DOE/RL-2020-39
Revision 0

Engineering Evaluation/Cost Analysis for the 200 West Area Tier 2 Buildings/Structures

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

U.S. DEPARTMENT OF ENERGY | Richland Operations Office

P.O. Box 550
Richland, Washington 99352

Approved for Public Release;
Further Dissemination Unlimited

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Date Published
February 2021

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APPROVED
By Janis Aardal at 8:58 am, Mar 02, 2021

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Executive Summary

This document presents, for public review and comment, the results of an engineering evaluation/cost analysis (EE/CA) for the proposed non-time-critical removal action alternatives of Hanford Site buildings/structures identified as Tier 2 pursuant to Section 8.1.3 in Ecology et al., 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*.[1] The scope of the EE/CA encompasses seven Tier 2 buildings/structures located in the 200 West Area on the Central Plateau of the Hanford Site. A removal action is required to mitigate potential threats to human health and the environment posed by contamination associated with these buildings/structures. Section 2.2 provides a detailed list of all buildings/structures within the scope of this EE/CA.

Three removal action alternatives were developed and evaluated in accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*.[2] With the exception of the No Action alternative, the proposed alternatives offer surveillance and maintenance combined with deactivation, decontamination, decommissioning, and demolition activities.

Removal action alternatives and their estimated costs are summarized in Table ES-1. The cost estimates represent present-worth cost for the three alternatives based on present-day (2020) dollars (estimates are based on the best available information on anticipated scope). The cost estimates include major costs that apply to all of the alternatives, as well as alternative-specific costs. The major costs are summarized in this EE/CA.

[1] Ecology, EPA, and DOE, 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington. Available at: http://www.hanford.gov/?page=82.

[2] *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, 42 USC 9601, et seq., Pub. L. 107-377, December 31, 2002. Available at: https://www.csu.edu/cerc/researchreports/documents/CERCLASummary1980.pdf

Table ES-1. Proposed Alternatives for the 200 West Area Tier 2 Removal Action

Alternative	Removal Action Description	Present-Worth Cost
1	No Action	$0
2	Continued Surveillance and Maintenance (for at least 15 years) with Future Decontamination, Deactivation, Decommissioning, and Demolition (D4) of Buildings/Structures.	$149.2 million
3	**Continued Surveillance and Maintenance with Near-Term Decontamination, Deactivation, Decommissioning, and Demolition (D4) of Buildings/Structures.**	**$135.2 million**

Notes: Accuracy range of the cost estimate is -30 percent to +50 percent. No sensitivity analyses were performed, and the following factors could impact costs: levels of contamination, amount of equipment in the structures, and differing structural design.

Bold signifies the recommended alternative.

Built at various times since the 1940s and unoccupied since the mid-1980s, the 200 West Tier 2 buildings/structures in the scope of this EE/CA are degrading. The 200 West Tier 2 buildings/structures contain chemical and/or radiological contamination as a result of their missions. If not timely addressed, the degrading conditions at the 200 West Tier 2 buildings/structures could present a threat to human health and the environment.

All alternatives were evaluated against established removal action objectives and compared in terms of effectiveness, implementability, and cost. Based on its efficacy in meeting these criteria, Alternative 3 was selected as the recommended removal action alternative. Alternative 3 provides the best combination of actions to protect workers, the public, and the environment while meeting removal action objectives. Alternative 3 is both technically and administratively feasible and will also support future remedial decisions and characterization activities in the 200 West Area.

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Terms

AM	action memorandum
AOP	*Hanford Site Air Operating Permit, Renewal 2 – Revision A*
ARAR	applicable or relevant and appropriate requirement
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
D4	deactivation, decontamination, decommissioning, and demolition
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
HCP EIS	*Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*
HEPA	high-efficiency particulate air
NCP	National Contingency Plan
NPL	National Priorities List
NTCRA	non-time-critical removal action
PCB	polychlorinated biphenyl
PFP	Plutonium Finishing Plant
RAO	removal action objective
RAWP	removal action work plan
RCRA	*Resource Conservation and Recovery Act of 1976*
REDOX	Reduction-Oxidation
ROD	record of decision
S&M	surveillance and maintenance
TMV	toxicity, mobility, or volume
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	transuranic
WIDS	Waste Information Data System

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1 Introduction

This engineering evaluation/cost analysis (EE/CA) has been prepared in accordance with the National Contingency Plan (NCP) (40 CFR 300.415(b)(4)(i), "National Oil and Hazardous Substances Pollution Contingency Plan," "Removal Action") to assist the U.S. Department of Energy (DOE) in identifying the most effective removal action alternative for addressing the potential risk posed by the release or threat of release of hazardous substances from Tier 2 buildings/structures located within the 200 West Area of the Central Plateau on the Hanford Site. The buildings/structures addressed in this EE/CA are located throughout the 200 West Area and include the following:

- 213W Waste Compactor Building
- 231Z Materials Engineering Laboratory
- 242S Evaporator Facility
- 242T Waste Disposal Evaporator Building
- 242TB Vent House
- 292S Jet Pit House
- 292T Fission Products Release Laboratory

Section 2.2 provides detailed descriptions of the buildings/structures within the scope of this EE/CA. The development of this EE/CA satisfies environmental review requirements and provides for stakeholder involvement while offering a framework for selecting the removal alternative. An Administrative Record for documentation of the removal action will be established.

Section 8.1.3 in Ecology et al., 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan* (hereinafter called the Tri-Party Agreement Action Plan), establishes a process for determining which buildings/structures on the Central Plateau should be dispositioned using the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA). Buildings/structures identified for disposition pursuant to Section 8.1.3 of the Action Plan are categorized as either Tier 1 or Tier 2. Tier 1 buildings/structures (e.g., Plutonium Uranium Extraction Plant or B Plant Canyon) are generally large, heavily shielded, metal and concrete structures containing tanks, heavily shielded gloveboxes or hot cells, underground vaults, piping, etc., that are integral to the structure which pose a threat of release of hazardous substances to the environment during disposition. Tier 2 buildings/structures are defined as chemically and/or radiologically contaminated buildings/structures that require a CERCLA response action because of their potential for substantial threat of release of hazardous substances. The buildings/structures addressed by the scope of this EE/CA are chemically and/or radiologically contaminated and are designated as Tier 2.

This non-time-critical removal action (NTCRA) is consistent with the joint DOE and EPA, 1995, *Policy on Decommissioning of Department of Energy Facilities Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)*, which establishes the CERCLA NTCRA process as the preferred approach for decommissioning surplus DOE facilities. Under this policy, a NTCRA may be taken when DOE determines that the action will prevent, minimize, stabilize, or eliminate a risk to human health and the environment. When DOE determines that a CERCLA NTCRA is necessary, DOE is authorized to evaluate, select, and implement the removal action that DOE determines is most appropriate to address the potential risk posed by the release or threat of release of hazardous substances. This policy states, in part, the following:

> Although the full range of CERCLA response actions may be applicable to decommissioning activities, NTCRAs should be used for decommissioning, consistent

> with this Policy. The alternative approaches available to conduct decommissioning projects typically are clear and very limited. This often will eliminate the need for the more thorough analysis of alternatives required for remedial actions. NTCRA requirements provide greater flexibility to develop decommissioning plans that are appropriate for the circumstances presented. Statutory time and dollar limits on removal actions do not apply to removal actions conducted by DOE, which increases the scope of projects that may be addressed by DOE removal action. Most importantly, NTCRAs usually will provide benefits to worker safety, public health, and the environment more rapidly and cost effectively than remedial actions. For these reasons, DOE may exercise removal action authority to conduct decommissioning whenever such action is authorized by CERCLA, the NCP, and Executive Order 12580.

Performance of this removal action will place the buildings/structures and debris in a configuration that is protective of human health and the environment. Without decommissioning these buildings/structures and cleaning up debris, a potential threat of release of hazardous substances exists; without action, adverse threats to human health and the environment eventually could occur.

The NCP (40 CFR.300.415(b)(2)) establishes factors to be considered in determining the appropriateness of a removal action. Those factors include the following:

- *Hazardous substances or pollutants or contamination in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release.* Hazardous substances, including radioactive substances, are contained within the 200 West Area Tier 2 buildings/structures. These substances pose a threat of accidental release that may result from equipment failure resulting from a fire or seismic event.
- *Other situations or factors are present that may pose threats to public health or the environment*.

Hazardous substances are present as fixed contamination within the buildings/structures and equipment. These substances pose a threat of release as fixed contamination becomes exposed and as structural integrity is compromised, resulting in a potential direct exposure of nearby personnel and the environment, and exposure to the public through airborne radioactive contaminants. Degradation may not be fully addressed by surveillance and maintenance (S&M) activities and the risk of release of hazardous substances will increase as degradation continues or goes undetected.

As the lead federal agency, DOE has determined that a removal action is an appropriate means to support the final end state and achieve environmental review requirements. The U.S. Environmental Protection Agency (EPA), as the lead regulatory agency, concurs that an NTCRA is warranted to place these excess buildings/structures and debris in a configuration that is protective of human health and the environment. This NTCRA will, to the extent practicable, contribute to the efficient performance of any anticipated long-term remedial action, as required by the NCP (40 CFR 300.415(d)).

This EE/CA identifies the objectives of the removal action and analyzes the effectiveness, implementability, and estimated cost of the proposed action to satisfy these objectives. This EE/CA also proposes to mitigate the threat to site workers, the public, and the environment by disposing generated waste at the Environmental Restoration Disposal Facility (ERDF). In accordance with Executive Order 12580, *Superfund Implementation*; and Section 7.2.4 of the Tri-Party Agreement Action Plan (Ecology et al., 1989b), DOE proposes to perform near-term deactivation, decontamination, decommissioning, and demolition (D4) of buildings/structures identified as Tier 2 in the 200 West Area, with S&M as needed as detailed in this EE/CA.

Removal action activities taken pursuant to this NTCRA will be conducted in compliance with DOE et al., 2012, *Hanford Federal Facility Agreement and Consent Order*, *Hanford Public Involvement Plan*, and public participation requirements established in the NCP (40 CFR 300.415(n)) and any applicable DOE policies. This EE/CA will undergo a 30-day public comment period. After the public comment period, a written response to significant comments will be provided in accordance with 40 CFR 300.820(a), "Administrative Record File for a Removal Action." The 30-day public comment period will also constitute the public review period for removal of 200 West Tier 2 building/structure fugitive sources from AOP-00-05-06, *Hanford Site Air Operating Permit, Renewal 2 – Revision A* (hereinafter called the AOP). After considering the comments received from the public, DOE will confer with EPA in the issuance of an action memorandum (AM). The AM will identify the selected alternative, which may be the alternative recommended or one of the other alternatives discussed in this EE/CA.

As a part of transitioning the Hanford Site facilities and emission units from an AOP basis, the AOP includes an agreement for transition, *contained in* the *Standard Terms and General Conditions Statement of Basis*. This provides an agreed upon process *for removing facilities from* the *Hanford Title V Air Operating Permit* upon the start of CERCLA work activities. After public comment of the EE/CA, a signed AM, a removal action work plan (RAWP), and a sampling analysis plan addressing all ARARs are approved and issued prior to start of CERCLA work activities. A Notice of Transition for the emission unit(s) will be provided to the regulatory agencies for review. The Notice of Transition will list an effective date (not the approval date) which will coincide with the onset of CERCLA field activities covered under this removal action. DOE is no longer required to certify to the AOP requirements after the onset of the field activities covered under the removal action. The necessary air emission controls will be described in the RAWP.

1.1 Purpose and Scope

This EE/CA evaluates the proposed alternatives for meeting the DOE goal of reducing the risk to human health and the environment at the 200 West Tier 2 buildings/structures by removing or stabilizing waste. The buildings/structures are located within the 200 West Area on the Hanford Site Central Plateau. DOE, in consultation with EPA, will use this EE/CA as the basis for selecting a removal action to mitigate potential risks to human health and the environment. Development of an AM, which will document the selected removal action alternative, will be based upon this EE/CA and public comments. An RAWP will be prepared to document cleanup standards and removal action methods.

Each building/structure addressed by this NTCRA is described in Section 2.2. Each building/structure was evaluated using a graded approach to establish its designation as Tier 2, based on the presence of hazardous substances that could be released to the environment. A "Facility Evaluation" was performed as required by Section 8.1.4 in the Tri-Party Agreement Action Plan (Ecology et al., 1989b), for the buildings/structures addressed by this NTCRA.

DOE may need to disposition other Hanford Site buildings/structures with similar characteristics, contaminants, and complexity to those identified in Section 2.2. Any future Tier 2 candidate buildings/structures in the 200 West Area will be evaluated in accordance with Section 8.1.4 in the Tri-Party Agreement Action Plan for potential addition to the scope of this NTCRA. Buildings/structures determined to qualify as Tier 2 will be added to Appendix J of the Tri-Party Agreement Action Plan and the AM issued as a result of this EE/CA. If buildings/structures are added or removed from the scope of this NTCRA, concurrence from the lead regulatory agency would first be obtained, and documentation would be placed in the Administrative Record for this NTCRA, identifying the building/structure and explaining why it is being added to or deleted from the NTCRA. Appendix J then would be revised to address the change.

1.2 Regulatory Overview

The President of the United States is given authority by CERCLA Section 104, "Response Authorities," when there is a threat to public health or welfare of the United States or to the environment, to take any appropriate removal action to abate, prevent, minimize, stabilize, mitigate, or eliminate the release or threat of release of contaminants into the environment. This authority is delegated to DOE, as the CERCLA lead agency by the NCP (40 CFR 300, Subpart B, "Responsibility and Organization for Response"), through Executive Order 12580. Expedited response actions are addressed by Section 7.2.4 in the Tri-Party Agreement Action Plan and paragraph 21 of the legal agreement (Ecology et al., 1989b), which cites and is consistent with Executive Order 12580.

In anticipation of the National Priorities List (NPL) designation (40 CFR 300, Appendix B, "National Priorities List"), DOE, EPA, and the Washington State Department of Ecology (Ecology) (collectively referred to as the Tri-Parties) entered into Ecology et al., 1989a, *Hanford Federal Facility Agreement and Consent Order* (hereinafter called the Tri-Party Agreement), which established a procedural framework and schedule for developing, implementing, and monitoring CERCLA response actions at the Hanford Site. The Tri-Party Agreement ensures compliance with remedial and/or removal action requirements under CERCLA and other environmental regulations including closure and post-closure requirements under the *Resource Conservation and Recovery Act of 1976* (RCRA). Section 8.0 of the Tri-Party Agreement Action Plan (Ecology et al., 1989b) outlines the approach for identifying buildings/structures that present sufficient potential environmental concern for which coordination of the decommissioning process with cleanup activities under the Tri-Party Agreement would be deemed necessary.

Appendix J of the Tri-Party Agreement Action Plan (Ecology et al., 1989b) lists facilities that are not fully addressed under Sections 6.0 or 7.0 of Ecology et al., 1989a, *Hanford Federal Facility Agreement and Consent Order* (hereinafter called the Tri-Party Agreement) and that have been determined by the Tri-Parties, in accordance with Section 8.0, to be subject to removal or remedial action under CERCLA. Each facility listed in Appendix J that has undergone an evaluation, as required by Section 8.1.4 of the Tri-Party Agreement Action Plan (Ecology et al., 1989b), is designated as a Tier 1 facility or a Tier 2 facility. If the facility has not yet been categorized, it is identified as to be determined (TBD).

2 Site Characterization

This chapter provides a general site description and background for the 200 West Area Tier 2 buildings/structures, as well as a more detailed description of each building/structure included in the scope of this EE/CA. This chapter also provides information about previous shutdown activities and current conditions that justify a removal action.

2.1 Site Description and Background

The Tier 2 buildings/structures in the scope of this NTCRA are located in the 200 West Area of the Hanford Site. The 200 West Area includes several canyon complexes (Reduction-Oxidation [REDOX], Plutonium Finishing Plant [PFP], U Plant, and T Plant), tank farms (S Farms, U Farm, and T Farms), and miscellaneous buildings/structures. The 200 West Area is located approximately 22 mi north-northwest of Richland, Washington, in an industrialized portion of the Central Plateau. Highway 240 is southwest of the 200 West Area, and the Columbia River is north-northeast (Figure 1).

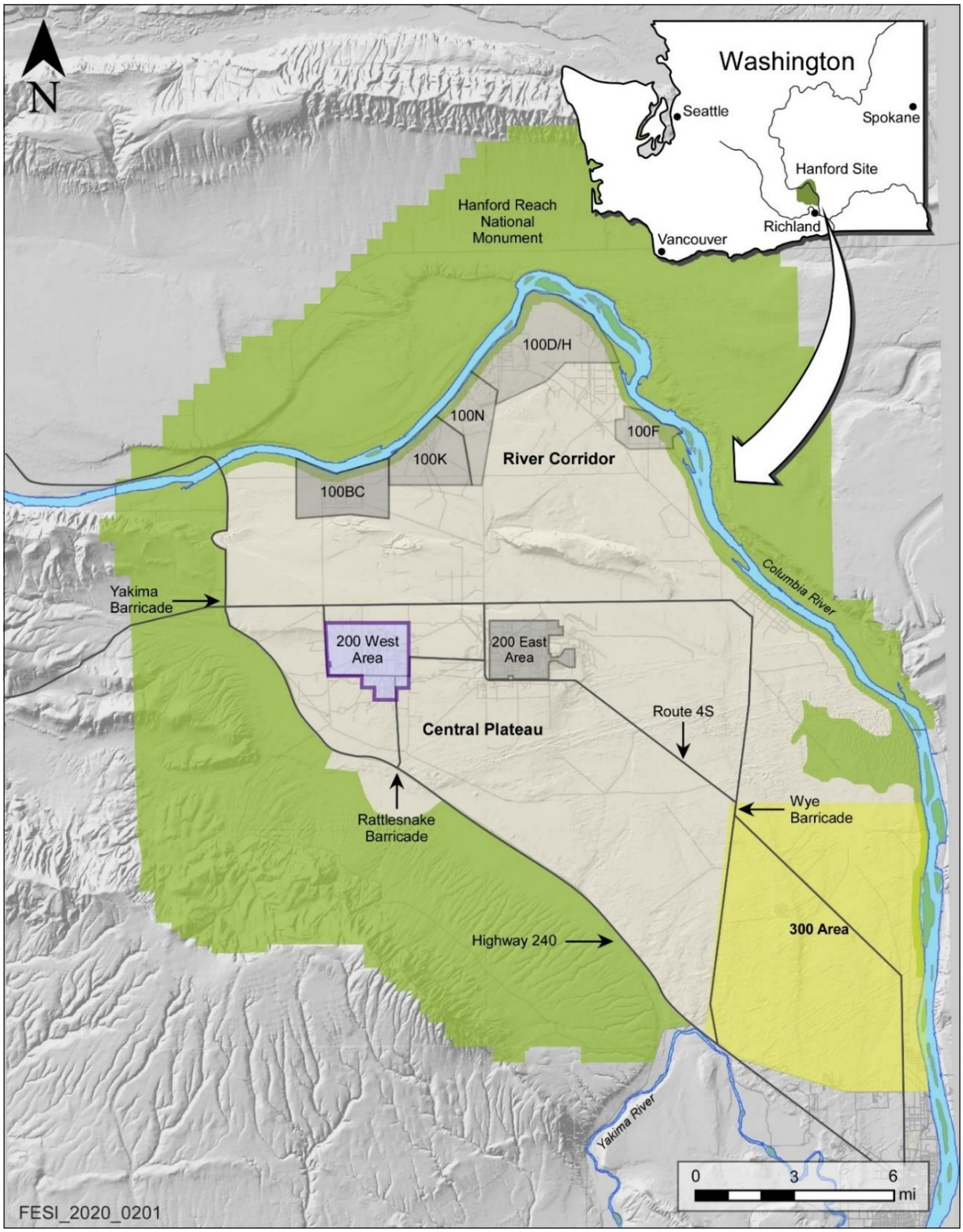

Figure 1. Hanford Site and 200 West Area Location

Public access to the Hanford Site is currently restricted and controlled at the Wye Barricade on Route 4 and the Yakima and Rattlesnake Barricades on State Highway 240. Unauthorized access to the 200 West Area is prohibited. The 200 West Area is surrounded by a 6 ft cyclone fence and has a limited number of entrances.

2.1.1 Background

The buildings/structures within the scope of this EE/CA were built between 1944 and 1988 and are within the 200 West Area. These buildings/structures supported various operations throughout the 200 West Area and can be grouped into the following general categories: laboratories, evaporators, or buildings/structures with miscellaneous purposes.

The Tier 2 buildings/structures in the 200 East Area are currently undergoing a removal action and therefore provide an example for other Tier 2 buildings/structures on the Hanford Site. An AM has been issued and authorizes a removal action for the 200 East Area Tier 2 buildings/structures that includes S&M and D4 activities (DOE/RL-2010-102, *Action Memorandum for Decontamination, Deactivation, Decommissioning, and Demolition (D4) Activities for 200 East Tier 2 Buildings/Structures*). Three separate RAWPs (DOE/RL-2016-47, *Removal Action Work Plan for the PUREX Complex Tier 2 Buildings/Structures*; DOE/RL-2016-50, *Removal Action Work Plan for the 200 East Tier 2 Miscellaneous Buildings/Structures*; and DOE/RL-2016-46, *Removal Action Work Plan for the B Plant Complex Tier 2 Buildings/Structures*), which describe the activities necessary to complete the removal action, have also been issued for Tier 2 buildings/structures in the 200 East Area. These documents authorize and describe the removal action for 200 East Area Tier 2 buildings/structures and therefore provide a framework for the 200 West Area Tier 2 buildings/structures removal action.

2.1.2 Physical Setting

The Hanford Site encompasses approximately 580 mi^2 in southeastern Washington State (Figure 2). It is north of the confluence of the Columbia, Yakima, and Snake Rivers. The Columbia River flows east through the northern part of the Hanford Site and, turning south, forms the eastern boundary. The Yakima River runs along part of the southern boundary and joins the Columbia River at the City of Richland, which bounds the Hanford Site on the southeast.

The Hanford Site lies east of the Cascade Mountains and has a semiarid climate caused by the rain-shadow effect of the mountains. Climatological data are monitored at the Hanford Meteorological Station, which is located between the 200 East and 200 West Areas. Weather stations are located throughout the Hanford Site. The seasonal average winter temperature (December through February) is 33.7°F, and the seasonal average summer temperature (June through August) is 73.7°F. The average normal maximum temperature is 91.6°F in July, and the average normal minimum temperature is 24.6°F in January (PNNL-15160, *Hanford Site Climatological Summary 2004 with Historical Data*). Average annual precipitation is 6.98 in. Most precipitation occurs during late autumn and winter, with more than half of the annual amount occurring from November through February.

2.1.3 Geology and Hydrology

The Hanford Site lies in a sediment-filled basin on the Columbia Plateau in southeastern Washington. The buildings/structures are located in the 200 West Area, which is in the Pasco Basin, a topographic and structural depression in the southwest corner of the Columbia Basin physiographic subprovince. Generally, this subprovince is characterized as relatively flat, low-relief hills with moderately incised river drainages.

The Columbia Basin subprovince is underlain by the Columbia River Basalt Group, which consists of a thick sequence of Miocene basalt flows that can be greater than 1.8 mi thick in the Pasco Basin. The suprabasalt sediments are approximately 555 ft thick and consist primarily of the Pliocene Ringold Formation fluvial and lacustrine deposits and Pleistocene Hanford formation flood deposits. Elevations across the central portion of the basin and the Hanford Site range from about 390 ft above mean sea level at the Columbia River to 3,480 ft above mean sea level at Rattlesnake Mountain, which forms the southwestern boundary of the site. Regional soil in the Hanford Site area is highly permeable. Soil in the 200 West Area is characterized as predominantly silty sand and gravelly sand.

Groundwater generally occurs under confined conditions within the sedimentary interbeds associated with the basalt sequence and under unconfined conditions within the overlying sedimentary section (uppermost aquifer). Regional groundwater flow in the 200 West Area is toward the north, east, and southeast, occurring primarily within the Ringold Formation. Depth to groundwater in the 200 West Area ranges from 260 ft in the southeast corner to 337 ft in the northwest corner. The primary source of aquifer recharge on the Hanford Site is precipitation. Estimates of recharge from precipitation range from 0 to 4 in./yr and are largely dependent upon soil texture and the type and density of vegetation. The Columbia River is the primary discharge area for both the unconfined and confined aquifers.

The Columbia River and its tributary (the Yakima River) are the primary Hanford Site surface water features. Other noted surface water features are Columbia River shoreline springs, springs on the Fitzner/Eberhardt Arid Lands Ecology Reserve on Rattlesnake Mountain, and West Lake. West Lake, which is about 12.85 ac and less than 3 ft deep, is the only natural lake on the Hanford Site.

Two ephemeral creeks, Cold Creek and Dry Creek, traverse the uplands of the Hanford Site southwest and south of the 200 West Area. The confluence of the two creeks is 3 mi southwest of the 200 West Area. Both creeks are upgradient from the 200 West Area and should not be affected by activities addressed in this EE/CA.

2.1.4 Anticipated Future Land Use

The reasonably anticipated future land use for the portion of the Inner Area where the Tier 2 buildings/structures are located is designated as industrial.

DOE worked for several years with cooperating agencies to define land-use goals for the Hanford Site. The cooperating agencies and stakeholders included the National Park Service, Tribal Nations, the states of Washington and Oregon, local/county and city governments, economic and business development interests, environmental groups, and agricultural interests. Drummond, 1992, *The Future for Hanford: Uses and Cleanup: The Final Report of the Hanford Future Site Uses Working Group*, was an early product of the efforts to develop land-use assumptions. The report recognized that the Central Plateau would be used for waste management activities for the foreseeable future. Following the report, DOE issued DOE/EIS-0222F, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (hereinafter called the HCP EIS), the associated record of decision (ROD) in 1999 (64 FR 61615, "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS)"), and a supplement analysis in 2008 (DOE/EIS-0222-SA-01, *Supplement Analysis: Hanford Comprehensive Land-Use Plan Environmental Impact Statement*).

The HCP EIS (DOE/EIS-0222F) analyzed the potential environmental impacts of alternative land-use plans for the Hanford Site and considered the land-use implication of ongoing and proposed activities. Under the preferred land-use alternative selected in the HCP EIS ROD (64 FR 61615), the Central Plateau was designated for industrial-exclusive use, defined as areas "suitable and desirable for management of hazardous, dangerous, radioactive, and nonradioactive waste, as well as related activities." The 2008

supplemental analysis reconfirmed the land-use designations in the HCP EIS (DOE/EIS-0222F) and clarified that the comprehensive land-use plan will remain in effect as long as DOE retains legal control of some portion of the Hanford Site, which is expected to be longer than 50 years.

The area designated as the Central Plateau in the Drummond (1992) report and the HCP EIS (DOE/EIS-0222F) is only a portion of the area now commonly known as the Central Plateau. The current 75 mi^2 area encompassed by the Central Plateau also includes a portion of the land known in previous documents as all other areas, with a designated land use of conservation (mining). The Inner Area portion of the Central Plateau is contained within the area designated for industrial/industrial-exclusive land use. At approximately 10 mi^2, the Inner Area covers about half of the industrial-exclusive area and is defined by DOE as the final footprint area of the Hanford Site that will be dedicated to permanent waste management and containment of residual contamination.

2.1.5 Cultural Resources

A Section 106 cultural resource review (*National Historic Preservation Act of 1966*) has not been completed for removal action activities. The cultural resources review process will ensure compliance with Section 106 and the provisions of DOE/RL-96-77, *Programmatic Agreement Among the U.S. Department of Energy, Richland Operations Office, the Advisory Council on Historic Preservation, and the Washington State Historic Preservation Office for the Maintenance, Deactivation, Alteration, and Demolition of the Built Environment on the Hanford Site, Washington*. As appropriate, walkthroughs of the building/structures may need to be conducted before demolition to finalize all mitigation requirements. Cultural resource review documentation for any specific building/structure would be finalized before removal action activities begin. Tagged artifacts (if they can be removed) would be collected for long-term curation. Tagged artifacts that cannot be removed would be photographed or documented. At the time of removal, assessments would be made regarding options and the feasibility of long-term curation of tagged artifacts.

Hanford Site buildings/structures have been evaluated for their National Register of Historic Places eligibility as part of DOE/RL-97-56, *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan*. Some buildings/structures have been determined to be contributing properties to the Manhattan Project/Cold War Era Historic District, with mitigation in the form of documentation required. DOE/RL-97-56 also requires that walkthroughs of these buildings/structures be completed to identify artifacts that are of educational and interpretive value.

2.1.6 Ecological Resources

The land area around the buildings/structures addressed by this NTCRA has been disturbed by construction and site operations. Because most of the proposed action would occur in previously disturbed areas, the potential for affecting sensitive ecological resources is expected to be minimal. Ecological reviews would be conducted before work begins to identify areas where the potential exists for adverse impacts to sensitive or rare biological resources, consistent with existing routine procedures (DOE/RL-95-11, *Ecological Compliance Assessment Management Plan*).

The buildings/structures have the potential to support nesting by migratory birds; therefore, structure-specific surveys must be conducted at each building/structure prior to beginning removal action activities. Project engineers would consult with the ecological compliance staff well in advance of planned removal action activities to allow for sufficient surveys. If any nesting birds (if not a nest, a pair of birds of the same species or a single bird that will not leave the area when disturbed) are encountered or suspected, removal activities shall be evaluated before continued work. Buildings/structures may also have the potential to provide roosting habitat for various species of bats. Communal roost sites for many bat species are considered a high conservation priority for the Washington Department of Fish and

Wildlife. Surveys for bats would be performed at each building/structure prior to commencement of removal action activities, and appropriate mitigation would be developed if any bats are found.

No plant or animal species listed as threatened or endangered under the federal *Endangered Species Act of 1973*, or candidates for such protection, are known to be in the vicinity of the buildings/structures planned to undergo removal action activities. Very little native or natural habitat is present near the buildings/structures planned to undergo removal action activities. Care will be taken to avoid or minimize damage to any native vegetation, especially shrubs near the buildings/structures.

Impacts on ecological resources would continue to be mitigated in accordance with DOE/RL-96-32, *Hanford Site Biological Resources Management Plan*.

2.2 Building/Structure Descriptions

This section describes the buildings/structures within the scope of this EE/CA and summarizes the processing history at these locations. The buildings/structures subject to the removal action proposed in this EE/CA are listed in Table 1 and depicted in Figure 2.

Table 1. 200 West Area Tier 2 Buildings/Structures within the Scope of This EE/CA

Structure Identification	Building/Structure Name
213W	Waste Compactor Building
231Z	Materials Engineering Laboratory
242S	Evaporator Facility
242T	Waste Disposal Evaporator Building
242TB	Vent House
292S	Jet Pit House
292T	Fission Products Release Laboratory

EE/CA = engineering evaluation/cost analysis

Figure 2. 200 West Area Tier 2 Buildings/Structures

2.2.1 213W Waste Compactor Building

The 213W Waste Compactor Building is an 853 ft^2, pre-engineered metal building constructed in 1985. The 213W Building has three rooms including a personnel entry room, a package inspection room with a roll-up garage door, and a compactor room. The compactor room was maintained at a slight negative pressure during operation and ventilated through two high-efficiency particulate air (HEPA) filters to an external, 29 ft, monitored exhaust stack. All rooms were protected by a fire suppression system. Floor drains are connected to an inactive, underground catch tank (213WTK1). The facility was used to compact low-level waste to approximately 10% of its original volume for disposal in the 200 West Area Low-Level Waste Burial Grounds.

Waste compaction activities ceased in 1994 and the building was occasionally used for equipment maintenance and repair activities. The 213W Building is currently empty and is expected to contain residual radiological contamination.

2.2.2 231Z Materials Engineering Laboratory

The 231Z Materials Engineering Laboratory was constructed in 1944 and was originally called the 231Z Isolation Building. The 231Z Building was originally 28,000 ft^2, but multiple additions were added to the building, bringing it to a total of 62,312 ft^2. From 1945 to 1957, it was used to purify and dry plutonium nitrate solution for the final step of the plutonium extraction process at T Plant. In 1957, the 231Z Building became a Plutonium Metallurgy Laboratory. Plutonium metallurgical research, fabrication development, and metallurgy work for weapons development was carried out until 1975. From 1978 to 1982, gloveboxes and equipment from the 300 Area were brought to the 231Z Building as part of a cleanup effort in the 300 Area. In 1982, a soils and sedimentation characterization laboratory was established in the 231Z Building, where experiments to characterize contaminated crib soils were conducted.

Plutonium and americium were measured by nondestructive assay in 2008 in various components of the processing areas in the 231Z Building. Inventory reduction was performed in 2008 that included removal of select equipment containing source material, applying fixative to two HEPA filter units, and isolating floor drains. Removed equipment includes a HEPA filter unit, chemicals from a cell, and gloveboxes. The 231Z Building was downgraded to a less than hazard category 3 facility after completion of the inventory reduction. Gloveboxes and other equipment still remain in the 231Z Building, but there are currently no operating processes. It is a beryllium-controlled facility and there is a beryllium-controlled area in the northern part of the building. There is also a radiological buffer area boundary around the building.

2.2.3 242S Evaporator Facility

The 242S Evaporator Facility includes two adjoining, but structurally independent sections (Structure A and Structure B) that were built in 1972. Structure A is the process and service area and is constructed of reinforced concrete walls and slab floors. Structure B houses the operating and support areas and is constructed of concrete block walls and structural steel. The 242S Facility was used to reduce the volume of low-level radioactive waste through evaporation and concentration. It contained controls for the tank waste transfer system in addition to major pieces of equipment, including a separator, reboiler, three condensers, an ion-exchange column, condensate catch tank, effluent tank, anti-foam tank, flow measurement tank, decontamination tank, de-entrainment tank, acid storage tank, and a floor sump.

The 242S Facility was shut down in 1985, which included flushing and draining process systems to remove radioactive liquids. Radiological and chemical contamination is expected to be present within the building. The condensate catch tank contains approximately 8,000 to 9,000 gal of unknown residual waste and the floor sump contains an undetermined amount of contaminated floor drainage. The 242S Facility is

currently posted as a radiation area, underground radioactive material area, fixed contamination area, contamination area, airborne radioactivity area, and high-radiation area. It is also a beryllium-controlled facility.

2.2.4 242T Waste Disposal Evaporator Building

The 242T Waste Disposal Evaporator Building, built in 1951, is a 2,762 ft^2 reinforced concrete and structural steel building. It consists of a control area, an evaporator area, and a condensate area. The evaporator area has a feed cell, an evaporator vessel, a cyclone separator, a catch tank, and two preheater tanks. The condensate area has offgas vessels, two condensate catch tanks, and a sample gallery. From 1951 to 1955 and 1965 to 1976, the 242T Building operated as a tank waste evaporator. The evaporator was used to increase the storage capacity in the underground single-shell tanks through a batch evaporation, waste concentration process. From 1976 to 1980, the 242T Building was used to neutralize PFP salt acid waste. This process ended in 1980, with the construction of the 244-TX Double-Shell Receiver Tank. From 1980 to 1985, the control area of the facility was used to support the saltwell pumping program. The 242T Building is also associated with the 242TB Vent House and the 242TA Vault.

The 242T Building is posted as a contamination area. Radioactive hazards remain in the 242T Building, but specific conditions of the building and the status of the equipment are not known.

2.2.5 242TB Vent House

The 242TB Vent House was built in 1973 and is a 192 ft^2 pre-engineered metal building on a reinforced concrete slab. It consists of a mechanical area, an electrical room, and an exhaust system with a 22.5 ft tall stack. The 242TB Building housed water piping and provided ventilation capabilities for the 242TA Vault, which is a concrete lined pit with a ground-level steel cover that contains a 4,000 gal receiver tank. The 242TA Vault is not within the scope of this EE/CA because it is a waste site (242-TA-R1) that will be addressed as part of a separate remedial action. The vault information, however, is described in this section for completeness.

The 242TB Building is within the contamination area boundary of the TX Tank Farms. Radioactive hazards remain, which are related to the 242TA Vault. The 242TB Building may still vent the 242TA Vault. The 242TA Vault has the following radiological postings as of 2018: radiation area, underground radioactive material area, radiological buffer area, radioactive material area, fixed contamination area, and high-contamination area. The status of remaining equipment is not known.

2.2.6 292S Jet Pit House

The 292S Jet Pit House is made of concrete and was built during construction of the REDOX Complex in 1951. It was the control point of discharge jets on dissolver vessels within Cells A, B, and C of the 202S Canyon Building. The 292S Building has two associated pits: an exhaust jet pit and a pit with a Drain Seal Tank (TK-191). The exhaust jet pit, constructed of concrete, is located directly beneath the 292S Building and housed a tank in addition to jets and actuators that controlled discharges from both the 291S Building and from dissolver vessels within the 202S Canyon Building. The second pit, located adjacent to the exhaust jet pit, is covered by exterior cover blocks. It is a 35 ft deep pit that contains the Drain Seal Tank for vent lines from the 202S Canyon Building and a sump that collects liquid from all vents and trenches in the 291S and 293S Buildings. Condensate from the 291S001 Stack also drains to the Drain Seal Tank. Before REDOX Complex operations ended, the liquid condensate remaining in the sump was jetted into the Drain Seal Tank and then to D Cell in the 202S Canyon Building.

The 292S Building is inactive. In 1998, it was reported that approximately 7 ft of water remains in the pit with the Drain Seal Tank. The 292S Building contains mixed fission products, plutonium, and americium present as surface contamination on tanks, piping, concrete, and in contaminated liquid waste.

2.2.7 292T Fission Products Release Laboratory

The 292T Fission Products Release Laboratory is a 930 ft^2 structure made of concrete and concrete block that was built in 1945. It originally housed the 291T stack gas sampling system to support 221T offgas monitoring. In the 1960s and 1970s, Battelle used the building to conduct fuel failure analyses of irradiated fuel rods. Irradiated N Reactor fuel rods were heated in an induction furnace until rupture or failure occurred, and any material that remained on the outer surface was dissolved with nitric acid. The remaining solution of trace amounts of irradiated fuel and nitric acid was poured into two adjacent underground storage tanks through risers. The solution in the tanks was then neutralized with sodium hydroxide. Neutralization caused the dissolved metals to precipitate and deposit in the tank bottoms.

The 292T Building is inside a contamination area boundary. It is known to contain radiological, biological, and chemical contamination. In 2008, it was documented that part of the roof had rotted away and exposed the interior to the atmosphere, which allowed for animal intrusion/biological contamination. The status of remaining equipment is not known.

2.3 Previous Investigations and Removal Actions

Various soil and groundwater investigations have been conducted within the 200 West Area. None of these investigations, however, were related to the buildings/structures addressed by this NTCRA. No previous removal action has been performed on the buildings/structures addressed by this NTCRA.

Multiple buildings/structures within the 200 West Area that are not part of this removal action have been removed or are planned to be removed under DOE/RL-2010-33, *Removal Action Work Plan for Central Plateau General Decommissioning Activities.*

2.4 Source, Nature, and Extent of Contamination

The buildings/structures are contaminated, to different degrees, with both radioactive and chemical substances that were used or generated during operations and waste management activities in the 200 West Area. Some of the hazardous substances were removed from the buildings/structures during shutdown or as part of routine S&M activities, but hazardous substances still remain. In addition to radiological and chemical hazards, structural hazards exist due to the degradation of structural integrity. Structural degradation could result in partial or total loss of radiological material, confinement, and/or worker injury.

The types of waste likely to require disposal under this NTCRA include, but are not limited to, inorganic and organic chemicals, solid waste, low-level radioactive waste, asbestos, radioactively contaminated asbestos waste, beryllium, and polychlorinated biphenyl (PCB) waste. Transuranic (TRU) waste may also be present. Resources (i.e., historical information, process knowledge, radiological survey reports, occurrence reports, assessment reports, personnel interviews, characterization reports, vulnerability assessments, inspections, walkdowns, and knowledge of construction and other materials) will be used to characterize the remaining hazardous substances (e.g., within equipment and piping/drains) to facilitate removal action activities and associated waste disposal.

To support characterization, a sampling and analysis plan will be prepared in conjunction with the RAWP. As the lead regulatory agency for this action, EPA will approve the RAWP and the sampling and analysis plan.

2.4.1 Chemical Hazards

Chemical hazards may be present within the buildings/structures covered in this EE/CA. The buildings/structures contain some friable and/or nonfriable asbestos in the form of insulation, ductwork, gasket material, transite siding, and floor tiles, which will be confirmed through process knowledge and/or sampling and analysis, as needed. Additional chemical hazards present may include, but are not limited to, the following materials:

- Inorganic chemicals (e.g., arsenic, beryllium, cadmium, lead, mercury, silver, uranium, and zinc)
- Organic chemical residues (e.g., lubricants, oils, and PCBs)
- Asbestos and asbestos-containing material
- Refrigerants
- Corrosives (including both acids and caustics)

2.4.2 Radiological Hazards

The primary hazardous substances associated with the buildings/structures are radioactive materials. Primary radionuclide contaminants include, but are not limited to, uranium-234, uranium-235, uranium-238, plutonium-239/240, americium-241, and mixed fission products such as strontium-90, cesium-137, cobalt-60, europium-152, europium-154, and europium-155. The majority of contaminants are found in the form of adherent films and residues within the buildings/structures and remaining equipment.

2.4.3 Current Hazard Conditions

The buildings/structures in the scope of this EE/CA contain hazardous and radiological materials. Additional information about each building/structure is in Section 2.2.

2.5 Risk Evaluation

The buildings/structures addressed by this NTCRA are contaminated with hazardous substances including radiological contaminants, organic and inorganic chemicals, beryllium, and asbestos, but the precise inventory of the contaminants and contaminant quantities remaining in the buildings/structures is not known. The buildings/structures were used for radiological and chemical processing activities and some contain significant inventories of hazardous substances that would present an increased threat to human health and the environment if not addressed. Contaminants could be released directly to the environment through a fire; breach in a utility pipe, containment wall, or roof; or structure collapse as the buildings/structures age and deteriorate. Contaminants could also be released to the environment indirectly through animal and human intrusions. Historically, intrusion and spread of contamination by rodents, insects, birds, and other organisms has and continues to be a factor.

Built between 1944 and 1988, the buildings/structures within the scope of this EE/CA are now at risk of structural deterioration. Structural deterioration and minor contamination spread have been observed at one structure (292T Fission Products Release Laboratory), but the potential for this exists at all other buildings/structures within the scope of this EE/CA. Contamination may intensify as the buildings/structures continue to degrade and, if not timely addressed, the condition would present an imminent threat to human health and the environment.

In general, the risk of structure failure due to degradation would increase over time, and the risk of an accidental release would also increase the longer the buildings/structures await the eventual remedial action. Therefore, current conditions present a sufficient threat of release to the environment under

a continued S&M scenario to justify a NTCRA. Chapter 1 discusses the factors to be considered in determining the appropriateness of a removal action.

3 Identification of Removal Action Objectives

This chapter discusses the removal objectives developed for the evaluated alternatives to reduce the risks associated with the 200 West Area Tier 2 buildings/structures. The removal action objectives (RAOs) for this NTCRA are to perform a removal action in a manner that would, to the extent practicable, support the long-term and final cleanup goals for the 200 Area NPL (40 CFR 300, Appendix B) site. The RAOs were developed in conjunction with the reasonable anticipated land use, contaminants of concern, and potential applicable or relevant and appropriate requirements (ARARs). Threats to be addressed are the remaining radiological inventory and residual hazardous chemical contamination associated with past operations.

RAOs are general descriptions of what the removal action is expected to accomplish. They are defined as specifically as possible and usually address the following variables:

- Media of interest (e.g., buildings/structures, contaminated soil, and process and support equipment)
- Types of contaminants (e.g., radionuclides and inorganic and organic chemicals)
- Potential receptors (e.g., humans, animals, and plants)
- Possible exposure pathways (e.g., external radiation and ingestion)

As described in Section 2.4, potential contaminants that may be encountered during this removal action include radionuclides, inorganic and organic chemicals, and asbestos. The radionuclide and/or chemical contamination that may present a risk to human health and the environment is described in Section 2.5. The RAOs identified to reduce potential hazards related to the buildings/structures are defined in the following section.

3.1 Removal Action Objectives

The RAOs for this NTCRA are to perform D4 activities in a manner that would, to the extent practicable, support the long-term and final cleanup goals for the 200 Area NPL (40 CFR 300, Appendix B) site. The following RAOs were developed to complete this scope:

- **RAO #1:** Reduce the inventory and any potential threat to human health and the environment from an unacceptable exposure to hazardous and radioactive substances.
- **RAO #2:** Minimize the general disruption and adverse impacts to cultural resources and wildlife habitat.
- **RAO #3:** Safely treat, as appropriate, and dispose of waste generated by the removal action.
- **RAO #4:** Be consistent with anticipated remedial actions in the 200 West Area.
- **RAO #5:** Minimize or eliminate the need for future S&M activities.

3.2 Applicable or Relevant and Appropriate Requirements

The NCP states, “Removal actions...shall, to the extent practicable considering the exigencies of the situation, attain applicable or relevant and ARARs under federal environmental or state environmental or facility siting laws” (40 CFR 300.415(j)).

The evaluation of potential ARARs for this proposed NTCRA are provided in Appendix A. This section provides an overview of the ARARs process and a summary of those ARARs that potentially affect the development of RAOs.

Identification of ARARs is a site-specific determination involving a two-part analysis: determine whether a given requirement is applicable and if it is not applicable, determine whether it is relevant and appropriate. A requirement is deemed applicable if the specific terms of the law or regulation directly address the contaminants, remedial action, or place involved at the site. If the jurisdictional prerequisites of the law or regulation are not met, a legal requirement may nonetheless be relevant and appropriate if the circumstances of the site are sufficiently similar to circumstances in which the law otherwise applies, and it is well suited to the conditions of the site.

A requirement must be substantive in order to constitute an ARAR for activities conducted onsite. Procedural or administrative requirements such as permits and reporting are not ARARs.

As the lead federal agency, DOE has the primary responsibility to identify federal ARARs at the 200 West Area Tier 2 buildings/structures. ARARs are presented in Chapter 5 for each of the alternatives considered. A detailed discussion of all ARARs considered for this EE/CA is provided in Appendix A.

4 Identification of Removal Action Alternatives

The 200 East Area Tier 2 removal action provides a framework for D4 of Tier 2 buildings/structures. Using the same approach, the removal action alternatives proposed in this EE/CA for the 200 West Area Tier 2 buildings/structures are consistent with the removal action alternatives described in DOE/RL-2010-54, *Engineering Evaluation/Cost Analysis for the 200 East Area Tier 2 Buildings/Structures*.

The removal action alternatives addressed in this chapter must be protective of human health and the environment and otherwise meet the RAOs. Table 2 includes the three removal action alternatives identified for evaluation.

Table 2. Proposed Alternatives for the 200 West Area Tier 2 Buildings/Structures Removal Action

Alternative	Removal Action Description
1	• No Action
2	• Continued S&M (for at least 15 years) of 200 West Tier 2 buildings/structures with facility life-cycle upgrades (e.g., roof repairs) • Future D4 of 200 West Tier 2 buildings/structures
3	• Continued S&M of 200 West Tier 2 buildings/structures • Near-term D4 of 200 West Tier 2 buildings/structures

D4 = deactivation, decontamination, decommissioning, and demolition
S&M = surveillance and maintenance

The removal action activities included in the proposed alternatives are S&M and (future/near-term) D4. For cost comparison purposes, a 5-year period of S&M was assumed in the EE/CA for Alternative 3. However, the actual implementation period to initiate D4 of the Tier 2 buildings/structures is based upon environmental risk, funding priority, and availability of trained resources. Descriptions of these activities are provided in this chapter. All activities will be performed in a manner that protects the safety of

employees and the general public, minimizes spills and releases to the environment, and meets regulatory requirements. Worker health and safety will be addressed in site-specific work plans.

Waste generated during removal action activities would be characterized and segregated by waste type (e.g., TRU, low-level radioactive, mixed low-level radioactive, hazardous, and nonhazardous). In compliance with WAC 173-303, "Dangerous Waste Regulations," and the *Atomic Energy Act of 1954*, waste would be dispositioned at appropriate EPA-approved waste disposal facilities.

ERDF is the preferred disposal location because it is an engineered facility that provides a high degree of protection to human health and the environment. Historically it has been shown that this disposal location is more cost effective than other waste disposal sites. Construction of ERDF was authorized using a separate CERCLA ROD (EPA et al., 1995, *Record of Decision U.S. DOE Hanford Environmental Restoration Disposal Facility Hanford Site Benton County, Washington*). ERDF is engineered to meet appropriate RCRA technological requirements for landfills, including standards for a double liner, leachate collection system, leak detection, monitoring, and a final cover.

Hazardous, mixed, low-level, asbestos, and *Toxic Substances Control Act of 1976* waste can be accepted for disposal at ERDF (ERDF-00011, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*). Demolition debris will be transported to ERDF or other EPA-approved facilities, and treated, as necessary, to meet applicable land disposal restrictions and waste acceptance criteria prior to disposal.

If a generated waste stream does not meet ERDF acceptance criteria or TRU waste is generated, it would be moved to an onsite facility for storage and managed according to applicable waste acceptance criteria prior to disposal at the Waste Isolation Pilot Plant near Carlsbad, New Mexico (HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*).

4.1 Removal Action Activities

Each alternative, with the exception of Alternative 1, includes S&M and D4. Waste generated from these actions will be treated, if needed, and disposed. The following sections describe these action categories.

4.1.1 Surveillance and Maintenance

S&M activities will be performed in accordance with the most current S&M plan for the area/complex on a routine and nonroutine basis. Routine S&M activities ensure that structural and passive confinement integrity is maintained and may include access control, periodic monitoring for potential radiological contamination and other hazards, cold weather protection, maintenance, roof inspections, identification and minor repair of friable asbestos, and general visual inspections. Nonroutine activities include major responses to undesirable observations (e.g., a leak in one area spreading radiological contamination to another area). Nonroutine maintenance and other facility life extension operations (e.g., roof maintenance) may be performed to ensure that buildings/structures remain in a safe condition and that the ongoing deterioration process is minimized to control the potential for accidental release of radioactive materials and hazardous substances. Appropriate surveillance activities will be conducted based upon facility conditions during the removal action.

The objective of S&M is to ensure adequate containment of any contaminants left in place, provide physical safety and security controls, and maintain the buildings/structures in a manner that will minimize risk to human health and the environment. In accordance with these objectives, some areas within the scope of this EE/CA are not accessed during the S&M phase.

4.1.2 Deactivation, Decontamination, Decommissioning, and Demolition

The primary elements within D4 are deactivation, decontamination, decommissioning, and demolition. D4 activities would include removal of abovegrade buildings/structures. Buildings/structures that are partially or completely belowgrade would be either removed or left intact (with penetrations secured or blanked), and backfilled with inert material, as appropriate. Equipment, material, piping, and appurtenances may be removed prior to demolition. Backfill would consist of clean fill materials or grout. All activities will be performed in a manner that protects the safety of employees and the general public, minimizes spills and releases to the environment, and meets regulatory requirements. Worker health and safety will be addressed in site-specific work plans.

The buildings/structures in the scope of the removal action are at various stages in the D4 process. Some of the buildings/structures will require more D4 work than others based on the extent to which D4 activities have already been performed. The 231Z Building is an example of a building/structure that is further along in the D4 process. In 2008, inventory reduction was performed that included removing select equipment, applying fixative, and isolating pipelines. Additional D4 work will still be needed prior to demolition.

4.1.2.1 Deactivation

Deactivation is the process of placing a facility in a stable condition. Deactivation includes removing hazardous and radioactive materials to ensure adequate protection of workers, public health and safety, and the environment, thereby reducing the long-term cost of S&M. Activities may include draining and/or de-energizing systems, removal of stored radioactive and hazardous materials. At this time, the buildings/structures in the scope of this removal action have undergone deactivation to place them in a stable condition. Further deactivation activities may be required based on the varying levels of deactivation performed.

4.1.2.2 Decontamination

Decontamination is the removal or reduction of residual radioactive or hazardous materials by mechanical or chemical techniques. During decontamination, substances are removed from within and around the buildings/structures, as needed, prior to demolition. Decontamination is generally performed using dry methods (e.g., brushing, wiping, and using HEPA-filtered vacuum cleaners) to the extent possible. When the use of wet methods (e.g., water wash and pressure washers) is required to achieve decontamination objectives, the associated water or cleaning solutions will be collected, and work will be conducted in accordance with best management practices. More aggressive equipment decontamination methods (e.g., grinding or wet grit blasting) may be used if other methods fail. These methods would also be conducted using best management practices to minimize the potential for airborne contamination and waste generation.

4.1.2.3 Decommissioning

Decommissioning occurs at the end of the life of a facility to retire it from service with adequate regard for human health and the environment. Decommissioning may include equipment dismantlement. The ultimate goal of decommissioning is unrestricted release or restricted use of the site.

4.1.2.4 Demolition

Demolition is preceded by decontamination, deactivation, and decommissioning activities. Demolition includes removing abovegrade structures. Belowgrade structural components, such as basements, will be left intact (with penetrations secured or blanked) and backfilled or grouted, as appropriate. If warranted, belowgrade structures and/or related equipment may be removed to facilitate other removal activities surrounding the area, or as deemed necessary by the U.S. Department of Energy, Richland Operations

Office, to support overall cleanup goals and priorities. If evidence of contamination to surrounding soil is encountered that is directly associated with the building/structure being removed or from the demolition activity, those surrounding soils would be excavated and disposed at ERDF in accordance with ERDF waste acceptance criteria (ERDF-00011). Characterization will be performed to document any remaining contamination for follow-on S&M activities, creation of a new Waste Information Data System (WIDS) site under the Tri-Party Agreement (Ecology et al., 1989a), or addition of information to an existing WIDS site, and a future remedial action. The area will be stabilized (e.g., backfill, contour, and vegetate), as necessary and appropriate.

4.2 Alternative 1 – No Action

CERCLA requires the No Action alternative as a baseline for comparison with other removal action alternatives. Under this alternative, it is assumed that the 200 West Tier 2 buildings/structures would be abandoned without any further action. No legal restrictions, institutional controls, or active measures are applied to the buildings/structures in this alternative. S&M activities would be discontinued, no additional facility stabilization would be performed, and degradation would continue indefinitely. Initial risks to human health and the environment from the No Action alternative would be minimal and barring an unusual event, contaminants are assumed to remain confined within the buildings/structures. Risks over time are expected to increase as deterioration progresses and structural integrity is compromised. The possibility of a chemical and/or radiological contamination spread would increase due to lack of monitoring and controls. Physical hazards associated with partial to full structural collapse would also be anticipated.

Although Alternative 1 would not have an associated implementation cost under this analysis, it is understood that taking No Action would ultimately result in a substantial cost in the future. Alternative 1 is not consistent with DOE obligations under federal law to protect human health and the environment; therefore, this alternative cannot be considered viable and is not considered further in this EE/CA. This alternative is used as a baseline for comparison purposes only.

4.3 Alternative 2 – Continued S&M (for at least 15 years) with Future Decontamination, Deactivation, Decommissioning, and Demolition of Buildings/Structures

The primary elements of Alternative 2 are as follows:

- Continued S&M (for at least 15 years) of the 200 West Tier 2 buildings/structures
- Future D4 of the 200 West Tier 2 building/structures including:
  - D4 of abovegrade buildings/structures
  - Backfill/grouting of belowgrade structures, as necessary

The scope of each removal activity is described in the following sections.

4.3.1 Surveillance and Maintenance

Under Alternative 2, S&M activities for all 200 West Tier 2 buildings/structures would continue for at least 15 years. After 15 years, D4 and associated waste disposal activities would commence, and S&M would continue until final disposition of the facilities. S&M efforts are expected to increase over time due to continued aging of buildings/structures and components, as no near-term removal action activities will take place. Alternative 2 continues to delay the start of D4 activities and would require extensive expenditures for the continued S&M with life extension maintenance (e.g., roof repair/replacements) expected to be performed.

4.3.2 Future D4

Under Alternative 2, D4 for all 200 West Tier 2 buildings/structures would commence after 15 years of S&M. D4 activities are described in the following sections. Each building/structure will require varying degrees of D4 activities prior to demolition based on contamination, inventory, and complexity.

4.3.2.1 Deactivation

Deactivation activities would be performed for the buildings/structures on as as-needed basis and may consist of the following:

- Remove hazardous substances. Hazardous substances such as asbestos, beryllium, PCBs, lubricants, hydraulic oils, fuel oils, aerosols, corrosive liquids, and chemical residues will be drained and recycled or disposed, as appropriate.
- Plug or grout piping and/or drains entering or exiting buildings/structures belowgrade to prevent potential pathways to the environment.
- Isolate systems.

4.3.2.2 Decontamination

Decontamination would be performed only if needed to prevent spread of contamination during demolition activities. Hazardous substances on surfaces or embedded in structural materials (e.g., lead paint and heavy metals such as arsenic, cadmium, chromium, and selenium) may be fixed in place prior to demolition.

4.3.2.3 Decommissioning

Decommissioning will be performed prior to demolition. Equipment and other components will be removed from within and around the buildings/structures as necessary to facilitate demolition. Contaminated equipment will be characterized, decontaminated, stabilized, and/or removed as needed to support open-air demolition. The equipment will be fixed or stabilized, as necessary, for disposal. Items requiring special handling will be identified, clearly marked, and prepared for removal before beginning structure demolition. Demolition planning will ensure that these marked items will not be subjected to demolition techniques, as they require special handling. Overhead utilities would be dismantled and removed. Connected buildings/structures will be decoupled and isolated prior to demolition.

4.3.2.4 Demolition

Abovegrade buildings/structures, including fans, ductwork, and exhaust stacks, will be demolished. Removal of transite from buildings/structures will be performed prior to demolition. Buildings/structures will be demolished to slab-on-grade to minimize infiltration of precipitation to underlying soils. Belowgrade structures will be evaluated on a case-by-case basis, using a graded approach, to determine the appropriate disposition. In buildings/structures that have basements, equipment and components may be removed and the area stabilized, as appropriate, for radiological/hazardous constituents. The basements will subsequently be backfilled with clean materials to grade. Demolition/isolation of adjacent buildings/structures will be coordinated with this removal action, as appropriate.

Following demolition of each building/structure, the area would be stabilized (for example, backfill, contour, and vegetate), as needed. The waste site evaluation process will be initiated for components such as slabs or soil contamination areas that may require further work under a separate response action.

4.4 Alternative 3 – Continued S&M with Near-Term D4 of Buildings/Structures

Alternative 3 includes all activities in Alternative 2, but replaces future D4 with near-term D4, therefore shortening the S&M period. For cost comparison purposes, a 5-year period of S&M was assumed. S&M activities would be ongoing until final building/structure disposition, with no facility lifecycle upgrades being performed. Alternative 3 would ensure that any hazardous substances are placed in a protective and safe condition for the foreseeable future, without the need for extensive ongoing preventative measures and inspections.

5 Analysis of Removal Action Alternatives

Consistent with EPA 540-R-93-057, *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA*, this chapter evaluates the alternatives identified in Chapter 4 with respect to three criteria: effectiveness, implementability, and cost. Table 3 outlines the subcriteria used in this evaluation process. This analysis of alternatives considers that the removal activities performed under this EE/CA are short-term, interim measures to prevent potential harm to human health and the environment through D4 of the buildings/structures.

Table 3. Alternative Analysis Criteria

Primary Criteria	Subcriteria for Evaluating Alternatives
Effectiveness	1. Protectiveness • Overall protection of human health and the environment • Compliance with applicable or relevant and appropriate requirements • Long-term effectiveness and permanence • Reduction of toxicity, mobility, or volume through treatment • Short-term effectiveness
	2. Ability to meet removal action objectives
Implementability	3. Technical and administrative feasibility
	4. Availability of equipment personnel, services, and disposal facilities
Cost	5. No subcriteria; estimated costs include the following: • Capital costs • Operational and maintenance costs

State and public acceptance will be considered after the public have an opportunity to review and comment on this EE/CA. Each criterion is explained briefly in the following subsections, as well as a detailed analysis of each alternative relative to each criterion. The actions associated with each alternative are reiterated in Table 4.

Table 4. Description of Removal Action Alternatives

Alternative	Removal Action Description
1	• No Action
2	• Continued S&M (for at least 15 years) of 200 West Tier 2 buildings/structures with facility life-cycle upgrades (e.g., roof repairs) • Future D4 of 200 West Tier 2 buildings/structures
3	• Continued S&M of 200 West Tier 2 buildings/structures • Near-term D4 of 200 West Tier 2 buildings/structures

D4 = deactivation, decontamination, decommissioning, and demolition
S&M = surveillance and maintenance

5.1 Effectiveness of Removal Action Alternatives

The two subcriteria for evaluating effectiveness of the NTCRA are protectiveness and the ability to achieve RAOs. The protectiveness analysis determines whether implementation of the removal action alternative and its ability to meet CERCLA thresholds are adequate for the protection of human health and the environment. Overall protection of human health and the environment involves the elimination, reduction, or control of risks posed by likely exposure pathways. Environmental protection also includes avoiding or minimizing impacts to natural, cultural, and historical resources. Compliance with ARARs overlaps with the protectiveness criterion by addressing chemical-, location-, and action-specific requirements for protection of human health and the environment.

The analysis of long-term effectiveness and permanence considers the protectiveness of each alternative at the conclusion of the proposed removal action, after the RAOs have been met. The ability of each removal action alternative to reduce the toxicity, mobility, or volume (TMV) of contamination effectively is also evaluated. The short-term effectiveness criterion addresses protection of workers and human health and the environment during implementation of the proposed action.

The ability of each alternative to meet RAOs is evaluated as part of the analysis of alternatives. The primary focus of this evaluation is the effectiveness of the different removal activities and associated controls that may be required to manage risk to protect human health and the environment.

5.1.1 Protectiveness

Protectiveness is the primary objective of a removal action and is a threshold criterion that must be met to recommend an alternative. Alternatives were evaluated relative to the protectiveness of workers, the community, and the environment both during implementation of the removal action (short term) and after the removal objectives have been met as the buildings/structures await final disposition (long term). The removal action activities proposed under each alternative demonstrate protectiveness to varying degrees, based on the timeframe in which they are completed and their abilities to reduce or prevent releases of, and subsequent exposure to, hazardous substances.

5.1.1.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment considers the protectiveness during the removal action and the post-implementation conditions for each alternative.

The No Action alternative (Alternative 1) would fail to provide overall protection of human health and the environment from the buildings/structures because contaminated waste would remain in place without any measures to contain or monitor contaminants or control exposure pathways. Alternative 1 will not meet any of the five RAOs outlined in Chapter 3. Because Alternative 1 fails to provide overall protection of human health and the environment, it is not effective and, therefore, is no longer considered a viable alternative. This alternative will not be discussed further in the analysis of alternatives.

Alternatives 2 and 3 meet requirements for the overall protection of human health and the environment to varying degrees because waste would be removed, exposure pathways would be eliminated, and active monitoring would be performed to prevent or address deteriorating conditions, but the alternatives would complete the removal action in varying timeframes.

5.1.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

The ARARs identified for the removal action are presented in Appendix A. The removal action activities proposed under all alternatives would be performed and managed in a manner compliant with ARARs, including emissions standards; waste management; and requirements for the protection of natural, cultural, and historical resources.

5.1.1.3 Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence criterion assesses the risk from waste and residuals remaining at the conclusion of site activities. This criterion also evaluates whether the alternative contributes to future remedial action objectives.

Key considerations for long-term effectiveness and permanence are the physical condition of the buildings/structures over time and the amount of management needed to prevent a release of hazardous substances prior to final disposition. As the buildings/structures continue to age without active intervention, the potential for a release of and subsequent exposure to hazardous substances could increase.

Alternatives 2 and 3 support future remedial objectives because they provide interim to long-term protectiveness.

5.1.1.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives 2 and 3 provide reduction in the TMV of contaminants through the treatment or removal of contamination via D4. The removal of materials and waste from the buildings/structures for disposal at ERDF under all alternatives would transfer long-term impacts of contamination from one area to another to a certain degree, but because ERDF was designed for disposal and has a double leachate liner collection system, disposal at ERDF is more environmentally protective.

5.1.1.5 Short-Term Effectiveness

The short-term effectiveness criterion refers to any potential adverse effects on human health and the environment (including workers and the public) during the removal action implementation phases.

Short-term risks to workers would be present where D4 activities are performed because these actions increase potential near-term exposure to hazardous substances during removal. Physical and industrial risks also exist near-term during active demolition. Personnel would enter the contaminated buildings/structures for a focused amount of time and would handle contaminated materials. However, proper worker safety controls, the application of stringent health and safety procedures, as low as reasonably achievable principles, and engineering controls for each alternative would mitigate some short-term risk.

Similarly, performance of D4 activities would temporarily increase environmental emissions and potential fugitive dust during facility stabilization, demolition, and waste removal. Breaching of containments during D4 activities would also increase the likelihood of potential release and subsequent exposure to hazardous or radiological substances.

Strict adherence to environmental regulations and work controls would ensure short-term effectiveness in protecting human health and the environment under Alternatives 2 and 3.

5.1.2 Ability to Achieve Removal Action Objectives

This section evaluates the effectiveness of each alternative to meet the RAOs. Ability to achieve the RAOs effectively is considered at the end of the removal action. The RAOs for this NTCRA are described in Section 3.1.

Alternatives 2 and 3 achieve all of the RAOs with varying degrees of effectiveness. Both alternatives reduce potential threat to human health and the environment from an unacceptable exposure to hazardous and radioactive substances (RAO #1). Both alternatives have little disruption or impact to cultural resources and wildlife (RAO #2). All waste generated in the removal action will be managed and disposed in accordance with state and federal regulations (RAO #3). Both alternatives are consistent with anticipated future remedial actions (RAO #4) and would minimize future S&M needs (RAO #5).

5.2 Implementability of the Removal Action Alternatives

The implementability of a removal action is dependent upon the technical and administrative feasibility of the action, including availability of materials and services needed to perform the selected action, as well as state and community acceptance of the action. This section discusses the technical and administrative implementability of the proposed removal action alternatives for the buildings/structures.

5.2.1 Technical and Administrative Feasibility

Alternatives 2 and 3 are technically and administratively feasible. All proposed removal action activities could be performed using existing knowledge and procedures that have proven successful at the Hanford Site. The methods for performing D4 are consistent with Hanford Site projects of similar scope (e.g., D4 activities of other Tier 2 buildings/structures such as 242B and 242BL). Disposal and recycling services are available, both on or off the Hanford Site, for the types of waste expected to be generated under all alternatives. ERDF is anticipated to be available to receive most or all of the waste to be generated by the removal action activities. Administratively, all included actions would adhere to applicable laws and would have demonstrated success at the Hanford Site under projects of similar scope.

5.2.2 Availability of Equipment, Personnel, and Services

Equipment to support Alternatives 2 and 3 is either available at the Hanford Site or is commercially available. Equipment, personnel, and services required for D4 are consistent with resources and capabilities used elsewhere on the Hanford Site for similar actions. Front-end loaders and trackhoes with processor end effectors, as well as transport trucks, are available onsite. Cranes capable of heavy lifts are also available onsite or are commercially available. Advanced methods are available for cutting contaminated equipment.

Disposal and recycling services are available on or off the Hanford Site for the types of waste expected to be generated by the activities performed under Alternatives 2 and 3. ERDF or other EPA-approved facilities will be used for management and/or disposal of waste from activities addressed in this removal action. ERDF is anticipated to be available for onsite disposal of most or all of the waste generated by the removal action activities. The need for specialized materials, services, treatment technology, or disposal facilities is expected to be minimal for Alternatives 2 and 3.

If performed concurrently with other Hanford Site cleanup activities, trained personnel are available to perform the proposed removal action activities under each alternative. If performance of the removal action activities is delayed significantly relative to other Hanford Site cleanup, additional training and remobilization of a qualified work force may be required.

5.3 Cost of the Removal Action Alternatives

Cost estimates have been prepared for the removal action alternatives evaluated in this EE/CA. The estimates were prepared in accordance with EPA 540-R-00-002, *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study*, and DOE G 430.1-1, *Cost Estimating Guide*.

Table 5 shows the cost estimates for the three alternatives, starting from a present-day, nondiscounted cost (i.e., constant dollars). Nondiscounted costs assume that all work is performed today, and the costs are not affected by general price inflation (i.e., they represent units of stable purchasing power). Because nondiscounted costs do not reflect the changing value of money over time, presentation of this information under CERCLA is for informational purposes only and is not a factor in the selection of a response action alternative.

Table 5. Summary of Cost Estimates for the Alternatives

Alternative	Nondiscounted Cost	Net Present-Worth Cost
Alternative 1 – No Action	N/A*	N/A*
Alternative 2 – • Continued S&M (for at least 15 years) of 200 West Tier 2 Buildings/Structures • Future D4 of 200 West Tier 2 Buildings/Structures	$156,592,000	$149,167,000
Alternative 3 – • Continued S&M of 200 West Tier 2 Buildings/Structures • Near-term D4 of 200 West Tier 2 Buildings/Structures	$136,076,000	$135,235,000

Note: Accuracy range of the cost estimate is expected to be -30% to +50%. No sensitivity analyses were performed, and the following factors could impact the costs: level of contamination, amount and type of equipment in the buildings/structures, and differing structural design.

*Alternative 1 is not consistent with DOE obligations under federal law to protect human health and the environment; therefore, this alternative cannot be considered viable and is not considered further in this engineering evaluation/cost analysis, but it is included for comparative purposes only. Although Alternative 1 would not have an associated implementation cost under this analysis, it is understood that taking no action would ultimately result in cost to DOE.

DOE = U.S. Department of Energy
S&M = surveillance and maintenance
D4 = deactivation, decontamination, decommissioning, and demolition
N/A = not applicable

5.3.1 Cost Estimate Rationale

Consistent with guidance from EPA and the U.S. Office of Management and Budget, present-worth analysis is used as the basis for comparing costs of cleanup alternatives under the CERCLA program (OMB Circular No. A-94, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs"). A discount rate (OMB Circular No. A-94) is applied for cost estimates that span multiple years, making it possible to evaluate expenditures associated with the alternatives that occur during different periods (EPA 540-R-00-002). Because of the time-dependent value of money, future expenditures are not considered directly equivalent to current expenditures. The present-worth cost method shows the amount required at the initial point in time (e.g., in the current year) to fund 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 (e.g., similar to how money placed in a savings account gains value because of the interest paid on the account). Although the federal government typically does not set aside funds 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, although actual costs could vary. While the funds might not actually be set aside, the present-worth costs were considered directly comparable for evaluating the costs of each alternative.

The information in the cost estimate is based on the best available information regarding the anticipated scope of the removal action alternatives. Changes in the cost estimate are likely to occur due to new information collected during preparation and performance of the removal action. Consistent with EPA guidance, this is an order-of-magnitude engineering cost estimate that was developed to be within -30 percent to +50 percent of actual project cost.

5.3.2 Cost Estimate Information for Each Alternative

This section provides the costs for each alternative. S&M is expected to continue throughout the duration of the NTCRA at the current yearly cost. Table 6 provides the cost estimates for the removal action alternatives associated with each building/structure.

Table 6. Total Present Value Cost Comparison

Structure	Alternative 1	Alternative 2	Alternative 3	Estimated Waste Quantity (tons)
213W	$0	$419,000	$192,000	16
231Z	$0	$116,763,000	$106,112,000	2,800
242S	$0	$24,034,000	$21,830,000	1,500
242T	$0	$5,212,000	$4,703,000	1,200
242TB	$0	$98,000	$43,000	7
292S	$0	$872,000	$771,000	53
292T	$0	$1,769,000	$1,584,000	129
All structures	$0	$149,167,000	$135,235,000	5,700

Alternative 1 is presented with no cost solely based on the context of no action being taken to mitigate existing hazardous conditions posed by structural deterioration and contamination spread. In reality, if no action was taken, costs would ultimately be incurred in terms of adverse impacts to human health and the environment and could result in costlier actions in the future.

For Alternative 2, D4 of the 200 West Tier 2 buildings/structures commence after 15 years of only performing S&M. The cost estimate assumes an annual cost per year per building/structure for each year of S&M and includes facility lifecycle upgrades. Because the field D4 schedule is still undefined, an additional S&M period was assumed for each of the buildings/structures, in addition to capital costs of D4, for estimating purposes.

For Alternative 3, it was assumed that the removal action will start immediately. For cost comparison purposes, a 5-year period of S&M was assumed in the EE/CA for Alternative 3. However, the actual implementation period to initiate D4 of the Tier 2 buildings/structures is based upon environmental risk, funding priority, and availability of trained resources.

5.4 Summary of Removal Action Alternative Evaluation

Table 7 summarizes the ability of the alternatives to achieve NTCRA CERCLA criteria for effectiveness, implementability, and cost for the removal action activities described in Chapter 4.

Table 7. Criteria Analysis Summary

Alternative	Effectiveness		Implementability		Net Present-Worth Cost
	Protectiveness	Removal Action Objectives	Technical/ Administrative	Availability	
Alternative 1					
No Action	No	No	No	No	$0
Alternative 2					
• Continued S&M (for at least 15 years) of 200 West Tier 2 Buildings/Structures • Future D4 of 200 West Tier 2 Buildings/Structures	Yes	Yes	Yes	Yes	$149,167,000
Alternative 3					
• Continued S&M of 200 West Tier 2 Buildings/Structures • Near-term D4 of 200 West Tier 2 Buildings/Structures	Yes	Yes	Yes	Yes	$135,235,000

Note: “Yes” indicates that actions performed under an alternative meet criteria. “No” indicates that actions performed under an alternative do not meet criteria.

D4 = deactivation, decontamination, decommissioning, and demolition

S&M = surveillance and maintenance

6 Comparative Analysis of Removal Action Alternatives

The removal action alternatives were compared in terms of the criteria and subcriteria for overall protection of human health and the environment, implementability, and cost. The removal action activities proposed under each alternative meet overall protectiveness criteria, but their degree of effectiveness and ability to meet RAOs varies based on the timeframe of actions undertaken. The comparative analysis of effectiveness, implementability and cost is provided in the following subsections and summarized in Section 6.4.

6.1 Effectiveness of Removal Action Alternatives

The effectiveness of the alternatives considers that the removal action activities performed under this EE/CA are short-term interim measures to prevent imminent harm to human health and the environment.

6.1.1 Protectiveness

As the 200 West Tier 2 buildings/structures degrade with age, near-term removal activities will be needed to ensure protection of human health and the environment. In this section, Alternatives 2 and 3 are compared against each other in terms of the level of protectiveness that would be achieved upon completion of the removal activities included in each alternative. This evaluation was made considering the protectiveness afforded by the removal activities within the context of each alternative.

Among the removal activities, S&M would prolong monitoring for potential sources of exposure, but would be the least effective to reduce the potential to release hazardous substances. The D4 activities ultimately conclude in demolition. Demolition provides the most effective long-term remedy by permanently removing and disposing of structures. Demolition would mitigate risks of structural failure and accidental release of contamination by demolishing the aging structures.

Of the active alternatives (2 and 3), Alternative 2 offers the least protection of human health and the environment because it provides the least long-term protectiveness through delayed demolition compared to Alternative 3, near-term demolition. Because Alternative 3 would complete the removal action activities on a shorter timeframe and therefore lessen the potential for the release of hazardous substances, this alternative provides a greater degree of overall protection of human health and the environment

6.1.2 Ability to Achieve Removal Action Objectives

Alternatives 2 and 3 are both considered to achieve the RAOs. Both alternatives eliminate the potential for release of and exposure to hazardous substances (RAO #1) through the completion of D4 activities.

Alternative 2 achieves all of the RAOs, but is considered to be less effective than Alternative 3 because it takes longer to achieve the RAOs. In comparison to Alternative 3, Alternative 2 prolongs the duration of S&M, therefore not reducing future S&M (RAO #5).

Alternative 3 contains all of the removal action activities included in Alternative 2, but with an expedited timeline for completion. Therefore, Alternative 3 has a greater ability to achieve the RAOs than Alternative 2.

6.2 Implementability

The comparative evaluation of implementability is based on technical and administrative feasibility and availability of equipment, personnel, services, and disposal facilities. Additional factors include state and community acceptance.

Alternatives 2 and 3 are technically feasible. All proposed removal action activities could be performed using existing knowledge and procedures proven successful at the Hanford Site. The methods for performing S&M, D4 is consistent with Hanford Site projects of similar scope (i.e., 200 East Tier 2 buildings/structures removal action). Disposal and recycling services are available for the types of waste expected to be generated under all alternatives, on or off the Hanford Site. ERDF is anticipated to be available to receive most or all of the waste to be generated by the activities.

Reliance on long-term S&M with future D4 in Alternative 2 could result in increased hazards to workers from degradation, and performance of this scope could be more costly at the time of the final disposition as compared to the near term.

Alternative 3 consists of near-term D4, which ensures that any hazardous substances are placed in a protective and safe condition for the foreseeable future, without the need for extensive ongoing preventative measures and inspections. If performed concurrently with other Hanford Site cleanup activities, trained personnel are available to perform the proposed removal action activities under each alternative.

Alternatives 2 and 3 are administratively feasible because all actions would adhere to applicable laws and would have demonstrated success at the Hanford Site under projects of similar scope.

6.3 Cost of Alternatives

The difference in costs between the two alternatives is the result of continuing S&M for 15 years and performing facility lifecycle upgrades (Alternative 2) versus near-term D4 (Alternative 3). The estimated cost for each alternative is provided in Section 6.4.

6.4 Summary of Comparative Analysis of Alternatives

Table 8 compares the effectiveness, implementability, and cost criteria of the removal action alternatives described in Chapter 4. Based on this analysis, an alternative is recommended in Chapter 7.

Table 8. Comparative Analysis Summary

Alternative	Effectiveness		Implementability			Net Present-Worth Cost
	Protectiveness	RAOs	Technical	Administrative	Availability	
Alternative 1						
No Action	Not protective	N/A*	N/A*	N/A*	N/A*	$0
Alternative 2						
• Continued S&M (for at least 15 years) of 200 West Tier 2 Buildings/Structures • Future D4 of 200 West Tier 2 Buildings/ Structures	◐	◐	◐	◐	◐	$149,167,000

Table 8. Comparative Analysis Summary

Alternative	Effectiveness		Implementability			Net Present-Worth Cost
	Protectiveness	RAOs	Technical	Administrative	Availability	
Alternative 3						
• Continued S&M of 200 West Tier 2 Buildings/ Structures • Near-term D4 of 200 West Tier 2 Buildings/Structures	○	○	●	●	●	$135,235,000

*Not applicable; the No Action alternative does not meet protectiveness criteria and is not a viable alternative.

● = performs less well against the criterion relative to the other alternatives with significant disadvantages or uncertainty

◐ = performs moderately well against the criterion relative to the other alternatives with some disadvantages or uncertainty

● = performs very well against the criterion relative to the other alternatives with minor disadvantages or uncertainty

RAO = removal action objective

7 Recommended Alternative

Based on the comparative analysis of the removal action alternatives provided in Chapter 6, the recommended removal action for the 200 West Area Tier 2 buildings/structures is Alternative 3:

- Continued S&M (to support D4 through completion)
- Near-term D4 of buildings/structures

Alternative 3 is the best for achieving the RAOs presented in this EE/CA. This alternative is administratively feasible and allows for the greatest reduction in TMV of hazardous substances. Alternative 3 removal activities are technically feasible at present and supports implementation of future remedial actions. Alternative 3 achieves the highest degree of long-term protectiveness of human health and the environment by reducing chemical, radiological, and physical hazards through D4.

The implementation of Alternative 3 is planned to commence upon issuance of the AM, which is anticipated in 2021. The removal action will be performed based on emergent facility conditions, funding availability, craft/engineering resource availability, and overall interactive site priorities.

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Appendix A

Applicable or Relevant and Appropriate Requirements

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Terms

ACM	asbestos-containing material
ARAR	applicable or relevant and appropriate requirement
Cat I	Category I
Cat II	Category II
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
LLW	low-level waste
NESHAP	"National Emission Standards for Hazardous Air Pollutants"
NTCRA	non-time-critical removal action
PCB	polychlorinated biphenyl
RCRA	*Resource Conservation and Recovery Act of 1976*
TAP	toxic air pollutant
TSCA	*Toxic Substances Control Act of 1976*

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A1 Applicable or Relevant and Appropriate Requirements

For the removal action being considered in this document, implementation of any selected alternative would be designed to attain the applicable or relevant and appropriate requirements (ARARs) cited in this appendix to the extent practicable. ARARs are defined to include only substantive requirements of environmental standards. ARARs do not include administrative requirements, including requirements to obtain any federal, state, or local permits (40 CFR 300.400(e), "National Oil and Hazardous Substances Pollution Contingency Plan," "General," and *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* [CERCLA], Section 121, "Cleanup Standards").

The ARARs listed in this appendix are the ARARs that the U.S. Department of Energy (DOE) proposes for implementation of the recommended alternative. Selection of these ARARs was based on knowledge regarding the hazardous substances within the 200 West Area Tier 2 buildings/structures. There are no impacts to groundwater or surface water as a result of this removal action.

Chemical-specific requirements are usually health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a contaminant that may be found in, or discharged to, the ambient environment. Action-specific requirements are usually technology or activity-based requirements or limitations triggered by the remedial actions performed at the Hanford Site.

The final ARARs will be established within the action memorandum(s). The key ARARs identified for the alternatives considered include waste management standards, standards controlling releases to the environment, standards for protection of natural resources, and safety and health standards.[1] Potentially applicable federal and state ARARs for the proposed removal action are provided in Tables A-1 and A-2, respectively.

A1.1 Waste Management Standards

A variety of waste streams would be generated under the proposed removal action alternatives. It is anticipated that the majority of the waste would be determined to be low-level waste (LLW). However, dangerous or mixed waste, transuranic waste, polychlorinated biphenyl (PCB) waste, and regulated asbestos-containing material could also be generated. The great majority of the waste would be in a solid form. However, some liquid waste might be generated.

Radioactive waste is managed by DOE under the authority of the *Atomic Energy Act of 1954*.

The identification, storage, treatment, and disposal of hazardous waste and the hazardous component of mixed waste are governed by the *Resource Conservation and Recovery Act of 1976* (RCRA). The State of Washington, which implements RCRA requirements under WAC 173-303, "Dangerous Waste Regulations," has been authorized to implement most elements of the RCRA program. The dangerous waste standards for generation and storage would apply to the management of any dangerous or mixed waste generated by removal action activities. Treatment standards for dangerous or mixed waste subject to RCRA land disposal restrictions are specified in WAC 173-303-140, "Land Disposal Restrictions," which incorporates 40 CFR 268, "Land Disposal Restrictions," by reference.

[1] Worker safety and health standards are not environmental standards per se and, therefore, not potential ARARs. Instead, compliance with applicable safety and health regulations is required external to the CERCLA ARAR process. However, due to the nature and importance of these standards, a discussion of the safety and health requirements is included in this appendix.

Table A-1. Identification of Potential Federal Applicable or Relevant and Appropriate Requirements and Requirements To Be Considered for the Removal Action

Regulatory Citation	ARAR Category	Description of Regulatory Requirement	Rationale for Consideration
***Clean Air Act of 1990*, as amended, 42 USC 7401 et seq.**			
40 CFR 60, "Standards of Performance for New Stationary Sources" 40 CFR 60, Subpart IIII, "Standards of Performance for Stationary Compression Ignition Internal Combustion Engines" 40 CFR 60, Subpart JJJJ, "Standards of Performance for Stationary Spark Ignition Internal Combustion Engine" 40 CFR 63, "National Emission Standards for Hazardous Air Pollutants for Source Categories" 40 CFR 63, Subpart ZZZZ, "National Emission Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines"	ARAR	The requirements for stationary engines changed on May 3, 2013 to include timers, maintenance plans, and meeting monitoring requirements.	The substantive requirements of these regulations apply to all stationary engines used during this NTCRA. This requirement is action-specific.
***Clean Air Act of 1977* (42 USC 7401, et seq.); 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants"**			
40 CFR 61.05, "Prohibited Activities"	ARAR	Identifies prohibition of any owner or operator of any stationary source subject to a national emission standard for hazardous air pollutants from constructing or operating the new or existing source in violation of any such standard.	Substantive requirements of this standard are applicable because the NTCRA may be subject to NESHAP, and resultant requirements have the potential to be detected in, and potentially emitted from, structures, components, debris, soil, or groundwater involved in the NTCRA. This requirement is action-specific.

Table A-1. Identification of Potential Federal Applicable or Relevant and Appropriate Requirements and Requirements To Be Considered for the Removal Action

Regulatory Citation	ARAR Category	Description of Regulatory Requirement	Rationale for Consideration
40 CFR 61.12, "Compliance with Standards and Maintenance Requirements"	ARAR	Requires the owner or operator of each stationary source of hazardous air pollutants subject to a national emission standard for a hazardous air pollutant to determine compliance with numerical emission limits in accordance with emission tests established in NESHAP (40 CFR 61.13, "Emission Tests and Waiver of Emission Tests") or as otherwise specified in an individual subpart. Compliance with design, equipment, work practice, or operational standards shall be determined as specified in the individual subpart. Also, maintain and operate the source, including associated equipment for air pollution control, in a manner consistent with good air pollution control practice for minimizing emissions.	Hazardous contaminants that would be subject to substantive provisions of NESHAP and resultant requirements have the potential to be detected in, and potentially emitted from, structures, components, debris, soil, or groundwater involved in the NTCRA. Associated design, equipment, work practice, or equipment for air pollution control may also be maintained and operated. This requirement is action-specific.
40 CFR 61.14, "Monitoring Requirements"	ARAR	Requires the owner or operator to maintain and operate each monitoring system as specified in the applicable subpart, and in a manner consistent with good air pollution control practice for minimizing emissions. Approvals of alternatives to any monitoring requirements or procedures are obtained from the regulatory agency.	Hazardous contaminants that would be subject to substantive provisons of NESHAP Air Pollutant Standards and resultant requirements have the potential to be detected in, and emitted from, structures, components, debris, soil, or groundwater involved in the NTCRA. The hazardous contaminants will be monitored as identified under each applicable NESHAP subpart. This requirement is action-specific.
40 CFR 61.92, "Standard"	ARAR	Establishes radionuclide emission standards to the ambient air from DOE facilities. DOE Hanford Site radionuclide airborne emissions shall be controlled so as not to exceed amounts that would cause an exposure to any member of the public of greater than 10 mrem/yr effective dose equivalent.	Hazardous radionuclide contaminants that would be subject to substantive provisions of NESHAP, Radionuclide Air Pollutant Standards and resultant requirements have the potential to be detected in, and emitted from, structures, components, debris, soil or groundwater involved in the NTCRA. This requirement is chemical-specific action.

Table A-1. Identification of Potential Federal Applicable or Relevant and Appropriate Requirements and Requirements To Be Considered for the Removal Action

Regulatory Citation	ARAR Category	Description of Regulatory Requirement	Rationale for Consideration
40 CFR 61.93, "Emission Monitoring and Test Procedures"	ARAR	Specifies that radionuclide emissions shall be determined and effective dose equivalent values to members of the public calculated to determine compliance with the 10 mrem/yr effective dose equivalent standard. Radionuclide emissions shall be collected and measured using approved methods. A quality assurance program shall be conducted that meets the performance requirements described in Appendix B, Method 114. Measurement by methods specified in the paragraph (b) shall be made at all release points that have the potential to discharge radionuclides to the air in quantities that cause an effective dose equivalent in excess of 1 percent of the 10 mrem/yr standard. For other release points that have a potential to release radionuclides into the air, periodic confirmatory measurements shall be made to verify the low emissions.	Hazardous radionuclide contaminants that would be subject to substantive provisions of NESHAP, Radionuclide Air Pollutant Standards and resultant requirements have the potential to be detected in, and emitted from, structures, components, debris, soil, or groundwater involved in the NTCRA. The hazardous contaminants will be monitored as identified under each applicable NESHAP subpart. This requirement is action-specific.
40 CFR 61.140, "Applicability" 40 CFR 61.145, "Standard for Demolition and Renovation" Specific subsections: 40 CFR 61.145(a)(5) 40 CFR 61.145(c)	ARAR	These standards apply to demolition activities, including the removal of RACM. The standards of 40 CFR 61.145 (a)(5), are used to determine when the requirements of 40 CFR 61.145(c) apply to demolition activities.	Some structures addressed under the NTCRA could contain asbestos. The substantive provisions of 40 CFR 61.145(c) would be complied in accordance with the substantive portions of 40 CFR 61.145(a)(1), (a)(2), and (a)(5) for the material that contains RACM under this NTCRA. This requirement is chemical-specific.
40 CFR 61.150(a) through (c), "Standard for Waste Disposal for Manufacturing, Fabricating, Demolition, Renovation, and Spraying Operations"	ARAR	The standards of 40 CFR 61.150(a) through (c) are used to control asbestos emissions during collection, processing, packaging, and transport of any asbestos-containing waste material.	The substantive provisions of 40 CFR 61.150(a) through (c) would be met during activities that involve collection, processing, packaging, and transport of asbestos-containing waste material under the NTCRA. This requirement is chemical-specific.

Table A-1. Identification of Potential Federal Applicable or Relevant and Appropriate Requirements and Requirements To Be Considered for the Removal Action

Regulatory Citation	ARAR Category	Description of Regulatory Requirement	Rationale for Consideration
***National Historic Preservation Act of 1966*, 16 USC 470, Section 106**			
36 CFR 800, "Protection of Historic Properties" 40 CFR 6.301(b), "Applicant Requirements" Executive Order 11593, *Protection and Enhancement of the Cultural Environment* 36 CFR 65, "National Historic Landmarks Program" 36 CFR 60, "National Register of Historic Places"	ARAR	The *National Historic Preservation Act of 1966* requires that historic properties are appropriately considered in planning federal initiatives and actions. Requires federal agencies to consider the impacts of their undertaking on cultural properties through identification, evaluation and mitigation processes.	Based on past identification of cultural and historic sites at the Hanford Site, these types of sites could be encountered during NTCRA activities. The substantive requirements of this act are potentially applicable to and would be complied with for actions that might disturb these types of sites. This requirement is location-specific.
Native American Graves Protection and Repatriation Act of 1990			
43 CFR 10, "Native American Graves Protection and Repatriation Regulations"	ARAR	These provisions establish federal agency responsibility for discovery of human remains, associated and unassociated funerary objects, sacred objects, and items of cultural patrimony. Requires consultation with area tribes in the event of discovery.	Based on Hanford Site history, these types of sites could be encountered during the NTCRA. Substantive requirements of this act are potentially applicable if remains and sacred objects are found during NTCRA activities. This requirement is location-specific.
***Endangered Species Act of 1973*, 16 USC 1531 et seq., Subsection 16 USC 1536(c)**			
"Endangered Species Act of 1973", as Amended 16 U.S.C. §§ 1531-1544, specifically Sections 7 and 9(a). 50 CFR Part 17 50 CFR 402, "Interagency Cooperation—Endangered Species Act of 1973, as Amended" 40 CFR 6.302(h), "Responsible Official Requirements"	ARAR	Prohibits actions by federal agencies that are likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of habitat critical to them. Also prohibits the taking of any endangered species.	Substantive requirements of this act are applicable if threatened or endangered species are identified in areas where the removal action will occur. If the NTCRA is within critical habitat or buffer zones surrounding threatened or endangered species, mitigation measures must be taken to protect the resource in accordance with substantive requirements of these laws and regulations. This requirement is location-specific.

Table A-1. Identification of Potential Federal Applicable or Relevant and Appropriate Requirements and Requirements To Be Considered for the Removal Action

Regulatory Citation	ARAR Category	Description of Regulatory Requirement	Rationale for Consideration
***Migratory Bird Treaty Act of 1918*, 16 USC 703 et seq.**			
Migratory Bird Treaty Act of 1918 (16 USC 703-712) 50 CFR Parts 10 and 21	ARAR	Protects all migratory bird species and prevents "take" of protected migratory birds, their young, or their eggs." Federal agencies are required to avoid or minimize impacts to migratory bird resources, restore or enhance their habitat and prevent or abate its detrimental alteration.	Three species of bird protected under the migratory bird treaty act may nest on or near the structures in the 200 West Area. If these bird species are impacted by the selected remedy, substantive requirements of this act will be applicable. It is also applicable to endangered or threatened species that may be identified near borrow sites. This requirement is location-specific.
40 CFR 82, "Protection of Stratospheric Ozone"			
40 CFR 82.156 "Proper Evacuation of Refrigerant from Appliances"" 40 CFR 82.158 "Standards for Recovery and/or Recycling Equipment" 40 CFR 82.161 "Technician Certification"	ARAR	The provisions 40 CFR 82.156 specify standards for evacuation of refrigerant from appliances to a recovery or recycling machine prior to disposal. The procedures and processes of 40 CFR 82.158 apply to recycling and recovery of ODS. 40 CFR 82.161 requires appropriate certification for workers who recover or recycle ODS.	Some structures addressed under the NTCRA could include appliances. Appliances identified for disposal under the NTCRA may include the recycling or recovery of ODS that would be conducted in accordance with the applicable substantive requirements and work practices. These requirements are action-specific.

Table A-1. Identification of Potential Federal Applicable or Relevant and Appropriate Requirements and Requirements To Be Considered for the Removal Action

Regulatory Citation	ARAR Category	Description of Regulatory Requirement	Rationale for Consideration
***Toxic Substances Control Act of 1976*; 40 CFR 761, "Polychlorinated Biphenyls Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions"**			
40 CFR 761.50(b)1, 2, 3, 4, and 7, "Applicability," "PCB Waste" 40 CFR 761.50(c), "Applicability", "Storage for Disposal" 40 CFR 761.60(a), "Disposal Requirements" "PCB liquids" 40 CFR 761.60(b), "Disposal Requirements", "PCB Articles" 40 CFR 761.60(c), "Disposal Requirements", "PCB Containers" 40 CFR 761.61, "PCB Remediation Waste" 40 CFR 761.62, "Disposal of PCB Bulk Product Waste" 40 CFR 761.79, "Decontamination Standards and Procedures"	ARAR	These regulations apply to the storage and disposal of PCB waste including liquid PCB waste, PCB items, PCB remediation waste, PCB bulk product waste, and PCB/radioactive waste at concentrations equal to or greater than 50 parts per million. These regulations also provide options for decontamination of materials contaminated with PCBs.	Some structures addressed under the NTCRA could include various forms of PCB waste, including, but not limited to, PCB items, PCB liquids, and PCB articles, and/or containers that would be managed in accordance with the substantive requirements of these standards if encountered and or generated during the NTCRA. This requirement is chemical-specific.

Note: Complete reference citations are provided in Chapter A2.

ARAR = applicable or relevant and appropriate requirement
DOE = U.S. Department of Energy
NESHAP = National Emission Standards for Hazardous Air Pollutants
NTCRA = non-time-critical removal action
ODS = ozone depleting substance
PCB = polychlorinated biphenyl
RACM = regulated asbestos-containing material

Table A-2. Identification of Potential State Applicable or Relevant and Appropriate Requirements for the Removal Action

ARAR Citation	ARAR	Requirement	Rationale for Consideration
WAC 173-218, "Underground Injection Control Program"			
WAC 173-218-120(3)(b), "Decommissioning a UIC Well," "Decommissioning Standards for Allowed UICs"	ARAR	This regulation provides the standards for decommissioning underground injection wells that are not in contact with the aquifer.	There is a potential to encounter UICs associated with buildings/structures during the NTCRA. While these UICs are not expected to be decontaminated, they do need to be decommissioned to the substantive requirements of this regulation. This requirement is action-specific.
Regulations Pursuant to the *Hazardous Waste Management Act* (RCW 70A.300, "Hazardous Waste Management")			
WAC 173-303-016, "Identifying Solid Waste" WAC 173-303-017, "Recycling Processes Involving Solid Waste"	ARAR	This regulation applies for determining which materials are and are not solid waste. This determination is used to establish which waste are subject to the designation procedures of WAC 173-303-070(3).	Solid waste will be generated during the NTCRA. Substantive requirements of these regulations are potentially applicable because they define how to determine which materials are subject to the designation regulations. Specifically, materials that are generated for removal from the CERCLA site during the NTCRA would be evaluated using the procedures for identifying solid waste to ensure proper management. This requirement is action-specific.
WAC 173-303-070(3), "Designation of Dangerous Waste"	ARAR	This regulation applies for the evaluation of solid waste to determine if such waste is designated as dangerous or mixed waste. Solid waste that designates as dangerous or mixed waste are subject to management and disposal standards of WAC 173-303.	There is potential for generating solid waste during the NTCRA that would designate as dangerous or mixed waste. Substantive requirements of these regulations are potentially applicable to such solid waste if generated or encountered during the NTCRA. Specifically, solid waste generated for removal from the CERCLA site during this NTCRA would be evaluated using the dangerous waste designation procedures to ensure proper management. This requirement is action-specific.
WAC 173-303-071, "Excluded Categories of Waste"	ARAR	This regulation lists waste categories that are excluded from management in accordance with the requirements of WAC 173-303.	There is potential for generating waste during the NTCRA that would qualify for management under the substantive provisions of these regulations, which would be used as appropriate during the NTCRA. This requirement is action-specific.
WAC 173-303-073, "Conditional Exclusion of Special Wastes"	ARAR	This regulation provides for management of waste that pose a relatively low hazard to human health and the environment. The standards provide for management of special waste with a level of protection that is intermediate between dangerous and nondangerous solid waste.	There is potential for generating waste during the NTCRA that would qualify for management under the substantive provisions of these regulations, which would be used as appropriate during the NTCRA. This requirement is action-specific.

Table A-2. Identification of Potential State Applicable or Relevant and Appropriate Requirements for the Removal Action

ARAR Citation	ARAR	Requirement	Rationale for Consideration
WAC 173-303-077, "Requirements for Universal Waste"	ARAR	This regulation provides alternate reduced standards for certain solid waste (that is, batteries, mercury-containing equipment, and lamps) as described in WAC 173-303-573, "Standards for Universal Waste Management."	There is potential for generating waste during the NTCRA that would qualify for management under the substantive provisions of these regulations, which would be used as appropriate during the NTCRA. This requirement is action-specific.
WAC 173-303-120, "Recycled, Reclaimed, and Recovered Wastes"	ARAR	This regulation describes requirements for recycling materials that are solid waste and dangerous.	There is potential for generating solid waste during the NTCRA that will designate as dangerous that may be recycled.
WAC 173-303-140(4), "Land Disposal Restrictions"	ARAR	This regulation establishes state standards for land disposal of dangerous waste and incorporates by reference the federal land disposal restrictions of 40 CFR 268 that are applicable to solid waste designated as dangerous or mixed waste in accordance with WAC 173-303-070(3).	There is potential for generating solid waste during the NTCRA that would designate as dangerous or mixed waste and further require treatment prior to land disposal. The substantive requirements of this regulation are potentially applicable to dangerous and/or mixed waste that is generated or encountered during the NTCRA. Specifically, dangerous and/or mixed waste generated and removed from the CERCLA site during the NTCRA for land disposal (for example, at ERDF or other approved disposal facility) would be evaluated for determination of applicable land disposal restrictions at the point of waste generation. This requirement is action-specific.
WAC 173-303-170(3), "Requirements for Generators of Dangerous Waste."	ARAR	This regulation establishes standards for the temporary management of waste that designates as dangerous or mixed waste.	There may be waste generated during the NTCRA that needs to be temporarily accumulated or stored. Substantive requirements of these regulations would be used for management of materials generated and/or encountered during the NTCRA. WAC 173-303-170(3) includes by reference the substantive provisions of both the satellite accumulation standards of WAC 173-303-200, "Accumulating Dangerous Waste On-Site," and the standards for management in containers under WAC 173-303-630, "Use and Management of Containers," and tanks under WAC 173-303-640, "Tank Systems." This requirement is action-specific.

Table A-2. Identification of Potential State Applicable or Relevant and Appropriate Requirements for the Removal Action

ARAR Citation	ARAR	Requirement	Rationale for Consideration
Regulations Pursuant to RCW 70.95, "Solid Waste Management—Reduction and Recycling"			
WAC 173-350-300(2), "Solid Waste Handling Standards," "On-Site Storage, Collection, and Transportation Standards"	ARAR	This regulation describes requirements for management of nondangerous, nonradioactive solid waste.	There is potential for generating nondangerous, nonradioactive solid waste during the NTCRA. This requirement is action-specific.
Regulations Pursuant to *Washington Clean Air Act of 1967* (RCW 70A.15, "Washington Clean Air Act") and RCW 43.21A, "Department of Ecology"			
WAC 173-400-040, "General Standards for Maximum Emissions"	ARAR	These laws and regulations require all sources of air contaminants to meet standards for visible emissions, fallout, fugitive emissions, odors, emissions detrimental to persons or property, sulfur dioxide, concealment and masking, and fugitive dust. Requires use of RACT.	All emission units will employ RACT, as determined on a case-by-case basis. Although unlikely, any visible emissions will be taken into account in order to assess any potential need for trained opacity checks. Controls will be in place to mitigate any potential fallout from particulate matter. There is potential for fugitive emissions during the NTCRA activities. Substantive requirements of the general standards for control of fugitive emissions would be applied as appropriate to minimize the generation of fugitive dust during NTCRA activities. In the event that odors result from this NTCRA, then good practices will be used to mitigate those odors. Emissions will be controlled and PPE will be employed throughout the NTCRA to ensure they are not detrimental to human health and the environment. Only low sulfur diesel fuel is delivered to the Hanford Site for use. No concealment or masking will occur throughout this NTCRA. These requirements are action-specific.
WAC 173-400-035(3), "Nonroad Engines"	ARAR	This regulation applies to all nonroad engines and requires use of ultra low sulfur diesel or ultra low sulfur biodiesel, gasoline, natural gas, propane, liquified petroleum gas, hydrogen, ethanol, methanol, or liquefied/compressed natural gas.	It is unlikely that the substantive provisions in this regulation would be triggered during the NTCRA. However, substantive requirements of this regulation potentially would be applicable if a nonroad engine is utilized that uses a different fuel type than listed during implementation of the NTCRA. This requirement is action specific.

Table A-2. Identification of Potential State Applicable or Relevant and Appropriate Requirements for the Removal Action

ARAR Citation	ARAR	Requirement	Rationale for Consideration
WAC 173-400-113, "Requirements for New Sources in Attainment or Unclassifiable Areas"	ARAR	This regulation applies to new and modified sources and requires controls to minimize the release of associated criteria and toxic air emissions. Emissions are to be minimized through application of best available control technology.	It is unlikely that the substantive provisions in this regulation would be triggered during the NTCRA. However, substantive requirements of this regulation potentially would be applicable to removal actions performed at the site if a treatment technology that emits regulated air emissions were necessary during the implementation of the NTCRA. This requirement is action-specific.
WAC 173-460, "Controls for New Sources of Toxic Air Pollutants" (adopts, by reference, 40 CFR 61.32, "Emission Standard") Specific subsections: WAC 173-460-060, "Control Technology Requirements"	ARAR	These regulations apply for determination of *de minimis* emission values and for establishment of control technology as appropriate for new or modified TAP sources likely to increase TAP emission. Requires T-BACT for regulated emissions of TAPs and demonstration that emissions of TAP will not endanger human health or safety.	Beryllium is listed as a TAP and may be encountered during performance of the NTCRA. It is not expected that work done under the NTCRA will trigger standards for T-BACT. However, substantive requirements of these regulations potentially would be applicable to removal actions performed at the site, if a treatment technology that emits toxic air emissions were necessary during the implementation of the NTCRA. These requirements are action-specific.
RCW 70.98, "Nuclear Energy and Radiation"			
WAC-246-247, "Radiation Protection—Air Emissions" Specific subsections: WAC 246-247-040(3) and (4), "General Standards"	ARAR	Requires that emissions be controlled to ensure ALARA-based and best available controls standards are not exceeded.	Hazardous contaminants that would be subject to the substantive provisions of radionuclide air emission standards and resultant requirements have the potential to be detected in, and emitted from, structures, components, debris, soil, or groundwater involved in the NTCRA. This requirement is action-specific.
WAC 246-247-075, "Monitoring, Testing and Quality Assurance"	ARAR	Establishes the monitoring, testing, and quality assurance requirements for radioactive air emissions. Emissions from nonpoint and fugitive sources of airborne radioactive material will be measured. Measurement techniques may include but are not limited to sampling, calculation, smears, or other reasonable method for identifying emissions as determined by the lead agency.	Hazardous contaminants at either the 200 West Area structures or generated from the NTCRA would be subject to substantive provisions of radionuclide air emission standards and resultant requirements have the potential to be detected in, and emitted from, structures, components, debris, soil, or groundwater involved in the removal action. This requirement is action-specific.

Table A-2. Identification of Potential State Applicable or Relevant and Appropriate Requirements for the Removal Action

ARAR Citation	ARAR	Requirement	Rationale for Consideration
WAC 173-480, "Ambient Air Quality Standards and Emission Limits for Radionuclides"			
WAC 173-480-040, "Ambient Standard"	ARAR	Requires that emissions of radionuclides in the air shall not cause a maximum effective dose equivalent of more than 10 mrem/y to the whole body to any member of the public.	The structures to be addressed under this NTCRA will contain radioactive constituents. Potential emissions from the NTCRA would be performed in accordance with substantive provisions of this standard. This requirement is action-specific.
WAC 173-480-050(1), "General Standards for Maximum Permissible Emissions"	ARAR	This regulation establishes general standards for all radionuclide emission units and requires emission units to meet WAC 246-247 requiring every reasonable effort to maintain radioactive materials in effluents to unrestricted areas, ALARA. The regulation indicates that control equipment of sites operating under ALARA shall be defined as RACT and ALARA control technology.	The potential for fugitive and diffuse emissions due to demolition and excavation and related activities potentially will require efforts to minimize those emissions by meeting substantive provisions of WAC 246-247. This requirement is action-specific.
WAC 173-480-060, "Emission Standards for New and Modified Emission Units"	ARAR	Requires that construction, installation, or establishment of a new air emission unit shall use best available radionuclide control technology.	The potential for fugitive and diffuse emissions due to demolition and excavation and related activities potentially will require efforts to minimize those emissions by meeting substantive provisions of WAC 246-247. This requirement is action-specific.

Note: Complete reference citations are provided in Chapter A2.

ALARA = as low as reasonably achievable
ARAR = applicable or relevant and appropriate requirement
CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
ERDF = Environmental Restoration Disposal Facility
NTCRA = non-time-critical removal action
PPE = personal protective equipment
RACT = reasonably available control technology
TAP = toxic air pollutant
T-BACT = toxics best available control technology
UIC = underground injection control

The management and disposal of PCB waste are governed by the *Toxic Substances Control Act of 1976* (TSCA), and 40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions." TSCA regulations contain specific provisions for PCB waste, including PCB waste that contains a radioactive component. PCBs unregulated under TSCA also are considered underlying hazardous constituents when present in dangerous or mixed wastes under RCRA and thus could be subject to WAC 173-303 and 40 CFR 268 requirements.

Removal and disposal of asbestos and asbestos-containing material (ACM) will be performed in accordance with the substantive provisions of the *Clean Air Act of 1990* (40 CFR 61, "National Emission Standards for Hazardous Air Pollutants" (hereinafter called NESHAP), Subpart M, "National Emission Standard for Asbestos"), which require special precautions to control airborne emissions of asbestos fibers during asbestos removal activities. Asbestos abatement activities will be performed in full compliance with all substantive NESHAP standards that are ARARs for the work. Prior to the commencement of the demolition, a thorough inspection of the affected facility will be performed and documented for the presence of asbestos, including Category I (Cat I) and Category II (Cat II) nonfriable ACM. All Cat II nonfriable ACM will generally be presumed to be potentially friable and will be removed prior to the start of actual demolition activities. If Cat II ACM is identified and allowed to remain in place, a demolition approach will be provided in advance to the U.S. Environmental Protection Agency (EPA). The demolition approach will describe how the Cat II ACM will not become crumbled, pulverized, reduced to powder, or otherwise friable during the demolition. Cat I nonfriable ACM will also be removed prior to the start of actual demolition activities, except in situations where demolition practices will be used that can be or have been demonstrated to the satisfaction of EPA not to render the Cat I ACM friable, consistent with NESHAP standards. Demonstration can be performed using existing EPA or Washington State guidance regarding asbestos abatement under NESHAP. Such Cat I nonfriable ACM must not be in poor condition, and planned demolition activities must not subject the ACM to sanding, grinding, cutting, or abrading. In all cases, ACM that is either friable or cannot be demonstrated to remain nonfriable during demolition will be removed prior to such demolition as required by NESHAP. Asbestos and ACM would be packaged, as appropriate, and disposed in the Environmental Restoration Disposal Facility (ERDF).

Beryllium may be encountered during performance of the non-time-critical removal action (NTCRA). If encountered, beryllium may be subject to the substantive requirements of NESHAP (40 CFR 61.32, "Emission Standard") or WAC 173-460, "Controls for New Sources of Toxic Air Pollutants."

Waste that is determined to be LLW according to ERDF[2] waste acceptance criteria (ERDF-00011, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*) would preferentially be disposed at ERDF, because ERDF is an engineered facility that provides a high degree of protection to human health and the environment. Previous engineering evaluations/cost analyses for other Hanford Site work have shown that this disposal option is more cost effective than disposal at other disposal sites. Construction of ERDF was authorized using a CERCLA record of decision (EPA, 1995, *Record of Decision, U.S. DOE Hanford Environmental Restoration Disposal Facility, Hanford Site, Benton County, Washington*). ERDF is designed, constructed, and operated to meet the ARAR provisions of the minimum technological requirements for a hazardous waste landfill, including standards for double liner, a leachate collection system, leak detection, monitoring, and a final cover. Alternate potential disposal locations may

[2] CERCLA Section 104(d)(4), "Response Authorities," 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 facilities can be treated as one for purposes of CERCLA response actions. Consistent with this, the Hanford structures and ERDF would be considered to be onsite for purposes of CERCLA Section 104, and waste may be transferred between the facilities without requiring a permit.

be considered when the NTCRA occurs if a suitable and cost effective location is identified. Any potential alternate disposal location will be evaluated for appropriate performance standards to ensure that it is adequately protective of human health and the environment. If the alternate location is offsite, it must comply with 40 CFR 300.440, "Procedures for Planning and Implementing Off-Site Response Actions," which applies to offsite transfer of CERCLA waste and requires that such waste must be placed in a disposal facility operating in compliance with applicable federal or state requirements.

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. DOE requirements for waste generated by the NTCRA would be identified and implemented before the waste is moved to ERDF.

Some of the aqueous waste determined to be LLW or designated as dangerous or mixed waste would be transported to Effluent Treatment Facility or other acceptable facility for treatment and disposal. Effluent Treatment Facility is a RCRA-permitted unit 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 applicable requirements.

Waste designated as nonliquid PCB waste likely would be disposed at ERDF, depending on whether it meets the waste acceptance criteria (ERDF-00011). PCB waste that does not meet ERDF waste acceptance criteria would be retained at a PCB storage area meeting the requirements for TSCA storage and would be transported for future disposal at an appropriate disposal facility.

Alternatives 2 and 3 can be performed in compliance with the waste management ARARs. Waste streams will be evaluated, designated, and managed in compliance with the ARARs. Before disposal, waste would be managed in a protective manner to prevent releases to the environment or unnecessary exposure to personnel.

A1.2 Standards Controlling Emissions to the Environment

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

A1.2.1 Radiological Air Emissions

The federal *Clean Air Act of 1990* and RCW 70A.15, "Washington Clean Air Act," require regulation of radioactive air pollutants. Implementing regulations in 40 CFR 61.92, "Standard," set limits for radionuclide emissions from the DOE Hanford Site, which cannot exceed those amounts that would cause any member of the public to receive an effective does equivalent of 10 mrem/yr. This requirement would be applicable to any aspects of the NTCRA with the potential to emit radionuclides to unrestricted areas. Verification of compliance with this standard is required by the state implementing regulation at WAC 173-480-070, "Ambient Air Quality Standards and Emission Limits for Radionuclides," "Emission Monitoring and Compliance Procedures." Radioactive air emissions are to be controlled through the use of best available radionuclide control technology or as low as reasonably achievable control technology where economically and technologically feasible (WAC 246-247-040(3) and (4), "Radiation Protection—Air Emissions," "General Standards," and associated definitions).

To address the substantive aspect of these potential requirements, best or reasonably achieved control technology could be accomplished by ensuring that applicable emission control technologies (those successfully operated in similar applications) would be used when economically and technologically feasible (i.e., based on cost/benefit). If it is determined that there are substantive aspects of the requirement for control of radioactive airborne emissions once ARARs are finalized, then controls will be administered as appropriate using the best methods from among those that are reasonable

and effective. Administrative requirements, like air licensing and permitting, will be discontinued once this CERCLA removal action has been approved, and any existing provisions will be removed from the Air Operating Permit after the removal action work plan has been issued, and the removal action is initiated.

A1.2.1 Criteria/Toxic Air Emissions

WAC 173-400, "General Regulations for Air Pollution Sources," and WAC 173-460 establish requirements for emissions criteria and toxic air pollutants (TAPs). The primary nonradioactive source of emissions resulting from this NTCRA will be fugitive particulate matter. In accordance with WAC 173-400-040, "General Standards for Maximum Emissions," reasonable precautions must be taken to prevent the release of air contaminants associated with fugitive emissions resulting from demolition, materials handling, or other operations and prevent fugitive dust from becoming airborne from fugitive sources of emissions.

The use of treatment technologies that would result in emissions of TAPs that would be subject to the substantive applicable requirements of WAC 173-460 are not anticipated to be a part of this NTCRA.

Treatment of some waste encountered during the NTCRA may be required to meet ERDF waste acceptance criteria (ERDF-00011). In most cases, the type of treatment anticipated would consist of solidification/stabilization techniques such as macroencapsulation or grouting, and WAC 173-460 would not be considered an ARAR because it would not result in the emission of TAPs. If more aggressive treatment is required that would result in the emission of regulated air pollutants above *de minimis* emission values in WAC 173-460-150, "Table of ASIL, SQER and de Minimis Emission Values," substantive requirements of WAC 173-400-113(2), "Requirements for New Sources in Attainment or Unclassifiable Areas," and WAC 173-460-060, "Control Technology Requirements," would be evaluated to determine applicability and satisfied if determined to be ARAR.

Emissions to the air will be minimized during implementation of the NTCRA through use of standard industry practices as needed, such as the application of water sprays and fixatives. These techniques are considered to be reasonable precautions to control fugitive emissions as required by regulatory standards.

A1.3 Standards for the Protection of Cultural and Ecological Resources

The *National Historic Preservation Act of 1966* (implemented in regulation via 36 CFR 800, "Protection of Historic Properties") requires federal agencies to consider the effect of an activity on any significant cultural resource, including properties listed on or eligible for inclusion on the National Register of Historic Places. The *Native American Graves Protection and Repatriation Act of 1990* establishes statutory provisions for the treatment of inadvertent discoveries of Native American remains and cultural objects. The *Archeological and Historical Preservation Act of 1974* requires action to recover and preserve archaeological or historic data in areas where activity may cause irreparable harm, loss, or destruction of significant data.

The *Endangered Species Act of 1973* (implemented via 50 CFR 402, "Interagency Cooperation–Endangered Species Act of 1973, as amended," and WAC 232-12-297, "Permanent Regulations," "Endangered, Threatened, and Sensitive Wildlife Species Classification") prohibits activities that threaten the continued existence of listed species or destroy critical habitat. The *Migratory Bird Treaty Act of 1918* makes it illegal to take, capture, or kill any migratory bird or any part, nest, or egg of any such bird.

Hanford Site structures have been evaluated for their National Register of Historic Places eligibility as part of DOE/RL-97-56, *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan*. Some structures have been determined to be contributing properties to the Manhattan Project/Cold War Era Historic District with mitigation in the form of documentation required. DOE/RL-97-56 also requires that walkthroughs be completed of these structures to identify artifacts that are of educational and interpretive value. Some of the 200 West Area Tier 2 buildings/structures have been determined to be contributing properties to the Manhattan Project/Cold War Era Historic District, with mitigation in the form of documentation required.

The 200 West Area has already been extensively disturbed. The annual ecological review of the facility indicates that three species of birds protected under the *Migratory Bird Treaty Act of 1918* may nest on or near the building. Care will be required with any of the alternatives to ensure completion of pre-job surveys and the development of mitigative measures should cultural or natural resources be encountered at the facility and at borrow areas.

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