0061022

Hanford Federal Facility Agreement and Consent Order
(Tri-Party Agreement)

Engineering Evaluation/Cost Analysis (EE/CA) for the 224-T Plutonium Concentration Facility

Public Comment Period
January 12 thru February 26, 2004

Tri-Party Agreement
U. S. Department of Energy
U.S. Environmental Protection Agency
Washington State Department of Ecology

Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement)
Reference Documents for

Engineering Evaluation/Cost Analysis (EE/CA) for the 224-T Plutonium Concentration Facility

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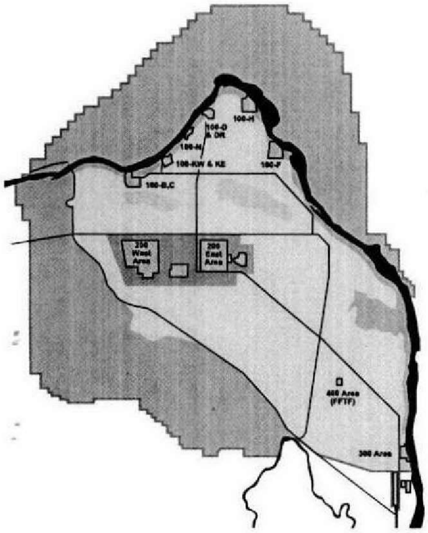
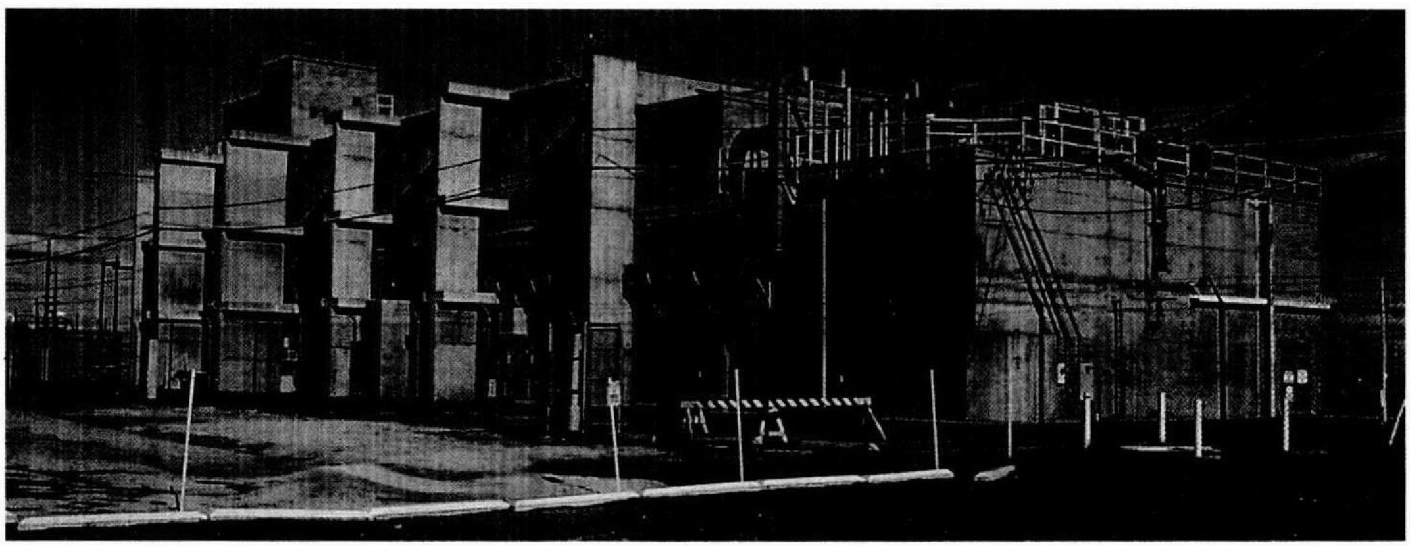


Fact Sheet

Next Steps for the 224-T Plutonium Concentration Facility

U.S. Department of Energy • Washington State Department of Ecology • U.S. Environmental Protection Agency

The U.S. Department of Energy (USDOE), the U.S. Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology) – the Tri-Party Agreement (TPA) agencies – would like your feedback on a draft Engineering Evaluation/Cost Analysis (EE/CA) for the 224-T facility. The draft EE/CA evaluates alternatives on what to do with the 224-T Plutonium Concentration Facility located in the 200 West Area on the Hanford Site.



The 224-T Plutonium Concentration Facility

Background

The 224-T Plutonium Concentration Facility (224-T facility) was built in 1944 and originally called the 224T Bulk Reduction Building. It operated as a chemical processing facility from 1945 until 1956.

After standing idle for several years, the facility was modified in 1975 to meet the requirements for storing plutonium-bearing wastes. In 1985 a section of the building was operated as a permitted Resource Conservation and Recovery Act (RCRA) treatment, storage and/or disposal (TSD) facility until the late 1990s.

The 224-T facility is currently an inactive facility and is administered under a surveillance and maintenance program while awaiting final disposition. The U.S. Department of Energy (USDOE) has identified no other use for the facility making it a candidate for decontamination and demolition.

The facility contains both radiological and chemical contaminants. Because part of the building operated as a RCRA TSD container storage unit, the facility is subject to the TSD closure standards of RCRA.

Public Comment

The Tri-Party agencies want your feedback on the draft 224-T EE/CA . The public comment period will be from **January 12 through February 26, 2004.**

Tri-Party Agreement
U.S. Department of Energy
Washington State Department of Ecology
U.S. Environmental Protection Agency

Fact Sheet

What is an Engineering Evaluation/Cost Analysis?

An EE/CA evaluates feasible and cost-effective alternatives for a proposed removal action, and recommends a preferred removal action under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

A removal action is an action taken over the short term to address a release or threatened release of a hazardous substance. The 224-T Plutonium Concentration facility is being decommissioned under a non-time critical removal action. This draft EE/CA identifies the goals of the non-time critical removal action, identifies and evaluates the various removal alternatives and recommends a preferred alternative for dealing with the facility.

What Cleanup Actions Were Evaluated?

The removal action alternative for the 224-T facility must be protective of human health and the environment, and meet the removal action objectives.

Based on these criteria, four removal action alternatives were evaluated:

1. No action
2. Continue surveillance and maintenance
3. Decontaminate and demolish to grade, excluding building foundation and underlying soils/structures
4. Decontaminate and demolish including building foundation and underlying soils/structures to approximately 39 inches below the foundation

The recommended alternative is to decontaminate and demolish to grade, excluding building foundation and underlying soils/structures (Alternative 3). Environmental sampling will be conducted in conjunction with, or following, decontamination and demolition activities in order to assess whether cleanup and stabilization objectives were achieved. Following analysis of sampling results, USDOE and Ecology will jointly determine whether additional cleanup activities at the site should be deferred to a subsequent CERCLA remedial action, or taken under this removal action.

A 45-day public comment period on the draft 224-T EE/CA will be from January 12 through February 26, 2004. The TPA agencies would like your feedback on this draft document and will consider all comments before finalizing it. **Please submit comments to:**

Larry Romine
U.S. Department of Energy
Richland Operations Office
P.O. Box 550 (A6-33)
Richland, WA 99352
Fax: (509) 376-0695
Larry_D_Romine@rl.gov

Rick Bond
Washington State Dept. of Ecology
Nuclear Waste Program
1315 West 4th Ave.
Kennewick, WA 99336
Fax: (509) 736-3030
fbon461@ecy.wa.gov

To request a copy of the draft document, contact the Hanford Cleanup Line (800-321-2008).

The Draft EE/CA can be viewed online at http://www.hanford.gov/calendar
under the Public Comment Period section

Fact Sheet

The draft document is also available for review at the Public Information Repositories listed below.

HANFORD PUBLIC INFORMATION REPOSITORY LOCATIONS

Portland
Portland State University
Branford Price and Millar Library
934 SW Harrison
Attn: Judy Andrews (503) 725-4126

Richland
U.S. Department of Energy Public Reading Room
Washington State University, Tri-Cities
Consolidated Information Center, Room 101-L
2770 University Drive
Attn: Janice Parthree (509) 372-7443

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Fact Sheet
Department of Energy
P.O. 550 MSIN A7-75
Richland WA, 99352

DOE/RL-2003-62
Revision 1

Engineering Evaluation/Cost Analysis for the 224-T Plutonium Concentration Facility

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

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

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December 2003

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For use with Technical Documents (when appropriate)	
EDC-	FMP-
EDT-	ECN-
Project No.:	Division:
Document Type:	Page Count:

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Abstract		Summary		Full Paper		Visual Aid	
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ACRONYMS

ACM	asbestos-containing material
ALARACT	as low as reasonably achievable control technology
AM	action memorandum
AR	administrative record
ARAR	applicable or relevant and appropriate requirement
BARCT	best available radionuclide control technology
CERCLA	*Comprehensive Environmental Response, Compensation and Liability Act of 1980*
CDI	Canyon Disposition Initiative
CFR	*Code of Federal Regulations*
CWC	Central Waste Complex
D&D	decontamination and demolition
DOE	U.S. Department of Energy
Ecology	State of Washington Department of Ecology
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESD	explanation of significant differences
ETF	200 Areas Effluent Treatment Facility
FR	*Federal Register*
LLW	low-level waste
NEPA	*National Environmental Policy Act of 1969*
NPL	National Priorities List
OMB	U.S. Office of Management and Budget
PCB	polychlorinated biphenyl
RCRA	*Resource Conservation and Recovery Act of 1976*
RCW	*Revised Code of Washington*
ROD	record of decision
RTR	real-time radiography
S&M	surveillance and maintenance
TBC	to-be-considered
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	transuranic
TRUSAF	Transuranic Waste Storage and Assay Facility
TSCA	*Toxic Substances Control Act of 1976*
TSD	treatment, storage, and/or disposal
USC	*United States Code*
WAC	*Washington Administrative Code*
WIPP	Waste Isolation Pilot Plant

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1.0 INTRODUCTION

This document presents the results of an engineering evaluation/cost analysis (EE/CA) that addresses the disposition of the 224-T Plutonium Concentration Facility (224-T Facility). The 224-T Facility is located on the Hanford Site in the 200 West Area, approximately 45.7 meters to the south and parallel to the T Plant Complex canyon building (221-T). Completed in 1944 and originally designated the 224-T Bulk Reduction Building, its purpose was to concentrate the plutonium nitrate solution produced in the first major step in the plutonium recovery process conducted at the T Plant Complex. It operated in this capacity from January 16, 1945 until early 1956, when the T Plant Complex was retired from active service as a chemical processing facility.

The 224-T Facility was idle for several years before being modified in 1975 to meet the requirements for storing plutonium-bearing wastes. In 1985 the building became the 224-T Transuranic Waste Storage and Assay Facility (TRUSAF) and operated in that capacity until the late 1990s.

These past operations resulted in contamination throughout the structure. The 224-T Facility is currently an inactive surplus facility and is administered under a surveillance and maintenance (S&M) program while awaiting final disposition. The U.S. Department of Energy (DOE) has identified no further use for the 224-T Facility making the 224-T Facility a candidate for decontamination and demolition (D&D).

1.1 REGULATORY OVERVIEW

1.1.1 Regulatory Framework/Decommissioning Policy

Four areas of the Hanford Site, including the 200 Areas, were placed on the U.S. Environmental Protection Agency's (EPA) *Comprehensive Environmental Response, Compensation and Liability Act of 1980* (CERCLA) National Priorities List (NPL) in November 1989. The work for cleanup of these NPL sites continues in accordance with the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1994) and the National Contingency Plan regulations of 40 *Code of Federal Regulations* (CFR) 300.

In addition to the NPL cleanup work, the DOE and the EPA have agreed on an approach for decommissioning surplus facilities consistent with the requirements of CERCLA. The approach is documented in the "*Policy on Decommissioning Department of Energy Facilities Under CERCLA*" (hereinafter referred to as the Policy) issued jointly by DOE and EPA on May 22, 1995 (DOE and EPA, 1995). The Policy is based on the provisions of Executive Order 12580, which delegates from the President to the Secretary of Energy certain CERCLA response authorities for facilities under DOE jurisdiction, custody, or control. The Policy establishes that decommissioning activities might be conducted as non-time critical removal actions unless the circumstances at the facility make this inappropriate.

The 224-T Facility is located within the 200 Areas NPL, but is not specifically part of a remedial action operable unit. The 224-T Facility contains CERCLA hazardous substances, predominantly residual radionuclides, and quantities of residual hazardous chemicals. Following the deactivation of the 224-T Facility in the 1990s, the integrity of the structure and internal systems has degraded, resulting in an increased potential for releases of these hazardous substances to the environment. The DOE has determined that a non-time-critical removal action is warranted to mitigate this threat.

1.1.2 EPA Involvement

EPA involvement will be in accordance with the Policy and the Tri-Party Agreement, as appropriate, to ensure that the removal action activities comply with applicable requirements, that protection of human health and the environment is achieved, and that the removal action is consistent with ongoing or subsequent related remedial actions. Accordingly, EPA approval will be sought for the Action Memorandum (AM) from this EE/CA process and for the sampling and analysis plan.

1.1.3 Stakeholder Involvement

Actions taken pursuant to the results of the 224-T Facility EE/CA will be conducted in compliance with the community relations and public participation requirements established in 40 CFR 300.415(n) and any applicable DOE policies. This EE/CA will be provided to the public consistent with the provisions of 40 CFR 300.415(n)(4). After a reasonable opportunity to comment is provided, a written response to significant comments will be provided in accordance with 40 CFR 300.820(a).

After all public comments have been dispositioned, an AM will document the selected removal action. The AM and the 224-T Facility EE/CA will be placed in an Administrative Record (AR) that will be established to provide a publicly accessible record. The AR will be accessible to the public for inspection and copying, consistent with the requirement of 40 CFR 300.415(n)(3)(iii).

The State of Washington Department of Ecology (Ecology) is authorized by EPA to implement and enforce a hazardous waste program in lieu of the federal *Resource Conservation and Recovery Act of 1976* (RCRA).

1.1.4 NEPA Values

In accordance with the Secretary of Energy's Policy Statement on the *National Environmental Policy Act of 1969* (NEPA) (DOE 1994), NEPA values have been incorporated into this EE/CA to the extent practicable.

1.2 SCOPE OF REMOVAL ACTION

The 224-T Facility removal action scope is to mitigate the risks associated with the residual hazardous substance inventory contained within the deteriorating aboveground structure. The scope does not include activities that might be performed in preparation for the removal action, nor does the scope include full remediation of potential belowgrade contamination. These are the subjects of other actions as discussed in Section 1.3.

1.3 RELATED CLEANUP ACTIONS

Other cleanup actions related to the 224-T Facility proposed removal action include deactivation, remediation of potential belowgrade contamination, and the Canyon Disposition Initiative (CDI). Their relationship to the proposed removal action and potential impacts are described in the following sections.

1.3.1 Facility Deactivation

Much of the 224-T Facility was deactivated within a few years after operations ended. Deactivation included removing bulk process and waste streams, and stabilizing the facility. Additional deactivation-type activities may be performed. If implemented, these activities would focus on removing additional transuranic (TRU) waste to reduce the risk to workers and the environment during D&D. Any waste generated will be managed appropriately. This removal would not substantially affect the analysis or the selection of an appropriate removal action.

1.3.2 Belowgrade Contamination

The majority of the potential belowgrade contamination is not included in this removal action scope. Belowgrade sources of contamination could include subsurface structures, pipelines, drains, or unplanned releases from previous activities. The belowgrade sources of contamination will be subject to future evaluation. The proposed removal action includes facilitating a smooth transition to the subsurface remediation process as one of the goals.

1.3.3 Canyon Disposition Initiative

The CDI project was initiated in 1996 and addresses the disposition of the five canyon facilities in the 200 Areas. The DOE is using the U Plant as a pilot to prepare a feasibility study and proposed plan for the CDI. However, it is intended that the results of the U Plant evaluation will be applied to the other canyon facilities. The concept behind the CDI is disposition of the canyon facilities in place instead of demolishing these and burying the debris elsewhere. Because the 224-T Facility is adjacent to the T Plant Complex canyon facility, one of the five canyon facilities included in the CDI, any alternative for removal actions at the 224-T Facility is expected to be consistent with remedial action alternatives considered for the CDI. Any alternative selected for final remedial action in the T Plant Complex canyon area would not be affected adversely by any of the removal action alternatives considered in this EE/CA.

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2.0 SITE CHARACTERIZATION

This section of the document describes the site of the proposed action, the source, nature, and extent of contamination at the site, and the justification for the proposed action.

2.1 BACKGROUND AND SITE DESCRIPTION

Highway 240 is to the southwest of the T Plant Complex, and the Columbia River is north-northwest (Figure 2-1). The 224-T Facility is located adjacent to the T Plant Complex in the 200 West Area of the Hanford Site (Figure 2-2), but is not within the T Plant Complex TSD boundary. Originally designated the 224-T Bulk Reduction Building, its purpose was to concentrate the plutonium nitrate solution produced in the first major step in the plutonium recovery process conducted at T Plant. In 1985, the building became the 224-T Transuranic Waste Storage and Assay Facility (TRUSAF) and operated storing plutonium-bearing wastes in that capacity until the late 1990s. The 224-T Facility is currently designated as an inactive, surplus facility awaiting final disposition.

2.1.1 Land-Use Access

Public access to the Hanford Site currently is restricted and controlled at the Wye Barricade on Route 4 and the Yakima and Rattlesnake Barricades on State Highway 240. Proposed alternatives for future land use were described in the *Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (DOE/EIS-0222-F). The Record of Decision (ROD) for that EIS identifies land use in the 200 West Area as industrial-exclusive use for the foreseeable future (64 FR 61615). The onsite Future Site Uses Working Group and the Exposure Scenario Taskforce also are sources for additional guidance on land use.

2.1.2 Flora and Fauna

The land area around the 224-T Facility is predominantly disturbed from building and parking lot construction activities. What little plant community does exist is primarily composed of semi-arid species common to disturbed areas, such as cheatgrass, rabbitbrush, and other nonnative plant species. Current fauna in this area includes, but is not limited to, rabbits, mice and coyotes. There are no known plants or animals on the federal or state list of endangered and threatened wildlife and plants in the vicinity of the 224-T Facility. If new information reveals the presence of such wildlife or plants in the vicinity of this facility, appropriate measures will be taken as necessary. Further information on ecological resources in the 200 Areas and threatened, endangered, and candidate species at the Hanford Site is available in PNL-6415. There are no perennial or ephemeral streams in the 200 Areas. There are no regulated wetlands within the 200 West Area.

Figure 2-1. Hanford Site and Washington State.

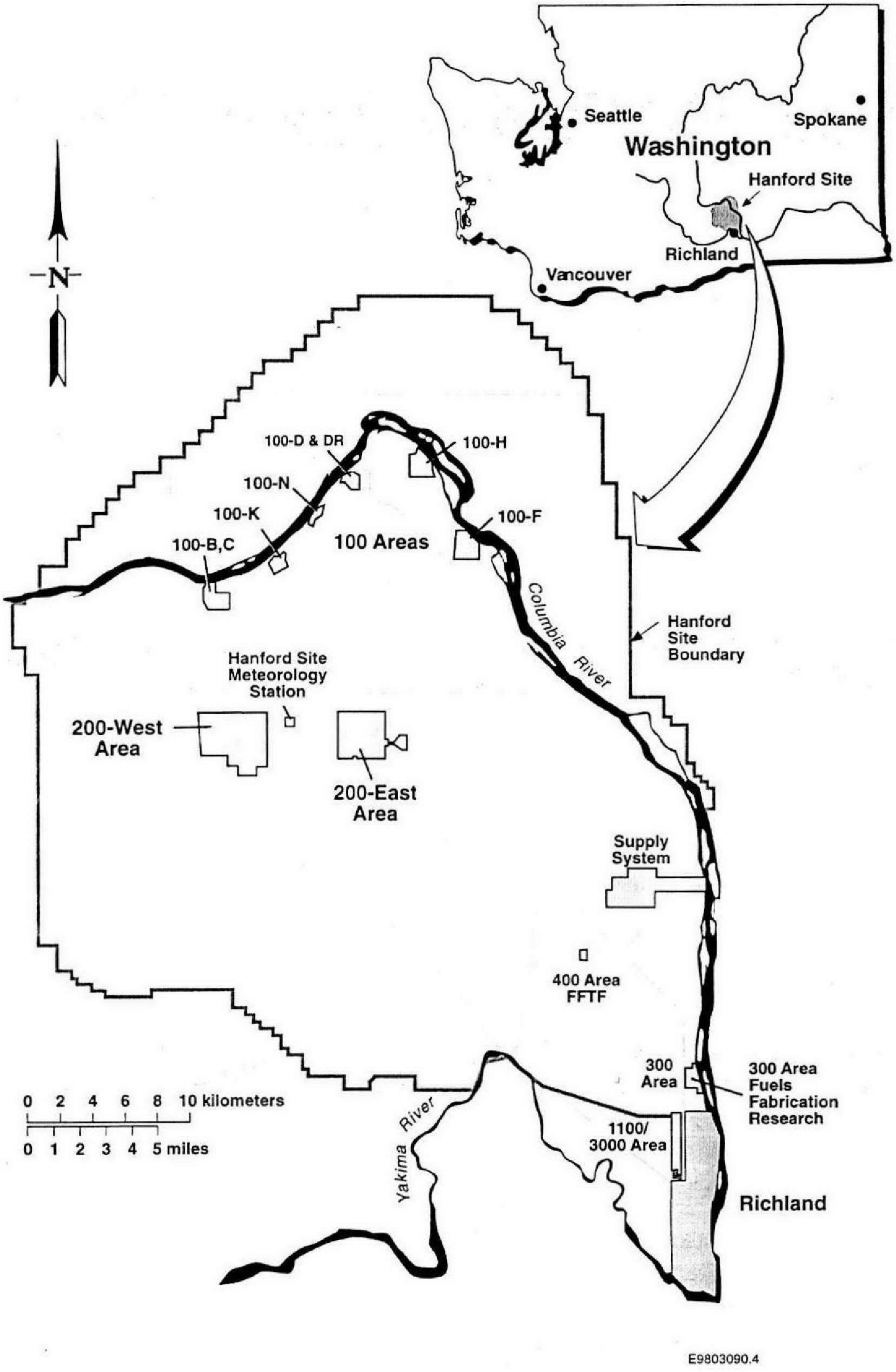
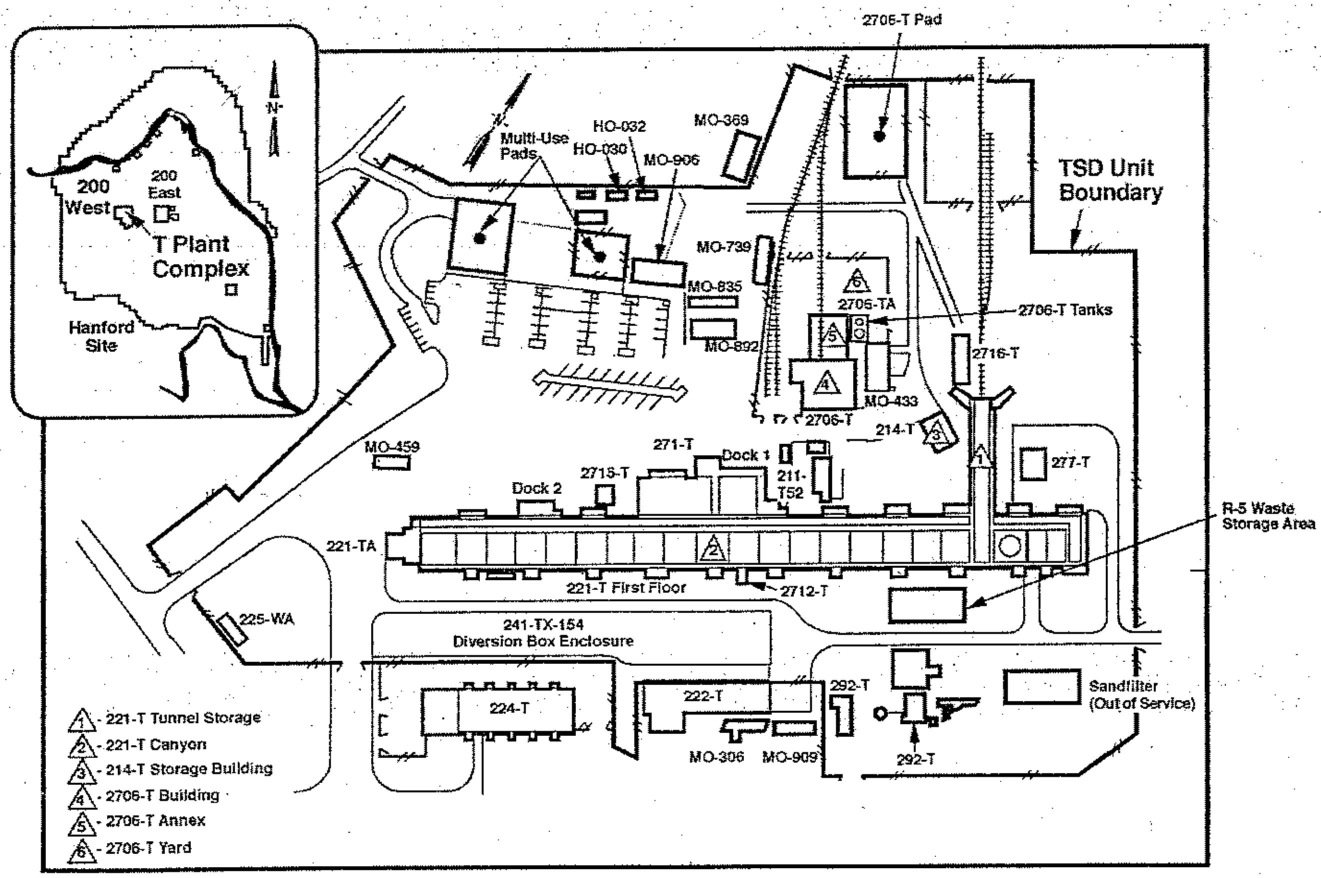


Figure 2-2. T Plant Complex Region of 200 West Area.



2.1.3 Cultural Resources

The 224-T Facility was determined to be a contributing property to the Hanford Site Manhattan Project/Cold War Era Historic District. However, the 224-T Facility was not selected for individual documentation or mitigation (DOE\RL-97-56). Therefore, under Stipulation IV(F) of the Historic Buildings Programmatic Agreement, no cultural resource review is required.

No archaeological resources or traditional-use areas are known to exist within the proposed project location. During decommissioning and demolition activities, however, personnel will be directed to watch for archaeological resources.

2.2 FACILITY DESCRIPTION

The 224-T Facility is a small canyon building located in the 200 West Area next to T Plant. The 224-T Facility is a three-story, reinforced concrete structure containing 21 rooms (in its original configuration) and five process cells, with a large operating gallery located on the third floor. A sixth process cell was provided in 1950 to boost production. The first and second floors have outside dimensions of approximately 60 meters by 18.3 meters. The third floor is 44.2 meters by 18.3 meters. A 30-centimeter-thick concrete wall divides the building into two main sections. Offices and operating galleries were originally located on the northwest side of the dividing wall. The walls, floors, and ceiling are constructed of reinforced concrete. The process cells are located on the southeast side of the dividing wall and have been sealed from the northwest section for over 25 years.

The process cell portion of the building consists of six cells (A through F). Cells A through E are three stories, or 12.2 meters high and are separated from each other by concrete walls that are 4.5 meters high and 20 centimeters thick. Each cell is approximately 7.6 meters by 8.5 meters. Cells A, B, D, and E are similar in equipment (e.g., tanks) and configuration, except that the Cell B contains an additional tank. Also, in Cell C, approximately one-half of the cell is a deep pit containing tanks, where the floor of the pit is 5.8 meters below the first floor level. There are ground level personnel access doors into each of the five cells on the southeast side of the building. In addition, there is a 3.7-meter by 3.7-meter high equipment access door located at the second floor level outside of E Cell.

A manually operated 8-ton bridge crane is installed over the cells. The rails run the length of Cells A through E, allowing access to each of the cells. The internal rails of the bridge crane are aligned with external rails that pass through the equipment access door, allowing the crane to move equipment into and out of the building. The crane was operated from a walkway that extends around the outside of the cells at the second-floor level. The crane is without power and is now deactivated. A 1.8-meter high wall shields the walkway from the cells, and access doors to the walkway are located at both ends of the A through E pipe gallery.

Cell F is 7.5 meters by 7.6 meters by 7.6 meters high and is separated from the other cells by a concrete wall. Modifications completed in the 1970s reduced the size of Cell F to approximately 50% of its original size with the installation of steel barrier walls. Access to the Cell F mezzanine is gained via an external staircase and door in the TRUSAF area. There are two additional points of access to Cell F: one is an exterior door on the southwest side of the building and the other is through a door in the TRUSAF receiving area.

The F-10 Loadout Hood is located on the ground floor in the southwest end of the building in the TRUSAF area and contains a small slab tank.

The 224-T Facility exhaust ventilation system is not in service, and the stack has been capped. Vessel ventilation of the 224-T tanks and centrifuges is provided by the T Plant Complex main exhaust system (the vacuum created by the 291-T fans). Air in-leakage provides the supply air to the process cells. Stainless steel sub-headers, connected to the tanks and centrifuges inside the cells, exit the southwest side of the building above grade. The stainless steel headers are directed down and transition to clay pipe below ground level. The clay pipes connect to a clay main header below grade. The line connects to the T Plant Complex main exhaust tunnel at the west-end of the 221-T building. In areas where the original soil cover was less than 1.2 meters or greater than 2.1 meters deep, the clay pipe is protected by a reinforced concrete encasement.

The service and aqueous make-up piping entered the building at the east-end. The aqueous make-up chemicals (originating from 271-T) and steam piping entered the building through overhead lines. The sanitary water below grade connection at the northeast end of the 224-T Facility has been isolated.

The 224-T Facility internal cell drainage system collects wastewater in the C-9 tank in the deep portion of Cell C. A gutter along the base of the northeast wall in Cell A to Cell F drains to a clay pipe laid below the cell floors. The operating decks, where the centrifuges are located, in Cells A, B, D, and E also drain to Cell C. Because there are no active pumps to transfer liquids, accumulated liquids could overflow the tank and collect in the pit.

2.3 SOURCE, NATURE, AND EXTENT OF CONTAMINATION

The 224-T Facility is contaminated with hazardous substances used or generated during plutonium concentration operations and/or the operation of TRUSAF. The TRUSAF began storing TRU and TRU-mixed wastes from DOE offsite and onsite generators in 1985. The TRUSAF provided a central location for interim storage of newly generated and retrieved TRU waste. Administrative waste processing in TRUSAF included inspection of containers and associated documentation, examination with a real-time radiography system to confirm the absence of prohibited items, and neutron assay of the waste containers to confirm fissile isotope content. The TRUSAF operations ended prior to receipt of the building by the responsible S&M organization in 2000. The cells in the process areas were sealed and isolated from the operating gallery and services areas of the building, and the service areas were stripped of all unnecessary control equipment. Panel boards and partitions were removed to provide 1,068 meters^2 of storage space on three floors.

Because the TRUSAF operated as a RCRA TSD container storage unit, the TRUSAF is subject to the TSD closure standards of RCRA as implemented through the Washington State Hazardous Waste Management Act. Information necessary to address closure of the TRUSAF is provided as Attachment 1 to this EE/CA.

To help identify hazardous substances, several sources of information were used, including characterization data, historical operations, process knowledge, and knowledge of the construction materials. Key radionuclide contaminants are TRUs, including plutonium-239 and americium-241 and mixed fission products such as strontium-90 and cesium-137. The majority of contaminants are found in the form of adherent films and residues encrusted in deactivated process vessels, piping, and ventilation system ductwork.

The results of this effort (PNNL 2002a and 2002b) are summarized in Table 2-1.

Table 2-1. 224-T Facility Plutonium/Americium Inventory Mass by Location.

Location	Pu-238 (g)	Pu-239 (g)	Pu-240 (g)	Pu-241 (g)	Pu-242 (g)	Am-241 (g)
Cell A	1.20E-03	8.10E+00	5.27E-01	3.09E-03	2.60E-03	4.43E-01
Cell B	1.44E-03	9.72E+00	6.33E-01	3.72E-03	3.12E-03	1.44E+00
Cell C[1]	1.33E-03	8.96E+00	5.84E-01	3.42E-03	2.88E-03	6.39E-02
Cell D	1.39E-04	9.37E-01	6.10E-02	3.58E-04	3.01E-04	7.08E-02
Cell E	4.75E-04	3.21E+00	2.09E-01	1.23E-03	1.03E-03	4.68E-01
Cell F[2]	2.38E-03	1.61E+01	1.05E+00	6.15E-03	5.17E-03	2.60E+00
F-10	1.52E-03	1.03E+01	6.71E-01	3.94E-03	3.31E-03	3.32E-01
Total	**8.48E-03**	**5.73E+01**	**3.73E+00**	**2.19E-02**	**1.84E-02**	**5.42E+00**

[1]Includes estimated inventory for submerged tanks.
[2]Not including F-10.

The primary hazardous materials of concern are radioactive materials. All known quantities of concentrated hazardous chemicals have been removed from the facility during deactivation and S&M operations. Some residual quantities of hazardous chemicals might remain as hold up or heels in process lines, tanks, and vessels. In addition, the 224-T Facility is anticipated to contain one or more of the following hazardous materials found in most Hanford Site facilities:

- Polychlorinated biphenyls (PCB) and non-PCB light ballasts
- Lead paint
- Lead for shielding
- Mercury switches, gauges, thermometers
- Mercury or sodium vapor lights
- Used oil from motors and pumps
- Unspecified chemical containers
- Friable and nonfriable forms of asbestos.

Specific chemicals that were used during or as part of the plutonium concentration process are listed in Table 2-2.

Table 2-2. Suspected Nonradiological Contaminants in the 224-T Facility.

Input Chemicals	
$BiPO_4$	Bismuth phosphate
$NaBiO_3$	Sodium metabismuthate
$Na_2Cr_2O_7 \bullet 2H_2O$	Sodium chromate
H_3PO_4	Phosphoric acid
HNO_3	Nitric acid
$La(NO_3)_5 \bullet 2NH_4NO_3 \bullet 4H_2O$	Lanthanum ammonium nitrate
$H_2C_2O_4 2H_2O$	Oxalic acid
HF	Hydrogen fluoride
KOH	Potassium hydroxide
$KMnO_4$	Potassium permanganate
Waste Solutions	
$BiPO_4$	Bismuth phosphate
HNO_3	Nitric acid
LaF_3	Lanthanum fluoride
KOH	Potassium hydroxide
H_3PO_4	Phosphoric acid
$NaNO_3$	Sodium nitrate
KNO_3	Potassium nitrate
$Cr(NO_3)_3$	Chromium nitrate
HF	Hydrogen fluoride
$H_2C_2O_4 \bullet 2H_2O$	Oxalic acid
$Mn(NO_3)_2$	Manganese nitrate
NH_4NO_3	Ammonium nitrate
KF	Potassium fluoride

Additional characterization would be conducted as part of the removal action activities in accordance with an approved sampling and analysis plan.

2.4 RISK EVALUATION AND SITE CONDITIONS THAT JUSTIFY A REMOVAL ACTION

The 224-T Facility is contaminated with hazardous substances, primarily a significant inventory of radionuclides (Table 2-1). Radionuclides are known carcinogens.

The risks to the public and the environment associated with routine S&M activities at the 224-T Facility have not been quantified. However, cell radiological conditions require special precautions for entry.

The CP-14641, *224-T Facility Documented Safety Analysis*, (2002) Beyond Design basis accident scenario indicates that should a seismic event occur significant enough to destroy the 224-T Facility, the calculated dose consequences are:

- The calculated dose at 100 m is 2.3 rem.
- The calculated dose at the Columbia River (13.1 km away) is 1.8E-03 rem.

The inhalation and ingestion pathways also are of concern if the material within the cell processing equipment and piping is disturbed. During canyon cell area D&D activities, the potential for radiological doses to personnel and the environment is considered to be a significant risk. D&D activities include process cell equipment dismantling (cutting process piping). Even though personal protective equipment will be worn, external radionuclides exposure and inhalation will still pose a risk. During initial D&D activities, the potential for a radionuclide release will increase. As the inventory is stabilized and disposed appropriately, the risk will decrease.

The current 224-T Facility contaminant release threat is relatively low. In general, the threat of an accidental radiological (e.g., from a structural failure resulting from fire or seismic event or even from simple structural deterioration) release increases the longer the facility remains in the S&M Program awaiting disposition. The risk from the 224-T Facility will increase with time because of the potential for inventory releases from structure degradation. The external radiation, inhalation, and ingestion risks associated with the contamination under a continued S&M scenario justify a non-time-critical removal action.

3.0 REMOVAL ACTION OBJECTIVES

The primary purpose of this EE/CA is to analyze removal action alternatives to address the risks at the 224-T Facility and determine the most appropriate removal action alternative for the 224-T Facility. Removal actions will be performed in a manner that is protective of human health and the environment. The principal threats to be addressed are radioactive hazardous substances associated with the 224-T Facility and contaminated surfaces.

Based on the potential hazards identified in Sections 2.3 and 2.4, the specific removal action objectives are as follows:

- Reduce or eliminate the potential for exposure to hazardous substances above levels that are protective of the public and environment
- Reduce or eliminate the potential for a release of hazardous substances
- Safely manage (treat and/or dispose) waste streams generated by the removal action
- To the extent practicable, contribute to the efficient performance of any anticipated long-term remedial action with respect to the release concerns and ensure an orderly transition from removal to remedial response actions, including any future subsurface soil remediation.

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4.0 DISCUSSION OF ALTERNATIVES

The removal action alternative for the 224-T Facility must be protective of human health and the environment, and otherwise meet the removal action objectives. Based on these considerations, the following four removal action alternatives were identified:

- Alternative One: No Action
- Alternative Two: Continued S&M
- Alternative Three: D&D (to grade, excluding building foundation and underlying soils/structures)
- Alternative Four: D&D (including building foundation and underlying soils/structures to 1 meter below foundation). NOTE: The foundation includes the footings of the structure.

With the exception of the No Action alternative, each of the alternatives would result in generation of waste. The majority of the contaminated debris likely would be designated as low-level waste (LLW); however, quantities of mixed waste, dangerous waste, and TRU waste might be generated. Waste management applicable or relevant and appropriate requirements (ARARs) are discussed in Section 5.1.2.1.

Waste generated under removal action Alternatives Two, Three, and Four would be disposed at an appropriate disposal site. Waste management would be a common element among these alternatives. For each alternative, recycling and/or reuse options would be evaluated and possibly implemented to reduce the volume of material disposed.

Contaminated waste for which no reuse, recycle, or decontamination option is identified would be assigned an appropriate waste designation (e.g., solid, asbestos, PCB, radioactive, dangerous, or mixed). Most of the contaminated waste generated during implementation of these alternatives would be disposed onsite at the Environmental Restoration Disposal Facility (ERDF) in the 200 West Area. ERDF would be the preferred waste disposal option because ERDF is an engineered facility that provides a high degree of protection to human health and the environment, and it is more cost effective than disposal at other disposal sites. Construction and operation of ERDF was authorized using a separate CERCLA ROD (EPA et al. 1995). ERDF is an engineered structure designed to meet RCRA minimum technological requirements for landfills, including standards for a double liner, a leachate collection system, leak detection, monitoring, and final cover.

The *U.S. Department of Energy Hanford Environmental Restoration Disposal Facility, Hanford Site, Benton County, Washington, Explanation of Significant Differences* (ESD) (EPA et al. 1996) modified the ERDF ROD (EPA et al. 1995 and EPA et al. 2002) to clarify the eligibility of waste generated during cleanup of the Hanford Site. Per the ESD, ERDF is eligible for disposal of any LLW, mixed waste, and hazardous/dangerous waste generated as a result of CERCLA or RCRA cleanup actions (e.g., D&D waste, RCRA past-practice waste, and investigation-derived waste), provided that the waste meets ERDF waste acceptance criteria and that appropriate CERCLA decision documents are in place.

The waste generated during the selected CERCLA removal action would fall within the definition of waste eligible for disposal at ERDF established in the ERDF ROD and subsequent ESD. Waste might require treatment to meet ERDF waste acceptance criteria. The type of treatment and the location of treatment would be determined on a case-by-case basis. Solidification, encapsulation, neutralization, and size reduction/compaction could be employed to treat various waste types. For waste requiring treatment, the techniques would be documented in a treatment plan.

Several mixed waste streams already have been reviewed and approved for treatment and disposal at ERDF. These mixed waste streams are as follows.

- Radioactively contaminated elemental mercury could be amalgamated.
- Radioactively contaminated elemental lead could be macroencapsulated at ERDF.
- Aqueous solutions could be treated (solidified) in accordance with the approved waste treatment plan and sent to ERDF.

While most waste generated during the removal action likely would meet ERDF waste acceptance criteria, some waste might not meet or might not be able to be treated to meet ERDF acceptance criteria. Specifically, this would include low-level radioactive and nonradioactive liquid waste and TRU waste that could be encountered or generated during the removal action.

Liquid waste containing levels of radioactive and/or nonradioactive hazardous substances meeting the 200 Areas Effluent Treatment Facility (ETF) waste acceptance criteria would be transferred to ETF and treated to meet ETF waste discharge criteria. Liquids that do not meet ETF waste acceptance criteria would be solidified and either disposed at ERDF (if ERDF waste acceptance criteria are met) or stored at the Central Waste Complex (CWC). Clean water (e.g., nonradioactive and nonhazardous) could be used for dust suppression.

TRU waste would be placed in interim storage at CWC and shipped to the Waste Isolation Pilot Plant (WIPP) in accordance with the schedule established for completing remedial actions on the Hanford Site.

The 224-T Facility and ERDF are considered to be onsite for management and/or disposal of waste from removal actions proposed in this document[1]. There is no requirement to obtain a permit to manage or dispose of CERCLA waste at the ERDF. It is expected that the great majority of the waste generated during the removal action proposed in this document can be disposed onsite. For waste that must be sent offsite, such as TRU waste, EPA would make a determination in accordance with 40 CFR 300.440 as to the acceptability of the proposed disposal site for receiving this CERCLA removal action waste if necessary.

4.1 ALTERNATIVE ONE: NO ACTION

Under the No Action alternative, access to the 224-T Facility would not be restricted. The No Action alternative would not address the hazards posed by the 224-T Facility. The 224-T Facility would continue to deteriorate. Initial risks of the No Action alternative would be minimal to the environment. Barring an unusual event, contaminants would be expected to remain confined within the 224-T Facility for the near term. Industrial and radiological hazards would exist under the No Action alternative because controls to prevent access would not be maintained. Risks over time could be expected to increase as deterioration of the 224-T Facility progresses and the structural integrity systems are compromised.

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

Eventually, decay is expected to result in radiological releases to the environment and potential exposure to personnel and the public. Physical hazards associated with partial structural collapse also would be anticipated.

4.1.1 Cost Estimates for Alternative One: No Action

The near-term costs for implementing this alternative would be negligible as no cost would be expended on security, radiological surveys, maintenance activities, etc.

4.2 ALTERNATIVE TWO: CONTINUED S&M

Alternative Two would ensure that the 224-T Facility is sustained in a safe condition until final disposition of the T Plant Complex and its ancillary buildings. Currently, D&D of the T Plant Complex is shown in the long-range plan (DOE\RL-96-105) to occur between 2017 and 2043. For this alternative, it is assumed that the S&M of the 224-T Facility and T Plant Complex canyon building (the 221-T Facility) would continue until 2026 in accordance with long-range plan's for final facility decommissioning.

Under this alternative, the 224-T Facility would remain in the S&M program until decommissioning occurs. The 224-T Facility would be maintained in a quiescent state for a considerable duration while ongoing preventive measures are implemented. These measures would include periodic radiological and industrial hazard monitoring (both inside and outside of the 224-T Facility), cold weather protection, preventive maintenance, annual roof inspections, identification and minor repair of friable asbestos, and general visual inspections. Major maintenance operations, such as roof maintenance, would be performed to ensure the maintenance of safe conditions and the control of the ongoing deterioration process. Additionally, limited decontamination and fixative application would occur to control the spread of radiological contamination.

The prime goal of this alternative is to prevent radiological environmental releases and to avoid industrial accidents. Adoption of the S&M alternative extends the life of the 224-T Facility for approximately the next 30 years, during which time deterioration progresses and unusual events (e.g., seismic) might occur. Severe weather conditions could create conditions amenable to radiological releases, and long-term aging of confinement structures could lead to eventual failure. These conditions, accompanied by minimum surveillance efforts, could result in an unplanned radiological release.

Because minimal surveillance readily would not detect 224-T Facility decay (e.g., system corrosion or structural breakdown), preventive maintenance might not occur in time, and response actions could be required. This approach could result in the spread of contamination. An ongoing S&M program would have to become increasingly more labor intensive and incorporate periodic characterization efforts to counter these conditions. Such conditions ultimately would lead to increased risk of exposure of radioactive material and contamination to personnel and the environment.

In this alternative, the magnitude of a continued S&M program would be controlled to conserve funding and be responsive to safety issues. Growth of the program was included to account for progressive 224-T Facility deterioration. Data evaluation, inspection/observations, and future 224-T Facility plans were factored into the continued S&M planning and implementation.

4.2.1 Cost Estimates for Alternative Two: Continued S&M

The detailed cost estimates for Alternative Two are shown in Table 4-1, along with a projection of costs over the S&M period for roof replacement and maintenance. The present-worth (discounted) cost for Alternative Two is approximately $1,220,000. The total nondiscounted cost for Alternative Two is approximately $1,670,000. Present-worth costs are used for evaluation of alternatives in the CERCLA process. Actual costs could vary. The total nondiscounted costs are presented for information and comparison purposes only.

Consistent with guidance established by the U.S. Office of Management and Budget (OMB), present-worth analysis is used as the basis for comparing costs of cleanup alternatives under the CERCLA program (OMB 1992). For purposes of this evaluation, present-worth (discounted) cost values were calculated using a discount rate of 3.2% (Marske 2003, OMB 1992).

S&M cleanup actions often incur costs at different times. For example, construction costs (e.g., roof replacement) could be followed by periodic costs in subsequent years or decades to maintain the effectiveness of the remedy. Because of the time-dependent value of money, future expenditures were not considered directly equivalent to current expenditures. The present-worth cost method shows the amount of money required at the initial point in time (e.g., in the current year) to fund all cleanup activities occurring over the life of the alternative. Present-worth analysis assumes that the funding set aside at the initial point in time increases in value as time goes on, similar to how money placed in a savings account gains in value as a result of interest paid on the account. Although the federal government typically does not set aside the money in this manner, the present-worth analysis is specified under CERCLA as the approach for establishing a common baseline to evaluate and compare alternatives that have costs occurring at different times. While the money actually might not be set aside, the present-worth costs were considered directly comparable for the purpose of evaluating alternative costs.

In contrast with the present-worth costs, the total nondiscounted costs do not take into account the value of money over time. The nondiscounted cost method displays the total costs occurring over the entire duration of an alternative, with no adjustment (or discounting) to reflect current year or set aside cost based on an assumed interest rate. Because nondiscounted costs do not reflect the changing value of funds over time, presentation of this information under CERCLA is for information purposes only, not for remedy selection purposes.

Table 4-1. Cost Estimate for Alternative Two: Continued S&M.

Item	Estimated cost ($1,000)
S&M	1,370
Roof replacement	140
Roof maintenance	160
Nondiscounted Grand Total	1,670
Present-Worth (Discounted)	1,220

Note: Details on the removal alternative estimates are discussed in Marske 2003. Marske 2003 addresses estimates for 224-B Facility. Since 224-T and 224-B Facilities are similar in size, structure and hazards, the estimates are also acceptable for the 224-T Facility.

4.3 ALTERNATIVE THREE: D&D (TO GRADE, EXCLUDING BUILDING FOUNDATION AND UNDERLYING SOILS/STRUCTURES)

This alternative consists of removing the nonradiological and radiological hazardous substances from the 224-T Facility, removing equipment and associated piping, decontaminating the structure and/or stabilizing the contamination, demolishing the structure to slab, disposing of the waste generated, and stabilizing the area.

Nonradiological hazardous substances, primarily on the gallery side of the 224-T Facility, would be removed. These would include asbestos-containing material (ACM), the chemical feed tanks and piping, equipment oil, mercury, control panels, and potentially materials/liquids in the floor drains. Radiological hazardous substances removal would include removal of the loadout hood on the west end of the first floor (F cell) and all of the canyon cell tanks and piping. Because most of the radioactive inventory exists within the process cell equipment and piping, the process cell equipment and piping would be removed completely and disposed as appropriate, either before or as part of the 224-T Facility demolition. Equipment, vessels, and piping might need to be cut to facilitate removal and/or disposal. Remote handling equipment and an upgraded canyon bridge crane could be used to facilitate removal of cell equipment and piping. The door on the south side on the second floor, adjacent to E cell, could be used during D&D for material removal.

In general, piping and vessels would be removed, either before or as part of 224-T Facility demolition. Piping and drains entering or exiting the 224-T Facility belowgrade would be plugged or grouted to prevent potential pathways to the environment.

The majority of the demolition would require the use of heavy equipment (e.g., excavator with various attachments) to demolish the structure. Other industry standard practices for demolition also could be used (e.g., mechanical saws, cutting torches). The 224-T Facility would be demolished to grade, with only a slab remaining. Areas such as the pipe tunnel area in C cell that exist belowgrade would be filled with grout, gravel, or other suitable material to grade level and the entire footprint of the 224-T Facility stabilized to prevent migration of any residual contamination to the environment.

The scope of this removal action does not include soil, groundwater, or waste site remediation. Further soil or waste site remediation would be conducted in coordination with future remedial actions as described in Section 1.3.

The major risk associated with this alternative is the safety of personnel and the environment involved in both the radiological aspects of the process system removal and decontamination and the industrial aspects of facility demolition/dismantlement. These risks are related to the potential release of contamination during operations and the hazards associated with D&D activities. Proven Dust suppression techniques will be used. Risks associated with credible natural phenomenon events (e.g., seismic actions and high-velocity wind) would continue to exist until the radioactive material inventory is removed. These risks would diminish as the 224-T Facility removal activities progress and the radiological inventory is removed.

The disposal of the radioactive material inventory in the 224-T Facility and the immediate removal of the 224-T Facility and systems are the most direct resolution of impending radiological and physical hazards. By backfilling over the belowgrade areas of the 224-T Facility and stabilizing the slab, the mobility of residual contaminants to the environment in and under the foundation would be reduced. In time, however, contaminants could still pose a risk, most likely through the groundwater transport exposure pathway. Therefore, a remedial action might be required as part of a later D&D activity such as CDI or as part of remedial actions associated with adjacent contaminated waste sites. While concerns for operational methods and technology used would be encountered and resolved during removal actions, no major issues exist that might compromise this alternative.

4.3.1 Cost Estimates For Alternative Three

Costs are presented in terms of total nondiscounted costs and present-worth (discounted) costs. The present-worth (discounted) cost for Alternative Three is approximately $16,490,000. The total nondiscounted cost (approximately $16,750,000) is a summation of the D&D costs for the duration of the project and reflects potential long-term costs that have not been discounted to reflect cost in 2003 dollars (present worth). As explained in more detail in Section 4.2.1, present-worth analysis is a standard methodology endorsed by the OMB that allows for a cost comparison of different remedial alternatives where costs are incurred in different time periods, on the basis of a single cost figure for each alternative (OMB 1992). Actual costs could vary. This single figure, or present worth (presented in Table 4-2), is the amount needed to be set aside at the start of the removal action to ensure that funds will be available in the future as needed. Present-worth (discounted) cost values were calculated using a discount rate of 3.2% (Marske 2003, OMB 1992).

Table 4-2. Cost Estimate for Alternative Three: D&D (To Grade, Excluding Building Foundation and Underlying Soils/Structures).

Item	Estimated cost ($1,000)
Project planning and equipment procurement	9,100
Site mobilization and facility upgrades	260
Facility/waste characterization	2,670
Facility demolition	2,990
Waste disposal	
LLW	525
TRU waste	755
Project closeout/demobilization	230
Post D&D Surveillance and Maintenance	220
Nondiscounted Grand Total	**16,750**
Present-Worth (Discounted)	**16,490**

Note: Details on the removal alternative estimates are discussed in Marske 2003. Marske 2003 addresses estimates for 224-B Facility. Since 224-T and 224-B Facilities are similar in size, structure and hazards, the estimates are also acceptable for the 224-T Facility.

4.4 ALTERNATIVE FOUR: D&D (INCLUDING BUILDING FOUNDATION AND UNDERLYING SOILS/STRUCTURES TO 1 METER BELOW FOUNDATION)

This alternative consists of the scope of Alternative Three (Section 4.3) plus the demolition and removal of the building foundation to a depth of 1 meter below the foundation and footings. In this alternative, potentially contaminated facility foundation, piping, drains, and surrounding soil would be removed to 1 meter below the foundation and 1 meter out from the building footprint. The resulting void space would be backfilled with clean soil or other acceptable media.

The demolition would use heavy equipment (e.g., excavator with various attachments) to demolish the structure. Other industry standard practices for demolition could also be used (e.g., mechanical saws).

Underground piping and trenches extending away from the 224-T Facility are only included in the scope to a distance of 1 meter from the walls of the structure, although additional piping or trenches might be removed and disposed, as necessary, to accommodate the removal action for the structure. Contaminated and uncontaminated soil to a distance of 1 meter from the walls and floors of the structure might be moved or removed as necessary to implement the removal of the structures; however, the scope of this removal action does not include any additional soil, groundwater, or waste site remediation.

The major risk associated with this alternative is the safety of personnel and the environment involved in both the radiological aspects of the process system removal and decontamination and the industrial aspects of facility demolition and dismantlement, which includes soil excavation. These risks are related to the potential release of contamination during operations and the hazards associated with construction activities. Proven dust suppression techniques will be used. Risks associated with credible natural phenomenon events (e.g., seismic actions and high-velocity wind) would continue to exist until the radioactive material inventory was removed. These risks would diminish as the 224-T Facility removal progresses and the radioactive inventory was removed.

The disposal of the radioactive material inventory in the 224-T Facility and the immediate removal of the facility and systems would be the most direct resolution to impending radiological and physical hazards. Because the foundation of the structure, as well as underlying and adjacent soils, would be removed to the extent described, this alternative would result in the removal of the greatest amount of contamination of the four removal action alternatives. In time, however, contaminants remaining in the soil, piping, or trenches could still pose a risk, most likely through the groundwater transport exposure pathway, and would need to be remediated as part of future remedial actions as described in Section 1.3. While concerns for operational methods and technology utilization would be encountered and resolved during removal actions, no major issues exist that might compromise this alternative.

4.4.1 Cost Estimates For Alternative Four

Costs are presented in terms of total nondiscounted costs and present-worth (discounted) costs. The present-worth cost for Alternative Four is approximately $18,330,000. The total nondiscounted cost (approximately $18,850,000) is a summation of the D&D costs for the duration of the project and reflects potential long-term costs that have not been discounted to reflect cost in 2003 dollars (present worth). As explained in more detail in Section 4.2.1, present-worth analysis is a standard methodology endorsed by the OMB that allows for a cost comparison of different remedial alternatives where costs are incurred in different time periods, on the basis of a single cost figure for each alternative (OMB 1992). Actual costs could vary. This single figure, or present worth (presented in Table 4-3), is the amount needed to be set aside at the start of the removal action to ensure that funds would be available in the future as funds are needed. Present-worth (discounted) cost values were calculated using a discount rate of 3.2% (Marske 2003, OMB 1992).

Table 4-3. Cost Estimate for Alternative Four: D&D (Including Building Foundation and Underlying Soils/Structures to 1 Meter Below Foundation).

Item	Estimated cost ($1,000)
Project planning and equipment procurement	9,600
Site mobilization and facility upgrades	260
Facility/waste characterization	2,780
Facility demolition	2,990
Belowgrade removal (1 meter below foundation)	1,060
Waste disposal	
LLW	955
TRU waste	755
Project closeout/demobilization	230
Post D&D surveillance and maintenance	220
Nondiscounted Grand Total	**18,850**
Present-Worth (Discounted)	**18,330**

Note: Details on the removal alternative estimates are discussed in Marske 2003. Marske 2003 addresses estimates for 224-B Facility. Since 224-T and 224-B Facilities are similar in size, structure and hazards, the estimates are also acceptable for the 224-T Facility.

5.0 ANALYSIS OF ALTERNATIVES

Non-time-critical removal action alternatives are evaluated against three criteria: effectiveness, implementability, and cost. To provide a more comprehensive evaluation, the criterion of effectiveness is divided into subcriteria that are consistent with the requirements for CERCLA actions. The removal action alternatives are evaluated against the following criteria:

- Effectiveness
  - Overall protection of human health and the environment
  - Compliance with applicable federal and state laws and regulations (i.e., ARARs)
  - Long-term effectiveness and permanence
  - Reduction of toxicity, mobility, or volume through treatment
  - Short-term effectiveness
- Implementability
- Cost.

State and public acceptance will be evaluated after individuals have an opportunity to review and comment on this EE/CA. Each criterion is explained briefly in the following subsections; a detailed analysis of each alternative relative to each criterion follows. Finally, the alternatives are compared against one another relative to each criterion.

The alternatives are as follows:

- Alternative One: No Action

- Alternative Two: Continued S&M

- Alternative Three: D&D (to grade, excluding building foundation and underlying soils/structures)

- Alternative Four: D&D (including building foundation and underlying soils/structures to 1 meter below foundation).

5.1 EFFECTIVENESS

5.1.1 Overall Protection of Human Health and the Environment

This criterion evaluates whether the alternative achieves adequate overall elimination, reduction, or control of risks to human health and the environment posed by the likely exposure pathways. This criterion draws on the assessment of the other evaluation criteria identified previously. Reducing the potential threat to acceptable levels is a threshold requirement and is the primary objective of the removal action. The evaluation of this criterion was based on qualitative analysis and assumptions regarding the radioactive inventory.

Alternative One does not provide overall protection to human health and the environment. As the 224-T Facility deteriorates over time with no ongoing maintenance, contamination could be released to the environment. The radioactive inventory, including alpha-emitting radionuclides, potentially could expose the public and environment to an unacceptable radiation dose.

Because Alternative One does not meet the threshold requirement of meeting overall protection of human health and the environment, especially in the long term, this alternative was not analyzed further. For the remainder of this EE/CA, when all the alternatives are mentioned, this represents Alternatives Two, Three, and Four.

Alternative Two provides adequate overall protection of human health and the environment, although the maintenance effort and funding required for maintaining this protection would increase over time. The structure and roof of the 224-T Facility would require significant modification, repair, and replacement in order to maintain contamination and radioactive inventory confinement within the structure during the period of S&M. Additionally, Alternative Two would not remove the radioactive inventory within the facility. Therefore, relative to the other alternatives, Alternative Two does not perform as well under this criterion.

Alternatives Three and Four would remove existing loose contamination and the majority of the radioactive inventory present at the 224-T Facility site. This would reduce or eliminate release pathways to the environment and meet the removal action objectives. The risk associated with residual subsurface contamination that might be present would be minimized through interim surface stabilization. Alternative Four would remove more inventory than Alternative Three because Alternative Four would remove the entire foundation and up to 1 meter of soil below the foundation. Alternative Four, however, does not include remediation of the subsurface, which would have to be backfilled while awaiting future remediation, similar to Alternative Three. Under Alternative Three, the stabilized foundation slab would remain in place, effectively isolating any subsurface contamination while awaiting future remediation.

5.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

This criterion addresses whether a removal action would, to the extent practicable, meet ARARs. ARARs are defined to mean only substantive requirements. ARARs do not include administrative requirements. Furthermore, onsite CERCLA actions are exempt from obtaining federal, state, and local permits (40 CFR 300.400(e)).

To-be-considered (TBC) information is nonpromulgated advisories or guidance issued by federal or state governments that are not legally binding and do not have the status of ARARs. As appropriate, TBCs should be referenced with ARARs in determining the removal action necessary for protection of human health and the environment. Because the activities would result primarily in waste generation and potential for air emissions, the key ARARs proposed for the alternatives being considered include waste management standards, standards controlling emissions to the environment, and environment, safety, and health standards. Final ARARs, which must be complied with during implementation of the selected removal action, would be documented in the CERCLA AM. The proposed ARARs are discussed generally in the following sections and are documented in detail in Table 5-1.

5.1.2.1 Waste Management Standards

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

Radioactive waste is governed under the authority of the *Atomic Energy Act of 1954*. Standards for management and storage of TRU waste are in 40 CFR 191.3.

The identification, storage, treatment, and disposal of hazardous waste and the hazardous component of mixed waste are governed by RCRA. Authority to implement most of the RCRA was delegated to the State of Washington, which implements RCRA requirements under *Washington Administrative Code* (WAC) 173-303. The dangerous waste standards for generation and storage would apply to the management of any dangerous or mixed waste generated at the 224-T Facility. Treatment standards for dangerous or mixed waste subject to RCRA land disposal restrictions are specified in WAC 173-303-140, which incorporates 40 CFR 268 by reference.

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

Removal and disposal of asbestos and ACM are regulated under the *Clean Air Act* (40 CFR 61, Subpart M) and Occupational Safety and Health Administration regulations (29 CFR 1910.1101 and WAC 296-62). These regulations provide for special precautions to prevent environmental releases or exposure to personnel of airborne emissions of asbestos fibers during removal actions. 40 CFR 61.52 identifies packaging requirements.

Waste that is designated as LLW that meets ERDF acceptance criteria would be disposed at ERDF, which is engineered to meet appropriate performance standards under 10 CFR 61. Waste that is designated as either contact-handled or remote-handled TRU waste or TRU mixed waste would be stored at CWC and would be shipped to WIPP in accordance with the schedule established for completing remedial actions on the Hanford Site. WIPP meets 40 CFR 191 requirements for TRU waste disposal and is a RCRA-permitted disposal facility.

Waste designated as dangerous or mixed waste would be treated as appropriate to meet land disposal restrictions and ERDF acceptance criteria, and disposed at ERDF. ERDF is engineered to meet landfill design standards under WAC 173-303-665. All applicable packaging and pre-transportation requirements for dangerous or mixed waste generated at the 224-T Facility would be identified and implemented before movement of any wastes.

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

Waste designated as PCB remediation waste likely would be disposed at ERDF or WIPP, depending on whether the waste is a LLW or a TRU waste respectively. ERDF is authorized to accept solid PCB waste containing PCB concentrations up to 500 ppm for disposal. All waste suspected to contain PCBs would be evaluated to determine whether the waste meets ERDF or WIPP waste acceptance criteria. Any PCB waste that does not meet ERDF or WIPP waste acceptance criteria would be retained at an onsite PCB storage area meeting the substantive requirements for TSCA storage, and would be transported for future disposal at an appropriate disposal facility.

Asbestos and ACM would be removed, packaged as appropriate, and disposed in ERDF.

CERCLA Section 104(d)(4) states that where two of more noncontiguous facilities are reasonably related on the basis of geography, or threat or potential threat, the facilities could be treated as one for purposes of CERCLA response actions. Consistent with this, the 224-T Facility and ERDF will be considered to be onsite for purposes of this removal action, and waste would be transferred between the facilities without requiring a permit.

It is anticipated that all alternatives would be performed in compliance with all waste management ARARs. All waste streams would be evaluated, designated, and managed in compliance with the appropriate requirements. Before disposal, waste would be managed in a protective manner to prevent releases to the environment or unnecessary exposure to personnel.

5.1.2.2 Standards Controlling Emissions to the Environment

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

The federal *Clean Air Act* and the "Washington Clean Air Act" (*Revised Code of Washington* [RCW] Chapters 70.94 and 43.21) regulate both toxic and radioactive airborne emissions. Under implementing regulations found in 40 CFR 61, Subpart H, and WAC 246-247, radionuclide airborne emissions from all combined operations on the Hanford Site can not exceed 10 mrem/yr effective dose equivalent to the hypothetical offsite maximally exposed individual. The WAC 246-247 also requires verification of compliance, typically through periodic confirmatory air sampling. Any potential for a nonzero radioactive emission requires use of best available radionuclide control technology (BARCT) or as low as reasonably achievable control technology (ALARACT). The potential to emit would be calculated before starting the removal action, and a monitoring plan would be developed and implemented as appropriate.

WAC 173-400 and 173-460 establish requirements for emissions of nonradionuclide air pollutants. The primary source of nonradionuclide emissions would be fugitive dust, which would be regulated under WAC 173-400-040(3). Fugitive emissions would be controlled through standard industrial practices such as application of water spray and fixatives and temporary confinement enclosures/glovebag containments. Alternatives Two through Four would be expected to comply with these standards.

5.1.2.3 Safety and Health Standards

The DOE requirements for personnel protection from radiation hazards are specified in "Occupational Radiation Protection" (10 CFR 835). This regulation establishes radiation protection standards, limits, and program requirements for protecting personnel from ionizing radiation. The regulation also requires that measures be taken to maintain radiation exposures as low as reasonably achievable.

Under Alternatives Two through Four, radiological and physical hazards would be identified and analyzed before the start of activities. Appropriate mitigation measures would be addressed in a site-specific health and safety plan. All alternatives would be expected to comply with these standards. A combination of personal protective equipment, personnel training, and administrative controls (e.g., limiting time in and distance from radiation zones) would be used to ensure that the requirements for personnel and visitor protection are met. Individual monitoring would be performed as necessary to verify compliance with the requirements. Because Alternative Two would extend over a longer time but would involve a lower potential for incidences to occur in the near term, it is uncertain whether Alternative Two would perform better or worse than the other alternatives.

Table 5-1. Identification of Potential Applicable or Relevant and Appropriate Requirements and To Be Considered Information for the 224-T Facility.

Potential ARAR citation	Potential ARAR or TBC	Requirement	Rationale for use
5.1.2.1 WASTE MANAGEMENT STANDARDS			
Regulations pursuant to the RCRA, 42 *United States Code* (USC) 6901, et seq. – Implemented through the *Hazardous Waste Management Act*, RCW 70.105			
Dangerous Waste Regulations, (WAC 173-303):			
Solid Waste Identification Specific subsections: WAC 173-303-016 WAC 173-303-017	ARAR	These regulations define how to identify when materials are and are not solid waste.	These regulations are applicable because these define how to determine which materials are subject to the designation regulations.
Incorporation of EPA Regulations By Reference Specific subsection: WAC 173-303-045	ARAR	This regulation clarifies that reference in WAC 173-303 or 40 CFR Parts 260 through 280 and Part 124 refer to those rules as these existed on July 1, 1999. It also clarifies which portions of the regulations are not incorporated or adopted by reference because these are provisions that EPA can not delegate to states.	This regulation clarifies how reference to federal RCRA regulations is implemented.
Dangerous/Mixed Waste Designation Specific subsections: WAC 173-303-070 WAC 173-303-071 WAC 173-303-080 WAC 713-303-081 WAC 173-303-082 WAC 173-303-083 WAC 173-303-090 WAC 173-303-100 WAC 173-303-110	ARAR	These regulations define the procedures to be used to determine if solid waste requires management as dangerous waste. The regulations identify which waste codes are appropriate for application to the waste.	These regulations are applicable to solid waste that will be generated during removal action.
Dangerous/Mixed Waste Management Specific subsections: WAC 173-303-073 WAC 173-303-077 WAC 173-303-170(3)	ARAR	These regulations establish the management standards for solid waste designated as dangerous or mixed waste. Special waste is addressed in WAC 173-303-073. Universal waste is addressed in WAC 173-303-077. Generator standards are addressed in -170 and -200.	These regulations are applicable to the management of materials subject to WAC 173-303. Specifically, the standards for management of special waste and universal waste and the standards for management of dangerous/mixed waste are applicable to the interim management of certain waste that will be generated during the removal action. WAC 173-303-170(3) includes the provisions of WAC 173-303-200 by reference. WAC 173-303-200 further includes certain standards from WAC 173-303-630 and -640 by reference.

Table 5-1. Identification of Potential Applicable or Relevant and Appropriate Requirements and To Be Considered Information for the 224-T Facility.

Potential ARAR citation	Potential ARAR or TBC	Requirement	Rationale for use
Dangerous/Mixed Waste Disposal Specific subsections: WAC 173-303-140	ARAR	This regulation establishes state standards for land disposal of dangerous waste and incorporates by reference federal land disposal restrictions of 40 CFR 268 that are applicable to solid waste that designates as dangerous or mixed waste in accordance with WAC 173-303-070.	This regulation is applicable to dangerous/mixed waste generated from the removal action that will be destined for land disposal.
Recycling Requirements Specific subsections: WAC 173-303-120(3) WAC 173-303-120(5)	ARAR	These regulations define the requirements for the recycling of materials that are solid and a dangerous waste. Specifically, WAC 173-303-120(3) provides for management of certain recyclable materials, including spent refrigerants, antifreeze, and lead-acid batteries. WAC 173-303-120(5) provides for the recycling of used oil.	These regulations provide for the management of materials, such as antifreeze and used oil, that will be generated during removal action. Such materials can be recycled and/or conditionally excluded from certain dangerous waste requirements.
Final Treatment, Storage, and Disposal (TSD) Facility Requirements Specific subsection: WAC 173-303-610	ARAR	This regulation establishes requirements applicable to final status TSD units undergoing closure.	This regulation would be applicable to any RCRA final status TSD unit undergoing closure activities in conjunction with the removal action. This regulation would be relevant and appropriate to any interim status TSD unit undergoing closure in conjunction with the removal action.
Regulations pursuant to the *Atomic Energy Act of 1954*, 42 USC 2011, et seq			
Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Waste (40 CFR 191)			
TRU Waste Storage Standards Specific subsection: 40 CFR 191.3	ARAR	This regulation establishes the standard for management of spent nuclear fuel, high level, or TRU waste at any facility operated by the Nuclear Regulatory Commission or by Agreement States and for management at disposal facilities operated by the DOE.	This requirement is potentially relevant and appropriate to TRU waste during onsite storage.

Table 5-1. Identification of Potential Applicable or Relevant and Appropriate Requirements and To Be Considered Information for the 224-T Facility.

Potential ARAR citation	Potential ARAR or TBC	Requirement	Rationale for use
Regulations pursuant to the *Toxic Substances Control Act (TSCA)*; 15 USC 2601 et seq.			
Polychlorinated Biphenyls Manufacturing, Processing, Distribution in Commerce, and Use Provisions (40 CFR 761)			
PCB Waste Management and Disposal Specific subsections: 40 CFR 761.50(b)(1) 40 CFR 761.50(b)(2) 40 CFR 761.50(b)(3) 40 CFR 761.50(b)(4) 40 CFR 761.50(b)(7) 40 CFR 761.50(c)	ARAR		These regulations are applicable to the storage and disposal of PCB liquids, items, remediation waste, and bulk product waste at >50 ppm. The specific identified subsections from 40 CFR 761.50(b) reference the specific sections for management of each PCB waste type. Radioactive PCB waste can be disposed in accordance with 40 CFR 761.50(b)(7).
Regulations pursuant to the *Solid Waste Management, Recovery and Recycling Act*, RCW 70.95			
"Minimum Functional Standards for Solid Waste Handling," (WAC 173-304)			
Nondangerous, Nonradioactive Solid Waste Management Specific subsections: WAC 173-304-190 WAC 173-304-200 WAC 173-304-350	ARAR	These regulations establish requirements for the management of solid waste that is not dangerous or radioactive waste. Affected solid waste includes garbage, industrial waste, construction waste, and ashes. Requirements for containerized storage, collection, transportation, treatment, and disposal of solid waste are included.	These regulations are applicable to onsite management and disposal of nondangerous, nonradioactive solid waste that could be generated during removal action.
To-Be-Considered pursuant to relevant facility acceptance criteria			
Environmental Restoration Disposal Facility Waste Acceptance Criteria (BHI-00139)	TBC	This document establishes waste acceptance criteria for ERDF.	Waste destined for management at ERDF must meet acceptance criteria to ensure proper disposal.

Table 5-1. Identification of Potential Applicable or Relevant and Appropriate Requirements and To Be Considered Information for the 224-T Facility.

Potential ARAR citation	Potential ARAR or TBC	Requirement	Rationale for use
5.1.2.2 STANDARDS CONTROLLING EMISSIONS TO THE ENVIRONMENT			
Regulations pursuant to the *Clean Air Act of 1977*, 42 USC 7401, et seq.			
"National Emission Standards for Hazardous Air Pollutants" (40 CFR 61)			
Emissions of Hazardous Air Pollutants Specific subsections: 40 CFR 61.01 40 CFR 61.05 40 CFR 61.12 40 CFR 61.14	ARAR	These regulations establish emission standards for hazardous air pollutants including radionuclides (except radon) and asbestos. These regulations provide general requirements and listings for regulated emissions at a regulated facility.	These regulations apply to the Hanford Site because there is potential to emit radionuclides to unrestricted areas. Radionuclide emissions from activities associated with the removal action must be controlled and monitored.
40 CFR 61.92		40 CFR 61.92 sets limits for emissions of radionuclides from the entire facility to ambient air. Radionuclide emissions can not exceed those amounts that would cause any member of the public to receive an effective dose equivalent of 10 mrem/yr. The definition of facility includes all buildings, structures, and operations at one contiguous site. The requirements also set standards to ensure that emissions from asbestos are minimized during collection, processing, packaging, and transportation.	
40 CFR 61.145(a)(1) 40 CFR 61.145(a)(5) 40 CFR 61.145(c) 40 CFR 61.150(a) 40 CFR 61.150(b) 40 CFR 61.150(c)		These regulations define regulated asbestos-containing materials and establish removal requirements based on quantity present and handling requirements. These regulations also specify handling and disposal requirements for regulated sources having the potential to emit asbestos.	

Table 5-1. Identification of Potential Applicable or Relevant and Appropriate Requirements and To Be Considered Information for the 224-T Facility.

Potential ARAR citation	Potential ARAR or TBC	Requirement	Rationale for use
Regulations pursuant to the *Washington Clean Air Act*, RCW 70.94 / *Department of Ecology*, RCW 43.21A			
"Radiation Protection - Air Emissions," (WAC 246-247)			
Radionuclide Emission Standards Specific subsections: WAC 246-247-120 WAC 246-247-130	ARAR	These regulations establish limits for airborne radionuclide emissions as defined in WAC 173-480 and 40 CFR 61, Subparts H and I. The ambient air standards under WAC 173-480 require that the most stringent standard be enforced. Ambient air standards under 40 CFR 61, Subparts H and I, are not to exceed amounts that result in an effective dose equivalent of 10 mrem/yr to any member of the public. These standards specify emission monitoring requirements and the application of BARCT requirements.	These regulations are applicable because these set emission limits and use of BARCT or ALARACT for airborne radionuclides.
"General Regulations for Air Pollution," (WAC 173-400)			
Air Contaminant Emission Standards Specific subsections: WAC 173-400-040 WAC 173-400-075	ARAR	These regulations require that reasonable precautions be taken to prevent the release of air contaminants associated with fugitive emissions resulting from materials handling, construction, demolition, or other operations. Emission standards are identified for visible, particulate, fugitive, odors, and hazardous air emissions. The regulations require that source testing and monitoring be performed.	Requirements of these regulations are relevant and appropriate to removal actions performed at the site that could result in the emission of hazardous air pollutants (e.g., fugitive dust). Substantive standards established for the control and prevention of air pollution under these regulations might be applicable during the removal action.
"Controls for New Sources of Air Pollution," (WAC 173-460)			
Controls for New Sources of Toxic Air Pollutants Specific subsection: WAC 173-460-040	ARAR	This regulation requires that new sources of air emissions provide emission estimates for toxic air contaminants listed in the regulation. The standard requires that emissions be quantified and used in risk modeling to evaluate ambient impacts and establish acceptable source impact levels. The standard establishes three major requirements for new sources of air pollutants: use of best available control technology, quantification of toxic emissions, and demonstration that human health is protected.	This regulation is relevant and appropriate to removal actions performed at the site, if a treatment technology that emits toxic air emissions were necessary during the implementation of the removal action.
"Ambient Air Quality Standards and Emission Limits for Radionuclides," (WAC 173-480)			
Ambient Air Standards for Radionuclides	ARAR	These requirements establish that the most stringent federal or state	Requirements of this standard are relevant and appropriate to removal actions

Table 5-1. Identification of Potential Applicable or Relevant and Appropriate Requirements and To Be Considered Information for the 224-T Facility.

Potential ARAR citation	Potential ARAR or TBC	Requirement	Rationale for use
Specific subsections: WAC 173-480-040 WAC 173-480-050 WAC 173-480-060		ambient air quality standard for radionuclides be enforced. The WAC 173-480 standard defines the maximum allowable level for radionuclides in the ambient air, which shall not cause a maximum accumulated dose equivalent of 25 mrem/yr to the whole body or 75 mrem/yr to any critical organ. However, ambient air standards under 40 CFR 61, Subparts H and I, are not to exceed amounts that result in an effective dose equivalent of 10 mrem/yr to any member of the public. Emission standards for new and modified emission units shall use BARCT.	performed at the site that could emit radionuclides to the air.
5.1.2.3 SAFETY AND HEALTH STANDARDS			
Occupational Radiation Protection (10 CFR 835)			
10 CFR 835	ARAR	This regulation establishes occupational dose limits for adults.	This regulation is applicable to the removal action.

5.1.3 Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence criterion addresses the risk after the removal action is completed. This criterion also refers to the ability of the removal action to maintain long-term reliable protection of human health and the environment after remedial action objectives have been met.

In Alternative Two, S&M would be carried out until the eventual D&D of the 224-T Facility, which is planned to occur between 2017 and 2043. Therefore, the alternative would be effective at protecting human health during this time frame, although the efforts to maintain that level of protection necessarily would become increasingly aggressive as the facility ages. Because contamination would be left in place with this alternative, environment release risk would remain. The structure would be monitored closely. With time, the effectiveness of this alternative would diminish. This alternative would not provide a permanent solution with respect to the 224-T Facility, because D&D or inventory removal would need to occur at some future time.

Alternatives Three and Four would provide greater protection of human health and the environment compared to Alternative Two. These alternatives would provide a more permanent remedy for the purposes of meeting the removal action objectives. Both Alternatives Three and Four would remove the majority of contaminated inventory associated with the 224-T Facility. Further remedial actions potentially would be required for subsurface and surrounding contamination. Aboveground contamination and structures would be removed and disposed, thereby creating an effective and permanent remedy for the structure. This would allow improved access to contamination surrounding the 224-T Facility for future remedial action. There would be no unacceptable risk attributable to the surface portions of the 224-T Facility after completion of the removal action under Alternatives Three and Four.

Alternative Four would result in removing the subsurface foundation and 1 meter of soil beneath the foundation, which potentially could provide additional long-term protection if significant radiological inventory actually is located in the foundation. However, Alternatives Three and Four are judged to be comparable in terms of long-term protectiveness because the foundation would be left in place under Alternative Three, thereby isolating any potential subsurface contamination. By placing the waste in ERDF, WIPP, or an offsite TSD facility, long-term protection to human health and the environment from contaminants in the 224-T Facility would be achieved.

5.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion refers to an evaluation of the anticipated performance of the treatment technologies that might be employed in the removal action. This criterion assesses whether the alternative permanently and significantly reduces the hazard posed through application of a treatment technology. This could be accomplished by destroying the contaminants, reducing the quantity of contaminants, or irreversibly reducing the mobility of contaminants. Reduction of toxicity, mobility, and/or volume contributes toward overall protectiveness.

Based on process knowledge of past facility activities, it is anticipated that a maximum of 10% of the waste generated under Alternatives Two through Four would require treatment to meet ERDF, WIPP, or offsite TSD facility waste acceptance criteria. Treatment would not be a significant component of the removal action. However, because Alternatives Three and Four would generate substantially more waste than Alternative Two, these alternatives could be considered more effective at meeting this criterion. Most of the treatment methods anticipated (e.g., macroencapsulation) would act to reduce the mobility of contaminants. Some treatment methods (e.g., elementary neutralization) would reduce the toxicity of contaminants. Each alternative would evaluate recycling to reduce the volume of material disposed.

5.1.5 Short-Term Effectiveness

The short-term effectiveness criterion refers to any potential adverse effects on human health (e.g., personnel or surrounding public) and the environment during the removal action implementation phases. The criterion also refers to an evaluation of the speed with which the remedy achieves protection.

Under Alternative Two, there would be a potential for exposure to personnel and the environment during the S&M period because personnel would be required to enter the contaminated facility to perform work. This potential for exposure would become greater as the facility deteriorates and eventually could include potential exposure to the public as well as the environment. The speed with which full protection is achieved, however, would be lengthy since the final removal of contaminant inventory might not occur until between 2017-2043.

With regard to short-term risks to personnel and the environment during implementation, Alternatives Three and Four would increase potential exposure in relation to Alternative Two because personnel would be entering the contaminated facility and would be handling more contaminated materials. The handling of contaminated materials would increase the potential for a release to the environment, especially to the air, in the near term. Strict adherence to all appropriate environmental regulations would help ensure that the potential for releases would be minimized. Alternative Two would present a lesser hazard but for a longer time.

5.2 IMPLEMENTABILITY

Implementability refers to the technical and administrative feasibility of a removal action, including the availability of materials and services needed to implement the selected solution.

From a technical standpoint, Alternative Two can be implemented easily, as demonstrated by success of the S&M program currently ongoing at the 224-T Facility. S&M techniques are widely used throughout the Hanford Site, and no specialized materials or services would be required except when major repairs are needed on the 224-T Facility. As time goes by, the primary implementation deterrent would be subjecting S&M personnel and the environment to increasing potential contamination exposure as facility deterioration increases. However, normal precautions for dealing with contamination would be applied.

Alternatives Three and Four also can be implemented with relative ease. The specialized skills that would be required to work in a highly alpha radiation contaminated facility would be available within the existing workforce on the Hanford Site. ERDF already is authorized via a ROD (EPA et al. 1995) to receive CERCLA waste meeting ERDF acceptance criteria generated on the Hanford Site. WIPP currently is operational, and TRU waste could be stored at CWC until the WIPP schedule could accommodate Hanford Site-generated waste.

Although any of the alternatives would be implementable, Alternative Two could be easier to implement in the near term because this alternative would not require the engineering, planning, and demolition activities necessary to implement Alternatives Three and Four. However, in the long term, implementation of Alternative Two could become less feasible, because S&M activities would need to become more costly, aggressive, and frequent.

None of the alternatives discussed in this report are expected to interfere with other nearby facility operations.

5.3 COST

Total costs for each alternative as described in Sections 4.2 through 4.4 are presented in Table 5-2.

Table 5-2. Total Costs for the 224-T Facility Removal Action Alternatives.

Alternative	Total Cost ($1,000)	
	Present worth	Nondiscounted
Two – S&M	1,220	1,670
Three – D&D (Excluding Building Foundation and Underlying Soils/Structures)	16,490	16,750
Four – D&D (Including Building Foundation Underlying Soils/Structures to 1 Meter Below Foundation)	18,330	18,850

5.4 OTHER CONSIDERATIONS

In accordance with DOE NEPA policy, DOE CERCLA documents are required to incorporate NEPA values (e.g., analysis of cumulative, offsite, ecological, and socioeconomic impacts) to the extent practicable.

Cumulative impacts might occur in both the short term and long term because of the interrelationships between the 224-T Facility removal action and other 200 Areas activities, such as remediation of waste sites and groundwater, deactivation and D&D of surrounding facilities, and operation of waste treatment or disposal facilities. For this action, short-term cumulative impacts were considered in terms of both air quality and resource allocation. With appropriate work controls, airborne releases from the 224-T Facility were expected to be minor under all of the removal action alternatives, so the contribution to cumulative impacts on local and regional air quality would be minimal. With respect to resource allocation, Alternatives Two through Four as well as other 200 Areas activities would require resources in terms of budget, materials, and disposal space. The contribution to cumulative impacts would be less for Alternative Two and greater for Alternatives Three and Four, which would require substantially greater budget resources.

In the long term, the overall cumulative effect of the 224-T Facility removal action and other activities in the 200 Areas would be to enhance the protection of personnel, the public, and the environment, which is consistent with the values expressed by the regulators, stakeholders, affected tribes, and the public. Alternatives Two through Four would contribute to this enhanced protection, with Alternatives Three and Four creating the greatest and most long-term positive effect. None of the alternatives would be expected to adversely affect existing ecological or cultural resources or to have any socioeconomic impacts, including disproportionately high and adverse impacts to minority or low-income populations. Alternatives Two through Four would require an irreversible and irretrievable commitment of resources in the form of land area at ERDF for waste disposal, but the total quantity of waste generated and the associated land area required would be relatively small for Alternatives Two, larger for Alternative Three, and the greatest for Alternative Four. Alternative Four also would require a commitment of resources for deep excavation and the clean fill material to backfill the site.

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6.0 RECOMMENDED ALTERNATIVE

The recommended removal action alternative for the 224-T Facility is Alternative Three – D&D (to grade, excluding building foundation and underlying soils/structures). This alternative would provide the best balance of protecting human health and the environment associated with the hazardous substance inventory within the facility, meeting the removal action objectives, and providing a cost-effective option.

Alternative One does not provide overall protection to human health and the environment. Alternative Two provides adequate overall protection of human health and the environment, but at an increasing cost over time. Additionally, Alternative Two would not remove the radioactive inventory within the facility. Therefore, neither of these alternatives is selected.

Alternatives Three and Four are judged to be comparable in terms of long-term protectiveness. Alternative Four potentially could provide additional long-term protection relative to Alternative Three if significant radiological inventory actually is located in the foundation. Alternative Three is comparable because this alternative leaves the stabilized facility foundation in place, thereby isolating any potential subsurface contamination remaining after removal of the main structure. Both Alternatives Three and Four would provide an end-state that does not preclude future actions beneath the 224-T Facility. Additionally, Alternative Three would incur significantly lower costs, and future remedial actions, if required, would require the removal of significantly smaller quantities of backfill material placed as a result of this removal action.

Environmental sampling will be conducted in conjunction with, or following, decontamination and demolition activities in order to assess whether cleanup and stabilization objectives have been achieved. Following analysis of sampling results DOE and EPA will jointly determine whether additional cleanup activities at the site should be deferred to a subsequent CERCLA remedial action, or taken under this removal action.

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ATTACHMENT 1
224-T TRANSURANIC WASTE STORAGE AND ASSAY FACILITY CLOSURE PLAN

1.0 FACILITY DESCRIPTION

The 224-T Transuranic Waste Storage and Assay Facility (224-T TRUSAF) *Resources Conservation and Recovery Act* (RCRA) treatment, storage, and/or disposal unit (TSD) is part of the 224-T Plutonium Concentration Facility (224-T Facility). The 224-T Facility is adjacent to T Plant Complex in the 200 West Area. The 224-T TRUSAF stored transuranic waste, transuranic mixed waste, mixed waste, and other properly characterized and packaged low-level waste. Dangerous wastes were removed from 224-T TRUSAF and the unit is no longer being operated as a TSD unit. Because dangerous waste does not include the source, special nuclear, and by-product material components of mixed waste, radionuclides are not within the scope of this documentation. The information on radionuclides is provided only for general knowledge.

The 224-T Facility remediation, which will include the 224-T TRUSAF TSD unit, will be conducted as a *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) removal action. The response action will be conducted as described in the joint Department of Energy/U.S. Environmental Protection Agency (EPA) policy, "Policy on Decommissioning Department of Energy Facilities under CERCLA," for decommissioning surplus DOE facilities consistent with the requirements of the CERCLA.

1.1 FACILITY OPERATIONS

On receipt of the transuranic mixed waste or mixed waste, the 224-T TRUSAF operations personnel performed an inspection (exterior only) of the waste container(s) and associated documentation, a neutron assay of the waste container to determine fissile isotope content, and/or an examination with a real-time radiography (RTR) system to confirm the absence of prohibited items (e.g., free liquids). If the waste container(s) and accompanying documentation were acceptable, the 224-T TRUSAF operations personnel stored the waste.

The 224-T Facility, constructed in the early 1940's entirely of reinforced concrete, was used as a chemical processing unit for purifying liquid plutonium nitrate by the lanthanum fluoride process. The 224-T Facility remained idle for several years after new processes made the lanthanum fluoride process obsolete. In 1975, the mission of the 224-T Facility changed to that of storing plutonium solutions and solid plutonium scrap. To meet the requirements for this new mission and the criteria for storing plutonium, the 224-T Facility underwent major structural upgrades and modifications. The modifications included reinforcing the facility for tornado and seismic loads and sealing off the areas previously used for chemical separations from personnel entry. The three floors of the building contain six radiologically contaminated process cells, which were sealed from the rest of the building in 1975. The six process cells (cells A through F) are not included in this closure plan documentation. In 1985, the storage of transuranic waste, transuranic mixed waste, mixed waste, and low-level waste commenced, and the portion of the 224-T Facility being operated was redesignated as the 224-T TRUSAF. This closure plan documentation covers only the RCRA regulated portion of the 224-T Facility referred to as

224-T TRUSAF. The entire building will be remediated as a decontamination and demolition activity as part of a CERCLA removal action.

The configuration of 224-T TRUSAF, which is approximately 60 meters long by 18.3 meters wide, allowed for approximately 1,068 square meters of storage space. The three floors of the 224-T TRUSAF are connected by stairway A at the north end of the building, by stairway B at the south end of the building, and by an elevator adjacent to stairway A. There also is a concrete elevator loading deck off the elevator on the outside of the building. The roof contains the ventilation exhaust equipment and a penthouse. The penthouse contains the elevator mechanical equipment.

The first floor contained storage modules, and includes a restroom, an administration office, a heating and ventilation mechanical room, an elevator, a transuranic waste assayer room, and a RTR unit. The storage modules on the first floor were in open areas and were marked with tape or paint on the floor. The second and third floors also contained open storage modules marked on the floor with tape or paint.

The floors of the 224-T TRUSAF were sealed with an epoxy sealant to meet secondary containment requirements. The fire protection system consisted of a dry-pipe fire system. Each floor had emergency exits and fire alarm pull boxes.

The 224-T TRUSAF consisted of the following areas:

- Administration office
- RTR room
- Transuranic waste assayer room
- Assay control room and storage unit operations office
- Elevator and stairways
- Heating and ventilation mechanical room
- Waste storage and holding areas
- Incoming waste receiving area
- Storage modules
- Acids
- Caustics
- Mixed waste
- Nonhazardous.

1.1.1 Real-Time Radiography Room

Real-time radiography was operated from a desk and control terminal. Only one container at a time was staged in this area for x-raying. In the RTR room, a roll-up door was used for building services. The entrance had a 5.08-centimeter high curb with a 0.3-meter long ramp leading down to floor level. The room contains no floor drains. Three personnel entrances to the RTR room were available, all with a 5.08-centimeter curb and a 0.3-meter-long ramp.

1.1.2 Transuranic Waste Assayer Room

Only one container at a time was staged in the transuranic waste assayer room. The transuranic waste assayer room contains the first floor emergency exit. All floor drains in the transuranic waste assayer room are sealed.

1.1.3 Assay Control Room and Storage Unit Operations Office

The assay control room and storage unit operations office served as the operations center. The transuranic waste assayer was operated from this office. There are no floor drains in the assay control room and storage unit operations office.

1.1.4 Elevator and Stairways

The elevator and stairways are located on the west side of the storage building service all three floors of the 224-T TRUSAF. The elevator was used for transporting waste to the upper floors for storage, for moving large or heavy equipment, and for outloading waste. Main floor entrances to the elevator are equipped with a 5.08-centimeter curb and a 0.3-meter-long ramp down to floor level. The elevator is not equipped with curbs.

1.1.5 Heating and Ventilation Mechanical Room

Presently, the heating and ventilation mechanical room, on the west-central side of the first floor, provides a constant negative pressure with respect to the atmosphere. Following closure activities, the heating and ventilation system will be deactivated in conjunction with 224-T Facility decontamination and demolition activities. The two entrances from the hallway into the heating and ventilation mechanical room have 5.08-centimeter curbs with 15.24-centimeter-long ramps down to floor level.

1.1.6 Waste Storage Modules

Waste storage modules on all three floors were open-array storage modules, delineated by markings taped or painted on the floor to prevent inadvertent commingling of incompatible waste forms. Incompatible dangerous waste was separated by placement on different floors or in different rooms on the second floor. Transuranic mixed waste was stored based on both transuranic element content and dangerous waste constituents. All floor drains in these areas were sealed with nonshrinking concrete and covered with epoxy sealant.

1.1.6.1 Receiving Area

The receiving area was located in the southeast corner of the first floor. A double metal door was provided for entrance to the receiving area to allow the movement of a forklift. A concrete pad outside of the door was used for unloading waste. The ceiling is two floors high in the extreme southeast portion of the receiving area. A portion of the ceiling is only one floor high and contains a 1-ton crane used for container-overpacking operations.

1.1.6.2 Temporary Staging Area

The temporary staging area, located at the southeast end, was used until offloading operations were complete.

1.1.6.3 First Floor Storage Modules

The first floor storage modules were used for short-term storage before examination and transfer of waste to other locations (i.e., upper floor storage, return to generators and/or generating units, Low-Level Burial Grounds), etc. All transuranic mixed waste was separated into compatible modules, two containers high, two containers wide, and as long as necessary to accommodate the amount of the waste.

1.1.6.4 Second Floor Storage Modules

The majority of the second floor was reserved for transuranic waste. Transuranic mixed waste also was stored on the second floor. Transuranic mixed waste containers were stored in open-array modules, two containers wide, and two containers high. Incompatible mixed waste was separated by being placed in different rooms on the second floor.

1.1.6.5 Third Floor Storage Modules

The third floor storage area contained two types of waste storage modules. Modules 3-1 were for transuranic mixed waste. Modules 3-2 were for transuranic waste. No incompatible transuranic mixed waste was stored on the third floor.

1.2 SECURITY INFORMATION

Security information for the Hanford Facility is discussed in the Hanford Facility Dangerous Waste Permit Application, General Information Portion (DOE/RL-91-28).

The 224-T TRUSAF is posted with signs stating "DANGER-UNAUTHORIZED PERSONNEL KEEP OUT," or an equivalent legend, in black and red letters on a white background. These signs are in English, legible from a distance of 7.6 meters, and visible from all angles of approach. In addition to these signs, the fences around the 200 West Area are posted with signs, printed in English, warning against unauthorized entry. The signs also are visible from all angles of approach. The 224-T TRUSAF also has its own perimeter fencing that remains locked during nonroutine working hours. The perimeter fence has postings to keep unauthorized personnel out, in addition to an access control point trailer (MO-289) within the fenced area.

2.0 CLOSURE STRATEGY AND PERFORMANCE STANDARDS

The 224-T TRUSAF was a clean and well-maintained TSD unit and will be clean closed. Therefore, postclosure activities are not anticipated. Closure of the 224-T TRUSAF will be accomplished by integrating the closure activities with the proposed CERCLA removal action for the entire 224-T Facility. Because the entire building will be disposed of in the Environmental Restoration Disposal Facility (ERDF), sampling activities will not be necessary.

2.1 MINIMIZE THE NEED FOR FURTHER MAINTENANCE

Closure of the 224-T TRUSAF by the eventual disposal of the building decontamination and demolition materials in ERDF will minimize the need for further maintenance specific to the 224-T TRUSAF.

2.2 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The 224-T TRUSAF will be closed by the eventual disposal of the building into ERDF which will provide protection for human health and the environment.

2.3 RETURN LAND TO THE APPEARANCE AND USE OF SURROUNDINGS

Future land use determinations will be made following clean closure of the 224-T TRUSAF and disposition of the entire 224-T Facility. The current proposal for the 224-T Facility is a 'slab-on grade' which consists of the following primary elements:

- Remove the nonradiological and radiological hazardous substances from the facility
- Remove equipment and associated piping
- Decontaminate/stabilize contamination
- Demolish structure to grade
- Dispose of waste generated during these operations
- Stabilize the area.

3.0 CLOSURE ACTIVITIES

The strategy for closure of the 224-T TRUSAF is clean closure. The waste inventory has been relocated to the Central Waste Complex or to another permitted TSD unit. Based on the clean nature of the 224-T TRUSAF and the proposed CERCLA removal action to D&D the entire 224-T Facility with only the slab and foundation remaining, and the structure being disposed of in ERDF, clean closure will be achieved. Certification of clean closure by an independent registered professional engineer will demonstrate that clean closure performance standards have been met.

3.1 REMOVAL OF DANGEROUS WASTE INVENTORY

The waste inventory has been removed and relocated to the CWC or to another permitted TSD unit.

3.2 CLOSURE ACTIVITIES

Closure activities will be integrated with the implementation of *the Engineering Evaluation/Cost Analysis (EE/CA) for 224-T Plutonium Concentration Facility*. The EE/CA proposes that the 224-T Facility be decontamination and decommissioned with the material being disposed of in ERDF.

3.2.1 Constituents of Concern for Closure

Sampling for dangerous waste constituents is not anticipated at this time. A sampling and analysis plan for the recommended removal action for the 224-T Facility will be prepared and implemented.

3.2.2 Field Logbook

There will be no field activities associated with the closure of the TRUSAF.

3.2.3 Reporting

There is no reporting requirement to implement the closure activities. However, after completion of the closure activities, a certification will be produced to verify clean closure.

3.2.4 Personnel Training

All personnel involved with the closure activities at the 224-T TRUSAF will receive training concerning the handling of mixed waste.

3.3 SCHEDULE OF CLOSURE

The schedule of closure will be integrated with the 224-T Facility CERCLA removal action.

3.4 AMENDMENT OF PLAN

Amendments to the closure plan, if required, will be prepared as described in the General Information Portion (DOE/RL-91-28).

3.5 CERTIFICATION OF CLOSURE

Certification of closure will be prepared as discussed in the General Information Portion (DOE/RL-91-28).