DOE/RL-2016-14
Draft A

Engineering Evaluation/Cost Analysis for the B Plant Complex

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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Executive Summary

This document presents for public review and comment the results of a non-time-critical removal action (NTCRA) engineering evaluation/cost analysis (EE/CA) addressing removal action activities at the B Plant Complex in the 200 East Area of the Hanford Site. This EE/CA was prepared in accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980.*

The purpose of this EE/CA is to evaluate removal action alternatives for the B Plant Complex. The removal action is proposed to occur before a remedial action in order to mitigate potential threats to human health and the environment (HHE). The evaluation and comparison of removal action alternatives are provided in this EE/CA with one alternative presented as the recommended alternative. The approach satisfies environmental review requirements, provides stakeholder involvement, and offers a framework for selecting the preferred alternative. In addition to the removal actions proposed in the alternatives, this NTCRA provides a mechanism to dispose of related waste in the Environmental Restoration Disposal Facility. Dangerous waste management units within the 221B Canyon Building under the *Resource Conservation and Recovery Act of 1976* B Plant Part A Form will require the preparation of closure plans.

The B Plant Complex was used for chemical separation of plutonium from irradiated fuel rods from 1945 through 1952. In the 1960s, B Plant was modified and restarted, with the new mission to separate cesium and strontium from tank waste. These missions resulted in contamination of buildings and structures within the complex. The scope of this EE/CA includes the 221B Canyon Building and the retired 291B Ventilation System.

This EE/CA evaluated four removal action alternatives:

- Alternative 1 – No Action
- Alternative 2 – Continued Surveillance and Maintenance (S&M) with Hazard Abatement of 221B and Demolition/Grouting of 291B
- Alternative 3 – All Actions Included in Alternative 2 Plus Demo Prep of 221B

After summarizing the site characteristics, providing a site description, and establishing removal action objectives (RAOs), these alternatives were evaluated in terms of

effectiveness, implementability, and cost. The EE/CA presents a detailed summary and comparison of the relative performance of each alternative in Chapters 4 and 5.

Table ES-1 identifies the net present-worth cost estimates for the four alternatives based on present-day (2016) dollars (estimates are based on the best available information on anticipated scope). This cost estimate includes major costs that apply to all of the alternatives, as well as alternative specific costs. The major costs are summarized in the document.

Table ES-1. Summary of Present-Worth Cost Estimates for the Alternatives

Alternative	Net Present-Worth Cost
Alternative 1 – No Action	N/A*
Alternative 2 – Continued S&M with Hazard Abatement of 221B and Demolition/Grouting of 291B	$118.4 M
Alternative 3 – All Actions Included in Alternative 2 Plus Demo Prep of 221B	**$123.1 M**

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

Bold signifies the recommended alternative.

*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 is included for comparative purposes only in the cost analysis. 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

N/A = not applicable

S&M = surveillance and maintenance

The buildings/structures in the scope of this EE/CA were built in the 1940s. The B Plant Complex was used for radiological and chemical processing activities and contains significant inventories of hazardous substances. If not timely addressed, the buildings/structures could present a threat to HHE.

The recommended removal action alternative for the B Plant Complex is Alternative 3: Continued S&M with Hazard Abatement of 221B, Demolition and Grouting of 291B, and Demolition Preparation (Demo Prep) of 221B. This alternative is recommended because it meets the RAOs as stated in Section 3.1. Alternative 3 supports future remedial decisions and characterization activities. Alternative 3 stabilizes significant amounts of radiological inventory and is both technically and administratively feasible. Chapter 7 describes the basis for this recommendation.

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Terms

AM	action memorandum
ARAR	applicable or relevant and appropriate requirement
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
demo prep	demolition preparation
DOE	U.S. Department of Energy
DWMU	dangerous waste management unit
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	Hanford Comprehensive Land Use Plan Environmental Impact Statement
HEPA	high-efficiency particulate air
HHE	human health and the environment
N/A	not applicable
NCP	National Contingency Plan
NPL	National Priorities List
NTCRA	non-time-critical removal action
OMB	U.S. Office of Management and Budget
OU	operable unit
PCB	polychlorinated biphenyl
RAO	removal action objective
RAWP	removal action work plan
RCRA	*Resource Conservation and Recovery Act of 1976*
ROD	record of decision
S&M	surveillance and maintenance
SAP	sampling and analysis plan
TBC	to be considered
TBD	to be determined

TPA	Tri-Party Agreement
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TSD	treatment, storage, and/or disposal
WESF	Waste Encapsulation and Storage Facility

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 placing the B Plant Complex in a configuration that is protective of human health and the environment (HHE). The B Plant Complex structures addressed in this EE/CA include the 221B Canyon Building (221B) and retired 291B Canyon Ventilation System (291B). Appendix A provides a detailed description of the each of the buildings/structures. Development of this EE/CA satisfies environmental review requirements and affords stakeholder involvement while providing a framework for selecting the removal alternative. An Administrative Record for documentation of the removal action will be established.

This non-time-critical removal action (NTCRA) is consistent with 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 *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) NTCRA process as the preferred approach for decommissioning surplus DOE facilities. Under this policy, an NTCRA may be taken when DOE determines that the action will prevent, minimize, stabilize, or eliminate a risk to HHE. 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. This policy states in part:

> *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 in a configuration that is protective of HHE. Without decommissioning these buildings/structures and cleaning up debris, a potential threat of release of hazardous substances exists and, without action, adverse threats to HHE eventually could occur. As the lead agency, DOE has determined that a removal action is an appropriate means to support the final end state and achieve environmental review requirements. The Washington State Department of Ecology (Ecology) is the lead regulatory agency for this removal action. Ecology concurs that an NTCRA is warranted to place these excess buildings/structures and debris in a configuration that is protective of HHE. This NTCRA will, to the extent practicable, contribute to the efficient performance of any anticipated long-term remedial action, as required by 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 of waste generated into the Environmental Restoration Disposal Facility (ERDF). A number of dangerous waste management units (DWMUs) will

be closed in accordance with WAC 173-303, "Dangerous Waste Regulations," as amended, and WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion for the Treatment, Storage, and Disposal of Dangerous Waste*, hereinafter called the Hanford Facility *Resource Conservation and Recovery Act of 1976* (RCRA) permit.

Removal actions taken pursuant to this EE/CA will be conducted in compliance with DOE et al., 2012, *Hanford Federal Facility Agreement and Consent Order Public Involvement Plan*, and public participation requirements established therein, and in 40 CFR 300.415(n), "Community Relations in Removal Actions." This EE/CA will undergo a 30-day public comment period. After the public comment period, a written response to comments will be provided in accordance with 40 CFR 300.820(a), "Administrative Record File for a Removal Action." After consideration of the comments received from the public, DOE will confer with Ecology in the issuance of the action memorandum (AM). The AM will identify the selected alternative, whether the one recommended here or one of the other alternatives.

1.1 Purpose and Scope

This EE/CA evaluates the proposed alternatives for meeting the DOE goal of reducing the risk to HHE at the B Plant Complex by removing or stabilizing wastes and preventing future cost escalation. The B Plant Complex buildings/structures are located within the 200 East Area on the Central Plateau at the Hanford Site. Appendix A provides a detailed description of each structure addressed by this EE/CA. DOE, in consultation with Ecology and the U.S. Environmental Protection Agency (EPA), will use this EE/CA as the basis for selecting removal actions to mitigate potential risks to HHE. Development of an AM, which will document the selected removal action alternative, will be based on this EE/CA and public comments. A removal action work plan (RAWP) will be prepared to document cleanup standards and removal action methods.

1.2 Regulatory Overview

The President of the United States is given authority by Section 104, "Response Authorities," of CERCLA, 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, *Superfund Implementation*. Expedited response actions are addressed by the Tri-Party Agreement (TPA) Action Plan (Ecology et al., 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*), Section 7.2.4, which cites and is consistent with Executive Order 12580.

In anticipation of the NCP National Priorities List (NPL) listing (40 CFR 300, Appendix B, "National Priorities List"), the Tri-Parties (DOE, EPA, and Ecology) entered into the TPA (Ecology et al., 1989a, *Hanford Federal Facility Agreement and Consent Order*) in May 1989. This agreement established a procedural framework and schedule for developing, implementing, and monitoring CERCLA response actions at the Hanford Site. The agreement ensures compliance with remedial and/or removal action requirements under CERCLA and other environmental regulations including closure and postclosure requirements under RCRA. Section 8.0, "Facility Disposition Process," of the TPA Action Plan (Ecology et al., 1989b) outlines the approach for identifying buildings/structures that present sufficient potential environmental concern that coordination of the decommissioning process with cleanup activities under the TPA would be deemed necessary.

Portions of the 221B Canyon Building are a permitted treatment, storage, and/or disposal (TSD) unit. A Part A Form has been issued that delineates the portions of the 221B Canyon Building and other

outside tank systems that are considered part of the TSD unit. In accordance with the TPA (Section 6.0) and WAC 173-303, closure of any DWMUs will require the preparation of closure plans. Following public review of and comment on these closure plans, they will be approved by Ecology and then incorporated into the Hanford Facility RCRA Permit. Any waste generated under this removal action at these DWMUs will be disposed at ERDF under the authority of this removal action.

The TPA Action Plan (Ecology et al., 1989b, Appendix J, "Central Plateau Facilities") lists facilities that are not fully addressed under Sections 6.0 or 7.0 of the TPA (Ecology et al., 1989a) 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 in Appendix J that has undergone an evaluation, as required by the TPA Action Plan (Section 8.1.4, "Disposition Documentation"), is designated as a Tier 1 facility, Tier 2 facility, or neither. Facilities that have not yet been evaluated, as required by the TPA Action Plan (Section 8.1.4), are identified as tier to be determined (TBD). The buildings/structures in this EE/CA, not included in Appendix J of the TPA Action Plan or designated as a tier TBD, will be subject to a facility evaluation and, with concurrence from the lead agency, will be added to Appendix J.

This EE/CA constitutes the facility evaluation, as required by TPA Action Plan (Ecology et al., 1989b) Section 8.1.4 for the following structures: the components of the retired 291B Canyon Ventilation System not already designated as Tier 2 in Appendix. It is recommended that the retired 291B Canyon Ventilation System be designated Tier 2 based on the level of contamination contained in these structures. The 221B Canyon Building is already designated as a Tier 1 facility in Appendix J of the TPA Action Plan. Approval of a change to Appendix J is to be completed in accordance with Section 12.0, "Changes to the Agreement," of the TPA.

As documented in Appendix J of the TPA Action Plan (Ecology et al., 1989b), DOE and Ecology have determined that the ultimate CERCLA response action for the 221B Building will be a remedial action. However, the TPA does not preclude DOE from undertaking an interim CERCLA removal action to address potential threats of releases from the B Plant Complex. Any removal action undertaken, pursuant to this EE/CA and the resulting AM, will be consistent with the final remedial action decisions and will 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 satisfies the requirement of TPA (Ecology et al., 1989a) Milestone M-085-74, "Submit to Ecology proposal(s) for expedited response actions for one or more of the Tier 1 and Tier 2 facilities in the B Plant Geographic Area listed in HFFACO Appendix J."[1]

[1] HFFACO (*Hanford Federal Facility Agreement and Consent Order*) in quote is referring to the Tri-Party Agreement.

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2 Site Characterization

This chapter provides a general site description and background for the B Plant Complex, as well as a more detailed description of the areas of the B Plant Complex included in the scope of this EE/CA. This chapter also provides information about previous deactivation activities and current conditions that justify a removal action.

2.1 Site Description and Background

The buildings/structures in the scope of this NTCRA are located within the B Plant Complex in the 200 East Area of the Hanford Site. Highway 240 is to the southwest of the B Plant Complex, and the Columbia River is north-northeast (Figure 2-1).

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 B Plant Complex is prohibited. The complex buildings/structures are locked, and a 1.8 m (6 ft) cyclone fence encloses the immediate deactivated area.

This EE/CA covers the 221B Canyon Building and the retired 291B Canyon Ventilation System. The term B Plant Complex refers to all structures contained within the B Plant Implementation Area. Specific buildings within the complex are referred to by their building identification numbers. The adjacent operational Waste Encapsulation and Storage Facility (WESF) is not included in the scope of this EE/CA.

2.1.1 Background

The 221B Canyon Building (B Plant), within the 200-CB-1 Operable Unit (OU), was built in 1945 and began separations processing using irradiated fuel from the Hanford Site B and D Reactors on April 13, 1945. The original separations process used at B Plant was the bismuth-phosphate process, which produced a plutonium nitrate product that was shipped to the Los Alamos Site in New Mexico for fabrication into atomic weapons. Due to greater efficiency of a new radiochemical separations process at a facility known as the Reduction-Oxidation Plant, B Plant was shut down in 1952. The canyon and process cells were extensively decontaminated of residual plutonium thereafter.

In the 1960s, B Plant was retrofitted for a large waste partitioning mission to separate cesium-137 and strontium-90 from the liquid wastes stored in the tank farms. Purified strontium and cesium solutions were then transferred to the adjacent WESF for solidification, encapsulation, and storage in pool cells.

From 1984 through 1985, B Plant was prepared for a demonstration test in the pretreatment of neutralized current acid waste. Pretreatment was to be the first step in processing the tank waste into a form compatible with long-term storage. In 1990, a determination was made that B Plant could not meet modern safety, seismic, and secondary containment criteria. B Plant was eliminated from consideration as the pretreatment facility.

In May 1991, B Plant was taken out of operating mode and in September 1995, the plant was placed in transition status. In 1996, transition activities were initiated to stabilize, remove, and dispose of major radioactive sources, hazardous materials, and dangerous waste. WESF utility systems were upgraded to support its own need. In 1998, WESF became independent of B Plant. The facilities were decoupled, and B Plant was isolated (HNF-14804, *B Plant Documented Safety Analysis*).

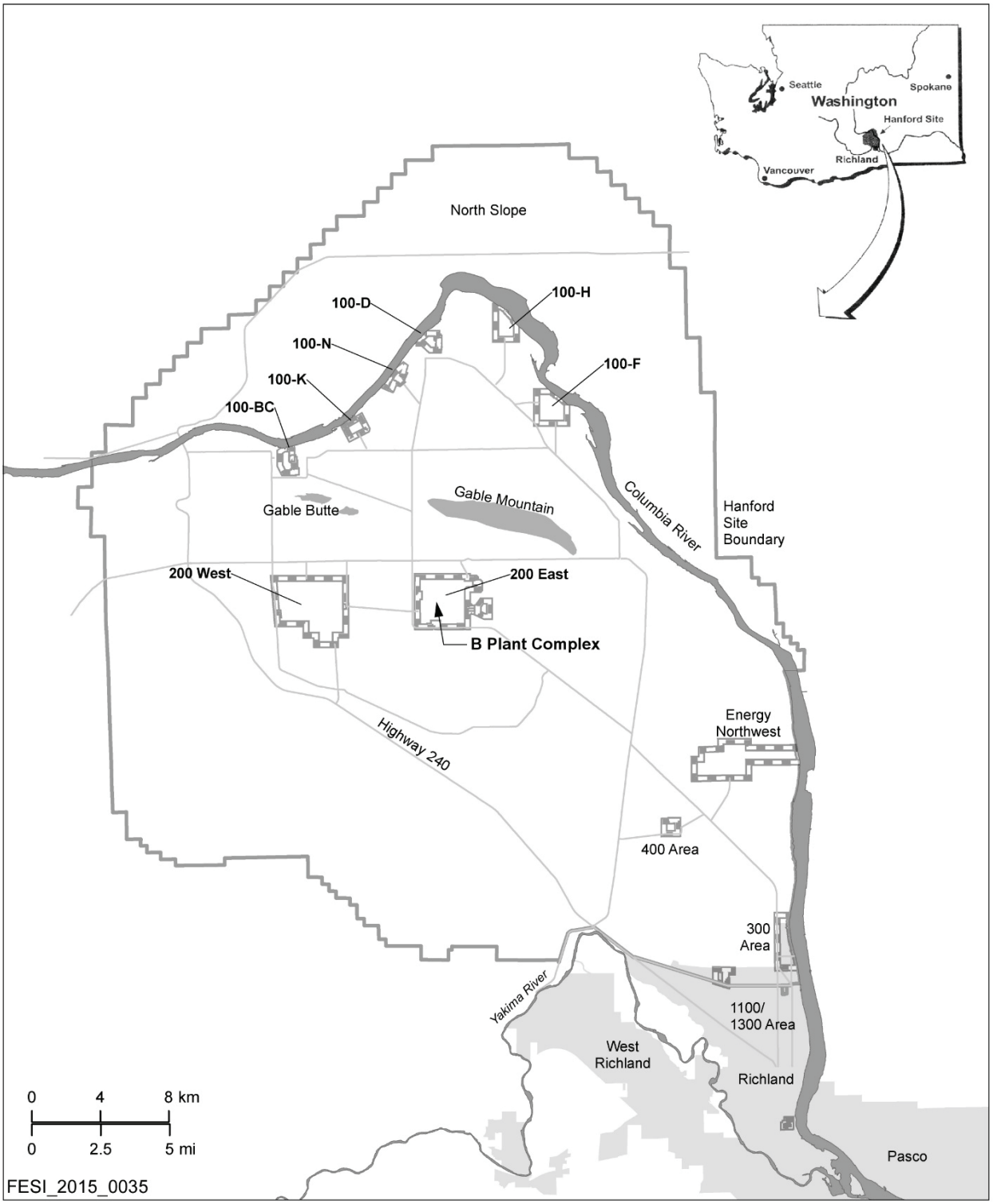

Figure 2-1. Hanford Site and B Plant Complex Location

2.1.2 Physical Setting

The Hanford Site encompasses approximately 1,517 km^2 (586 mi^2) in southeastern Washington State (Figure 2-1). 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 of the site. 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 0.9°C (33.7°F), and the seasonal average summer temperature (June through August) is 23.2°C (73.7° F). The average normal maximum temperature is 33.1°C (91.6°F) in July, and the average normal minimum temperature is -4.1°C (24.6°F) in January (PNNL-15160, *Hanford Site Climatological Summary 2004 with Historical Data*). Average annual precipitation is 17.73 cm (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 B Plant Complex is located in the 200 East 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 by 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 3 km (1.8 mi) thick in the Pasco Basin. The suprabasalt sediments are approximately 169 m (555 ft) thick and consist primarily of the Pliocene Ringold Formation fluvial and lacustrine deposits and Pleistocene Hanford formation flood deposits. The surface elevation of the 200 East Area is approximately 210 m (689 ft) above mean sea level. Ringold Formation sediments were reworked and/or removed when Pleistocene period cataclysmic flooding flowed through Gable Gap and into the central portion of the Hanford Site. During this post-Ringold period, erosion created a northwest-southeast oriented paleochannel that filled with highly permeable Hanford formation sediments (PNNL-12261, *Revised Hydrogeology for the Suprabasalt Aquifer System, 200-East Area and Vicinity, Hanford Site, Washington*).

Regional groundwater generally flows from upland areas in the west toward the discharge area north and east along the Columbia River. Beneath the 200 East Area, groundwater flows to the south-southeast within the buried paleochannel. The unconfined aquifer within the area exhibits high hydraulic conductivity and has a low hydraulic gradient. The resultant water table is very flat and more than 90 m (300 ft) below ground surface (DOE/RL-2015-07, *Hanford Site Groundwater Monitoring Report for 2014*). The Ringold Formation lower mud unit represents the base of the unconfined aquifer in the southern portions of the 200 East Area (DOE/RL-2011-118, *Hanford Site Groundwater Monitoring for 2011*).

The Columbia River and its tributary, the Yakima River, are the primary Hanford Site surface water features. West Lake, about 5.2 ha (12.85 ac) and less than 0.91 m (3 ft) deep, is the only natural lake on the Hanford Site. In the past, wastewater disposal to the ground surface created artificial surface water bodies across the Hanford Site (HNF-3358, *B Plant Surveillance and Maintenance Phase Safety Analysis Report*).

2.1.4 Anticipated Future Land Use

The reasonably anticipated future land use for the portion of the Inner Area where the 200-CB-1 OU is 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. A 1992 report (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* (HCP EIS), associated record of decision (ROD) (64 FR 61615, "Record of Decision: Hanford Comprehensive Land Use Plan Environmental Impact Statement (HCP EIS)") in 1999, and a supplemental analysis (DOE/EIS-0222-SA-01, *Supplement Analysis: Hanford Comprehensive Land-Use Plan Environmental Impact Statement*) in 2008.

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, nonradioactive wastes, and related activities." The 2008 supplemental analysis (DOE/EIS-0222-SA-01) 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 195 km^2 (75 mi^2) area Central Plateau also encompasses a portion of the land known in the previous documents as "all other areas," with a designated land use of conservation (mining). The Inner Area portion of the Central Plateau (described in Section 1.3) is contained within the area designated for Industrial/Industrial-Exclusive land use. At approximately 25 km^2 (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 resources review (*National Historic Preservation Act of 1966*) would be conducted to address removal action activities. The removal action activities would be performed in areas that have been extensively disturbed by past construction activities. Before field activity begins, each building/structure requiring documentation would be evaluated for the type of documentation required, such as the Historic Property Inventory or Expanded Historic Property Inventory Form. Cultural resources review documentation for any specific building/structure would be finalized before removal action activities began. Tagged artifacts, if removable, would be collected for long-term curation. Tagged artifacts that could not be removed would be photographed or documented. At the time of removal, assessments would be made regarding options and 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 from building and parking lot construction activities. Because most of the proposed action would occur in previously disturbed areas, the potential for effects on sensitive ecological resources is expected to be minimal. Ecological reviews would be conducted before work begins to identify where there is potential 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, building-specific surveys must be conducted at each building/structure prior to commencement of 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 nesting migratory birds are observed, removal action activities would potentially be delayed until after the end of the nesting season. Appropriate mitigation efforts will be used to reduce the disturbance. The 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 (if any are found) will be performed at each building/structure prior to commencement of removal action activities, and an appropriate mitigation plan will be developed.

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 near the buildings/structures slated to undergo removal action activities. Very little native or natural habitat is present near the buildings/structures slated to undergo removal action activities. Care would be taken to avoid or minimize damage to any native vegetation, especially shrubs that are 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 B Plant Complex Description

This section describes the B Plant Complex buildings/structures within the scope of this EE/CA and summarizes the processes that occurred at these locations. The buildings/structures included are the 221B Canyon Building and the retired 291B Ventilation System. The B Plant Complex contains buildings, tanks, ventilation systems, and other structures that were used during B Plant operations (Figure 2-2). Many of these buildings/structures have been included in previous regulatory decision documents. Appendix C contains a list of all buildings/structures within the B Plant Complex Implementation Area and associated regulatory decision documents. Table 2-1 lists the buildings/structures in the B Plant Complex that are in the scope of this EE/CA. Appendix A contains additional information about the buildings/structures addressed in this EE/CA.

2.2.1 221B Canyon Building

The 221B Canyon Building is a reinforced concrete and steel structure divided into 20 sections with transverse section joints that are keyed and offset to ensure necessary shielding. The building was designed and built with specific containment and confinement features to prevent excessive radiation exposure to workers and the public.

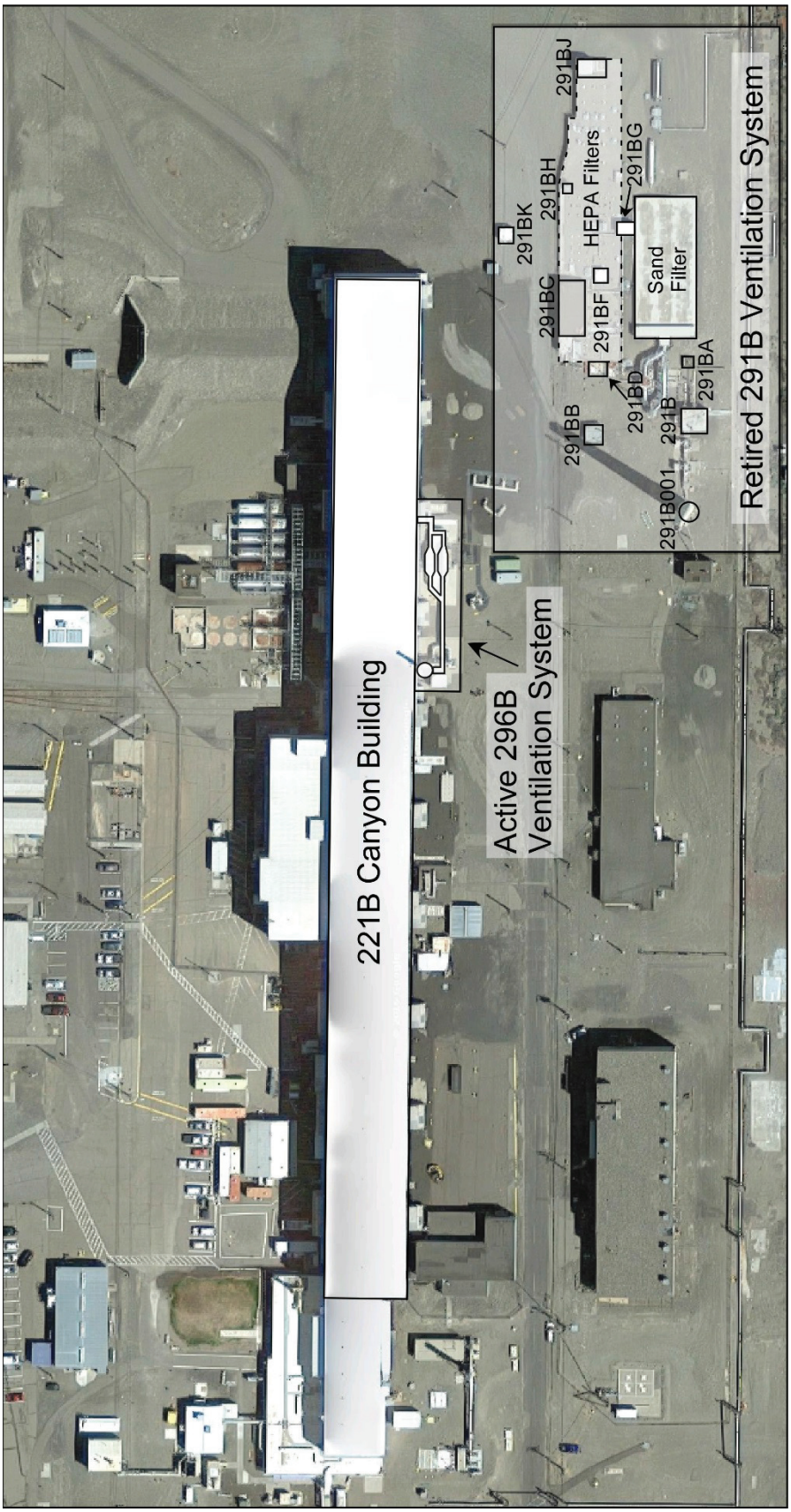

Figure 2-2. B Plant Complex Buildings and Structures

Table 2-1. B Plant Complex Structures in the Scope of this EE/CA

Building/Structure Identification	Building/Structure Name
221B	B Plant Canyon Building
291B	Exhaust Control Fans/Turbine Building
291B System	Retired Ventilation System (A through F HEPA Filters, Sand Filter, Ducts, Fans, Stack, Passive Vent, and Support Buildings)
291BA	Exhaust Air Sample House
291BB	A&B Filters Instrument Building
291BC	Access Control Building
291BD	C Filter Instrument Building
291BF	D Instrument Building
291BG	E Instrument Building
291BH	E Filter Vault Plug Cover
291BJ	F Filter Instrument Building
291BK	Instrument Building
291B001	Retired Canyon Ventilation Stack
296B002	Filter Vault Passive Vent (For A through F HEPA Filters)

HEPA = high-efficiency particulate air

The canyon is composed of 40 process cells; Hot Pipe Trench; Air Tunnel; Crane Cab Gallery; Canyon Deck; and Operating, Pipe, and Electrical Galleries. The process cells and Hot Pipe Trench are covered with removable concrete cover blocks that make up the Canyon Deck. An overhead bridge crane spans the total width of the building. The roof is a steel structure enclosed with metal panels built over and enclosing the original roof. Figures 2-3 and 2-4 show a plan view of the canyon building, and Figure 2-5 provides a cross-sectional view.

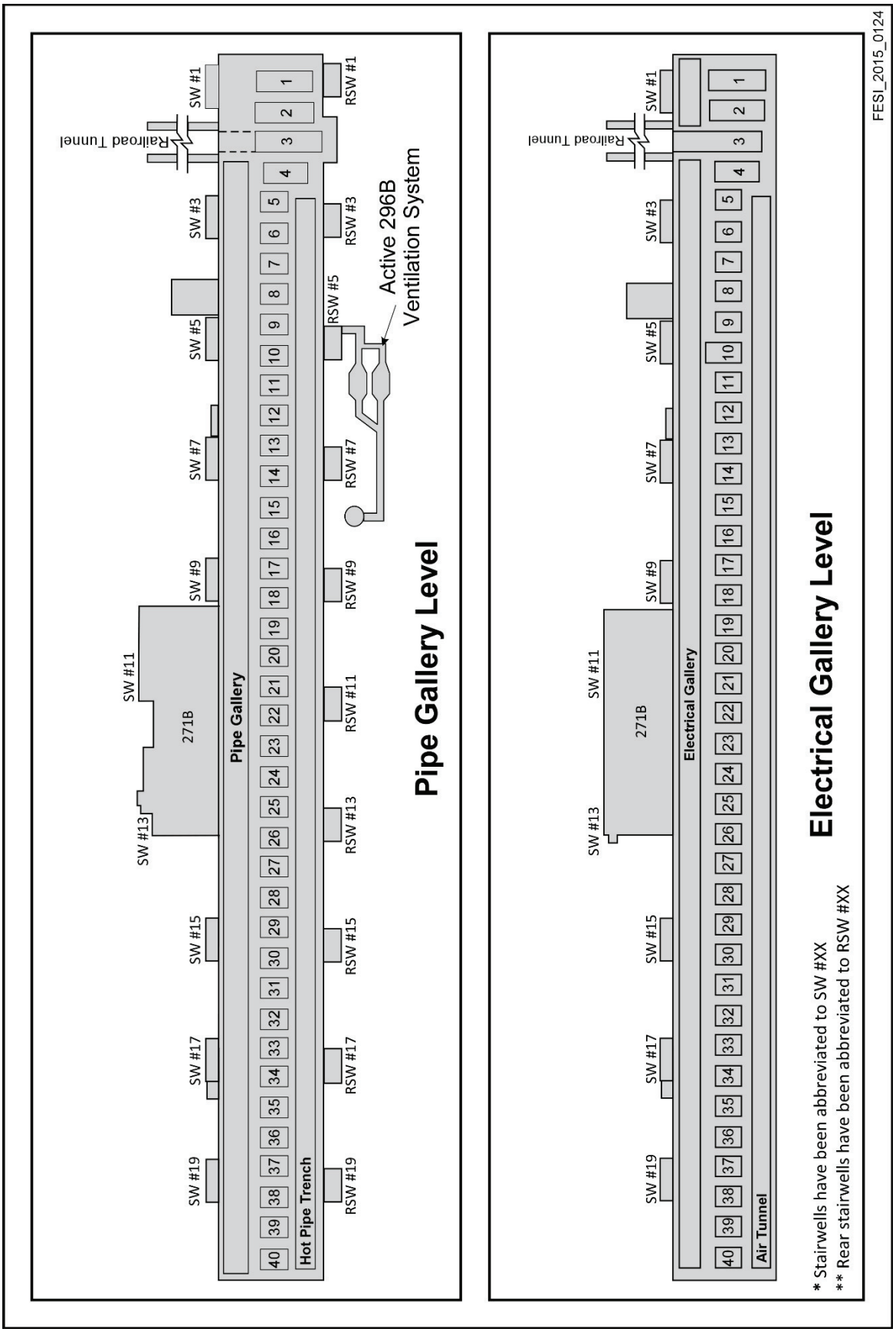

Figure 2-3. Plan View of the 221B Canyon Building (Below Deck Level)

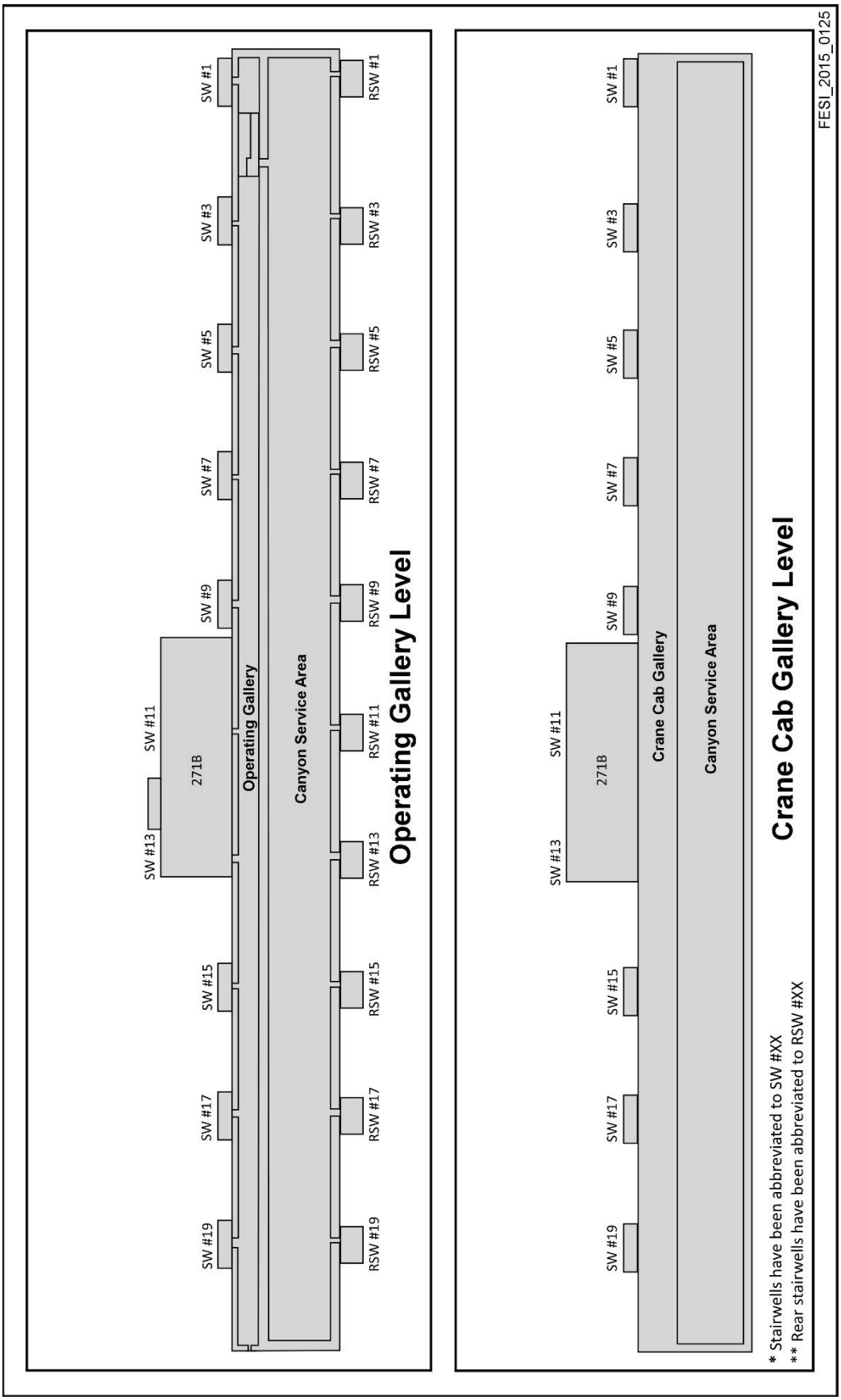

Figure 2-4. Plan View of the 221B Canyon Building (Above Deck Level)

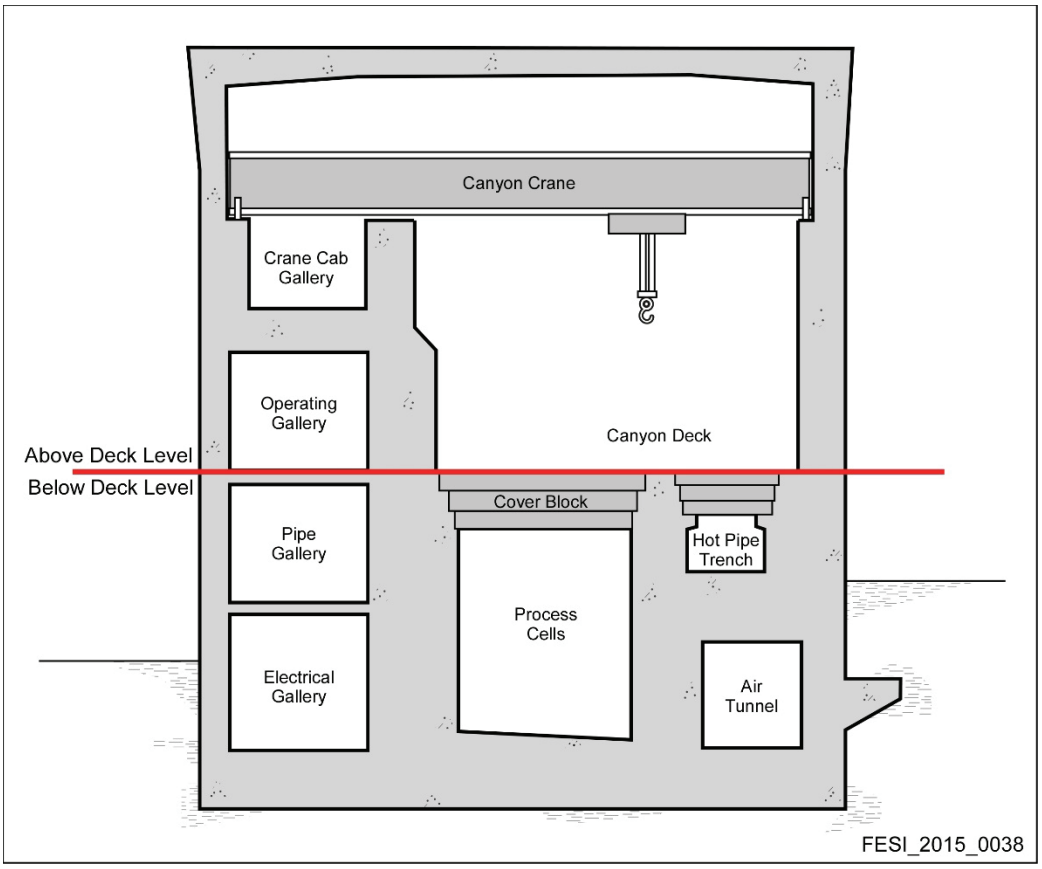

Figure 2-5. Cross Section of the 221B Canyon Building

The canyon and process cells were extensively decontaminated of residual plutonium when the facility was being prepared for the cesium separations mission. A minimal amount of plutonium may remain in the Air Tunnel, underground ducts, and old ventilation system; however, the only known or estimated remaining plutonium is in the 291B Ventilation System filters (HNF-3358).

The 221B Canyon Building is a dangerous waste storage permitted facility under the Hanford Facility RCRA Permit B Plant Part A Form. Table 2-2 lists the dangerous waste within the 221B Canyon Building that is included in the RCRA B Plant Part A Form. In addition to the dangerous waste listed in Table 2-2, The RCRA B Plant Part A Form lists dangerous waste within the B Plant Complex that is located outside the canyon building.

2.2.1.1 Service Area and Canyon Deck

The Canyon Deck is the area above the process cells, Hot Pipe Trench, and Air Tunnel. The Canyon Deck spans the length of the canyon and consists of the cell cover blocks. The deck was cleaned during deactivation, but it still contains various equipment. All equipment is radiologically contaminated, and some of it contains lead. Lead is present on the Canyon Deck as both shielding and waste. HNF-3208, *Documentation of Remaining Hazardous Substances/Dangerous Wastes in B Plant*, provides a list of dose rates present on the Canyon Deck.

Table 2-2. 221B Canyon Building Dangerous Waste Storage Systems Included in the RCRA B Plant Part A Form

Type of Storage System	Location (Cell)	Tank/Vessel Identification
Low-Level Waste Treatment and Storage System	9	TK-9-1
		TK-9-2
	10	TK-10-1
	24	TK-24-1
	25	TK-25-1
		TK-25-2
	26	TK-26-3
	39	TK-39-1
Miscellaneous Storage Tank System	5	E-5-2
	17	TK-17-1
		TK-17-2
	18	T-18-2
		TK-18-3
	20	E-20-2
	21	TK-21-1
	22	TK-22-1
	28	T-28-1
	29	TK-29-2
	30	T-30-1
	32	TK-32-1
	33	TK-33-1
	34	TK-34-2
	35	TK-35-2
	36	TK-36-1
	221B Canyon Deck	TK-100
Containment Building Storage	Canyon Deck and Process Cells	Lead Shielding

Type of Storage System	Location (Cell)	Tank/Vessel Identification
Low-Level Waste Concentrator	23	E-23-3
		E-23-3-1
		E-23-3-2
		D-23-2
		E-23-4
		TK-23-1
Organic Mixed Waste Storage System	26	TK-26-1
	27	TK-27-2
		TK-27-3
		TK-27-4
	28	TK-28-3
		TK-28-4
	29	TK-29-4
	30	TK-30-3
Neutralized Current Acid Waste Treatment and Storage System	6	TK-6-2
	7	TK-7-1
		TK-7-2
	8	TK-8-1
		TK-8-2
	13	TK-13-1
	14	TK-14-2
	29	TK-29-3
	39	TK-39-2
	39	TK-39-5
Cell 4 Container Storage	4	7 Containers

2.2.1.2 Galleries

B Plant has three galleries: Electrical Gallery, Pipe Gallery, and Operating Gallery. The galleries span from Cell 4 to Cell 40, except for the Operating Gallery, which spans the entire length of the building. The galleries are shielded by the north interior longitudinal wall, which is 3 m (9 ft) thick at cell level and 2 m (7 ft) thick above the Canyon Deck level.

In addition to the galleries, three rooms are located on the other side of the railroad tunnel on the Pipe and Electrical Gallery levels. These rooms (Special Work Permit Change Room Lobby, Laundry Storage, and Fan Room) are expected to contain minimal hazards and contamination.

2.2.1.3 Electrical Gallery

The Electrical Gallery, the lowest gallery below grade, housed electrical switchgear, automatic transfer switches, and uninterruptible power supply battery systems for the distributed control system and canyon emergency lighting. All systems have been deactivated and electrically isolated as part of deactivation. The Electrical Gallery is on a current surveillance and maintenance (S&M) path and is radiologically and chemically contaminated.

2.2.1.4 Pipe Gallery

The Pipe Gallery, located on the main level of B Plant, housed electrical switchgear, instrument racks, nonradioactive solution piping, chemical addition tanks, and associated gang valves that served the in-cell equipment. All systems have been deactivated, and piping has been drained as part of deactivation. The Pipe Gallery contained seven high-efficiency particulate air (HEPA) filters that exhausted air outside in order to control any gallery airborne contamination. These filters have been removed, and ducts are expected to be free of contamination. The Pipe Gallery is on a current S&M path and is chemically and radiologically contaminated. Water intrusions were observed in 2015, and an elevated level of radiological contamination has been noted since 2008. It is suspected that the contamination originated from the Operating Gallery. As of 2015, this contamination has not been addressed.

2.2.1.5 Operating Gallery

The Operating Gallery, located above the Pipe Gallery, consisted of a series of panels that housed instruments, indicators, controls, and alarms to support the in-cell process equipment. A number of small chemical tanks and scales also reside on this gallery. The Operating Gallery is not on a current S&M path.

2.2.1.6 Process Cells, Hot Pipe Trench, and Air/Wind Tunnel

The 40 process cells run east to west the length of the canyon. The process cells span the height of the Electrical and Pipe Gallery levels. The process cells are south of the galleries and north of the Hot Pipe Trench and the Air/Wind Tunnel (Air Tunnel). The Air Tunnel is at the Electrical Gallery level, and the Hot Pipe Trench is at the Pipe Gallery level. The process cells, Hot Pipe Trench, and Air Tunnel are not part of the current S&M path and contain significant amounts of radiological contamination. Figure 2-5 shows a cross section of the 221B Building.

The process cells provided segregation of the highly contaminated process vessels and equipment, as well as access and storage space. Cells 1 through 4, 15, 16, and 40 were used for controlled access and storage space for radioactive solid waste and failed parts. Cells 5 through 14 and 17 through 39, except for Cell 10, are standard canyon cells that contained highly contaminated process vessels and equipment. The process cells contain chemicals, as listed in HNF-3208. Table 2-2 provides a list of Part A DWMU tanks and containers in the process cells.

The Hot Pipe Trench is parallel to the process cells from Cells 5 through 40. The trench provided the isolation and shielding of contaminated piping for intercell solution transfer and vessel venting systems.

The Air Tunnel is located below the Hot Pipe Trench and served as the exhaust manifold for air from the process cells, Hot Pipe Trench, and 212B Cask Station.

2.2.1.7 Crane and Crane Cab Gallery

The crane is a 41 metric ton (45 ton) capacity overhead bridge crane that spans the total internal width of the canyon. It is electrically operated from the cab in the Crane Cab Gallery, which is above the Operating Gallery. These areas are not part of the current S&M path and are expected to have asbestos, lead, chemicals, and radiological contamination.

2.2.2 Retired 291B Ventilation System

The retired 291B Ventilation System consists of a main duct coming from the 221B Canyon Building; six HEPA filter cells; a sand filter; a stack; and various fans, ductwork, and support buildings. The support buildings (291B, BA, BB, BC, BD, BF, BG, BH, BJ, and BK) are discussed in more detail in Appendix A. During operations, the exhaust ventilation filters formed the final barrier to prevent contaminated air from reaching the environment through the stack. The entire system was isolated and abandoned in place by plugging part of the main exhaust duct with concrete about 15 m (49.2 ft) from the canyon building. This EE/CA covers the ventilation ducts, HEPA alphabet filter vaults, sand filter, 291B001 Stack, and all abovegrade supporting structures (including the structures previously covered in DOE/RL-2010-54, *Engineering Evaluation/Cost Analysis for 200 East Area Tier 2 Buildings/Structures*). The entirety of the retired ventilation system is radiologically contaminated. The HEPA filter vaults contain a significant amount of contamination, as listed in Table 2-3. Further details on the retired ventilation system are provided in Appendix A. Figure 2-6 shows the general configuration of the retired 291B Ventilation System.

Table 2-3. B Plant Radioactive Material Inventories

Location	Type	Inventory (Ci)
A Filter	Cs-137	≤18,000
	Sr-90	≤12,000
	Pu-mix	≤1 g or 0.175 Ci
B Filter	Cs-137	≤43,000
	Sr-90	≤29,000
	Pu-mix	≤1 g or 0.175 Ci
C Filter	Cs-137	≤25,000
	Sr-90	≤16,000
	Pu-mix	≤1 g or 0.175 Ci
D Filter	Cs-137	≤70,000
	Sr-90	≤14,000
	Pu-mix	≤1 g or 0.175 Ci

Table 2-3. B Plant Radioactive Material Inventories

Location	Type	Inventory (Ci)
E Filter	Cs-137	3
	Sr-90	2
Sand Filter	Cs-137	2,000
	Sr-90	3,000
	Pu-mix	≈11 g or 1.925 Ci
Canyon	Cs-137	81,000
	Sr-90	44,000

Note: Inventories are from Table 3.3-3 of HNF-3358, *B Plant Surveillance and Maintenance Phase Safety Analysis Report*.
Cs-137 = cesium-137
Sr-90 = strontium-90
Pu-mix = assumed to be a mixture of plutonium-238 through plutonium-242 and americium-241

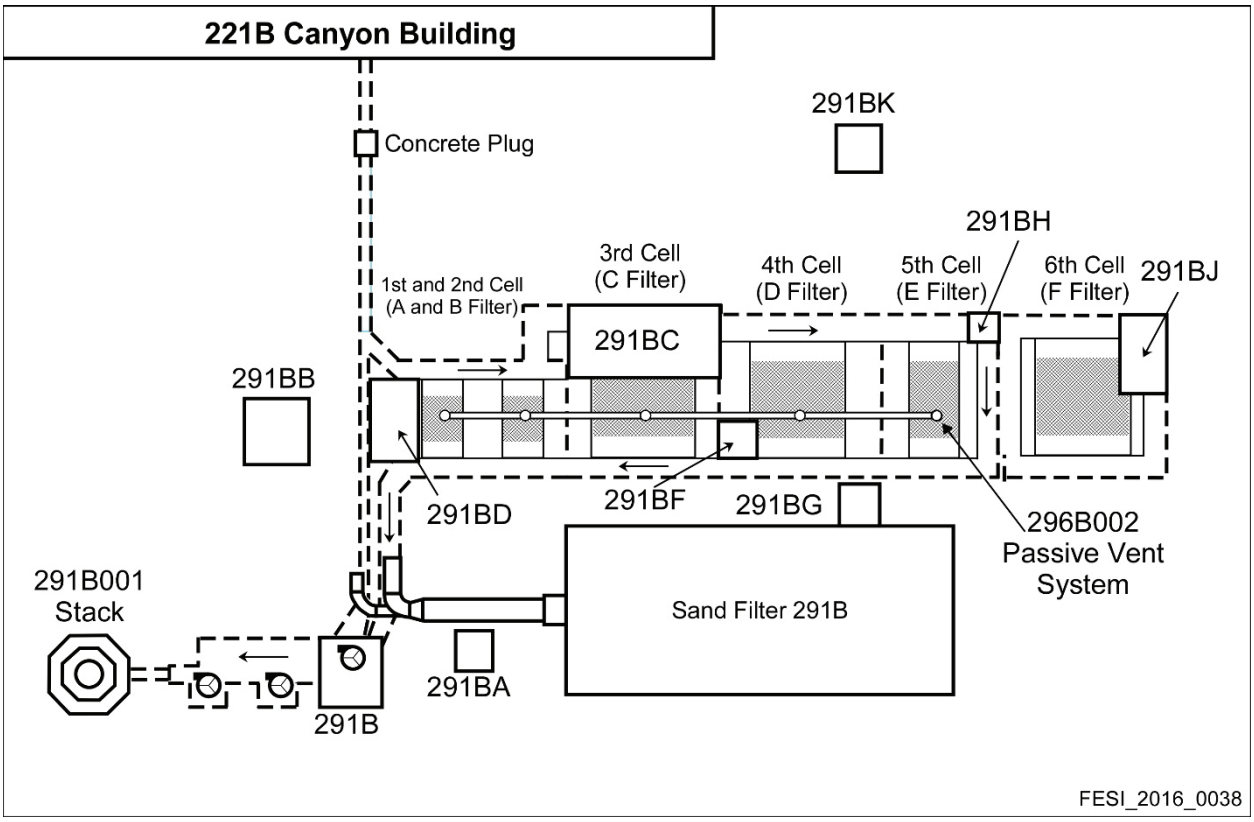

Figure 2-6. Retired 291B Ventilation System Configuration

2.2.2.1 296B002 Filter Vault Passive Vent System

The six filter cells contained within the retired 291B Ventilation System are equipped with a passive HEPA filter vent system (296B002), which allows any gases generated from radiolytic decomposition of water or any other substances to dissipate naturally, while preventing transfer of contaminants to the

atmosphere. 296B002 contains two HEPA filters. The first HEPA filter serves to filter the vent stream and prevent a release of contaminants to the atmosphere. The second HEPA filter is an approved alternative to a record sampler and is used to perform in-place nondestructive assay for reporting emissions from the passive vent discharge.

2.3 Previous Investigations and Removal Actions

Various soil and groundwater investigations have been conducted within the 200 East Area on the Central Plateau of the Hanford Site. No investigations, however, were related to the buildings/structures addressed by this NTCRA. No previous removal actions have been performed on the buildings/structures addressed by this NTCRA.

2.4 Source, Nature, and Extent of Contamination

The buildings/structures are, to different degrees, contaminated with both radioactive and chemical substances that were used or generated during facility operations and waste management activities. Some hazardous substances were removed during the deactivation period. Others will be removed from the buildings/structures as part of routine S&M activities. In addition to radiological and chemical hazards, structural hazards exist due to degradation of the structural integrity of the buildings/structures. Structural degradation could result in partial or total loss of radiological containment and/or worker injury.

Resources such as 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 remaining hazardous substances (for example, within equipment and piping/drains) in order to facilitate removal action activities and associated waste disposal.

To support characterization of waste within the buildings/structures, a sampling and analysis plan (SAP) will be prepared in conjunction with the RAWP. As the lead regulator for this action, Ecology will approve the RAWP and SAP. The SAP will also be submitted to EPA for approval.

2.4.1 Radiological Hazards

Primary hazardous substances associated with the buildings/structures are radioactive materials. Primary radionuclide contaminants include, but are not limited to, cesium-137 and strontium-90. There are minor amounts of plutonium mix assumed to consist of plutonium-238 through plutonium-242 and americium-241. Most contaminants are found within process cells in the 221B Canyon Building and HEPA filters of the retired 291B Ventilation System. Table 2-3 summarizes the radioactive material inventory (HNF-3358). Dose rates within 221B are provided in HNF-3208.

2.4.2 Chemical Hazards

The following chemical hazards may be present within the B Plant Complex. The buildings/structures contain some friable and/or nonfriable asbestos, in the form of insulation and ductwork, which will be confirmed through process knowledge and/or sampling and analysis. Additional chemical hazards present may include, but are not limited to, one or more of the following materials:

- Polychlorinated biphenyls (PCBs)
- Beryllium
- Lead paint, shielding, and equipment
- Other heavy metals (for example, arsenic, cadmium, and uranium)

- Mercury switches, gauges, and thermometers
- Mercury or sodium vapor lights
- Incandescent light bulbs
- Used oil from motors and pumps
- Emergency light batteries
- Refrigerants
- Lubricants
- Corrosives (including both acids and caustics)

2.4.3 Current Hazard Conditions

Current S&M areas are identified in DOE/RL-99-24, *Surveillance and Maintenance Plan for the 221-B Facility (B Plant)*, hereinafter called the S&M plan. These areas are surveyed annually to identify any changes in the condition of the building. Table 2-4 lists conditions noted from 2008 to 2014.

Table 2-4. Current Hazard Conditions

Area	Surveyed Area	Documented Conditions
Electrical Gallery	Yes	The Electrical Gallery contains numerous unknown chemical leaks, stains, and powders and areas of fixed contamination.
Pipe Gallery	Yes	In general, the Pipe Gallery has both known and unknown chemical leaks, stains, and powders throughout, such as caustic lines leaking. There are also water intrusions, exposed insulation, and structural deterioration around expansion joints. In 2015, the Pipe Gallery had a large water intrusion that threatened accessibility. In 2013, an area of the Pipe Gallery with contamination levels voided the Radiological Work Permit. The highest levels of contamination appear to be coming from the ceiling and are thought to originate in the Operating Gallery.
Operating Gallery	No	The Operating Gallery is not on a surveillance path and has not been entered since deactivation. It was not added to a surveillance path due to the apparent lack of hazardous conditions. The high levels of contamination in the Pipe Gallery indicate that this is no longer the case.

2.5 Risk Evaluation

The buildings/structures addressed by this NTCRA are contaminated with hazardous substances including radiological contaminants, heavy metals, PCBs, beryllium, and asbestos. The buildings/structures were used for radiological and/or chemical processing activities and contain significant inventories of hazardous substances that could present an increased threat to HHE if not addressed.

The buildings/structures addressed by this EE/CA were built in the 1940s and are structurally deteriorating. A new roof was placed on B Plant to mitigate water intrusion into the canyon building due to structural degradation and, while this issue is now fixed, the rest of the building has continued to degrade over time. Contamination could further spread throughout the building or to the environment as the buildings/structures continue to deteriorate. Contaminants could be released directly to the environment through a fire; breach in a utility pipe, containment wall, or roof; or building collapse as the buildings age and deteriorate.

Radiological and chemical conditions of B Plant, as described in Section 2.4, indicate that contamination is spreading in locations that are currently surveyed. Contamination spreading in these locations indicates that there may be spreading of contamination in other areas that are not entered. Several locations within B Plant are radiologically contaminated and need to be addressed before the occurrence of an unpredictable event that could be a threat to HHE.

Because TPA (Ecology et al., 1989a) Milestone M-085-70, "Submit Remedial Investigation/Feasibility Study Work Plan for 200-CB-1 to Ecology," is not required until September 30, 2019, the remedial actions are not expected to be implemented for a number of years thereafter. In general, the risk of an accidental release (for example, from a structure failure) increases the longer the buildings/structures await the eventual remedial action activities for the OU. Without the near term hazard mitigation actions, the structural deterioration and contamination spread could result in an unacceptable release to HHE. Therefore, the removal action is needed to alleviate this potential future risk. Radiological and chemical contamination present a sufficient threat of release to the environment under a continued S&M scenario to justify an NTCRA.

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3 Identification of Removal Action Objectives

This chapter discusses the removal objectives developed for the evaluated alternatives to reduce the risk associated with 221B and 291B. The removal action objectives (RAOs) for this NTCRA are to perform removal actions in a manner that would, to the extent practicable, support 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). The principal threats to be addressed are the remaining radiological inventory and residual hazardous chemical contamination associated with past operations.

The 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., structures, process tanks, and support equipment)
- Types of contaminants (e.g., radionuclides, inorganic, and organic chemicals)
- Potential receptors (e.g., humans, animals, and plants)
- Possible exposure pathways (e.g., external radiation and ingestion)

Section 2.4 describes the radionuclide and/or chemical contamination that may present a risk to HHE. The following RAOs have been identified, based on the potential hazards discussed in Chapter 2.

3.1 Removal Action Objectives

The following RAOs for this NTCRA are to perform removal actions to address identified risks 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:

1. Reduce the inventory and any potential threat to HHE from an unacceptable exposure to hazardous and radioactive substances.
2. Minimize the general disruption and adverse impacts to cultural resources and wildlife habitat.
3. Safely treat, as appropriate, and dispose of waste generated by the removal action.
4. Be consistent with anticipated remedial actions at the B Plant Complex.
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 appropriate requirements under federal environmental or state environmental or facility siting laws” (40 CFR 300.415(j)).

The evaluation of ARARs for this EE/CA can be found in Appendix B. Appendix B 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: first, a determination of whether a given requirement is applicable; then if it is not applicable, whether it is relevant and appropriate. A requirement is deemed applicable if the specific terms of the law or regulation directly address the primary 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 requirements, are not ARARs.

In addition to ARARs, the NCP provides that where ARARs do not exist, agency advisories, criteria, or guidance are to be considered (TBC) useful "in helping to determine what is protective at a site or how to carry out certain actions or requirements." The NCP preamble states, however, that provisions in the TBC category "should not be required as cleanup standards because they are, by definition, generally neither promulgated nor enforceable, so they do not have the same status under CERCLA as do ARARs" (40 CFR 300).

As the lead federal agency, DOE has the primary responsibility for the identification of federal ARARs at the B Plant Complex. As the lead regulatory agency, Ecology has the responsibility for identifying state ARARs (Appendix B). Requirements of ARARs and TBCs are generally divided into three categories: chemical-specific, location-specific, and action-specific. Chemical-specific and location-specific ARARs affecting the development of RAOs are discussed in the following chapter. Other chemical-specific, location-specific, and action-specific ARARs are presented in Chapter 5 for each of the alternatives considered. Appendix B provides a detailed discussion of all the ARARs considered for this EE/CA.

4 Identification of Removal Action Alternatives

This chapter identifies the removal action alternatives. The purpose of these alternatives is to mitigate the risk of release and exposure to hazardous substances from 221B and 291B. These alternatives were developed with consideration for eventual disposition of the 221B Canyon Building, which is not included in the scope of this EE/CA.

The removal actions proposed in this EE/CA are consistent with and would support a final disposition similar to those described in EPA et al., 2005, *Record of Decision, 221-U Facility (Canyon Disposition Initiative), Hanford Site, Washington*. The 221U Canyon Building remedial action is considered a pilot project for the remediation of other Hanford Site canyon buildings. The 221U Canyon remedial action involved removal of waste from abovegrade level galleries and the Canyon Deck and grouting of internal spaces below the Canyon Deck level. All of these actions have been completed. The U Canyon ROD (EPA et al., 2005) specified the final state of U Canyon as removal of roof and wall sections down to deck level and construction of an engineered barrier over the remnants of the canyon. These actions are still ongoing.

The alternatives were developed in consideration of a future B Plant Canyon Building ROD, which would include evaluation of remedial actions similar to those described in the 221U Canyon Building ROD (EPA et al., 2005). The consistency with expected remedial decisions at the B Plant Complex is addressed in Chapter 5 of this EE/CA. All alternatives will be evaluated against this criterion.

The following removal action alternatives were identified for evaluation in this EE/CA:

- Alternative 1 – No Action
- Alternative 2 – Continued S&M with Hazard Abatement of 221B and Demolition/Grouting of 291B
- Alternative 3 – All Actions Included in Alternative 2 Plus Demo Prep of 221B

For all actions, wastes generated during removal action activities may include, but are not limited to, radiologically and/or chemically contaminated equipment and structural and construction materials. Structural and construction material includes wood, metal, roofing, siding, gypsum, and concrete. Equipment includes pumps, pipes, tanks, containers, boilers, compressors, ductwork, and electrical components. The preferred location for disposal of waste is ERDF. Waste treatment and/or disposal may take place at other facilities that are on the Hanford Site, or offsite, and have been authorized by their own EPA regional offices in accordance with the NCP (40 CFR 300.440, "Procedures for Planning and Implementing Off-Site Response Actions") as suitable to receive waste from CERCLA sites.

Waste generated during removal action activities would be characterized and segregated by waste type (e.g., low-level radioactive, mixed low-level radioactive, hazardous, and nonhazardous). In compliance with WAC 173-303 and the *Atomic Energy Act of 1954*, waste would be dispositioned at appropriate onsite or offsite waste disposal facilities. ERDF, Low-Level Burial Ground Trench 31/34, T Plant, and the Central Waste Complex are considered onsite facilities for management and/or disposal of waste from activities addressed in this document.

ERDF is the preferred disposal location because it is an engineered facility that provides a high degree of protection to HHE. 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, 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, a leachate collection system, leak detection, monitoring, and a final cover.

Hazardous, mixed, low-level, asbestos, and *Toxic Substances Control Act of 1976* wastes can be accepted for disposal at ERDF (WCH-191, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*). It is expected that most of the waste generated during removal activities would be disposed onsite at ERDF. If transuranic and/or other waste generated during implementation of this NTCRA cannot be disposed of at ERDF, it would be moved to an onsite facility for storage and managed according to applicable waste acceptance criteria (HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*).

Treatment of waste may be necessary before disposal at ERDF or storage at an onsite facility. Residuals from treatment of waste originating from activities addressed in this EE/CA would be disposed at ERDF, provided that treatment residuals meet ERDF waste acceptance criteria (WCH-191). Waste treatment and/or disposal may take place at other facilities that are on the Hanford Site or at offsite facilities that have been authorized by EPA regional offices in accordance with the NCP (40 CFR 300.440) as suitable to receive waste from CERCLA sites.

4.1 Removal Action Activities

Each alternative, with the exception of Alternative 1, includes the following types of actions: S&M, hazard abatement, demolition preparation (demo prep), demolition, and grouting. Waste generated from these actions will be treated and/or disposed of properly. The following subsections describe these action categories.

4.1.1 Surveillance and Maintenance

S&M activities will be performed according to the most current S&M plan (DOE/RL-99-24). Activities conducted during the S&M phase are established to monitor containment of contaminants left in place, provide physical safety and security controls, and maintain the facility in a manner that will minimize risk to HHE. S&M activities may be conducted on a routine and/or a nonroutine basis. Routine activities ensure that the structural and passive confinement integrity is maintained and may include periodic monitoring for potential radiological contamination, maintenance, identification, and minor repair of friable asbestos, general visual inspections, and annual roof inspections. Nonroutine activities include major responses to hazardous conditions (e.g., a leak in one area spreading radiological contamination to another area). Surveillance must satisfy the inspection requirements identified in Table 6-1, “B Plant Regulatory Compliance during Surveillance and Maintenance” of the S&M plan (DOE/RL-99-24). The S&M plan will be revised to reflect the current facility conditions and identify appropriate surveillance requirements, as needed.

4.1.2 Hazard Abatement

Hazard abatement differs from S&M in that it allows for a proactive response to mitigate or reduce risk before a major response would be required. Hazard abatement may range from stabilization to complete removal of equipment and waste, as needed, to mitigate hazards. Identification of areas that will receive hazard abatement will be based on S&M activities and observations. Ventilation system modifications will be evaluated to support removal actions within the 221B building, as needed.

4.1.3 Demolition Preparation (Demo Prep)

Demo prep includes activities such as general housekeeping and removal of equipment and waste. Decontamination, fixing/stabilization of contamination, and isolation of systems may be performed. Overhead utilities and adjacent concrete and asphalt will be removed, as needed. Fluids will be drained from piping and equipment. Piping entering or exiting a structure may be plugged, blocked, or grouted to

prevent potential release pathways to the environment, as appropriate. These activities will be managed in accordance with procedures that address removing, handling, and disposing of equipment and waste in a manner that protects the safety of workers and the public, minimizes spills and releases to the environment, and meets regulatory requirements.

4.1.4 Demolition

Demolition can include hazard abatement and demo prep activities such as removing radioactive and hazardous substances from within and around buildings and structures; decontaminating, fixing contamination, and isolating systems; removing equipment; and plugging piping or drains entering or exiting belowgrade buildings/structures. Demolition of buildings and structures includes removal of abovegrade structures. The area will be stabilized (for example, backfill, contour, and vegetate) as necessary and appropriate. Demolition will be performed in a manner that protects HHE and reduces or eliminates the need for ongoing S&M activities.

4.1.5 Grouting

Grouting of structures will be performed to reduce the mobility, solubility, and/or toxicity of the structures and support final disposition. Structures and systems, including piping, utility systems, and structural steel, may be abandoned in place and grouted. Residual radioactive materials in proposed grouted areas will remain in place and will be managed in accordance with DOE/RL-2001-41, *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions and RCRA Corrective Actions*. Void spaces would be grouted, as necessary, and/or backfilled as appropriate and practicable. A controlled density fill material, such as grout or other similar material, may be installed to stabilize the void space, provide shielding, and facilitate demolition and/or future removal or remedial actions.

4.2 Alternative 1 – No Action

CERCLA requires the No Action alternative as a baseline for comparison with other removal action alternatives. Under the No Action alternative, it is assumed that 221B and 291B would be abandoned without any further action. No legal restrictions, institutional controls, or active measures are applied to 221B or 291B in this alternative. S&M activities would be discontinued, no additional facility stabilization would be performed, and degradation would continue indefinitely. Initial risks to HHE of the No Action alternative would be minimal and, barring an unusual event, contaminants are assumed to remain confined within the 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 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 HHE; 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 only.

4.3 Alternative 2 – Continued S&M/Hazard Abatement of 221B/Demolition and/or Grouting of 291B

The primary elements of Alternative 2 are as follows:

- Continued S&M
- Hazard Abatement of Operating and Pipe Galleries

- Grouting of Belowgrade Void Spaces within the Retired 291B Ventilation System
- Demolition of Abovegrade Structures Associated with the Retired 291B Ventilation System

Figure 4-1 summarizes the removal activities for Alternative 2, and the following subsections describe the scope of each removal activity.

4.3.1 Surveillance and Maintenance

Under Alternative 2, S&M activities for the B Plant Complex would continue.

4.3.2 Hazard Abatement

The Operating and Pipe Galleries (Figure 4-1) contain pipes, tanks, and equipment that are chemically and/or radiologically contaminated. Alternative 2 proposes proactive mitigation of risk from used equipment and waste in these areas that poses a threat to HHE. Hazard abatement in the Operating and Pipe Galleries includes stabilization or, if possible, complete decontamination and removal of the sources of contamination. Hazard abatement also includes complete removal of all piping and equipment, as necessary. If cleanout is not possible in either gallery, contamination would be stabilized in place. A modification to the active 296B Ventilation System may be necessary to support hazard abatement.

4.3.3 Grouting/Demolition

All belowgrade void space within the retired 291B Ventilation System would be grouted. Both the HEPA filters and sand filter associated with 291B were isolated and abandoned in place (DOE/RL-2010-54). The filter cells contain significant radiological inventory, which is identified in Table 2-4. Under this alternative, the filter cells, sand filter, and belowgrade ducts would be grouted in place. Abovegrade structures, including support buildings, fans, ductwork, and the 291B001 Stack, would be demolished. The 296B002 Passive Vent System would be grouted/demolished, as necessary, once the HEPA filters are grouted.

4.4 Alternative 3 – Continued S&M/Hazard Abatement 221B/Demolition and/or Grouting of 291B/Demo Prep of 221B

Alternative 3 includes all activities in Alternative 2, with the primary element following in italics:

- Continued S&M (Alternative 2)
- Hazard Abatement of Operating and Pipe Galleries (Alternative 2)
- Grouting of Belowgrade Void Spaces within the Retired 291B Ventilation System (Alternative 2)
- Demolition of Abovegrade Structures Associated with the Retired 291B Ventilation System (Alternative 2)
- *Demo Prep of the 221B Canyon Building above Deck Level Areas*

4.4.1 Demo Prep

Demo prep would occur in all 221B above deck level areas. These areas include the Operating Gallery, Crane Cab Gallery and crane area, and Canyon Deck. Each area would be emptied of waste, equipment, furniture, and nonstructural utilities, as appropriate. The crane will not be activated or removed. Activities such as general housekeeping, fixing/stabilization of contamination, decontamination, draining fluid from piping and equipment, and removing equipment and waste may be performed in each area.

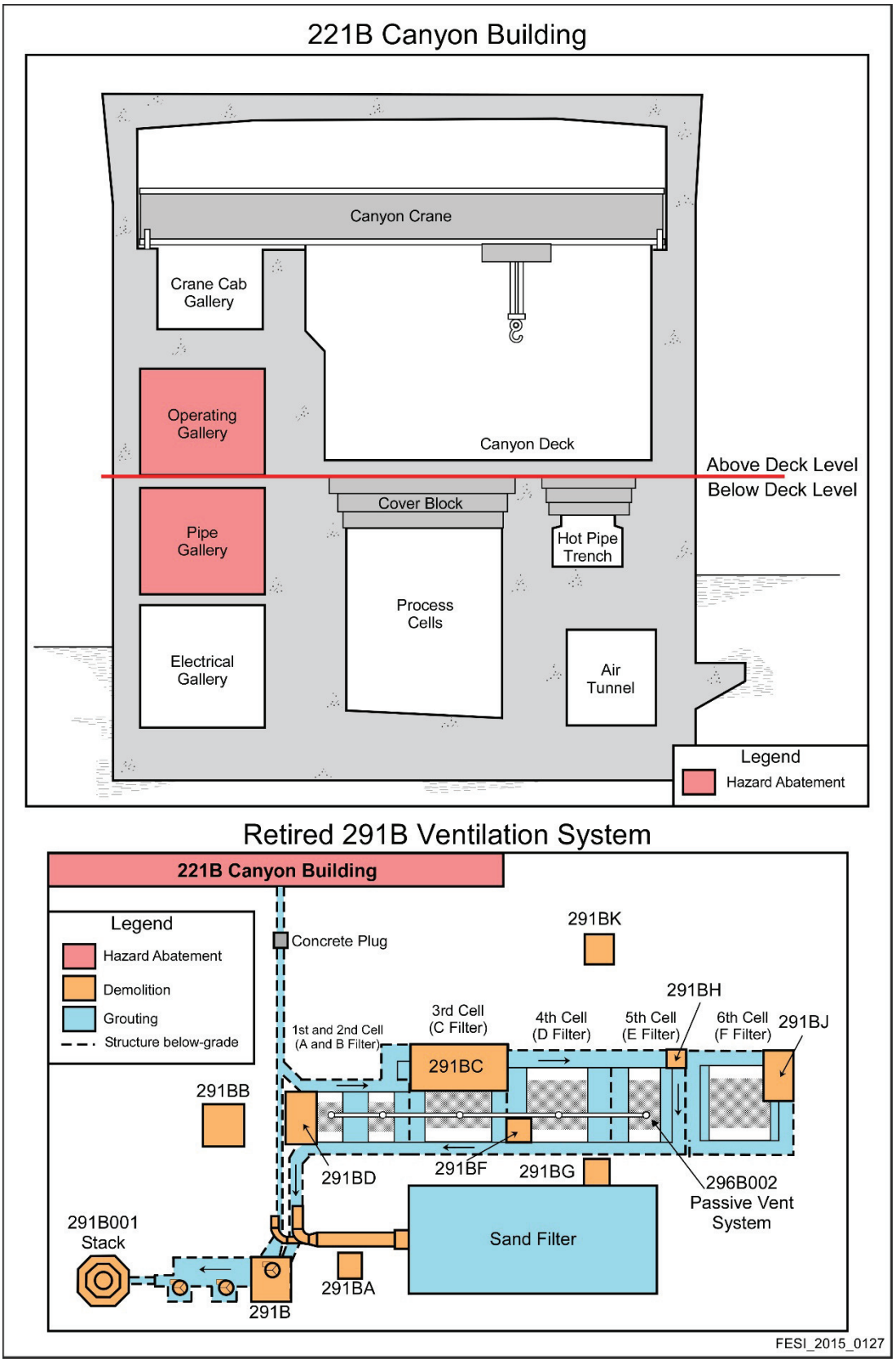

Figure 4-1. Alternative 2 – Proposed Actions

The Pipe and Electrical Galleries are not included because it is likely that a close-in-place cleanup approach will be selected as the final disposition of 221B based on the U Canyon remedial decision. The close-in-place cleanup approach will include grouting these galleries. Hazard abatement, as necessary in these galleries, will address and/or prevent future hazards prior to final disposition.

The removal activities for Alternative 3 are summarized in Figure 4-2.

4.5 Summary of Alternatives

Table 4-1 summarizes the four proposed alternatives, showing the actions included as they apply to the B Plant Complex buildings and structures.

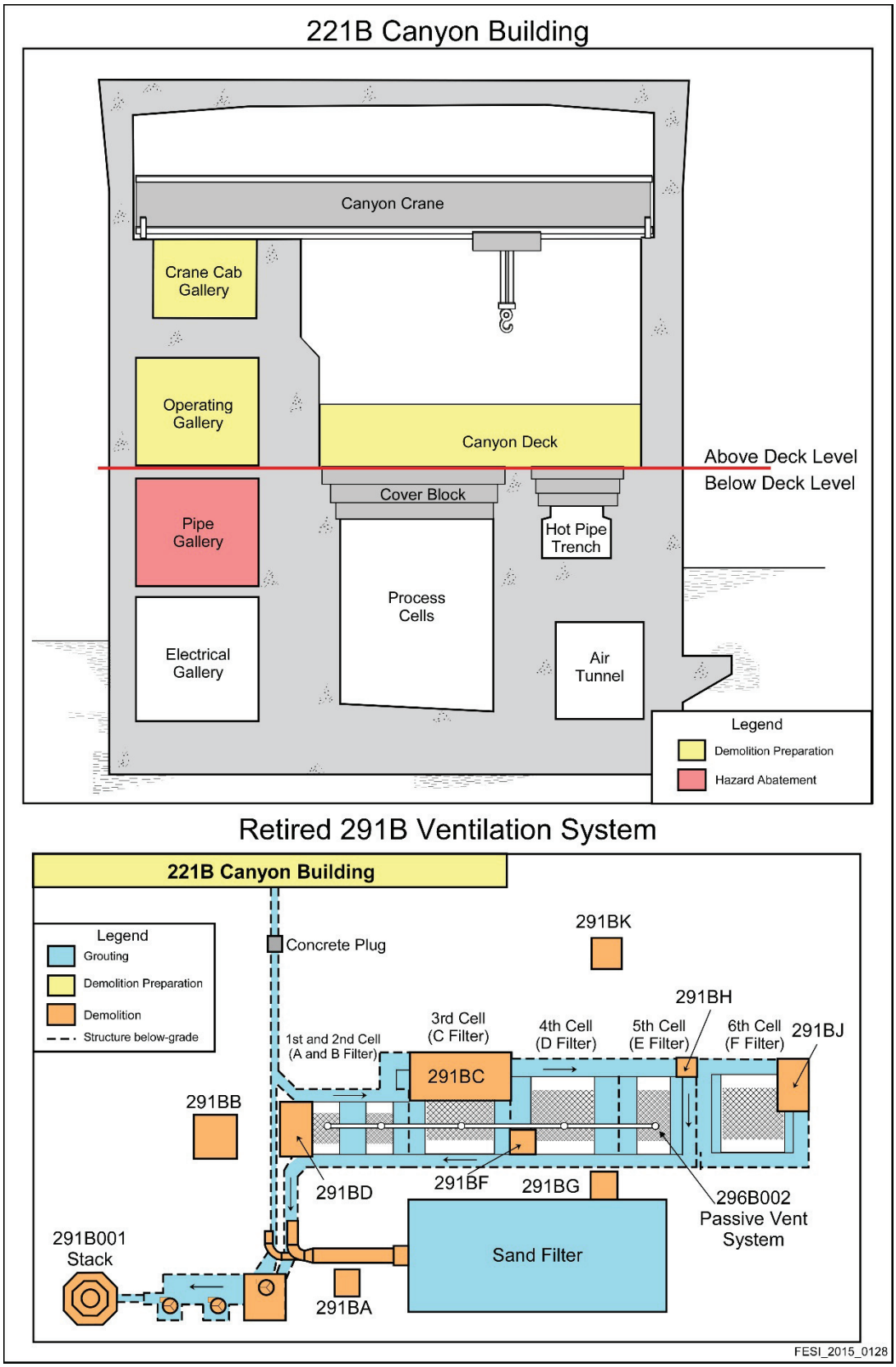

Figure 4-2. Alternative 3 – Proposed Actions

Table 4-1. Summary of Alternatives

	Structure/Building					
	291B Retired Ventilation System	**221B Operating Gallery**	**221B Pipe Gallery**	**221B Electrical Gallery**	**221B Canyon Deck and Crane Area**	**221B Process Cells, Air Tunnel, and Hot Pipe Trench**
Alternative 1						
No Action						
Alternative 2						
Surveillance and Maintenance	▲	▲	▲	▲	▲	▲
Hazard Abatement		▲	▲			
Demo Prep						
Demolition	▲					
Grouting	▲					
Alternative 3						
Surveillance and Maintenance	●	●	●	●	●	●
Hazard Abatement		●	●			
Demo Prep		▲			▲	
Demolition	●					
Grouting	●					

▲ = Action is new to this alternative.

● = Action was part of preceding alternative.

5 Analysis of Removal Action Alternatives

In accordance 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 against three criteria: effectiveness, implementability, and cost. Effectiveness includes two subcriteria: protectiveness and ability to meet the RAOs. Implementability is evaluated based on technical and administrative feasibility and availability of equipment, personnel, services, and disposal facilities. Costs are estimated, including capital costs and operations and maintenance costs. Subcriteria used in the evaluation process are outlined in Table 5-1.

Table 5-1. Alternative Analysis Criteria

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

The analysis of alternatives considers that the removal actions performed under this EE/CA are short-term, interim measures to prevent potential harm to HHE. Long-term treatment or containment activities required for the permanent closure of the 221B Canyon Building will be executed under a future remedial action, as determined by a ROD.

Sections 5.1 through 5.3 provide an analysis of the alternatives being considered for this NTCRA:

- Alternative 1 – No Action
- Alternative 2 – Continued S&M with Hazard Abatement of 221B and Demolition/Grouting of 291B
- Alternative 3 – All Actions Included in Alternative 2 Plus Demo Prep of 221B

5.1 Effectiveness of Removal Action Alternatives

The two subcriteria for evaluating effectiveness of the NTCRA are protectiveness and ability to achieve RAOs. The protectiveness analysis determines whether implementation of the removal action alternative

and its ability to meet CERCLA thresholds is adequate for the protection of HHE. Overall protection of HHE involves the elimination, reduction, or control of risks posed by likely exposure pathways. Environmental protection also includes avoiding or minimizing effects to natural, cultural, and historic resources. Compliance with ARARs overlaps with the protectiveness criteria by addressing chemical, location, and action-specific requirements for protection of HHE.

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 extent and effectiveness of controls that may be required to manage risk.

5.1.1 Protectiveness

Overall protection of HHE is the primary objective of the removal action. The protectiveness analysis determines whether implementation of the NTCRA and its ability to meet CERCLA thresholds is adequate for the protection of HHE. This criterion must be met for an alternative to be eligible for consideration. Other factors included in the evaluation of each alternative include long-term effectiveness; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness.

The ARARs and TBCs identified for the removal actions are presented in Appendix B. An alternative that does not meet the ARAR(s) must either use a waiver under CERCLA Section 121(d)(4) “Cleanup Standards,” “Degree of Cleanup,” or be eliminated from further consideration. Onsite response actions must comply, to the extent practicable, with the substantive requirements that may be ARARs. ARARs are environmental regulations that have been evaluated and are potentially pertinent to the removal action. For the removal action being considered in this document, implementation of any selected alternative, with the exception of Alternative 1, would be designed to comply with the ARARs cited in Tables B-1 and B-2 to the extent practicable.

Alternative 1 (No Action) does not provide overall protection of HHE and does not achieve the RAOs. Over time with no ongoing maintenance, contamination could spread, potentially exposing personnel, the environment, and the public to unacceptable hazards. Because this alternative is not consistent with DOE obligations under federal law to protect HHE, this alternative cannot be considered viable and is not considered further in this EE/CA.

Alternatives 2 and 3 provide overall protection of HHE and are considered viable alternatives. As discussed in Section 2.5, as the buildings/structures continue to age, the threat of substantial release of hazardous substances increases with time, and mitigating release to the environment becomes more difficult. Alternatives 2 and 3 address this situation by implementing hazard abatement. During implementation of the activities associated with Alternatives 2 and 3, there would be potential for worker exposure and release of contaminants. The use of proven control technologies and strict adherence to safety and environmental regulations during these activities would minimize these risks. These considerations are important in evaluating the short- and long-term protection of workers, the public, and the environment for each action or alternative.

The short-term effectiveness criterion refers to any potential adverse effects on HHE during removal action implementation phases. There would be potential for exposure to the workers and the environment during the initiation of Alternatives 2 and 3. Workers would be required to enter the contaminated facility to perform work; however, administrative and engineering barriers will be in place for worker protection. Once hazard abatement, demolition, and/or demo prep are complete, potential hazards encountered during S&M of the remaining buildings/structures would be greatly reduced. The NTCRA would allow for an expedited response to current hazards. The time in which full protection is achieved, however, would be lengthy for the reason that final disposition of the 221B Canyon Building is contingent upon the completion of the remedial action process under CERCLA.

Alternatives 2 and 3 provide for reduction in toxicity, mobility, or volume of contaminants through the removal of contamination via hazard abatement, demolition, and/or demo prep. Grouting of the retired 291B ventilation system, as proposed in Alternatives 2 and 3, may irreversibly reduce the toxicity and mobility of contaminants through immobilization and shielding, but the volume of waste and hazardous substances would not be reduced. The removal of materials and wastes from the B Plant Complex for disposal at ERDF would transfer long-term impacts of contamination from one area to another but because ERDF was designed for disposal and has a double leachate liner collection system, it is more environmentally protective. The long-term effectiveness and permanence criterion evaluates whether the alternative leaves an unacceptable risk after the removal action is completed. This criterion also evaluates whether the removal actions included in an alternative contribute to a future remedial action. Hazard abatement activities proposed in Alternatives 2 and 3 would provide effective short and long-term protectiveness because physical, chemical, and radiological hazards would be removed or isolated from the workers and the environment. Demo prep provides an even higher degree of interim protectiveness by removing and disposing of contamination, equipment, and structural material that may otherwise hinder future remedial action. Demolition provides the most effective long-term remedy by permanently removing and disposing of abovegrade structures. Grouting, as mentioned previously, does not remove the contamination/inventory, but it places the building/structures in a configuration that is more protective.

5.1.2 Ability to Achieve Removal Action Objectives

This section evaluates the effectiveness of each alternative to meet the RAOs. Ability to achieve RAOs effectively is considered at the end of the NTCRA. The following RAOs for this NTCRA are stated in Section 3.1 and listed for the purposes of this discussion:

1. Reduce the inventory and any potential threat to HHE from an unacceptable exposure to hazardous and radioactive substances.
2. Minimize the general disruption and the adverse impacts to cultural resources and wildlife habitat.
3. Safely treat, as appropriate, and dispose of waste generated by the removal action.
4. Be consistent with anticipated remedial actions at the B Plant Complex.
5. Minimize or eliminate the need for future S&M activities.

Alternatives 2 and 3 achieve RAOs 1, 2, 3, and 4 while less effectively achieving RAO 5. Alternatives 2 and 3 would reduce the amount of chemical and radiological contamination at only above Canyon Deck level locations. Highly contaminated areas within 221B, such as the process cells, are not addressed. Future S&M activities are still needed as the major source of radiological inventory will not be mobilized or removed.

5.2 Implementability of the Removal Action Alternatives

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

5.2.1 Technical and Administrative Feasibility

Alternatives 2 and 3 are technically and administratively feasible. Alternative 2 could be implemented with ease due to the continual nature of S&M within the B Plant Canyon Building. Additionally, grouting, demolition, and abatement of hazardous substances are techniques used regularly at the Hanford Site. Alternative 3 would require the same actions as Alternative 2 with the addition of demo prep. This work would require specialized skills due to the radioactive contamination present in the B Plant

Canyon Building. As the 221B Building and other buildings/structures within the B Plant Complex continue to age, the threat of substantial release of CERCLA hazardous substances increases with time. Confining hazardous substances and preventing a release become more difficult with time and would require a more extensive planning and engineering evaluation.

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 hazard abatement, demo prep, demolition, and grouting are consistent with resources and capabilities used elsewhere on the Hanford Site for similar actions. Front-end loaders and trackhoes with processor end effectors and 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. It is not anticipated that treatability studies would be required, as similar types of contamination have been addressed in other removal and remedial actions at Hanford.

Disposal and recycling services are available on or off the Hanford Site for the types of waste expected to be generated by the actions performed under Alternatives 2 and 3. ERDF has been designated through a CERCLA ROD (EPA, 1995) to receive CERCLA wastes generated on the Hanford Site that meet its acceptance criteria. ERDF is anticipated to be available for onsite disposal of most or all of the waste generated by the activities.

If performed concurrently with other Hanford Site cleanup activities, trained personnel are available to perform the proposed removal actions under each alternative. If performance of the removal actions 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*, along with DOE G 430.1-1, *Cost Estimating Guide*. ECE-200E15-00004, *Environmental Cost Estimate for the B Plant Complex*, provides an overview of removal action specific cost inputs, methodology, and results.

Table 5-2 shows the cost estimate for the four alternatives, starting from a present-day, nondiscounted cost, also called constant dollars. Nondiscounted costs assume that all work is performed today and 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 information purposes only and is not a factor in the selection of a response action alternative.

Table 5-2. 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 with Hazard Abatement of 221B and Demolition/Grouting of 291B	$130.3 M	$118.4 M
Alternative 3: All Actions Included in Alternative 2 Plus Demo Prep of 221B	$135.2 M	$123.1 M

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, 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 is included for comparative purposes only in the cost analysis. 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

N/A = not applicable

S&M = surveillance and maintenance

Consistent with guidance from EPA and the U.S. Office of Management and Budget (OMB), present-worth analysis is used as the basis for comparing costs of cleanup alternatives under the CERCLA program (OMB 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, 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.

5.3.1 Cost Estimate Rationale

This section provides the major costs for each alternative. The expected duration before the remedial action will be implemented for all the alternatives is assumed to be 25 years. S&M is expected to continue throughout the duration of the NTCRA at the current yearly cost. In addition to S&M, all the alternatives include costs for facility safety upgrades, site preparation, ventilation system modifications, and safety document reviews and updates. Ventilation system upgrades are included for all of the alternatives to allow for hazard abatement, demo prep, and grouting activities within the Canyon Building.

Table 5-3 provides the costs associated with each building/structure for each alternative. The costs that are not specific to any one building/structure are included in Site 0, "B Plant Complex."

Table 5-3. Comparison of Total Cost of Removal Action Alternatives (by Site)

Site No.	Site Name	Alternative 1	Alternative 2	Alternative 3
0	B Plant Complex*	$0	$58.1 M	$58.3 M
1	221B	$0	$20.9 M	$25.3 M
2	291B	$0	$40.2 M	$40.2 M

Note: Total cost in title means total present value.

*Only cost items that are inclusive of all the sites are included in Site 0. This includes costs such as site preparation, surveillance and maintenance, and support facilities.

Alternative 1 is presented with no cost solely in 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 HHE, and possibly costlier actions in the future.

For Alternative 2, significant costs come from grouting the retired 291B Ventilation System. Costs associated with grouting the retired ventilation system include a safety evaluation, engineering design, labor, equipment, and material. Other costs incurred in Alternative 2 would be due to demolition of abovegrade portions of 291B and hazard abatement within 221B. Both of these actions will incur costs from waste disposal, demolition labor, characterization sampling, and air monitoring.

Alternative 3 adds additional costs due to the increase in work inside the 221B Canyon Building for demo prep. Demo prep within B Plant includes characterization sampling, air monitoring, labor, and waste disposal costs.

5.4 Summary of Removal Action Alternative Analysis

Table 5-4 summarizes the ability of each alternative to achieve NTCRA CERCLA criteria for effectiveness, implementability, and cost criteria of the removal actions described in Chapter 4.

Table 5-4. Criteria Analysis Summary

	Effectiveness			
	Protectiveness	RAOs	Implementability	Net Present-Worth Cost
Alternative 1: No Action	No	No	No	Not Applicable*
Alternative 2: Continued S&M with Hazard Abatement of 221B and Demolition/Grouting of 291B	Yes	Yes	Yes	$118.4 M

Table 5-4. Criteria Analysis Summary

	Effectiveness			
	Protectiveness	**RAOs**	**Implementability**	**Net Present-Worth Cost**
Alternative 3: All Actions Included in Alternative 2 Plus Demo Prep of 221B	Yes	Yes	Yes	$123.1 M

Note: Yes indicates that actions performed meet criteria. No indicates that actions performed do not meet criteria.

* 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 is included for comparative purposes only in the cost analysis. 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

RAO = removal action objective

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6 Comparative Analysis of Removal Action Alternatives

The removal action alternatives were compared in terms of the criteria and subcriteria for overall protection of HHE, implementability, and cost. The removal actions proposed under each alternative meet the overall protectiveness criteria, but their degree of effectiveness and the ability to meet RAOs is based on the magnitude of actions undertaken. The comparative analysis of effectiveness, implementability, and cost is provided in the following subsections and summarized in Table 6-1.

6.1 Effectiveness of Removal Action Alternatives

The effectiveness of alternatives considers that the removal actions performed under this EE/CA are short-term, interim measures to prevent imminent harm to HHE. Long-term treatment or containment activities required for the permanent closure of 221B and the active 296B Ventilation System will be executed under a future remedial action, as determined by a final ROD. Alternatives for this NTCRA are evaluated on the basis of protectiveness and their ability to achieve RAOs prior to issuance of the final ROD.

6.1.1 Protectiveness

As 221B and 291B degrade with age, increasingly aggressive removal actions will be required to ensure protection of HHE. Amongst all alternatives, S&M activities would prolong monitoring for potential sources of exposure but would be least effective at reducing the potential to release hazardous substances. Hazard abatement activities would specifically target the removal or stabilization of hazardous substances that have been identified as posing an elevated risk of spreading or a high risk to workers. Hazard abatement would reduce or eliminate the release pathways to the environment at a higher degree, reducing the need for S&M. Demo prep provides an even higher degree of interim protectiveness by removing and disposing of most or all contamination, equipment, and structural material that may otherwise hinder future remedial action. Demolition provides the most effective long-term remedy by permanently removing and disposing of aboveground structures. Both demo prep and demolition would mitigate risks of structural failure and accidental release of contamination by stabilizing or demolishing the aging structures. Grouting of below deck level portions of 221B and 291B would encapsulate wastes, thereby shielding and reducing the mobility of contamination, which is protective of HHE.

Alternative 2 offers the least ongoing protection for HHE because it proposes the highest degree of continued S&M, with less long-term protectiveness through additional demo prep and demolition activities than Alternative 3. Alternative 3 provides increasing levels of protectiveness by reducing the interim and long-term chemical, radiological, and physical hazards through direct removal via hazard abatement, demo prep, and demolition.

The primary risk to workers in each alternative is handling waste and contaminated materials. Alternative 3 includes implementation of approaches and additional activities not addressed in the current S&M program, which will remove many of the identified risks. Implementation of the actions in Alternative 3 would place the buildings in a more stable condition than Alternative 2 and would minimize hazards, to the extent possible, to the workers and environment.

6.1.2 Ability to Achieve Removal Action Objectives

Alternatives 2 and 3 all achieve the RAOs to varying degrees. Both alternatives will remove and dispose of CERCLA hazardous substances through hazard abatement and will also prevent unacceptable exposure through administrative and physical controls, followed by future remedial actions to mitigate the hazards.

While Alternative 2 achieves all of the RAOs, it is considered the least effective alternative because the removal actions included in this alternative are less effective than those in Alternative 3 in terms of reducing inventory of hazardous and radioactive substances, reducing or eliminating the potential for exposure, and reducing or eliminating the potential for a release (RAO 1). In comparison to Alternative 3, Alternative 2 maintains the highest degree of continued S&M and is, therefore, the least effective in achieving RAO 5.

Alternative 3 contains the removal actions included in Alternative 2 with the addition of demo prep. Implementation of demo prep will allow for greater reduction of hazardous and radioactive substances (RAO 1) than is achievable under removal actions included for these buildings/structures in Alternative 2. It will also expedite future remedial actions (RAOs 4 and 5) more effectively than Alternative 2.

6.2 Implementability

Implementability is based on technical and administrative feasibility and availability of equipment, personnel, services, and disposal facilities.

Alternatives 2 and 3 are technically feasible. All proposed removal actions could be performed using existing knowledge and procedures proven successful at the Hanford Site. Methods for performing S&M, hazard abatement, demo prep, demolition, and grouting are consistent with Hanford Site projects of similar scope (i.e., disposition of Plutonium Finishing Plant and U Plant and 100 Areas remedial actions). 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 continued S&M and deferral of demo prep 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 remedial action as compared to the near term.

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

6.3 Cost of Alternatives

The cost increases in subsequent alternatives due to the addition of new actions. The estimated cost for each alternative is provided in Table 6-1.

6.4 Summary of Comparative Analysis of Alternatives

Table 6-1 compares the effectiveness, implementability, and cost criteria of the removal actions described in Section 4. Based on this analysis, an alternative is recommended in Chapter 7.

Table 6-1. Comparative Analysis Summary

Alternative	Effectiveness		Implementability		Estimated Cost (Approximate)
	Protectiveness	RAOs	Technical/ Administrative	Availability	
Alternative 1: No Action	●	N/A*	N/A*	N/A*	N/A*

Table 6-1. Comparative Analysis Summary

Alternative	Effectiveness		Implementability		Estimated Cost (Approximate)
	Protectiveness	RAOs	Technical/ Administrative	Availability	
Alternative 2: Continued S&M with Hazard Abatement of 221B and Demolition/Grouting of 291B	◐	◐	◐	○	$118.4 M
Alternative 3: All Actions Included in Alternative 2 Plus Demo Prep of 221B	○	○	◐	○	$123.1 M

● = Performs not as 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.

* Alternative 1 is not consistent with DOE obligations under federal law to protect human health and the or uncertainty environment; therefore, this alternative cannot be considered viable and is not considered further in this engineering evaluation/cost analysis but is included for comparative purposes only in the cost analysis. 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

N/A = not applicable

RAO = removal action objective

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7 Recommended Removal Action Alternative

This chapter provides a summary of the preferred removal action alternative and path forward for implementing the removal actions.

Based on the comparative analyses of the removal action alternatives discussed in Chapter 6, the following removal action is recommended:

Alternative 3 – Continued S&M/Hazard Abatement of 221B/Demolition and/or Grouting of 291B/Demo Prep of 221B

Alternative 3 offers a cost effective balance of hazard removal, risk reduction, and achievement of RAOs, while being consistent with current and future remedial actions at the Hanford Site. Alternative 3 provides the most short-term and long-term effectiveness, while being technically and administratively feasible. The estimated net present-worth cost for Alternative 3 is $123.1 million dollars. The scope of Alternative 3 follows:

- **Continued S&M.** S&M activities would be performed according to the most current S&M plan (DOE/RL-99-24). Activities conducted during the S&M phase are established to monitor containment of contaminants left in place, to provide physical safety and security controls, and to maintain the facility in a manner that will minimize risk to HHE.
- **Hazard Abatement of Below Deck Level Galleries.** Hazard abatement would address and/or prevent future hazards in the galleries prior to final disposition. Hazard abatement in the Operating and Pipe Galleries includes stabilization or, if possible, complete decontamination and removal of the sources of contamination. Hazard abatement also includes the complete removal of all piping and equipment, as necessary. If cleanout is not possible, contamination would be stabilized in place. Areas scheduled to receive hazard abatement would be identified based on S&M activities and observations. An area, such as the Electrical Gallery, may be selected for hazard abatement based upon the severity of hazards present.
- **Grouting of Void Spaces Belowgrade Within the Retired 291B Ventilation System.** All belowgrade void space within the retired 291B Ventilation System, including ducts, filter cells, the sand filter, and any other structures not included in other removal actions, would be grouted in place.
- **Demolition of Abovegrade Structures Associated with the Retired 291B Ventilation System.** Abovegrade structures, including support buildings, fans, ductwork, and the 291B001 Stack, would be demolished. The 296B002 Passive Vent System would be grouted/demolished, as necessary, once the HEPA filters are grouted.
- **Demo Prep of the 221B Canyon Building Above Deck Level Areas.** Demo prep would occur in all areas in 221B above deck level. These areas include the Operating Gallery, Crane Cab Gallery and crane area, and Canyon Deck. Each area would be completely emptied of all waste, equipment, furniture, and nonstructural utilities, as possible. Demo prep also includes stabilization or, if possible, complete decontamination and removal of the sources of contamination and the complete removal of all piping and equipment, as necessary. If cleanout is not possible, contamination would be stabilized in place.

The removal activities for Alternative 3 are summarized in Figure 4-2. Implementation of Alternative 3 is planned to commence upon issuance of the AM, which is anticipated in 2017.

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8 References

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*. Available at: http://www.gpo.gov/fdsys/pkg/CFR-2010-title40-vol27/xml/CFR-2010-title40-vol27-part300.xml.

300.415, "Removal Action."

300.440, "Procedures for Planning and Implementing Off-Site Response Actions."

300.820, "Administrative Record File for a Removal Action."

Subpart B, "Responsibility and Organization for Response."

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," Appendix B, "National Priorities List," *Code of Federal Regulations*. Available at: http://www.gpo.gov/fdsys/pkg/CFR-2010-title40-vol27/xml/CFR-2010-title40-vol27-part300-appB.xml.

64 FR 61615, "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS)," *Federal Register*, Vol. 64, No. 218, pp. 61615-61625, November 12, 1999. Available at: http://www.gpo.gov/fdsys/pkg/FR-1999-11-12/pdf/99-29325.pdf.

Atomic Energy Act of 1954, as amended, 42 USC 2011, Pub. L. 83-703, 68 Stat. 919. Available at: http://epw.senate.gov/atomic54.pdf.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq., Pub. L. 107-377, December 31, 2002. Available at: http://epw.senate.gov/cercla.pdf.

Section 121(d)(4) "Cleanup Standards," "Degree of Cleanup."

DOE and EPA, 1995, *Policy on Decommissioning of Department of Energy Facilities Under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)*, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington. Available at: http://energy.gov/em/policy-decommissioning-department-energy-facilities-under-comprehensive.

DOE, Ecology, and EPA, 2012, *Hanford Federal Facility Agreement and Consent Order Hanford Public Involvement Plan*, U.S. Department of Energy, Richland Operations Office; Washington State Department of Ecology; and U.S. Environmental Protection Agency, Richland, Washington. Available at: http://www.hanford.gov/files.cfm/FacAgreementand-Consent-Order_FINAL.pdf.

DOE/EIS-0222-F, 1999, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statements*, U.S. Department of Energy, Washington, D.C. Available at:
http://pdw.hanford.gov/arpir/index.cfm/docDetail?accession=D199158842.
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D199158843.
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D199158844.
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D199158845.
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D199158846.
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D199158847.

DOE/EIS-0222-SA-01, 2008, *Supplement Analysis: Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www.hanford.gov/files.cfm/SAwith_signed-R1.pdf.

DOE G 430.1-1, 1997, *Cost Estimating Guide*, U.S. Department of Energy, Washington, D.C. Available at: https://www.directives.doe.gov/directives-documents/400-series/0430.1-EGuide-1-TOC.

DOE/RL-95-11, 2006, *Ecological Compliance Assessment Management Plan*, Rev. 2, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0084174.

DOE/RL-96-32, 2013, *Hanford Site Biological Resources Management Plan*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www.hanford.gov/files.cfm/DOE-RL-96-32-01.pdf.

DOE/RL-97-56, 1998, *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0081103H.

DOE/RL-99-24, 2008, *Surveillance and Maintenance Plan for the 221-B Facility (B Plant)*, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA06814117.

DOE/RL-2001-41, 2015, *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions and RCRA Corrective Actions*, Rev. 8, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0081640H.

DOE/RL-2010-54, 2010, *Engineering Evaluation/Cost Analysis for 200 East Area Tier 2 Buildings/Structures*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0084114.

DOE/RL-2011-118, 2011, *Hanford Site Groundwater Monitoring for 2011*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0091795.

DOE/RL-2015-07, 2015, *Hanford Site Groundwater Monitoring Report for 2014*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0080600H.

Drummond, Marshall E., 1992, *The Future for Hanford: Uses and Cleanup: The Final Report of the Hanford Future Site Uses Working Group*, prepared by the Hanford Future Site Uses Working Group for the U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196123428.

ECE-200E15-00004, 2016, *Environmental Cost Estimate for the B Plant Complex*, Rev. 0, CH2M HILL Plateau Remediation Company, Richland, Washington.

Ecology, EPA, and DOE, 1989a, *Hanford Federal Facility Agreement and Consent Order*, 2 vols., as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington. Available at: http://www.hanford.gov/?page=81.

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.

Endangered Species Act of 1973, Pub. L. 93-205, as amended, 7 USC 136, 16 USC 1531, et seq. Available at: http://www.nmfs.noaa.gov/pr/pdfs/laws/esa.pdf.

EPA, 1995, *Record of Decision U.S. DOE Hanford Environmental Restoration Disposal Facility Hanford Site Benton County, Washington*, U.S. Environmental Protection Agency, U.S. Department of Energy, and Washington State Department of Ecology. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196041064.

EPA, DOE, and Ecology, 2005, *Record of Decision 221-U Facility (Canyon Disposition Initiative) Hanford Site, Washington*, U.S. Environmental Protection Agency, U.S. Department of Energy, and Washington State Department of Ecology, Olympia, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA01060264.

EPA 540-R-00-002, 2000, *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, OSWER 9355.0-75, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C. Available at: http://yosemite1.epa.gov/ee/epa/ria.nsf/vwAN/S200010.pdf/$file/S200010.pdf.

EPA 540-R-93-057, 1993, *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA*, OSWER Directive 9360.0-32, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C. Available at: http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=9100SN02.txt.

Executive Order 12580, 1987, *Superfund Implementation*, Ronald W. Reagan, January 23. Available at: http://www.archives.gov/federal-register/codification/executive-order/12580.html.

Hanford Facility Resource Conservation and Recovery Act of 1976 (RCRA) Permit, Dangerous Waste Portion for the Treatment, Storage, and Disposal of Dangerous Waste, Revision 8c. Available at: http://www.ecy.wa.gov/programs/nwp/permitting/hdwp/rev/8c/.

HNF-3208, 1999, *Documentation of Remaining Hazardous Substances/Dangerous Wastes in B Plant*, Rev. 0A, B&W Hanford Company, Richland, Washington.

HNF-3358, 1999, *B Plant Surveillance and Maintenance Phase Safety Analysis Report*, Rev. 0, B&W Hanford Company, Richland, Washington.

HNF-14804, 2016, *B Plant Documented Safety Analysis*, Rev. 6, CH2M HILL Plateau Remediation Company, Richland, Washington.

HNF-EP-0063, 2011, *Hanford Site Solid Waste Acceptance Criteria*, Rev. 16, CH2M HILL Plateau Remediation Company, Richland Washington. Available at: http://www.hanford.gov/files.cfm/HNF-EP-0063_Rev16_041111_Website.pdf.

National Historic Preservation Act of 1966, Pub. L. 89-665, as amended, 16 USC 470, et seq. Available at: http://www.achp.gov/docs/nhpa%202008-final.pdf.

OMB Circular No. A-94, 2015, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs" (memorandum for Heads of Executive Departments and Establishments), Appendix C, "Discount Rates for Cost-Effectiveness, Lease Purchase, and Related Analyses," as revised, Office of Management and Budget, Washington, D.C. Available at: http://www.whitehouse.gov/omb/circulars_a094_a94_appx-c/.

PNNL-12261, 2000, *Revised Hydrogeology for the Suprabasalt Aquifer System, 200-East Area and Vicinity, Hanford Site, Washington*, Pacific Northwest National Laboratory, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0906180659.

PNNL-15160, 2005, *Hanford Site Climatological Summary 2004 with Historical Data*, Pacific Northwest National Laboratory, Richland, Washington. Available at: http://www.pnl.gov/main/publications/external/technical_reports/PNNL-15160.pdf.

Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq. Available at: http://www.epa.gov/rcraonline/.

Toxic Substances Control Act of 1976, Pub. L. 107-377, as amended, 15 USC 2601, et seq. Available at: http://epw.senate.gov/tsca.pdf.

WA7890008967, *Hanford Facility Resource Conservation and Recovery Act (RCRA) Permit, Dangerous Waste Portion for the Treatment, Storage, and Disposal of Dangerous Waste,* Revision 8c, as amended, Washington State Department of Ecology. Available at: http://www.ecy.wa.gov/programs/nwp/permitting/hdwp/rev/8c/index.html.

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

WCH-191, 2015, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*, Rev. 4, Washington Closure Hanford, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0080195H.

Appendix A

B Plant Complex Buildings and Structures Descriptions

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Table

Table A-1. B Plant Complex Buildings and Structures A-1

Terms

HEPA	high-efficiency particulate air
RCRA	*Resource Conservation and Recovery Act of 1976*
S&M	surveillance and maintenance
SWP	special work permit

A1 Buildings and Structures List

Table A-1 lists the buildings and structures in the B Plant Complex that are in the scope of this non-time-critical removal action.

Table A-1. B Plant Complex Buildings and Structures

Building/Structure Identification	Building/Structure Name
221B	Canyon Building • Canyon Deck/Service Area • Galleries: Operating, Pipe, Electrical, SWP Lobby, Fan Room, Laundry Storage • Process Cells, Hot Pipe Trench, Wind Tunnel • Crane Cab Gallery, Crane
291B System	Retired Ventilation System Components • A, B, C, D, E, F HEPA Filters • Ducts • Sand Filter • Fans and other miscellaneous equipment
291B	Exhaust Fans Control/Turbine Building
291BA	Exhaust Air Sample House
291BB	A&B Filters Instrument Building
291BC	Access Control Building
291BD	C Filter Instrument Building
291BE	D Instrument Building
291BF	E Instrument Building
291BG	E Filter Vault Plug Cover
291BH	F Filter Instrument Building
291BJ	Instrument Building
291BK	Exhaust Air Sample House
291B001	Retired Canyon Ventilation Stack
296B002	Filter Vault Passive Vent Stack (for HEPA Filters)

HEPA = high-efficiency particulate air
SWP = special work permit

A1.1 221B Canyon Building

The 221B Canyon Building is a reinforced concrete and steel structure divided into 20 sections with transverse section joints that are keyed and offset to ensure necessary shielding requirements. The canyon is composed of 40 cells; a Hot Pipe Trench; an Air Tunnel; a Crane Cab Gallery; a Canyon Deck; and the Operating, Pipe, and Electrical Galleries. The cells and Hot Pipe Trench are covered with removable concrete blocks that make up the Canyon Deck. A 41 metric ton (45 ton) capacity overhead bridge crane spans the total width of the building. The roof is a steel structure that is enclosed with metal panels and was built over the original roof. Figures 2-3 and 2-4 in the main text (Chapter 2) provide a plan view of the canyon building, and Figure 2-5 provides a cross sectional view; Figure A-1 provides a cutaway.

The canyon building is 247.4 m (811.5 ft) long and is supported on a 2 m (6 ft) thick concrete slab. The canyon is 24 m (77 ft) high with partial embedments of 7 m (22.5 ft) and 5 m (16 ft) on the south and north sides. The cross-sectional width of 20 m (66 ft) is constant to a height of 18 m (60 ft), and then increases to a maximum of 21 m (68 ft) at the roof top. The roof slab varies in thickness from 1 m (3 ft) at mid-span to 1.2 m (4 ft) at the edges where it is supported by the exterior walls.

A1.1.1 Service Area and Canyon Deck

The Canyon Deck is the area above the Process Cells, Hot Pipe Trench, and Wind Tunnel. The Canyon Deck is approximately 246.9 m (810 ft) long and 10.7 m (35 ft) wide. It spans the length of the canyon, and is made up of the cell cover blocks. The deck was cleaned during deactivation, but minimal equipment remains. The remaining equipment includes a truck, Tank 100, a waste transfer cask, carts, scaffolding, and the active ventilation duct coming from Cell 10. All equipment is radiologically contaminated (HNF-3208, *Documentation of Remaining Hazardous Substances/Dangerous Wastes in B Plant*).

The cover blocks form the moveable confinement barrier to the process cells and Hot Pipe Trench. The blocks served as shielding barriers from high-intensity radiation emanating from the process equipment. The cover blocks have stepped construction that allowed ventilation air flow from the Canyon Deck to the process cells. There are four cover blocks per cell (except Cell 10). Cells 5, 20, and 23 have cover blocks that are 1 m (3 ft) thick to allow adequate clearance for the in-cell equipment. These blocks are structurally equivalent to the other blocks and are painted red along the borders for easy identification. The rest of the cover blocks are 2 m (6 ft) thick.

A1.1.2 Galleries

B Plant has three galleries: Electrical Gallery, Pipe Gallery, and Operating Gallery. The galleries span from Cell 4 to Cell 40, except for the Operating Gallery, which spans the entire length of the building. The galleries are shielded by the 3 m (9 ft) thick (at cell level) and 2 m (7 ft) thick (above the Canyon Deck level) north interior longitudinal wall.

In addition to the galleries, three rooms are located on the other side of the railroad tunnel on the Pipe Gallery and Electrical Gallery levels: Special Work Permit (SWP) Change Room Lobby, Laundry Storage, and Fan Room. These rooms are expected to contain minimal hazards and contamination.

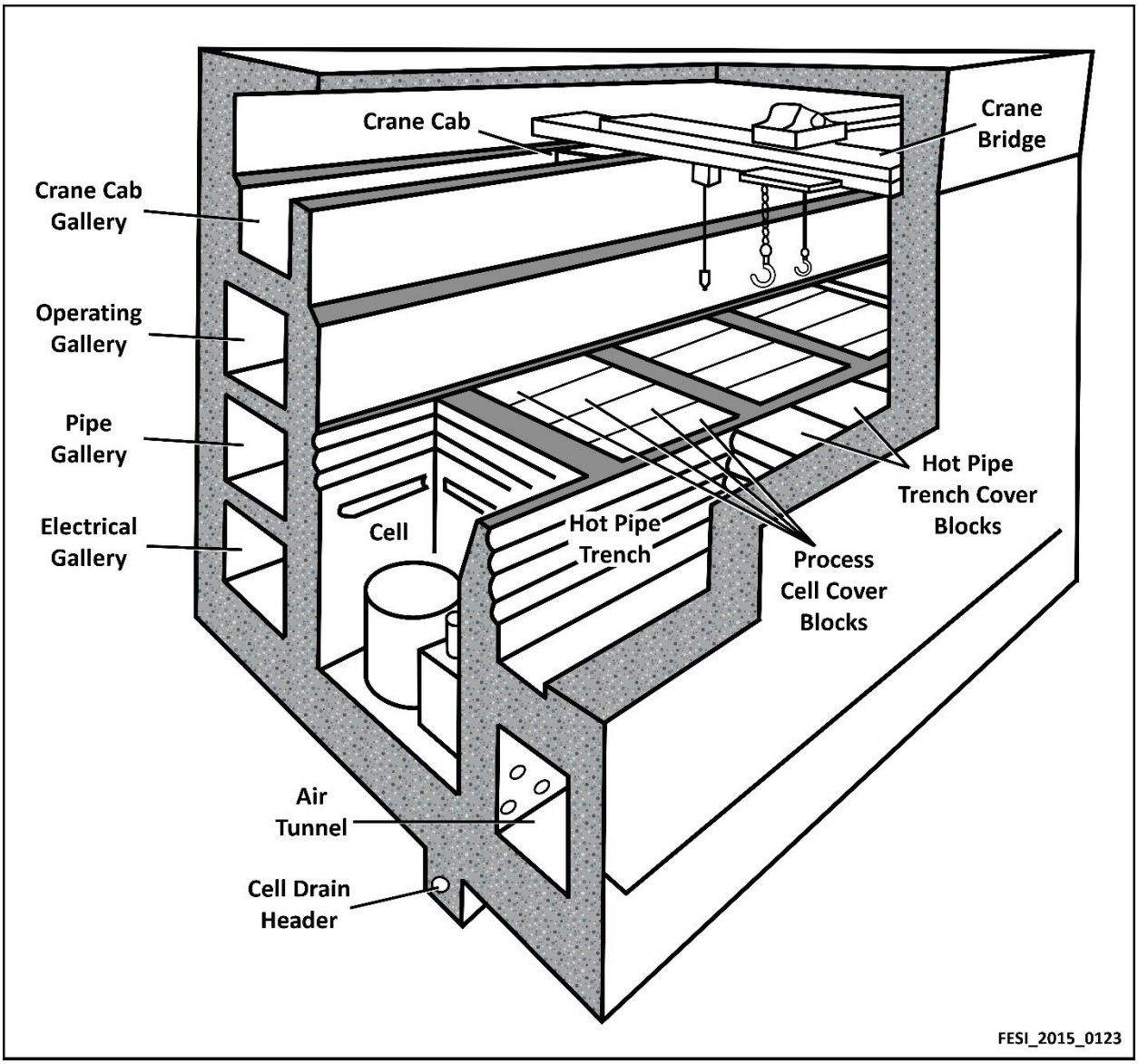

Figure A-1. Cutaway of the 221B Canyon Building

A1.1.2.1 *Electrical Gallery*

The Electrical Gallery is the lowest gallery below grade and housed electrical switchgear, automatic transfer switches, and uninterruptible power supply battery systems for the distributed control system and canyon emergency lighting. All systems have been deactivated and electrically isolated as part of deactivation. The Electrical Gallery is on a current surveillance and maintenance (S&M) path and is radiologically and chemically contaminated.

A1.1.2.2 *Pipe Gallery*

The Pipe Gallery is located on the main level of the 221B Canyon Building and housed electrical switchgear, instrument racks, nonradioactive solution piping, chemical addition tanks, and associated gang valves that served the in-cell equipment. All systems have been deactivated, and piping has been drained as part of deactivation. The Pipe Gallery contained seven high-efficiency particulate air (HEPA) filters that exhaust air outside in order to control any gallery airborne contamination. These filters have

been removed, and ducts are expected to be free of contamination. The Pipe Gallery is on a current S&M path and is chemically and radiologically contaminated. Water intrusions were observed in 2015, and an elevated level of radiological contamination has been noted since 2008. It is suspected that the contamination originated from the Operating Gallery. As of 2015, this contamination has not been addressed.

A1.1.2.3 *Operating Gallery*

The Operating Gallery is located above the Pipe Gallery. The gallery consisted of a series of panels that house instruments, indicators, controls, and alarms to support the in-cell process equipment. A number of small chemical tanks and scales also reside on this gallery. The Operating Gallery is not on a current S&M path.

A1.1.3 Process Cells, Hot Pipe Trench, and Wind Tunnel

There are 40 process cells that run east to west the length of the canyon. The process cells span the height of the Electrical and Pipe Gallery levels. The process cells are south of the galleries and north of the Hot Pipe Trench and Wind/Air Tunnel (Air Tunnel). The Wind Tunnel is at Electrical Gallery level, and the Hot Pipe Trench is at the Pipe Gallery level. The process cells, Hot Pipe Trench, and Wind Tunnel are not part of the current S&M path and contain significant amounts of radiological contamination. Figure 2-5 depicts a cross section of the 221B Building.

A1.1.3.1 *Process Cells*

The process cells provided segregation of the highly contaminated process vessels and equipment, as well as access and storage space. Cells 1 through 4, 15, 16, and 40 were used for controlled access and storage space for radioactive solid waste and failed parts. Cells 5 through 14 and 17 through 39, except for Cell 10, are standard canyon cells that contained highly contaminated process vessels and equipment. The process cells contain chemicals (HNF-3208) and *Resource Conservation and Recovery Act of 1976* (RCRA) Part A tanks. Table 2-2 of the main text provides a list of the tanks that are included in the RCRA B Plant Part A Form.

Cells 5 through 14 and 17 through 39, except for Cell 10, are standard canyon cells that contained highly contaminated process vessels and equipment. Each cell is separated from the adjacent cell by a 2 m (7 ft) thick concrete wall. All process vessels have been emptied as much as possible and minimum heels remain.

Cells 1 through 4, 10, 15, 16, and 40 were used for controlled access and storage space for radioactive solid waste and failed parts. Cells 1 and 2 form a single cell. Cell 3 is the railroad tunnel that has a steel sliding cover instead of a removable cover block. The railroad tunnel was used as the loading area to transfer equipment and solid waste in and out of the canyon building. Cell 10 is currently used for the active exhaust system and liquid waste holding and monitoring. Tank 40 provided a shielded sample cave for obtaining high-activity level samples from the process vessels in Cells 38 and 39.

Tank TK-10-1 (located in Cell 10) served as a collection tank for liquids that leaked into the process cells and Air Tunnel. Drains from all the cells are connected to a common drain header and routed to Cell 10. TK-10-1 is the lowest tank in the canyon building and has a capacity of 38 kL (10,000 gal). The tank is a completely open, rectangular, 5.5 m (18 ft) long, 3.4 m (11 ft) wide, and 2.1 m (7 ft) high stainless steel lined vault. The original cover blocks for Cell 10 were redesigned and replaced. The cover blocks now have a small port allowing access into Cell 10. The port is provided for future installation of a submersible sump pump in the event liquids accumulate and need to be pumped out of TK-10-1. The liquid level in TK-10-1 is continually monitored by instrumentation in the 221BK Building.

The tank was emptied to minimum heel during deactivation period. A small amount of liquid may be in the tank due to the residual liquids left in pipes. The tank is designed to catch liquid if water leaks into the canyon from rain or snowmelt. In 1998, an elevated liquid level in TK-10-1 was observed due to the extreme snowmelt infiltration. A new roof was designed and installed in 2002 to reduce or preclude this infiltration path. Since then, no detectable liquid accumulation in TK-10-1 has occurred.

A1.1.3.2 *Hot Pipe Trench*

The Hot Pipe Trench is parallel to the process cells from Cells 5 through 40 and provides shielding of contaminated piping for intercell solution transfer and vessel venting systems. Lead brick shielding barriers exist in the Hot Pipe Trench between Cells 12 and 13. Piping stubs extend through the barrier to permit future tie-ins.

A1.1.3.3 *Wind Tunnel*

The Wind Tunnel is located below the Hot Pipe Trench and served as the exhaust manifold for air from the process cells, Hot Pipe Trench, and 212B Cask Station. The Wind Tunnel runs parallel to Cells 5 through 40 and is interconnected to the cells by twelve 36 cm (14 in.) diameter cylindrical holes through a 2 m (7 ft) thick partition wall.

A1.1.4 Crane and Crane Cab Gallery

The crane is a 41 metric ton (45 ton) capacity overhead bridge crane that spans the total internal width of the canyon. It is electrically operated from the cab in the Crane Cab Gallery, which is above the Operating Gallery. The Crane Cab Gallery is separated from the canyon by a 1.5 m (5 ft) thick and 3 m (9.3 ft) high concrete parapet wall. The parapet wall provides shielding from direct gamma radiation for the operators in the cab. The steel structure of the cab provides protection from scattered radiation. Entry to the structure of the cab is through an 8 cm (3 in.) thick doorway, and HEPA-filtered ventilation air is provided through a shielded duct from a blower mounted on top.

A1.2 Retired 291B Ventilation System

The retired 291B Canyon Ventilation System consists of a main duct coming from the 221B Canyon Building; six HEPA filter cells; a sand filter; a stack; and various fans, ductwork, and support buildings. The exhaust ventilation duct and filters formed the final barrier to potentially contaminated air reaching the environment through the stack. The system was isolated and abandoned in place in the late 1990s. Concrete was pumped into the main exhaust duct and formed a plug about 15 m (49.2 ft) from the canyon building. This engineering evaluation/cost analysis covers the ventilation ducts, HEPA alphabet filter cells, sand filter, 291B001 Stack, and any other abovegrade equipment not covered in DOE/RL-2010-54, *Engineering Evaluation/Cost Analysis for 200 East Area Tier 2 Buildings/Structures*. The retired filter cells are equipped with a passive, HEPA filtered vent system as described in Section A1.3. The retired ventilation system contained a significant amount of radiological contamination. Table 2-3 provides the amount of contamination present in each of the filter cells.

A1.2.1 Support Buildings

Multiple support buildings associated with the 291B System are listed in Table A-1. The buildings were used for monitoring, sample collection, and storage of equipment and instruments for the HEPA filter vaults.

A1.2.2 Exhaust Ventilation Ducts

The main exhaust duct is a concrete, rectangular duct that extends underground perpendicularly about 59.3 m (194.5 ft) from the air tunnel south of 221B to the 291B Area. The retired system exhaust duct

coming from the 221B Canyon Building splits into an underground main duct and an underground duct routed to the underground HEPA filter vaults. The main duct, which routed exhaust air to the sand filter, was blocked with two concrete walls in 1964. An underground concrete exhaust duct from the filter vaults merges with the main exhaust duct downstream of the two concrete walls that block the main duct.

An underground concrete exhaust duct from the filter vaults merges with the main exhaust duct downstream of the two concrete walls. The main duct extends to the exhaust fans. One steam turbine-driven fan and two electric energy-driven fans were used. Stainless steel ducts routed exhaust air from the underground main exhaust duct to the sand filter structures aboveground and to the aboveground fans. Stainless steel plates have been installed in flanges of the aboveground stainless steel ducts to isolate the fans and sand filter from the retired HEPA filter vaults.

Stainless steel ducts routed the exhaust from the fans to the underground duct between the fans and the 291B001 stack. The fans and stack are also retired. The configuration of the 291B system is shown in Figure A-2.

A1.2.3 291B HEPA Filters and Filter Vaults

The retired 291B HEPA filters are located in underground vaults southeast of 221B. The vaults are reinforced concrete with steel filter frames inside. The vaults are covered by approximately 1 m (3.1 ft) of soil and gravel and are bermed with soil and gravel on three sides. The east end has a vacant vault (F vault) east of and adjacent to the last in-service filter (E filter). The A, B, C, D, and E filters were equipped with multiple banks of HEPA filters, and some filters were also equipped with one or more banks of pre-filters. The filters and vaults have been isolated and abandoned in place.

A1.2.4 291B Sand Filter

The sand filter is located south of the HEPA filters. The sand filter roof consists of 60 precast slabs, covered by a waterproofing membrane composed of layers of asphalt and fabric. The roof is supported by concrete walls and precast concrete beams, upheld by concrete columns. The floor has hollow concrete blocks laid longitudinally and separated by wooden dowels for distributing incoming air.

The sand filter is a deep bed of rock, gravel, and sand, constructed in layers, graded with about 2 to 1 variation in granule size from layer to layer. Air flow direction is upward, and granules decrease in size in the direction of the air flow. The collection mechanism of a sand filter is largely gravity settling and Brownian diffusion. A top layer of moderately coarse sand prevents fluidization of the finer sand.

The sand filter has been isolated and deactivated by disabling a sand filter inlet duct motor-operated valve in the closed position, and by installing a pancake flange in the sand filter outlet duct directly downstream from the deactivated outlet water seal tank, which is now empty.

A1.3 296B002 Filter Vault Passive Vent System

A filter vault passive vent was installed to preclude explosive hydrogen concentrations if the contaminated filters were to become flooded. The retired 291B filter cells are equipped with a passive, HEPA-filtered vent system to allow any gasses generated from radiolytic decomposition of water or any other substances in the filters or filter vaults to dissipate naturally, while preventing transfer of contaminants to the atmosphere. Vent lines connected to a riser at each of the five filter vaults are intertied to a common vent line header. Air exhausting from the filter vaults is filtered through two HEPA filters placed in a series prior to release through vent line 296B002 Stack. The first HEPA filter serves to filter the vent stream and prevent a release of contaminants to the atmosphere. The second HEPA filter serves as an approved alternative to a record sampler and is used to perform in-place nondestructive assay for reporting emissions from the passive vent discharge.

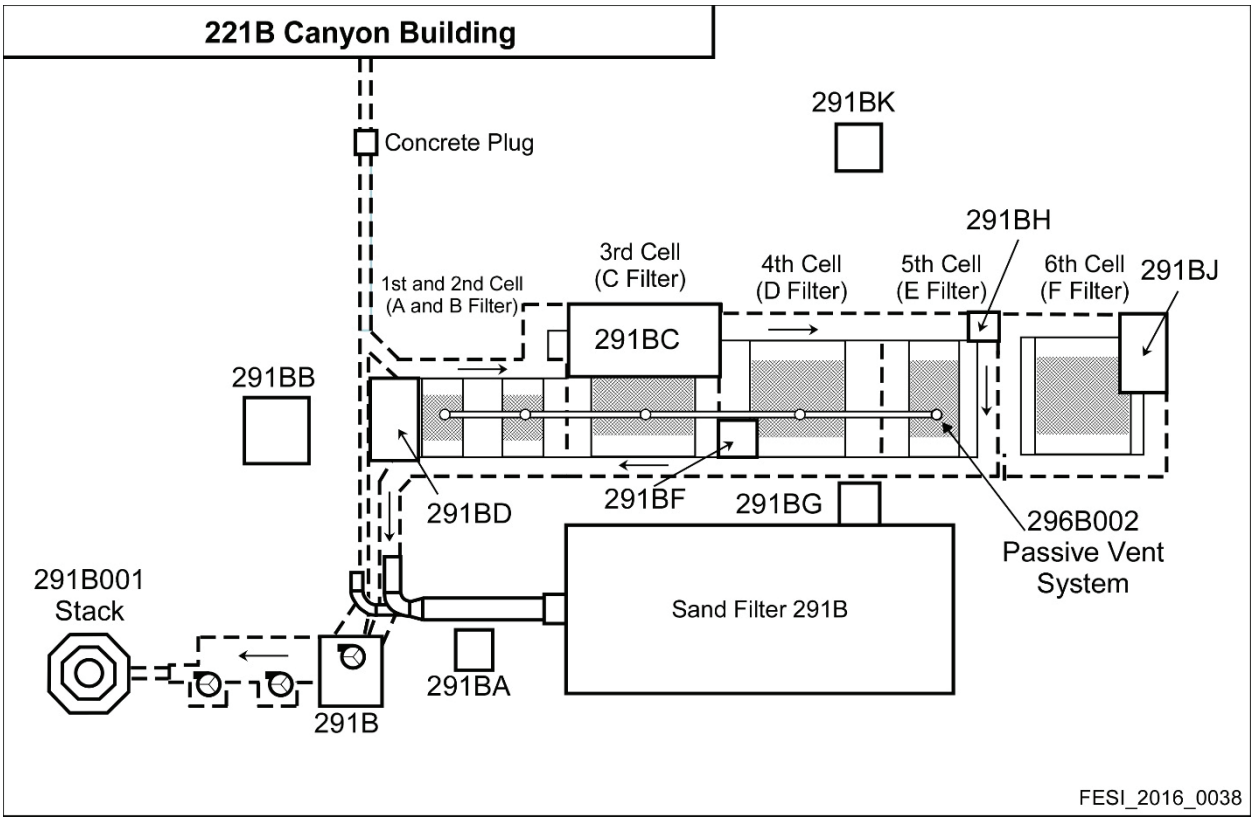

Figure A-2. Retired 291B Ventilation System

A2 References

DOE/RL-2010-54, 2010, *Engineering Evaluation/Cost Analysis for 200 East Area Tier 2 Buildings/Structures*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0084114.

HNF-3208, 1999, *Documentation of Remaining Hazardous Substances/Dangerous Wastes in B Plant*, Rev. 0A, U.S. Department of Energy, Richland Operations Office Richland, Washington.

Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq. Available at: http://www.epa.gov/rcraonline/.

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Appendix B

Applicable or Relevant and Appropriate Requirements

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Terms

ACM	asbestos-containing material
ALARA	as low as reasonably achievable
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*
COPC	contaminant of potential concern
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ETF	Effluent Treatment Facility
HHE	human health and the environment
LLW	low-level waste
NESHAP	"National Emission Standards for Hazardous Air Pollutants" (40 CFR 61)
NRC	U.S. Nuclear Regulatory Commission
NTCRA	non-time-critical removal action
PCB	polychlorinated biphenyl
RACM	regulated asbestos-containing material
RACT	reasonably available control technology
RCRA	*Resource Conservation and Recovery Act of 1976*
T-BACT	toxics best available control technology
TAP	toxic air pollutant
TBC	to be considered
TSCA	*Toxic Substances Control Act of 1976*
UIC	underground injection control

B1 Applicable or Relevant and Appropriate Requirements

For the removal action being considered in this document, implementation of any selected alternative would be designed to comply with the applicable or relevant and appropriate requirements (ARARs) cited in this section 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 B Plant Complex buildings/structures.

Chemical-specific requirements are usually health-based 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-based or activity-based requirements or limitations triggered by the remedial actions performed at the 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 and requirements to be considered (TBC) for the proposed removal action are provided in Tables B-1 and B-2, respectively.

B1.1 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, polychlorinated biphenyl (PCB) waste, and asbestos-containing material (ACM) 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.

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

[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.

Commerce, and Use Prohibitions." TSCA regulations contain specific provisions for PCB waste, including PCB waste that contains a radioactive component. PCBs also are considered underlying hazardous constituents under RCRA and thus could be subject to WAC 173-303 and 40 CFR 268 requirements.

Removal and disposal of asbestos and ACM 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 (40 CFR 61) 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 DOE identifies any Cat II ACM that should be allowed to remain in place during demolition based on the knowledge that the demolition will not render it friable, information identifying the planned demolition approach and describing how the Cat II ACM will not become crumbled, pulverized, or reduced to powder, by the forces expected to act on it during the demolition or otherwise friable, will be provided in advance to the U.S. Environmental Protection Agency (EPA) for approval. 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 (40 CFR 61) standards. Demonstration can be performed using existing EPA or Washington State guidance regarding asbestos abatement under NESHAP (40 CFR 61). 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 (40 CFR 61). 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 (WCH-191, *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 (HHE). 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 be considered when the NTCRA occurs if a suitable and cost effective location is

[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 buildings/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.

identified. Any potential alternate disposal location will be evaluated for appropriate performance standards to ensure that it is adequately protective of HHE. 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 RCRA or other applicable federal or state requirements. Any potential alternate offsite disposal location will also require approval from the treatment, storage, and/or disposal facility's EPA Region that the disposal facility is acceptable to receive waste from any CERCLA site, to ensure that the CERCLA waste will not be released to the environment at the new location and create a new CERCLA site.

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. Applicable packaging and pre-transportation requirements for dangerous or mixed waste generated by the NTCRA would be identified and implemented before movement of any waste outside the CERCLA onsite areas.

Some of the aqueous waste determined to be LLW or designated as dangerous or mixed waste would be transported to Effluent Treatment Facility (ETF) or other acceptable facility for treatment and disposal. ETF 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. 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 ARAR requirements. Before disposal, waste would be managed in a protective manner to prevent releases to the environment or unnecessary exposure to personnel.

B1.2 Standards Controlling Emissions to the Environment

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

B1.2.1 Radiological Air Emissions

The federal *Clean Air Act of 1990* and RCW 70.94, "Washington Clean Air Act," require regulation of radioactive air pollutants. Implementing regulations in 40 CFR 61.92, "National Emission Standards for Hazardous Air Pollutants," "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 achieved 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. Existing air permits/licenses will be modified to reflect this removal action decision.

B1.2.2 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. 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.

B1.3 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 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 be completed of these buildings/structures to identify artifacts that are of educational and interpretive value. The 221B Canyon Building was determined not to be a contributing property and was not recommended for individual documentation.

The area around the B Plant Complex 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.

Table B-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.	This applies to all stationary engines used during this NTCRA. This requirement is action-specific.

Table B-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 61.140, "Applicability" 40 CFR 61.145, "Standard for Demolition and Renovation" Specific subsections: 40 CFR 61.145(a)(1), (a)(2), and (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)(1), (a)(2), and (a)(5), are used to determine when the requirements of 40 CFR 61.145(c) apply to demolition activities.	Some buildings/structures addressed under the NTCRA could contain asbestos. The substantive provisions of 40 CFR 61.145(c) would be complied in accordance with 40 CFR 61.145(a)(1), (a)(2), and (a)(5) for the material that contains RACM under this B Plant 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 B Plant NTCRA. This requirement is chemical-specific.
***Archeological and Historic Preservation Act of 1974*, as amended, 16 USC 469aa-469mm**			
40 CFR 6.301(c), "Procedures for Implementing the National Environmental Policy Act and Assessing the Environmental Effects Abroad of EPA Actions," "Applicant Requirements"	ARAR	Requires that the removal action at the B Plant Complex does not cause the loss of any archaeological or historic data. This act mandates preservation of the data and does not require protection of the actual historical sites.	Archeological and historic sites have been identified within the 200 Areas; therefore, the substantive requirements of this act are applicable to removal actions that might disturb these sites. This requirement is action-specific.
***National Historic Preservation Act of 1966*, 16 USC 470, Section 106**			
36 CFR 800, "Protection of Historic Properties" 36 CFR 65, "National Historic Landmarks Program" 36 CFR 60, "National Register of Historic Places"	ARAR	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 B Plant 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.

Table B-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
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.	Based on Hanford Site history, these types of sites could be encountered during the B Plant 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)**			
50 CFR 402, "Interagency Cooperation—Endangered Species Act of 1973, as amended"	ARAR	These regulations prohibit actions by federal agencies that are likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification or critical habitat.	Substantive requirements of this act are applicable if threatened or endangered species are identified in areas where the removal action will occur. This requirement is location-specific.
***Migratory Bird Treaty Act of 1918*, 16 USC 703 et seq.**			
50 CFR 10.13, "Wildlife and Fisheries," "List of Migratory Birds"		These standards make it illegal to pursue, hunt, take, capture, kill, possess, trade, or transport any migratory bird, part, nest, or egg included in the terms of the conventions between U.S. and Great Britain, U.S. and Mexico, and U.S. and Japan.	Three species of bird protected under the migratory bird treaty act may nest on or near the B Plant Complex. If these bird species are impacted by the selected remedy, 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.

Table B-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), "Storage for Disposal" 40 CFR 761.60(b), "PCB Articles" 40 CFR 761.60(c), "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 buildings/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.

Table B-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
Radiological Dose and Cleanup (To Be Considered)			
Luftig and Weinstock, 1997, "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" Luftig and Page, 1999, "Distribution of OSWER Radiation Risk Assessment Q&A's Final Guidance"	TBC	This memorandum presents clarification for establishing protective cleanup levels in media for radioactive contamination at CERCLA sites. EPA has determined that the dose limits established by the NRC in 62 FR 39058, "Radiological Criteria for License Termination" (25 mrem/yr, which is equivalent to 5×10^{-4} increase lifetime risk), will not provide a protective basis for establishing preliminary remediation goals under CERCLA. A dose of 15 mrem/yr effective dose (approximately equivalent to 3×10^{-4} increase in lifetime risk) is preferred as the maximum dose limit for humans. In the final guidance, EPA further clarifies that 15 mrem/yr is not a presumptive cleanup level under CERCLA. Rather, site decision makers should continue to use the CERCLA risk range when ARARs are not used to set cleanup levels. This is for several reasons, as using dose based guidance would result in unnecessary inconsistency regarding how radiological and nonradiological (chemical) contaminants are addressed at CERCLA sites.	Soil and debris in the B Plant Complex may contain radioactive contaminants that, if not removed, could pose unacceptable risk to human health.

Table B-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
Radiological Dose and Cleanup (To Be Considered)			
EPA/540-R-00-007, *Soil Screening Guidance for Radionuclides: User's Guide* (OSWER Directive 9355.4-16A)	TBC	This soil screening guidance is a tool developed by EPA to help standardize and accelerate the evaluation and cleanup of radioactively contaminated soil sites on the National Priorities List (40 CFR 300, Appendix B) where future residential land use is anticipated. The guidance provides a simple step-by-step methodology for environmental science/engineering professionals to calculated risk-based, site-specific soil screening levels for radionuclides in soil that may be used to identify areas needing further investigation at National Priorities List sites.	This TBC guidance is pertinent to the B Plant NTCRA alternatives that will leave radiological contaminants in place following removal.
OSWER Directive 9285.7-55, *Guidance for Developing Ecological Soil Screening Levels*	TBC	Provides a set of risk-based (ecological) soil screening levels for several soil contaminants that are of ecological concern for terrestrial plants and animals at hazardous waste sites. Also describes the process used to derive these levels and provides guidance for their use.	Soil in the B Plant Complex may contain contaminants that require removal. Comparison to soil screening levels may be appropriate for defining potential COPCs or to default to an ecological soil screening level for COPCs that lacks corresponding published state cleanup criteria.
EPA/540/R/99/006, *Radiation Risk Assessment At CERCLA Sites: Q & A* (OSWER Directive 9200.4-31P)	TBC	This directive provides guidance on radiological cleanup levels at CERCLA sites and states that a cleanup level is protective of HHE when dose limits generally achieve risk levels in the 1×10^{-4} to 1×10^{-6} risk range.	The 1×10^{-4} to 1×10^{-6} risk range identified in this memorandum, although a TBC is considered to be protective in lieu of NRC standards; therefore, it must be considered in the planning for 200 Area remedial actions.

ARAR = applicable or relevant and appropriate requirement
CERCLA= *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
COPC = contaminant of potential concern
EPA = U.S. Environmental Protection Agency
HHE = human health and the environment
NRC = U.S. Nuclear Regulatory Commission
NTCRA = non-time-critical removal action
PCB = polychlorinated biphenyl
RACM = regulated asbestos-containing material
TBC = to be considered

Table B-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, "Undergound 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 *Solid Waste Management Recovery and Recycling Act of 1969* (RCW 70.95, "Solid Waste Management—Reduction and Recycling")			
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 NTRCA. This requirement is action-specific.

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

ARAR Citation	ARAR	Requirement	Rationale for Consideration
WAC 173-303-073, "Conditional Exclusion of Special Wastes"	ARAR	This regulation provides for management of waste that pose a relatively low hazard to HHE. 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.
Regulations Pursuant to the *Solid Waste Management Recovery and Recycling Act of 1969* (RCW 70.95, "Solid Waste Management—Reduction and Recycling")			
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.

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

ARAR Citation	ARAR	Requirement	Rationale for Consideration
WAC 173-303-170(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.
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.
RCW 70.105D, "Hazardous Waste Cleanup—Model Toxics Control Act"			
WAC 173-340-745(5), "Soil Cleanup Standards for Industrial Properties" WAC 173-340-745(6), "Soil Cleanup Standards for Industrial Properties, Adjustments"	ARAR	Rules set standards for degree of cleanup required by a remedial action where industrial land use represents the reasonable maximum exposure under both current and future site use conditions. Total excess cancer risk may not exceed 1×10^{-5} or a noncancer hazard index of 1 for chemical contaminants.	The selected NTCRA will comply through removal, treatment, and disposal of contaminants generated from the NTCRA that exceed the standards. This requirement is a chemical-specific.

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

ARAR Citation	ARAR	Requirement	Rationale for Consideration
WAC 173-340-747(3) through (8), "Deriving Soil Concentrations for Groundwater Protection"	ARAR	Establishes soil concentrations that will not cause contamination of groundwater at levels that exceed the groundwater cleanup levels established under WAC 173-340-720, "Groundwater Cleanup Standards." Provides an overview of the methods for deriving these soil concentrations to meet relevant criteria. Certain methods are tailored for particular types of hazardous substances or sites and certain methods are more complex than others and/or require the use of site-specific data.	Soil in the B Plant Complex may contain contaminants that require removal. The requirements corresponding to soil cleanup levels may be used to calculate cleanup levels to ensure protection of groundwater. Although groundwater is not currently used for drinking water, it is a potential drinking water source. This is a chemical-specific requirement.
RCW 70.105D, "Hazardous Waste Cleanup—Model Toxics Control Act"			
WAC 173-340-7490, "Terrestrial Ecological Evaluation Procedures" WAC 173-340-7493, "Site-Specific Terrestrial Ecological Evaluation Procedures" WAC 173-340-7494, "Priority Contaminants of Ecological Concern"	TBC	Defines goals and procedures for determining whether a release of hazardous substances to soil may pose a threat to the terrestrial environment. Characterizes existing or potential threats to terrestrial plants or animals exposed to hazardous substances in soil; establishes site-specific cleanup standards for the protection of terrestrial plants and animals. WAC 173-340-7494 provides for numeric concentrations of hazardous substances determined to persist, bioaccumulate, or be highly toxic to terrestrial ecological receptors.	Soil in B Plant Complex may contain contaminants that require evaluation to determine if ecological exposures have the potential to cause significant adverse effects. This is a chemical-specific action.

Table B-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 *Washington Clean Air Act of 1967* (RCW 70.94, "Washington Clean Air Act") and RCW 43.21A, "Department of Ecology"			
WAC 173-400, "General Regulations for Air Pollution" Specific subsection: WAC 173-400-040(3), "General Standards for Maximum Emission" WAC 173-400-040(8)	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.	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. These requirements are action-specific.
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.
Regulations Pursuant to *Washington Clean Air Act of 1967* (RCW 70.94, "Washington Clean Air Act") and RCW 43.21A, "Department of Ecology"			
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" WAC 173-460-070, "Ambient Impact Requirement" WAC 173-460-150, "Table of ASIL, SQER and de Minimis Emission Values"	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.

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

ARAR Citation	ARAR	Requirement	Rationale for Consideration
WAC 246-247-035, (1)(a)(i), "National Standards Adopted by Reference for Sources of Radionuclide Emissions" (adopts, by reference, 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 B Plant 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
Regulations Pursuant to *Washington Clean Air Act of 1967* (RCW 70.94, "Washington Clean Air Act") and RCW 43.21A, "Department of Ecology"			
WAC 246-247-035 (1)(a)(i) (adopts, by reference, 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 NESHAP and resultant requirements have the potential to be detected in, and potentially emitted from, structures, components, debris, soil, or groundwater involved in the B Plant NTCRA. Associated design, equipment, work practice, or equipment for air pollution control may also be maintained and operated. This requirement is action-specific.
WAC 246-247-035 (1)(a)(i), "National Standards Adopted by Reference for Sources of Radionuclide Emissions" (adopts, by reference, 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 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 B Plant NTCRA. The hazardous contaminants will be monitored as identified under each applicable NESHAP subpart. This requirement is action-specific

Table B-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 *Washington Clean Air Act of 1967* (RCW 70.94, "Washington Clean Air Act") and RCW 43.21A, "Department of Ecology"			
WAC 246-247-035 (1)(a)(ii), "National Standards Adopted by Reference for Sources of Radionuclide Emissions" (adopts, by reference, 40 CFR 61.92, "Standard")	ARAR	Establishes emission standards for radionuclides equivalent to NESHAP (40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities"), by reference. 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 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.
WAC 246-247-035 (1)(a)(ii), "National Standards Adopted by Reference for Sources of Radionuclide Emissions" (adopts, by reference, 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 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 B Plant NTCRA. The hazardous contaminants will be monitored as identified under each applicable NESHAP subpart. This requirement is action-specific report.

Table B-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 *Washington Clean Air Act of 1967* (RCW 70.94, "Washington Clean Air Act") and RCW 43.21A, "Department of Ecology"			
WAC 246-247-040(3), "General Standards" WAC 246-247-040(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 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 B Plant 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 B Plant Complex or generated from the NTCRA would be subject to 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.
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 buildings/structures to be addressed under this NTCRA will contain radioactive constituents. Potential emissions from the NTCRA would be performed in accordance with 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 WAC 246-247. This requirement is action-specific.

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

ARAR Citation	ARAR	Requirement	Rationale for Consideration
WAC 173-480-060, "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 WAC 246-247. This requirement is action-specific.
WAC 173-480-070(2), "Emission Monitoring and Compliance Procedures"	ARAR	Requires that procedures specified in WAC 246-247 or approved specifically by the regulatory agency shall be used to determine compliance with the 10 mrem/yr standard for dose to any member of the public. Compliance is determined by calculating the dose to members of the public at the point of maximum annual air concentration in an unrestricted area where any member of the public may be.	The potential for radionuclide emissions from some NTCRAs, such as fugitive and diffuse emissions during demolition and excavation and related activities, would be performed in compliance with the public dose standard. This requirement is action-specific.

ALARA = as low as reasonably achievable
CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
HHE = human health and the environment
NESHAP = "National Emissions Standards for Hazardous Air Pollutants"
NTCRA = non-time-critical removal action
RACT = reasonably available control technology
TAP = toxic air pollutant
T-BACT = toxics best available control technology
UIC = underground injection control

B2 References

36 CFR 60, "National Register of Historic Places," *Code of Federal Regulations*. Available at: http://www.access.gpo.gov/nara/cfr/waisidx_10/36cfr60_10.html.

36 CFR 65, "National Historic Landmarks Program," *Code of Federal Regulations*. Available at: http://www.access.gpo.gov/nara/cfr/waisidx_10/36cfr65_10.html.

36 CFR 800, "Protection of Historic Properties," *Code of Federal Regulations*. Available at: http://www.access.gpo.gov/nara/cfr/waisidx_08/36cfr800_08.html.

40 CFR 6.301, "Procedures for Implementing the National Environmental Policy Act and Assessing the Environmental Effects Abroad of EPA Actions," "Landmarks, Historical, and Archaeological Sites," *Code of Federal Regulations*. Available at: https://www.gpo.gov/fdsys/granule/CFR-2000-title40-vol1/CFR-2000-title40-vol1-sec6-301/content-detail.html.

40 CFR 60, "Standards of Performance for New Stationary Sources." *Code of Federal Regulations*. Available at: http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40cfr60_main_02.tpl.

Subpart IIII, "Standards of Performance for Stationary for Compression Ignition Internal Combustion Engines."

Subpart JJJJ, "Standards of Performance for Stationary Spark Ignition Internal Combustion Engines."

40 CFR 61, "National Emission Standards for Hazardous Air Pollutants," *Code of Federal Regulations*. Available at: http://www.access.gpo.gov/nara/cfr/waisidx_09/40cfr61_09.html.

61.05, "Prohibited Activities."

61.12, "Compliance with Standards and Maintenance Requirements."

61.13, "Emission Tests and Waiver of Emission Tests."

61.14, "Monitoring Requirements."

61.32, "Emission Standard."

61.92, "Standard."

61.93, "Emission Monitoring and Test Procedures"

61.140, "Applicability."

61.145, "Standard for Demolition and Renovation."

61.150, "Standard for Waste Disposal for Manufacturing, Fabricating, Demolition, Renovation, and Spraying Operations."

Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities."

Subpart M, "National Emission Standard for Asbestos."

40 CFR 63, "National Emission Standards for Hazardous Air Pollutants for Source Categories," *Code of Federal Regulations*. Available at: http://www.gpo.gov/fdsys/pkg/CFR-2011-title40-vol9/xml/CFR-2011-title40-vol9-part63.xml.

Subpart ZZZZ, "National Emission Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines."

40 CFR 268, "Land Disposal Restrictions," *Code of Federal Regulations*. Available at: http://www.access.gpo.gov/nara/cfr/waisidx_09/40cfr268_09.html.

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*. Available at: http://www.access.gpo.gov/nara/cfr/waisidx_10/40cfr300_10.html.

300.400, "General."

300.440, "Procedures for Planning and Implementing Off-Site Response Actions."

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," Appendix B, "National Priorities List," *Code of Federal Regulations*. Available at: http://www.gpo.gov/fdsys/pkg/CFR-2010-title40-vol27/xml/CFR-2010-title40-vol27-part300-appB.xml.

40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions," *Code of Federal Regulations*. Available at: http://www.access.gpo.gov/nara/cfr/waisidx_09/40cfr761_09.html.

761.50, "Applicability."

761.60, "Disposal Requirements."

761.61, "PCB Remediation Waste."

761.62, "Disposal of PCB Bulk Product Waste."

761.79, "Decontamination Standards and Procedures."

43 CFR 10, "Native American Graves Protection and Repatriation Regulations," *Code of Federal Regulations*. Available at: http://www.access.gpo.gov/nara/cfr/waisidx_09/43cfr10_09.html.

50 CFR 10.13, "Wildlife and Fisheries," "List of Migratory Birds," *Code of Federal Regulations*. Available at: https://www.gpo.gov/fdsys/granule/CFR-2000-title50-vol1/CFR-2000-title50-vol1-sec10-13.

50 CFR 402, "Interagency Cooperation—Endangered Species Act of 1973, as amended," *Code of Federal Regulations*. Available at: http://www.access.gpo.gov/nara/cfr/waisidx_09/50cfr402_09.html.

62 FR 39058, "Radiological Criteria for License Termination," *Federal Register*, Vol. 62, No. 139, pp. 39058-39092, July 21, 1997. Available at: http://www.gpo.gov/fdsys/pkg/FR-1997-07-21/pdf/97-17752.pdf.

Archeological and Historic Preservation Act of 1974, Pub. L. 93-291, as amended, 16 USC 469a-1 – 469a-2(d). Available at: http://www.nps.gov/history/local-law/fhpl_archhistpres.pdf.

Atomic Energy Act of 1954, 42 USC 2011, et seq. Available at: http://epw.senate.gov/atomic54.pdf.

Clean Air Act of 1990, 42 USC 7401, et seq., Pub. L. 101-549. Available at: http://www.epa.gov/air/caa/.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq., Pub. L. 107-377, December 31, 2002. Available at: http://epw.senate.gov/cercla.pdf.

Section 104, "Response Authorities."

Section 121, "Cleanup Standards."

DOE/RL-97-56, 1998, *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0081103H.

Endangered Species Act of 1973, 16 USC 1531, et seq. Available at: http://www.access.gpo.gov/nara/cfr/waisidx_09/50cfr402_09.html.

EPA, 1995, *Record of Decision, U.S. DOE Hanford Environmental Restoration Disposal Facility, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, U.S. Department of Energy, and Washington State Department of Ecology. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196041064.

EPA/540-R-00-007, 2000, *Soil Screening Guidance for Radionuclides: User's Guide*, OSWER 9355.4-16A, Office of Radiation and Indoor Air, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C. Available at: https://rais.ornl.gov/documents/SSG_rad_user.pdf.

EPA/540/R/99/006, 1999, *Radiation Risk Assessment At CERCLA Sites: Q & A*, Directive 9200.4-31P, Office of Emergency and Remedial Response and Office of Radiation and Indoor Air, U.S. Environmental Protection Agency, Washington, D.C. Available at: http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1000RP3.txt.

Luftig, Stephen D. and Larry Weinstock, 1997, "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" (memorandum to Addressees), OSWER No. 9200.4-18, Office of Emergency and Remedial Response and Office of Radiation and Indoor Air, U.S. Environmental Protection Agency, Washington, D.C., August 22. Available at: http://www.philrutherford.com/Radiation_Cleanup_Standards/OSWER_9200-4-18.pdf.

Luftig, Stephen D. and Stephen D. Page, 1999, "Distribution of OSWER Radiation Risk Assessment Q & A's Final Guidance" (memorandum to Addressees distributing OSWER Directive 9200.4-31P), Office of Emergency and Remedial Response and Office of Radiation and Indoor Air, U.S. Environmental Protection Agency, Washington, D.C., December 17. Available at: http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1000RP3.PDF.

Migratory Bird Treaty Act of 1918, 16 USC 703, et seq. Available at: http://www.animallaw.info/statutes/stusmba.htm.

National Historic Preservation Act of 1966, 16 USC 470, et seq. Available at: http://www.achp.gov/docs/nhpa%202008-final.pdf.

Native American Graves Protection and Repatriation Act of 1990, 25 USC 3001, et seq. Available at: http://www.nps.gov/history/local-law/FHPL_NAGPRA.pdf.

OSWER Directive 9285.7-55, 2005, *Guidance for Developing Ecological Soil Screening Levels*, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C. Available at: https://rais.ornl.gov/documents/ecossl.pdf.

RCW 43.21A, "Department of Ecology," *Revised Code of Washington*, Olympia, Washington. Available at: http://apps.leg.wa.gov/RCW/default.aspx?cite=43.21A.

RCW 70.94, "Washington Clean Air Act," *Revised Code of Washington*, Olympia, Washington. Available at: http://apps.leg.wa.gov/RCW/default.aspx?cite=70.94.

RCW 70.95, "Solid Waste Management—Reduction and Recycling," *Revised Code of Washington*, Olympia, Washington. Available at: http://apps.leg.wa.gov/RCW/default.aspx?cite=70.95.

RCW 70.105D, "Hazardous Waste Cleanup—Model Toxics Control Act," *Revised Code of Washington*, Olympia, Washington. Available at: http://apps.leg.wa.gov/RCW/default.aspx?cite=70.105D.

Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq. Available at: http://www.epa.gov/epawaste/inforesources/online/index.htm.

Toxic Substances Control Act of 1976, 15 USC 2601, et seq. Available at: http://frwebgate.access.gpo.gov/cgi-bin/usc.cgi?ACTION=BROWSE&TITLE=15USCC53.

WAC 173-218, "Underground Injection Control Program," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-218.

218-120, "Decommissioning a UIC Well."

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

303-016, "Identifying Solid Waste."

303-017, "Recycling Processes Involving Solid Waste."

303-070, "Designation of Dangerous Waste."

303-071, "Excluded Categories of Waste."

303-073, "Conditional Exclusion of Special Wastes."

303-077, "Requirements for Universal Waste."

303-120, "Recycled, Reclaimed, and Recovered Wastes."

303-140, "Land Disposal Restrictions."

303-170, "Requirements for Generators of Dangerous Waste."

303-200, "Accumulating Dangerous Waste On-Site."

303-573, "Standards for Universal Waste Management."

303-630, "Use and Management of Containers."

303-640, "Tank Systems."

WAC 173-340, "Model Toxics Control Act—Cleanup," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-340.

340-720, "Groundwater Cleanup Standards."

340-745, "Soil Cleanup Standards for Industrial Properties."

340-747, "Deriving Soil Concentrations for Groundwater Protection."

340-7490, "Terrestrial Ecological Evaluation Procedures."

340-7493, "Site-Specific Terrestrial Ecological Evaluation Procedures."

340-7494, "Priority Contaminants of Ecological Concern."

WAC 173-350-300, "Solid Waste Handling Standards," "On-Site Storage, Collection and Transportation Standards," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-350-300.

WAC 173-400, "General Regulations for Air Pollution Sources," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-400.

400-040, "General Standards for Maximum Emission."

400-113, "Requirements for New Sources in Attainment or Unclassifiable Areas."

WAC 173-460, "Controls for New Sources of Toxic Air Pollutants," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-460.

460-060, "Control Technology Requirements."

460-070, "Ambient Impact Requirement"

460-150, "Table of ASIL, SQER and de Minimis Emission Values."

WAC 173-480, "Ambient Air Quality Standards and Emission Limits for Radionuclides," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-480.

480-040, "Ambient Standard."

480-050, "General Standards for Maximum Permissible Emissions."

480-060, "Emission Standards for New and Modified Emission Units."

480-070, "Emission Monitoring and Compliance Procedures."

WAC 232-12-297, "Permanent Regulations," "Endangered, Threatened, and Sensitive Wildlife Species Classification," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=232-12-297.

WAC 246-247, "Radiation Protection—Air Emissions," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=246-247.

247-035, "National Standards Adopted by Reference for Sources of Radionuclide Emissions."

247-040, "General Standards."

247-075, "Monitoring, Testing and Quality Assurance."

WCH-191, 2015, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*, Rev. 4, Washington Closure Hanford, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0080195H.

Appendix C

B Plant Implementation Area

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Terms

EE/CA	engineering evaluation/cost analysis
RI/FS	remedial investigation/feasibility study
SQUID	subsequent unit for individual development
WESF	Waste Encapsulation and Storage Facility

C1 B Plant Implementation Area

The Central Plateau of the Hanford Site is divided into Implementation Areas, as defined in DOE/RL-2012-33, *Central Plateau Remediation Optimization Study*. These areas are configured around major components such as canyon buildings, landfills, and tank farms. Implementation Areas were developed by the U.S. Department of Energy to track cleanup activities on the Hanford Site. Implementation Areas each have a defined inventory of facilities and waste sites that lie in proximity to each other to enable effective management of future cleanup actions.

The boundary of the B Plant Implementation Area is shown in Figure C-1. Each building/structure within the B Plant Implementation Area is listed Table C-1. All of the buildings/structures within the B Plant Implementation Area will be considered during the development of the associated operable unit remedial action(s). Prior to the remedial action, removal actions and *Resource Conservation and Recovery Act of 1976* closures will be undertaken within the B Plant Implementation Area. Table C-1 provides the documents that are currently in place for each building/structure.

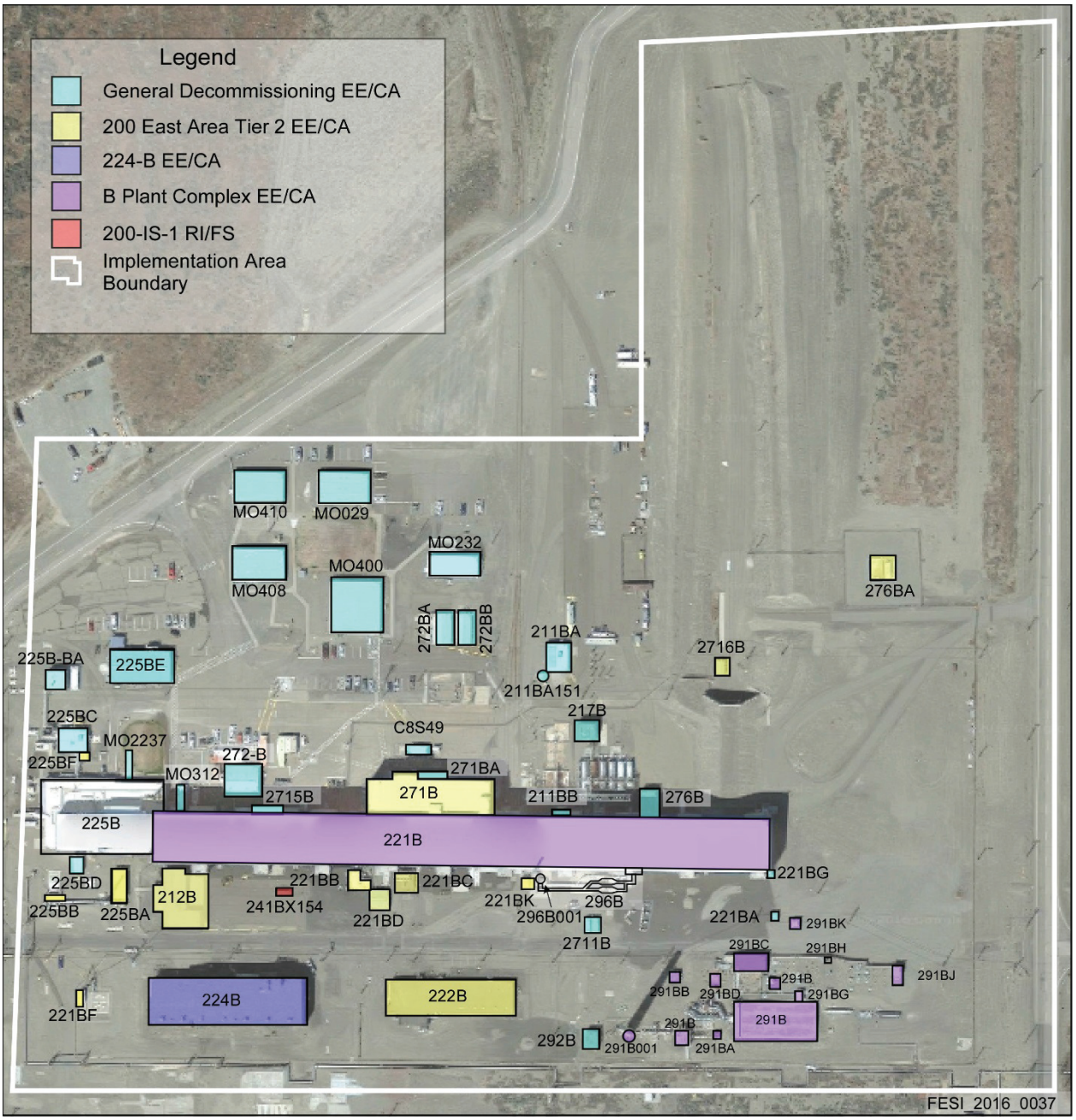

Figure C-1. Buildings/Structures within the B Plant Implementation Area

Table C-1. B Plant Implementation Area Buildings/Structures

Official Name	Description	SQUID	EE/CA	Action Memorandum	Removal Action Work Plan	RI/FS and/or Closure Plan
211BA	Electrical Maintenance Equipment Storage	North	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
211BA151	Monitoring Station	North	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
211BB	Motor Control Center Building	Main	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
212B	Fission Products Load Out Station	Main	200 East Tier 2	200 East Tier 2		200-CB-1
217B	Demineralizer Building	Main	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
221B	B Plant Canyon	Main	B Plant Complex			200-CB-1
221BA	Cooling Water Monitoring Station	Main	General Decommissioning			200-CB-1
221BB	Process Steam and Condensate Building	Main	200 East Tier 2	200 East Tier 2		200-CB-1
221BC	SWP Change House	Main	200 East Tier 2	200 East Tier 2		200-CB-1
221BD	Laundry Storage Building	Main	200 East Tier 2	200 East Tier 2		200-CB-1
221BF	Condensate Effluent Discharge Facility	Main	200 East Tier 2	200 East Tier 2		200-CB-1
221BG	B Plant Cooling Water Sampling Building	Main	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
221BK	Canyon Ventilation Instrument Building	Main	200 East Tier 2	200 East Tier 2		200-CB-1

Table C-1. B Plant Implementation Area Buildings/Structures

Official Name	Description	SQUID	EE/CA	Action Memorandum	Removal Action Work Plan	RI/FS and/or Closure Plan
222B	Office Building	Main	200 East Tier 2	200 East Tier 2	200 East Tier 2 B Plant Complex*	200-CB-1
224B	Concentration Facility	Main	224-B	224-B		200-CB-1
225B	Waste Encapsulation and Storage Facility (WESF)	Main				200-CB-1/ WESF Closure Plan
225BA	K1 Filter Pit Encapsulation Facility	Main	200 East Tier 2	200 East Tier 2		200-CB-1
225BB	Encapsulation K3 Filter Pit	Main	200 East Tier 2	200 East Tier 2		200-CB-1
225B-BA	225B Boiler Annex	North	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
225BC	Encapsulation Compressor Facility	Main	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
225BD	Encapsulation Waste Monitoring Building	Main	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
225BE	Encapsulation Maintenance Shop	North	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
225BF	WESF Air Dryer Building	Main	200 East Tier 2	200 East Tier 2		200-CB-1
241BX154	Diversion Box	Main				200-IS-1/ 200-CB-1
2711B	Breathing Air Compressor Building	Main	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
2715B	Paint Storage Building	Main	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1

Table C-1. B Plant Implementation Area Buildings/Structures

Official Name	Description	SQUID	EE/CA	Action Memorandum	Removal Action Work Plan	RI/FS and/or Closure Plan
2716B	Radiation Monitoring Checkout Station	North	200 East Tier 2	200 East Tier 2	200 East Tier 2 B Plant Complex*	200-CB-1
271B	B Plant Support Building	Main	200 East Tier 2	200 East Tier 2		200-CB-1
271BA	Laundry Storage Building	Main	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
272B	Electrical Maintenance Shop	Main	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
272BA	Dry Material Storage Building	North	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
272BB	Insulation Shop	North	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
276B	Paint Shop	Main	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
276BA	Organic Storage Tank Area	North	200 East Tier 2	200 East Tier 2	200 East Tier 2 B Plant Complex*	276-BA Organic Storage Tank Closure Plan
291B	Exhaust Air Control House, Sand Filter	Main	B Plant Complex			200-CB-1
291B001	Canyon Ventilation Stack (Retired)	Main	B Plant Complex			200-CB-1
291BA	Exhaust Air Sample House	Main	B Plant Complex			200-CB-1
291BB	Instrument Building	Main	B Plant Complex			200-CB-1
291BC	Access Control Building, Filter Vaults	Main	B Plant Complex			200-CB-1

Table C-1. B Plant Implementation Area Buildings/Structures

Official Name	Description	SQUID	EE/CA	Action Memorandum	Removal Action Work Plan	RI/FS and/or Closure Plan
291BD	Instrument Building and Filter Vault	Main	B Plant Complex			200-CB-1
291BF	Instrument Building and Filter Vault	Main	B Plant Complex			200-CB-1
291BG	Instrument Building and Filter Vault	Main	B Plant Complex			200-CB-1
291BH	Fifth Filter Vault Plug Cover	Main	B Plant Complex			200-CB-1
291BJ	Instrument Building and 6th Filter Vault	Main	B Plant Complex			200-CB-1
291BK	Instrument Building	Main	B Plant Complex			200-CB-1
292B	Stack Monitor Station	Main	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
296B001	Canyon Ventilation Stack (Active)	Main				200-CB-1
296B002	Filter Vault Passive Vent	Main	B Plant Complex			200-CB-1
C8S49	Main Substation for 221B	Main	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
MO029	Storage Trailer at 271B	North	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
MO2237	Mask Issue Station - North of 225B	Main	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
MO232	Office Trailer at 271B	North	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1

Table C-1. B Plant Implementation Area Buildings/Structures

Official Name	Description	SQUID	EE/CA	Action Memorandum	Removal Action Work Plan	RI/FS and/or Closure Plan
MO312	Storage Trailer at 225B	Main	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
MO400	Office Trailer at 271B	North	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
MO408	Storage Trailer - North of 271B	North	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1
MO410	Office Trailer - North of 271B	North	General Decommissioning	General Decommissioning	General Decommissioning	200-CB-1

Note: This table is current as of April 1, 2016.

*References, including in progress and upcoming:

DOE/RL-2000-06, *Engineering Evaluation/Cost Analysis for the 224-B Plutonium Concentration Facility*.

DOE/RL-2004-36, *Action Memorandum for the Non-Time Critical Removal Action for the 224-B Plutonium Concentration Facility*.

DOE/RL-2010-14, *Engineering Evaluation/Cost Analysis for General Hanford Site Decommissioning Activities*.

DOE/RL-2010-22, *Action Memorandum for General Hanford Site Decommissioning Activities*.

DOE/RL-2010-33, *Removal Action Work Plan for Central Plateau General Decommissioning Activities*.

DOE/RL-2010-54, *Engineering Evaluation/Cost Analysis for 200 East Area Tier 2 Buildings/Structures*.

DOE/RL-2010-102, *Action Memorandum for Decontamination, Deactivation, Decommissioning, and Demolition (D4) Activities for 200 East Tier 2 Buildings/Structures*.

WA7890008967, Part III, Operating Unit Group 14, Waste Encapsulation and Storage Facility, Addendum H-A, *Hot Cell A through Hot Cell F Dangerous Waste Management Unit Closure Plan*.

C2 References

DOE/RL-2000-06, 2003, *Engineering Evaluation/Cost Analysis for the 224-B Plutonium Concentration Facility*, Rev. 2, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D3482667.

DOE/RL-2004-36, 2004, *Action Memorandum for the Non-Time Critical Removal Action for the 224-B Plutonium Concentration Facility*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D6731933.

DOE/RL-2010-14, 2010, *Engineering Evaluation/Cost Analysis for General Hanford Site Decommissioning Activities*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0084795.

DOE/RL-2010-22, 2010, *Action Memorandum for General Hanford Site Decommissioning Activities*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0084445.

DOE/RL-2010-33, 2010, *Removal Action Work Plan for Central Plateau General Decommissioning Activities*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0084342.

DOE/RL-2010-54, 2010, *Engineering Evaluation/Cost Analysis for 200 East Area Tier 2 Buildings/ Structures*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0084169.

DOE/RL-2010-102, 2011, *Action Memorandum for Decontamination, Deactivation, Decommissioning, and Demolition (D4) Activities for 200 East Tier 2 Buildings/Structures*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0083998.

DOE/RL-2012-33, 2012, *Central Plateau Remediation Optimization Study*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://www.osti.gov/scitech/servlets/purl/1053710.

Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq. Available at: http://www.epa.gov/rcraonline/.