regulated as a *Resource Conservation and Recovery Act of 1976*¹ treatment, storage, and/or disposal unit. The system had four major components (an ion exchange column, a waste accumulation tank, an evaporator unit, and a condensate collection tank) that treated a variety of laboratory wastes. The system will be closed pursuant to WAC 173-303-610, "Closure and Post-Closure"² with clean closure being the preferred result. One of the four major components (the ion exchange column) has already been removed. The closure plan includes the requirements and activities for closure by removal of the remaining components, ancillary equipment, and underlying concrete. No waste remains in the components requiring removal. The components and ancillary equipment will be removed and disposed in accordance with solid and dangerous waste regulations and Environmental Restoration Disposal Facility waste acceptance criteria. Prior to equipment removal, the site will be inspected, and locations and dimension of all cracks or other openings will be documented to support closure certification. Closure will be complete after the 1706-KE Building basement is demolished and removed. The site will be graded, and inspections will be discontinued.

It is anticipated that clean closure can be achieved. Therefore, no postclosure care or monitoring requirements are included in this closure plan. If clean closure is not achievable, this closure plan will be modified to include additional requirements.

¹ *Resource Conservation and Recovery Act of 1976*, 42 USC 6901, et seq.

² WAC 173-303-610, "Dangerous Waste Regulations," "Closure and Post-Closure," *Washington Administrative Code*, Olympia, Washington.

Contents

1.	Introduction	1
2.	Facility Description	5
3.	Process Information	6
4.	Waste Characteristics	8
5.	Groundwater Monitoring	8
6.	Closure Strategy and Performance Standards	8
	6.1 Closure Strategy	8
	6.2 Performance Standards	9
7.	Closure Activities	9
	7.1 Waste Inventory Removal	10
	7.2 Process Equipment Removal	10
	7.3 Waste Disposal	10
	7.4 Equipment Decontamination	11
	7.5 Modifications to the Closure Plan	11
	7.6 Security	11
	7.7 Site Restoration	11
	7.8 Training	12
	7.9 Inspections	12
	7.10 Closure Certification	12
	7.11 Closure Schedule	12
8.	Postclosure Plan	12
9.	References	12

Figures

Figure 1.	1706-KE WTS Facility Location	2
Figure 2.	Ion Exchange Column and Waste Accumulation Tank.....	3
Figure 3.	Waste Accumulation Tank.....	3
Figure 4.	Evaporation Unit.....	4
Figure 5.	Condensate Collection Tank.....	5
Figure 6.	1706-KE WTS Schematics	6
Figure 7.	1986 Epoxy Incident in Evaporator Unit.....	7
Figure 8.	Current 1706-KE WTS Photographs of the Evaporator and the Condensate Collection Tank	10

Terms

CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>
CFR	<i>Code of Federal Regulations</i>
Ecology	Washington State Department of Ecology
ERDF	Environmental Restoration Disposal Facility
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
Tri-Party Agreement	Ecology et al., 1989, <i>Hanford Federal Facility Agreement and Consent Order</i>
WAC	<i>Washington Administrative Code</i>
WTS	waste treatment system

1. Introduction

This closure plan describes the planned activities and performance standards for closing the 1706-KE Waste Treatment System (WTS), a waste management unit that stored and treated dangerous waste. The 1706-KE WTS is a *Resource Conservation and Recovery Act of 1976* (RCRA) treatment, storage, and/or disposal unit. The U.S. Department of Energy, Richland Operations Office, U.S. Environmental Protection Agency, and Washington State Department of Ecology (Ecology) have agreed to integrate the cleanup and closure of the 1706-KE WTS with the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) process. The agreement called for the 1706-KE WTS to be remediated based on the requirements of EPA/541/R-99/039, *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6 and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington (100 Area Remaining Sites)*, as provided by EPA, 2004, *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision*. Field implementation of the closure will follow applicable sections of DOE/RL-96-17, *Remedial Design Report/Remedial Action Work Plan for the 100 Area* and DOE/RL-96-22, *100 Area Remedial Action Sampling and Analysis Plan*, as well as other documented agreements, such as Tri-Party Agreement (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*) change notices made during the closure action.

The 1706-KE WTS is located within the 1706-KE Building in the 100-K Area of the Hanford Site (Figure 1) and is composed of the four major components (an ion exchange column, a waste accumulation tank, an evaporator unit, and a condensate collection tank) depicted in Figures 2 through 5. The 1706-KE WTS has been nonoperational since 1987. All waste has been removed from the 1706-KE WTS components and the ion exchange column has been removed and disposed.

The 1706-KE WTS will undergo clean closure to the performance standards of WAC 173-303-610(2)(b)(ii), "Closure Performance Standard," with respect to all dangerous waste contamination from dangerous waste/RCRA operations. To accomplish clean closure, the unit, ancillary equipment, and underlying concrete will be removed and disposed to the Environmental Restoration Disposal Facility (ERDF). The closure plan will be modified to address required additional closure or post-closure activities. Because waste or waste constituents are not expected to be left in place at the completion of closure, no postclosure care or monitoring is anticipated.

The schedule of closure activities under this plan supports completion of Milestone M-16-52 by July 31, 2009.

Note: Because dangerous waste does not include source, special nuclear, and by-product material components of mixed waste, radionuclides are not within the scope of this documentation. Any information on radionuclides is provided only for general knowledge and to support clean closure.

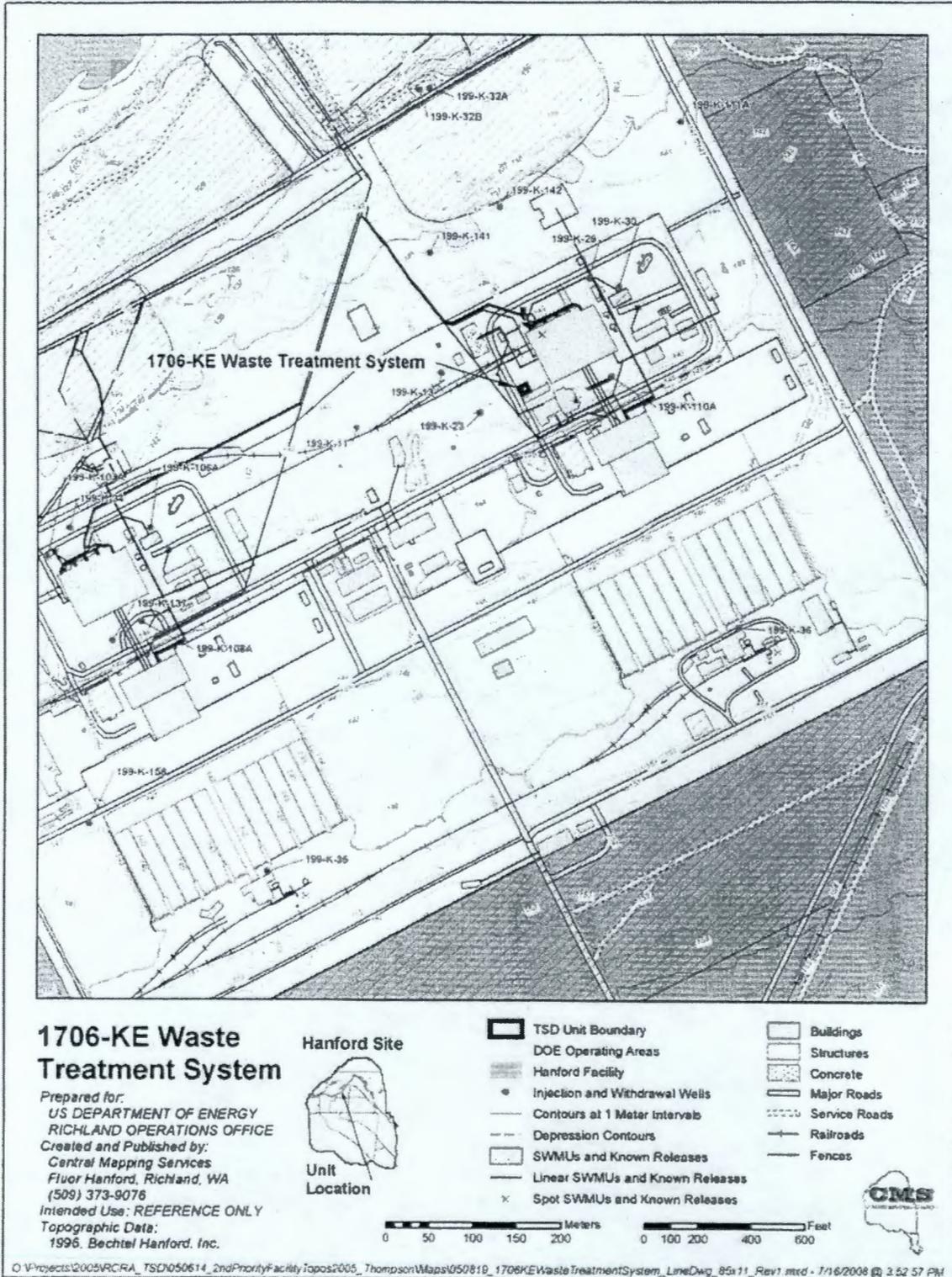
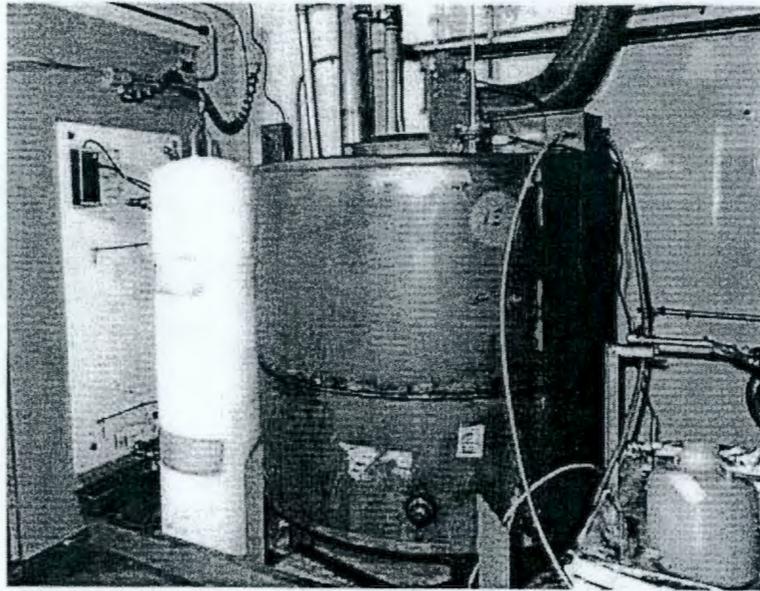


Figure 1. 1706-KE WTS Facility Location



Ion Exchange Column & Waste Accumulation Tank

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Photo Taken 1987

NOTE: Ion exchange column (left) has been removed since the photograph was taken.

Figure 2. Ion Exchange Column and Waste Accumulation Tank

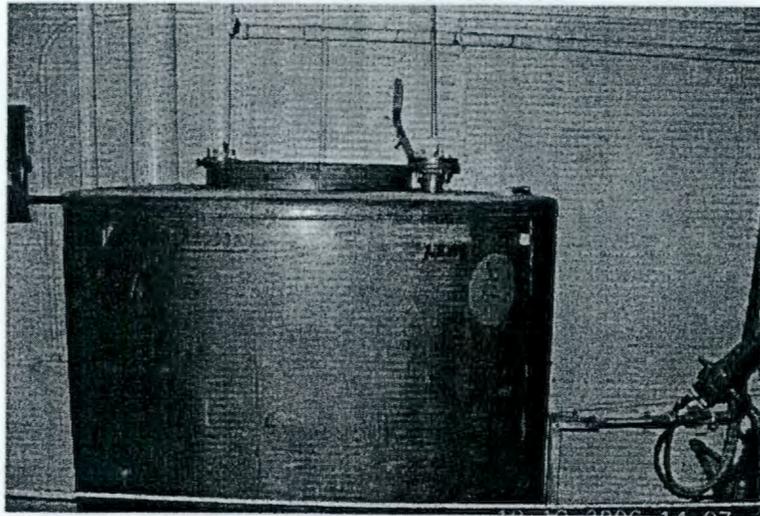
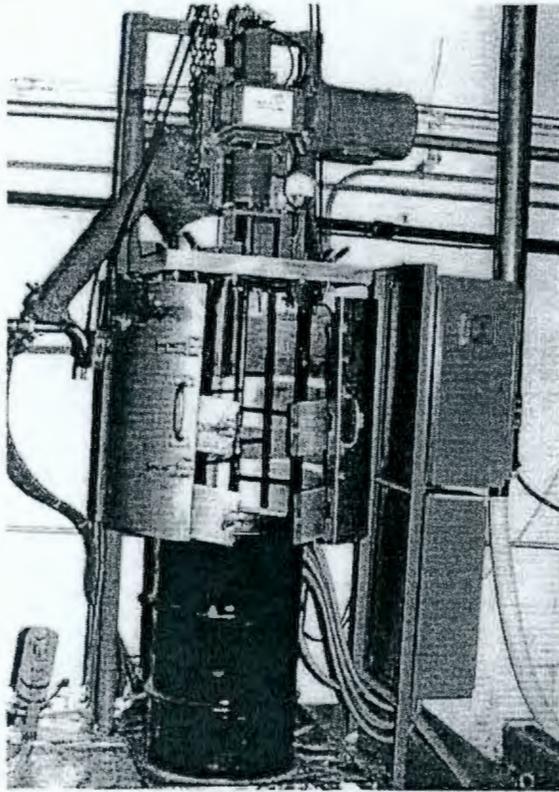
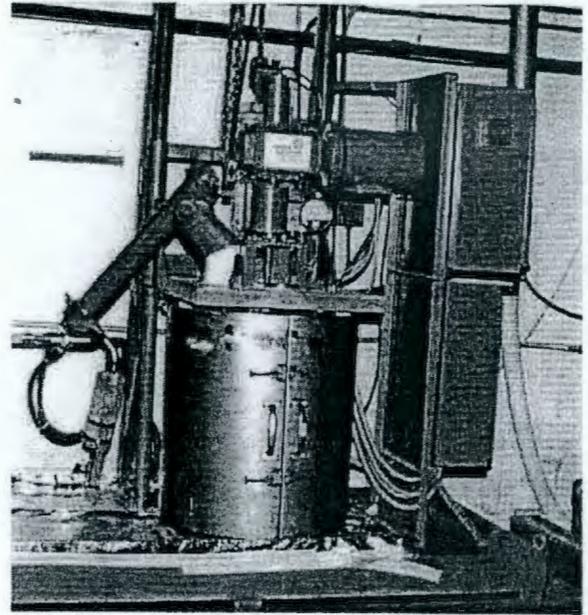


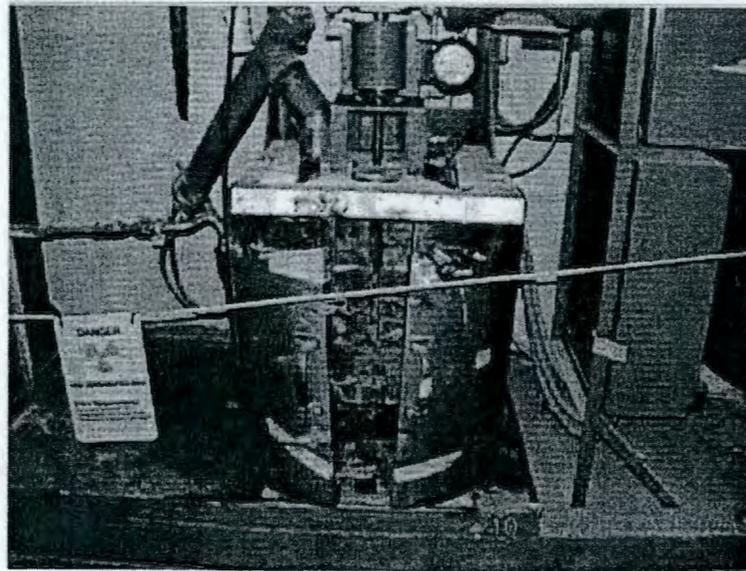
Figure 3. Waste Accumulation Tank



Evaporator Unit in Up Position



Evaporator Unit in Down Position Evaporating Waste



Evaporator Unit

Figure 4. Evaporation Unit

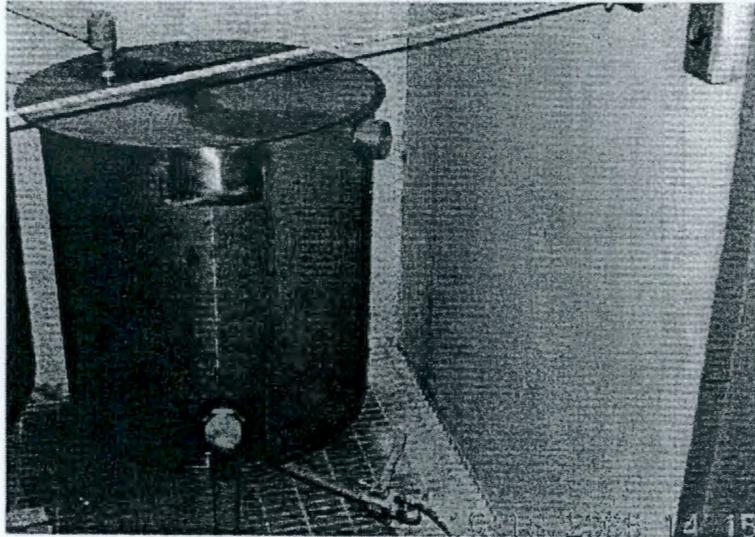


Figure 5. Condensate Collection Tank

2. Facility Description

The 1706-KE WTS consisted of a 114 L (30-gal) evaporator unit, a 2,082 L (550-gal) waste accumulation tank, a 0.14 m³ (5-ft³) mixed-bed resin ion exchange column, and a 363 L (96-gal) condensate collection tank (Figure 6). The ion-exchange column has been removed and disposed of as described in Section 7.2.

The maximum process design capacities for tank storage (S02) are 2,445 L (646 gal) and for tank treatment-other (T04) is 5,678 L (1,500 gal).

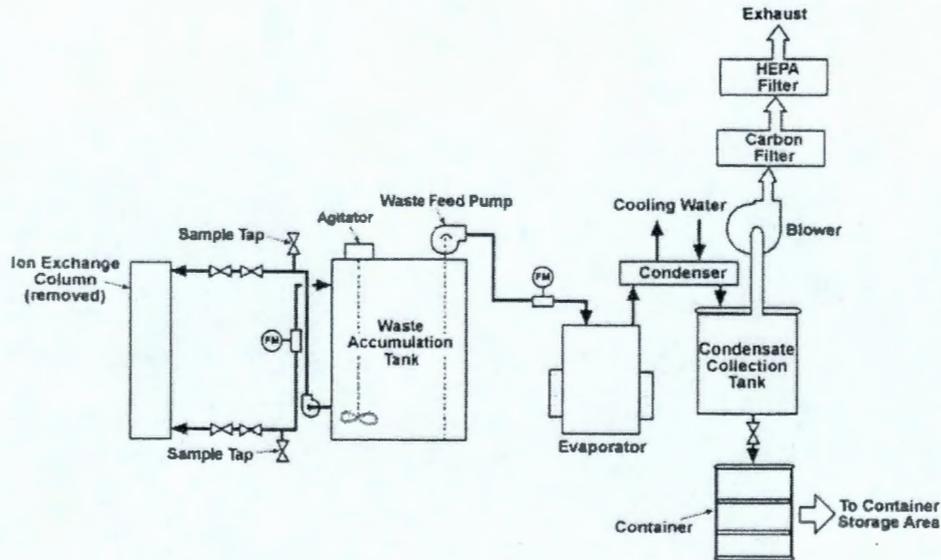
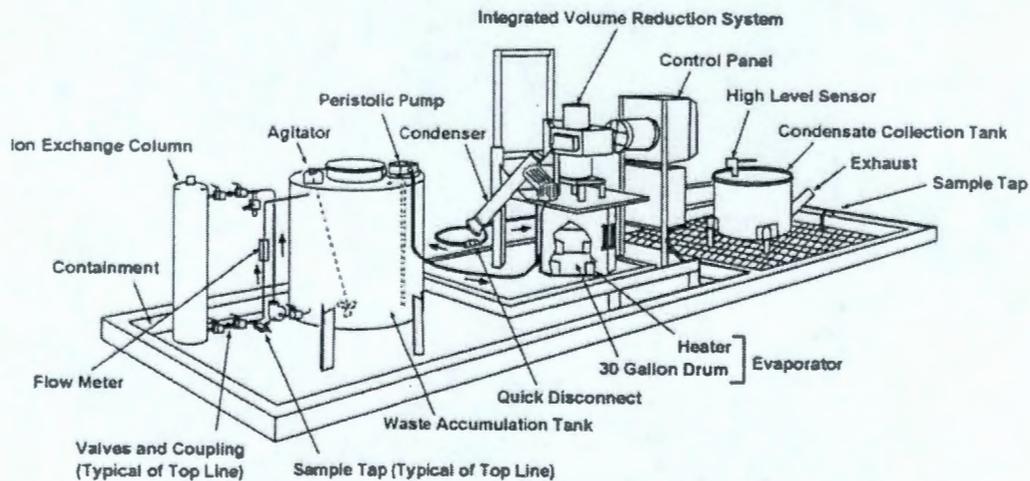
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Figure 6. 1706-KE WTS Schematics

3. Process Information

The 1706-KE WTS was designed and installed for waste management operations in July 1986. The unit was procured to treat mixed waste generated in the laboratories of the 1706-KE Building. The 1706-KE WTS was designed to treat approximately 6,804 kg (15,000 lb) of waste per year.

Waste generated in the 1706-KE Building was transferred from the waste accumulation tank to the ion exchange column and then continuously re-circulated to remove the ionic constituents from the waste stream. The waste then was transferred to the evaporator. The evaporator heated and boiled the liquid

waste to steam to form residual salts prior to solidification. The steam condensed and collected in the condensate collection tank with the exhaust from the evaporation unit being passed through a high-efficiency particulate air filter prior to discharge. The residual salts were mixed with heated epoxy for solidification and disposal.

Operation of this unit ceased shortly after initial startup because of unanticipated anomalies during operation. In August of 1986, epoxy resin in the evaporator overheated, possibly caused by a development of a steam pocket within the epoxy. Thick white vapor was observed from the 1706-KE WTS and some epoxy was ejected through the observation port onto the ceiling and adjoining wall. The system was immediately shut down. The epoxy cooled and solidified, as shown in Figure 7. The room and the equipment were decontaminated for continued use. The waste associated with the release was removed and appropriately managed. No waste was released outside the radiologically posted area or into the environment (D/T 86-01, 1986, *Epoxy Overheat in 1706-KER 100K*). The 1706-KE WTS has not operated since 1987.

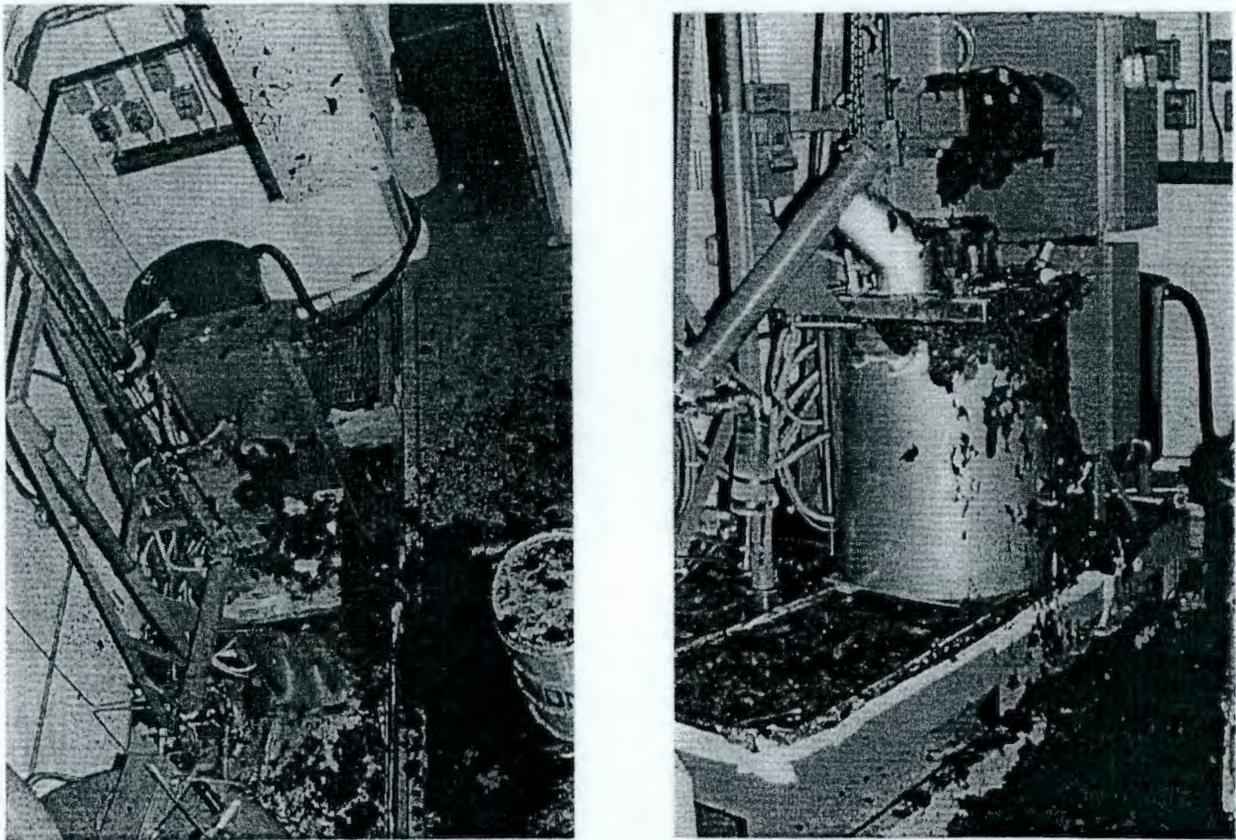


Figure 7. 1986 Epoxy Incident in Evaporator Unit

In July 1987, the accumulation tank was disconnected from the other components, emptied, and cleaned so that it could be used as the feed tank for the Liquid Effluent Treatment Facility studies. To ensure the feed stock would not be contaminated, the tank was physically cleaned and decontaminated with scrub brushes and detergents. It then was filled with demineralized water, to which trace amounts of cesium and iodine were added to simulate 100-N Reactor water. The water was processed through candidate ion

exchange resins to evaluate the resins for use in the Liquid Effluent Treatment Facility. The effluent water from these tests was stored in drums, analyzed, and released. At least 10 tanks full were processed between July 1987 and February 1988 when testing ceased.

From early 1988 to March of 1990, the waste accumulation tank was used to collect effluents and loop bleeds from the TF-9 high-pressure test loop, which performed long-term corrosion tests in support of the 100-N Reactor tritium fuel cladding program. The effluent in the accumulation tank consisted of demineralized water with ammonium hydroxide added to a pH of 10.3. In addition, a small quantity of low oxidation metal ions solution, ammonium citrate and 100-N Reactor water were added as part of the laboratory cleanup. The effluent in the accumulation tank was analyzed and treated, as needed. Then tank effluent recirculated through an ion exchange column and was analyzed for radionuclide content.

No dangerous waste remains in the 1706-KE WTS components at this time.

4. Waste Characteristics

The 1706-KE WTS was designed and installed to treat a variety of laboratory waste. The majority of this waste was expected to be acidic or caustic solutions (D002, characteristic, corrosive, dangerous waste).

5. Groundwater Monitoring

Because the 1706-KE WTS was managed as a tank system treatment unit within the 1706-KE Building, groundwater monitoring has not been required and is not included as part of this closure plan.

6. Closure Strategy and Performance Standards

This section discusses the closure strategy and performance standards.

6.1 Closure Strategy

Clean closure of the 1706-KE WTS will be achieved after completion of the following actions:

- All waste is removed, treated as needed, and disposed of at an approved waste disposal facility (ERDF) for each of the remaining components. Any solid residues will be designated in accordance with WAC 173-303, "Dangerous Waste Regulations," and treated (as applicable) to meet WAC 173-303-140, "Land Disposal Restrictions," and disposed to an approved disposal facility.
- Each of the components and any ancillary equipment contaminated with dangerous waste from the 1706-KE WTS is removed, treated as needed, and disposed to a waste disposal facility authorized to accept such wastes.
- Prior to equipment removal, the concrete floor is inspected to determine if further actions are required to ensure clean closure of the 1706-KE WTS. All cracks and other openings (e.g., drains) identified during the inspection will be identified and evaluated to determine if releases of dangerous waste or dangerous waste constituents have occurred. If the inspection results are inconclusive or do not lead to clean closure of the concrete floor as is, clean closure of the concrete floor will be delayed until demolition of the 1706-KE Building basement.

6.2 Performance Standards

Clean closure of the 1706-KE WTS will be accomplished by using the closure standard in WAC 173-303-610(2)(b)(ii), which states the following:

For all structures, equipment, bases, liners, etc., clean closure standards will be set by the department on a case-by-case basis in accordance with the closure performance standards of WAC 173-303-610(2)(a)(ii) and in a manner that minimizes or eliminates post-closure escape of dangerous waste constituents.

WAC 173-303-610(2)(a)(ii) further states that a facility must be closed in a manner that meets the following:

Controls, minimizes or eliminates to the extent necessary to protect human health and the environment, post-closure escape of dangerous waste, dangerous constituents, leachate, contaminated run-off, or dangerous waste decomposition products to the ground, surface water, ground water, or the atmosphere.

Closure of the 1706-KE WTS will be accomplished in accordance with WAC 173-303-610(2)(b)(ii). The clean closure performance standard is the physical removal and disposal of the 1706-KE WTS components, including ancillary equipment. To clean close, all components will be managed as waste, in accordance with Section 7.3 of this closure plan.

For contaminated structural components of the 1706-KE WTS (e.g., unit components, ancillary equipment, concrete), the closure performance standard will be a "clean debris surface" to establish that a component has been decontaminated, or whether the unit or ancillary equipment can be designated as non-hazardous debris. Attainment of a clean debris surface can be verified visually, in accordance with the standard in WAC 173-303-140(2)(a), "Applicability," incorporating 40 CFR 268.45, "Treatment Standards Based on HTMR," Table 1, footnote 3, which states:

"Clean debris surface" means that the surface, when viewed without magnification, will be free of all visible contaminated soil and hazardous (dangerous) waste except that residual staining from soil and waste consisting of light shadows, slight streaks, or minor discolorations, and soil and waste in cracks, crevices, and pits may be present provided that such staining and waste and soil in cracks, crevices, and pits will be limited to no more than 5 % of each square inch of surface area.

7. Closure Activities

This closure plan provides for the following:

- Waste inventory removal
- Process equipment removal
- Waste disposal
- Equipment decontamination
- Site restoration
- Training
- Facility inspections
- Certification of closure activities in accordance with the closure plan.

Closure of the unit will consist of actions discussed in the following sections. Closure activities will be performed consistent with DOE/RL-96-17 and Ecology Publication 92-91, *Dangerous Waste Regulations Chapter 173-303 WAC*.

7.1 Waste Inventory Removal

No waste remains in the 1706-KE WTS condensate collection tank (Figure 8), the evaporator, or waste accumulation tank. Waste removed from the 1706-KE WTS has been disposed to the Low-Level Burial Grounds (WHC, 1990, "1706-KE Waste Treatment System Tank;" WHC, 1996, " *Low-Level Burial Grounds Solid Waste Storage/Disposal Records, 1706-94-001700 and 1706-96-000016*)

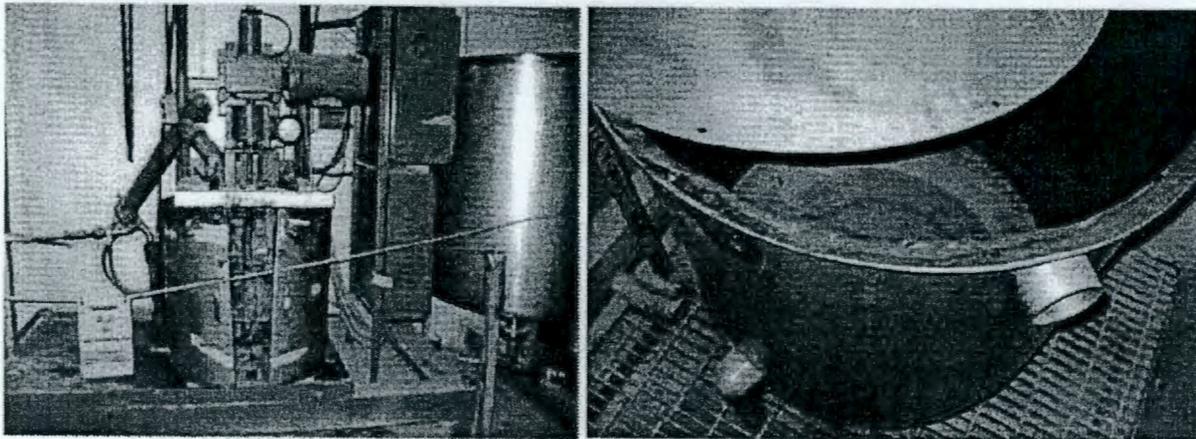


Figure 8. Current 1706-KE WTS Photographs of the Evaporator and the Condensate Collection Tank

7.2 Process Equipment Removal

To close the unit, all 1706-KE WTS tanks, tank system components (including ancillary equipment and structural components) will be removed. Size reduction also may be performed.

The 1706-KE WTS components and ancillary equipment used in operations will be removed using standard industrial equipment used for structural demolition. The components will be designated and managed under Section 7.3.

7.3 Waste Disposal

The 1706-KE WTS components and ancillary equipment used in the operations will be packaged to meet ERDF acceptance criteria and loaded into transport containers for shipment to the ERDF for disposal, following DOE/RL-96-17, Chapter 4.0. If the waste does not meet ERDF waste acceptance criteria, it will be staged at the 100-K Area or ERDF while a plan is developed. After any necessary characterization, processing, and treatment, the waste will be disposed at the ERDF or another approved facility.

Waste generated during closure activities will be staged in a waste storage area established near the 1706-KE Building prior to shipment.

7.4 Equipment Decontamination

Decontamination of equipment (used for WTS removal) at the completion of the 1706-KE WTS closure activities generally will be performed using dry methods (such as wiping) to the extent possible. When the use of wet methods (such as pressure washing) is required to achieve decontamination objectives, the associated water will be collected, and work will be conducted by trained site workers in accordance with the following best management practices.

- Decontamination activities generally will be performed within the area of contamination where removal has taken place.
- The amount of water used to clean equipment will be minimized.
- Only raw or potable water will be used.
- Regulated soaps, detergents, or other cleaning agents will not be added to wash water.
- Pressure washing will use cold water.

Any decontamination fluids generated during equipment cleaning will be contained and disposed to either the 200 Area Effluent Treatment Facility or solidified and disposed to the ERDF. Waste designations will be performed, in accordance with WAC 173-303, on the generated fluids. The project also may opt to perform other methods of equipment washing and/or decontamination for a completed site (e.g., wrap the equipment for transfer to a decontamination pad, provide for a temporary facility at the site to collect wash water, or affix the contamination to the equipment).

Any solid waste debris generated by decontamination of equipment (e.g., rags and personal protective equipment) will be collected and disposed as nondangerous waste at the ERDF, unless chemicals introduced during operations would cause the debris to designate as a dangerous waste.

Sampling of items and solid residues known to be contaminated and intended for disposal is not necessary if process knowledge accurately designates the wastes with the proper dangerous waste identification codes. The waste will be transferred to the ERDF or an approved treatment, storage, or disposal unit either onsite or offsite facility for appropriate disposal.

7.5 Modifications to the Closure Plan

If closure plan revisions are necessary to achieve clean closure, a modification to this closure plan (including revised schedules) will be submitted to Ecology, in accordance with WAC 173-303-830, "Permit Changes."

7.6 Security

The 100-K Area is located on the Hanford Site, which is a controlled access site. Appropriate and effective administrative controls are in place to prevent unauthorized access. Additional security is not required to meet the requirements of WAC 173-303-320, "General Inspection."

7.7 Site Restoration

Because the 1706-KE WTS has been managed as a tank system treatment unit within the 1706-KE Building, site restoration is not planned or included as part of this closure plan.

7.8 Training

According to 02-RCA-0328, 2002, "Integrated Closure of the 1706-KW Waste Treatment System," 0080575, "Re: Integrated Closure of the 1706-KE Waste Treatment System, 02-RCA-0328," and 0058502, "Re: Hanford Facility Dangerous Waste Part A Permit Application, Form 3, for the 1706-KE Waste Treatment System, Revision 4 (TSD: T-1-3)," a training plan is not required for the 1706-KE WTS. Training requirements during closure activities will be consistent with DOE/RL-96-17.

7.9 Inspections

The concrete floor will be inspected prior to equipment removal, as described in Section 6.1.

Records of the locations and dimensions of all cracks or other openings identified during closure will be documented in the facility operating record.

7.10 Closure Certification

Certification of closure will be submitted in accordance with WAC 173-303-610(6), "Certification of Closure," following demolition of the 1706-KE Building basement. Clean closure will be complete when the concrete floor has been removed from the 100-K Area.

At the time of closure certification, the RCRA corrective action status of the 1706-KE WTS will be determined, in accordance with Permit Condition II.Y.2.c.

7.11 Closure Schedule

This closure plan includes a schedule consistent with the requirements of WAC 173-303-610(3)(a)(vii), "Closure Plan; Amendment of Plan," for implementation of all closure activities. Closure removal and disposal activities of the 1706-KE WTS will be coordinated with the CERCLA removal actions for the 100-KE Reactor facilities and ancillary facilities and Tri-Party Agreement Milestones M-16-52 by July 31, 2009. Closure activities will start by July 31, 2009 (per Tri-Party Agreement Milestone M-16-52) and be completed with the demolition and removal of the 1706-KE Building basement. To coordinate with the remedial action, completion of closure activities is expected to exceed 180 days.

8. Postclosure Plan

No postclosure activity will be required following successful completion of the requirements of this plan. If the closure period must be modified, the closure plan will be modified in accordance with WAC 173-303-830.

9. References

- 40 CFR 268.45, "Land Disposal Restrictions," "Treatment Standards for Hazardous Debris," *Code of Federal Regulations*. http://www.access.gpo.gov/nara/cfr/waisidx_08/40cfr268_08.html
- 0058502, 2002, "Re: Hanford Facility Dangerous Waste Part A Permit Application, Form 3, for the 1706-KE Waste Treatment System, Revision 4 (TSD: T-1-3)" (letter to J. Hebdon, U.S. Department of Energy from J. B. Price), Washington State Department of Ecology, Kennewick, Washington, December 20.
www5.hanford.gov/pdw/fsd/AR/FSD0001/FSD0018/D9205830/D9205830_32174_2.pdf

0080575, 2002, "Re: Integrated Closure of the 1706-KE Waste Treatment System, 02-RCA-0328" (letter to Hebdon, U.S. Department of Energy from J. B. Price and L. Gadbois), Washington State Department of Ecology, Kennewick, Washington, May 14.
<http://www2.hanford.gov/ARPIR/index.cfm?content=detail&AKey=0903311060>

02-RCA-0328, 2002, "Integrated Closure of the 1706-KW Waste Treatment System" (letter to J.B. Price, Washington State Department of Ecology from J. Hebdon), U.S. Department of Energy, Richland Operations Office, Richland, Washington, May 6.
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<http://www5.hanford.gov/arpir/?content=detail&AKey=0903311061>

Ecology Publication 92-91, 2000, *Dangerous Waste Regulations Chapter 173-303 WAC*, Washington State Department of Ecology, Olympia, Washington. <http://www.ecy.wa.gov/biblio/9291.html>

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, 2 vols., as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.
<http://www.hanford.gov/?page=91&parent=0>

EPA, 2004, *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington. <http://www5.hanford.gov/arpir/?content=findpage&AKey=D4855290>

EPA/541/R-99/039, 1999, *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6 and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington (100 Area Remaining Sites)*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington.
<http://www.epa.gov/superfund/sites/rods/>

WA7890008967, 2007, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*, as amended, Washington State Department of Ecology, Richland, Washington.
http://www.ecy.wa.gov/programs/nwp/2007-12-20_Permit_Rev%208C.pdf

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, Olympia, Washington. <http://apps.leg.wa.gov/WAC/default.aspx?cite=173-303>

- WAC 173-303-140, "Land Disposal Restrictions."
- WAC 173-303-140(2)(a), "Applicability."

- WAC 173-303-320, "General Inspection."
- WAC 173-303-610(2), "Closure Performance Standard."
- WAC 173-303-610(3), "Closure Plan; Amendment of Plan."
- WAC 173-303-610(6), "Certification of Closure."
- WAC 173-303-830, "Permit Changes."

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