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08-AMCP-0186

MAY 28 2008

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

RECEIVED
JUN 04 2008

EDMC

Dear Ms. Hedges:

ACTION MEMORANDUM FOR THE NON-TIME-CRITICAL REMOVAL ACTION
FOR THE NORTHERN PART OF THE BC CONTROLLED AREA (UPR-200-E-83),
DOE/RL-2008-21, REVISION 0

The purpose of this letter is to transmit the Action Memorandum for the Non-Time-Critical Removal Action for the Northern Part of the BC Controlled Area (UPR-200-E-83), DOE/RL-2008-21, Revision 0, to the State of Washington Department of Ecology for approval. This document is the decision resulting from the Comprehensive Environmental Response, Compensation, and Liability Act and the Engineering Evaluation/Cost Analysis for the Northern Part of the BC Controlled Area (UPR-200-E-83), DOE/RL-2007-51.

The U.S. Department of Energy, Richland Operations Office (RL) has selected the remove, treat, and dispose alternative for the northern part of the BC Controlled Area. This action is protective of the environment, the workers, minimizes disposal costs, and shrinks the area of contamination of the Central Plateau.

Comments received on Revision A have been resolved. To document your approval, please sign the approval page in the attached report and return it to RL. If you have any questions, please contact me, or your staff may contact Matt McCormick, Assistant Manager for the Central Plateau, on (509) 373-9971.

Sincerely,

David A. Brockman
Manager

AMCP:MJV

Attachment

cc: See Page 2

Ms. J. A. Hedges
08-AMCP-0186

-2-

MAY 28 2008

cc w/attach:

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Administrative Record
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Action Memorandum for the Non-Time-Critical Removal Action for the Northern Part of the BC Controlled Area (UPR-200-E-83)

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



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

**Approved for Public Release;
Further Dissemination Unlimited**

Action Memorandum for the Non-Time-Critical Removal Action for the Northern Part of the BC Controlled Area (UPR-200-E-83)

Date Published

May 2008

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



**United States
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Release Approval

05/15/2008

Date

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APPROVAL

DOE/RL-2008-21, *Action Memorandum for the Non-Time-Critical Removal Action for the Northern Part of the BC Controlled Area (UPR-200-E-83)*, Rev. 0.



David A. Brockman, Manager
Richland Operations Office
U.S. Department of Energy

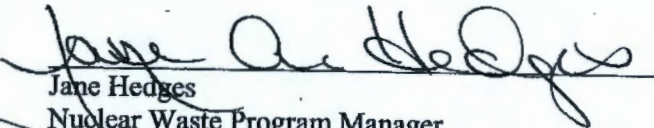
5/28/08

Date

APPROVAL

COPY

DOE/RL-2008-21, *Action Memorandum for the Non-Time-Critical Removal Action for the Northern Part of the BC Controlled Area (UPR-200-E-83)*, Rev. 0.


Jane Hedges

Nuclear Waste Program Manager

Washington State Department of Ecology

5/30/08
Date

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ACRONYMS

ARAR	applicable or relevant and appropriate requirement
BHI	Bechtel Hanford, Inc.
CERCLA	<i>Comprehensive Environmental Response, Compensation and Liability Act of 1980</i>
CFR	Code of Federal Regulations
D&D	deactivation & decommissioning
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESD	<i>The U.S. Department of Energy Hanford Environmental Restoration Disposal Facility, Hanford Site, Benton County, Washington, Explanation of Significant Differences</i>
ETF	200 Area Effluent Treatment Facility
HCP EIS	<i>Hanford Comprehensive Land-Use Plan Environmental Impact Statement</i>
IC	institutional control
LLW	low-level waste
MEI	maximally exposed individual
MNA	monitored natural attenuation
mrem/yr	millirem per year
NCP	<i>National Oil and Hazardous Substances Pollution Contingency Plan</i>
OU	operable unit
pCi/g	picocuries per gram
PRG	preliminary removal goal
PUREX	Plutonium Uranium Extraction (Plant)
RAO	Removal Action Objective
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
RCW	Revised Code of Washington
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RTD	remove, treat, and dispose
SCA	Soil Contamination Area
TBC	to be considered
TEDE	total effective dose equivalent
USC	United States Code
WAC	Washington Administrative Code
WIDS	Waste Information Data System
WIPP	Waste Isolation Pilot Plant

METRIC CONVERSION CHART

Into metric units

Out of metric units

If you know	Multiply by	To get	If you know	Multiply by	To get
Length			Length		
inches	25.40	millimeters	millimeters	0.03937	inches
inches	2.54	centimeters	centimeters	0.393701	inches
feet	0.3048	meters	meters	3.28084	feet
yards	0.9144	meters	meters	1.0936	yards
miles (statute)	1.60934	kilometers	kilometers	0.62137	miles (statute)
Area			Area		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.09290304	square meters	square meters	10.7639	square feet
square yards	0.8361274	square meters	square meters	1.19599	square yards
square miles	2.59	square kilometers	square kilometers	0.386102	square miles
acres	0.404687	hectares	hectares	2.47104	acres
Mass (weight)			Mass (weight)		
ounces (avoir)	28.34952	grams	grams	0.035274	ounces (avoir)
pounds	0.45359237	kilograms	kilograms	2.204623	pounds (avoir)
tons (short)	0.9071847	tons (metric)	tons (metric)	1.1023	tons (short)
Volume			Volume		
ounces (U.S., liquid)	29.57353	milliliters	milliliters	0.033814	ounces (U.S., liquid)
quarts (U.S., liquid)	0.9463529	liters	liters	1.0567	quarts (U.S., liquid)
gallons (U.S., liquid)	3.7854	liters	liters	0.26417	gallons (U.S., liquid)
cubic feet	0.02831685	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.7645549	cubic meters	cubic meters	1.308	cubic yards
Temperature			Temperature		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit
Energy			Energy		
kilowatt hour	3,412	British thermal unit	British thermal unit	0.000293	kilowatt hour
kilowatt	0.94782	British thermal unit per second	British thermal unit per second	1.055	kilowatt
Force/Pressure			Force/Pressure		
pounds (force) per square inch	6.894757	kilopascals	kilopascals	0.14504	pounds per square inch

06/2001

Source: *Engineering Unit Conversions*, M. R. Lindeburg, PE., Third Ed., 1993, Professional Publications, Inc., Belmont, California.

ACTION MEMORANDUM FOR THE NON-TIME-CRITICAL REMOVAL ACTION FOR THE NORTHERN PART OF THE BC CONTROLLED AREA (UPR-200-E-83)

1.0 PURPOSE

The BC Controlled Area waste site is part of the 200-UR-1 Unplanned Release Waste Group Operable Unit (OU) and is reported in the Hanford Waste Information Data Systems (WIDS) as an unplanned release site (UPR-200-E-83). The contamination in the BC Controlled Area (UPR-200-E-83) was the result of animal intrusion and wind dispersion from the BC Cribs and Trenches. The BC Cribs and Trenches are separate waste sites and are part of the 200-BC-1 OU. This Action Memorandum documents approval of the proposed non-time-critical removal action described herein for the northern part of the BC Controlled Area (UPR-200-E-83), located on the Hanford Site, Richland, Washington.

A final remedial decision for the 200-UR-1 OU has not been made; however, *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) radioactive hazardous substances¹ in the northern part of the BC Controlled Area present a potential threat to human health and the environment to the extent that a removal action² is warranted before a final remedial decision is documented. This removal action minimizes the potential for a release of hazardous substances from the northern part of the BC Controlled Area that could adversely impact human health and the environment, is protective of site personnel and the environment, and contributes to the efficient performance of any anticipated long-term remedial actions, including any future soil remediation.

A 30-day public comment and review period was held from February 25, 2008 through March 26, 2008 on the engineering evaluation/cost analysis (EE/CA) (DOE/RL-2007-51) prepared to evaluate removal action alternatives for the Northern part of the BC Controlled Area (UPR-200-E-83). The comments and responses are contained in the administrative record.

¹ "Hazardous substances" means those substances defined by the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), Section 101(14), and include both radioactive and chemical substances.

² "Remove" or "removal" as defined by CERCLA, Section 101(23), refers to the cleanup or removal of released hazardous substances from the environment; actions if a threat of release of hazardous substances occur; actions to monitor, assess, and evaluate the release (or threat of release) of hazardous substances; the disposal of removed material; or other actions that may be necessary to prevent, minimize, or mitigate damage to public health or welfare or the environment, which may otherwise result from a release or threat of release. If a planning period of at least 6 months exists before onsite actions must be initiated, the removal action is considered non-time critical and an EE/CA is conducted.

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2.0 SITE CONDITIONS AND BACKGROUND

The BC Controlled Area is located south of the 200 East Area (in what is commonly called the 600 Area) near the center of the Hanford Site in south-central Washington State (Figure 2-1) and lies between Route 4S and the Army Loop Road. Route 4S is to the north and east of the BC Controlled Area, and the Columbia River is approximately 11.5 km (7 mi.) to the north-northeast of the BC Controlled Area.

2.1 BACKGROUND

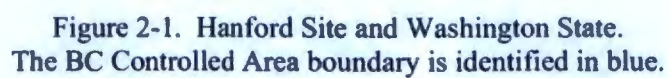
This section provides a summary of the source of the unplanned contaminated release and the nature and extent of this contamination.

Historical Site Assessment of the Surface Radioactive Contamination at BC Controlled Area (WMP-18647) contains detailed information on the BC Controlled Area and a narrative of the contamination sources. According to WMP-18647, the BC Cribs and Trenches are known to be the source of the BC Controlled Area contamination. The BC Cribs and Trenches were constructed in 1955 and received radioactive discharges of waste from two general sources: the uranium recovery project and 300 Area wastes, with the majority of the waste coming from the uranium recovery project.

During the period between the 1950s and 1960s, animal intrusions into the trenches occurred. In 1969, about 46,000 m³ (60,000 yd³) of sand and gravel were used to cover and stabilize the BC Trenches thus stopping most of the remaining spread of contamination from these sources by animals. When the trenches were covered, it was identified that an adjacent area of about 10 km² (4 mi²) was contaminated.

During 1972 to 1974, a program was implemented to study the distribution of the contamination and the mechanisms that could spread the contamination. This program included aerial gamma surveys of the BC Controlled Area, soil and in-situ exposure rate measurements, and a study of the physical and biological forces that could be spreading the contamination. The primary radionuclides found in the soil were cesium (Cs)-137 and strontium (Sr)-90. Other radionuclides also present included plutonium-239/240, europium-155, cobalt-60, and americium-241; however, more recent sampling has not identified detectable contamination from these radionuclides. Animals, tumbleweeds, and strong winds were identified as the contributors to the spread of radionuclide contamination.

In August 1974, it was concluded, that there was no indication of undue risk to the public and employees from the BC cribs and trenches and, therefore, no immediate action was necessary to decontaminate the BC Controlled Area (as identified at that time; 10 km² [4mi²]) (WMP-18647). However, by the late 1970s and early 1980s, stabilization measures of the BC cribs and trenches that had been taken in the 1960s had failed and contamination was spreading into the BC controlled area, primarily due to contaminated tumbleweed and animal intrusions (WMP-18647). In 1982, additional stabilization was completed of the BC Cribs and Trenches area. Discoveries of contamination in the BC Controlled Area continued to occur after this stabilization.



Aerial surveys in 1973, 1978 and 1988 showed varying amounts of contamination by Cs-137 (aerial gamma survey results show approximately 15 percent of the total activity present at the time of the survey), with the highest levels in areas immediately adjacent the BC Cribs and Trenches. Additional characterization activities occurred throughout these years, as described in WMP-18647, all of which agree on the basic distribution of the contamination: the highest level of contamination is in the area south of the trenches (Zone A); an arm of the contaminated area extends toward the southeast; an arm of the contamination extends toward the southwest; a contaminated area exists to the west and contamination exists to the south and extends into the dunes (sparse contamination) that run generally east to west. The contamination shown in these surveys corresponds to the northern part of the BC Controlled Area (except for the sand dunes) (Figure 2-2).

By late January or early February 1997, additional surveys had been completed that determined that either many contaminated spots would have to be posted as radiologically controlled areas or a larger area containing the contaminated spots would need to be established. Based on these findings, the area bounded by the Army Loop Road was established as the BC Controlled Area. This action expanded the posted area south of the BC Cribs and Trenches from approximately 10 km² (4 mi²) to approximately 34.7 km² (13.4 mi²); this is the current waste site boundary as identified in WIDS.

An assessment of the nature and extent of contamination of the BC Controlled Area is described in greater detail in the *200-UR-1 Unplanned Release Waste Group Operable Unit Remedial Investigation/Feasibility Study Work Plan* (DOE/RL-2004-39) and WMP-18647, along with identification of supporting sources of historical information. In addition, recent analytical sampling of this area was conducted under the *200-UR-1 Unplanned Release Waste Group Operable Unit Sampling and Analysis Plan* (DOE/RL-2006-50) and the *Sampling and Analysis Instruction for BC Controlled Area Soil Characterization* (D&D-24693).

Contamination in the northern part of the BC Controlled Area is believed to be bound to the soil; Cs-137 and Sr-90 are the primary radiological contaminants. Sampling in 1999 showed that strontium surface soil concentrations range from 0.32 to 3420 pCi/g across the northern part of the BC Controlled Area. Cs-137 surface soil concentrations range from 0.35 to 2290 pCi/g across the area. Thus, the surface soil concentrations of Cs-137 and Sr-90, the two radionuclides likely to deliver the greatest dose to a recipient, vary widely across the northern part of the BC Controlled Area. According to WMP-18647, soil depth profiles of activity are also expected to vary. Recent analytical data (i.e., calendar years 2005 and 2007) has shown the bulk of activity in places with contamination due to biological transport mechanisms (i.e., spread from animals) is primarily in the top 15 cm (6 in.) of soil, but is greater in some areas. For areas contaminated due to non-biological transport mechanisms (i.e., windblown contamination), primarily in Zone B, the radionuclides are probably in the top 2.5 cm (1 in.) of soil, except for Sr-90, which is distributed down about 6-in, based on sample results. The top inch is expected to contain about 40 percent of the Sr-90. Depth profiles are discussed in greater detail in Section 3.5 of WMP-18647.

2.2 WASTE SITE DESCRIPTION

The northern part of the BC Controlled Area is a geographical area approximately 1,500 hectares (3,800 acres) in size. Figure 2-2 shows the conceptual site model identifying the Zone A and Zone B radiological contamination areas within the northern BC Controlled Area. The BC Controlled Area waste site was divided into separate regions based on past historical information and recent analytical sampling events, as was discussed in *Historical Site Assessment of the Surface Radioactive Contamination at BC Controlled Area* (WMP-18647). The northern part of the BC Controlled Area is the region of the BC Controlled Area that is located north of the sand dunes that cross the controlled area from east to west. The northern part of the BC Controlled Area addressed by this Action Memorandum does not include the BC Cribs and Trenches; however, it does include a region referred to as "Zone A," which has the highest

levels of contamination from Cs-137 and Sr-90 within the BC Controlled Area. The remainder of the northern part of the BC Controlled Area ("Zone B") contains detectable amounts of contamination; however, these are generally considered to be of lower risk. The southern part of the BC Controlled Area, the region south of and including the sand dunes, is not addressed by this Action Memorandum because recent radiological surveys concluded that contamination levels were not sufficient to warrant classification as a Soil Contamination Area.



Figure 2-2. Conceptual Diagram of the BC Controlled Area.

The BC Controlled Area waste site is the result of unplanned releases of contamination, primarily from the BC Cribs and Trenches, as summarized in Sections 2.1 and 2.3. For the purposes of this Action Memorandum, the term "BC Cribs and Trenches" will include the area immediately surrounding the cribs and trenches assigned to the 200-BC-1 OU, the shallow pipeline burial trench, and waste sites 200-E-14, 200-E-114-PL and 200-E-222-PL.

Several firebreak roads exist within the northern part of the BC Controlled Area, which will allow travel within the northern region of the waste site. Buried equipment (e.g., inactive lead sheathed telephone lines) can also be found in this region. The northern part of the BC Controlled Area also contains

200-E-101 200 East Deep Lysimeter Site. This site is identified in the site diagram of Attachment 1 of the EE/CA (DOE/RL-2007-51). The 200-E-101 200 East Deep Lysimeter Site has been assigned to the 200-MG-1 OU. Activities planned to prevent disturbance of this waste site include locating the site and placing radiological postings around the area prior to the BC Controlled Area removal action. The final remedial action for the 200-E-101 200 East Deep Lysimeter Site will be documented in the 200-MG-1 record of decision (ROD).

Also contained within the northern part of the BC Controlled Area is a borrow pit located to the north of the BC Cribs and Trenches. This pit is a shallow, scraped area that provided the clean backfill material needed to surface stabilize the BC Cribs and Trenches in the early 1980s. No waste was placed in the borrow pit from that activity. This borrow pit has been surveyed and it has been verified that no surface contamination is present in this location.

2.3 RELEASES OR THREATENED RELEASE INTO THE ENVIRONMENT OF A HAZARDOUS SUBSTANCE OR POLLUTANT OR CONTAMINANT

Animal intrusions into the BC Cribs and Trenches, as well as wind dispersal of contaminated soils, are considered to be the most significant sources of contamination in the BC Controlled Area. Other contributing contamination mechanisms include contaminated tumbleweeds and radiological releases from the Plutonium-Uranium Extraction (PUREX) Plant in 1960. As stated previously, WMP-18647 contains extensive characterization information about the BC Controlled area and its contaminants of concern.

Attachment 2 of the EE/CA (DOE/RL-2007-51) contains a detailed map showing a summary of the data collection locations. This shows the different isopleths of radioactivity concentrations, based on preliminary removal goals (PRGs) of two times the human health unrestricted exposure levels (6.2 pCi/g for cesium-137 and 4.5 pCi/g for strontium-90). This screening level accounts for the short decay time frame (approximately 30 years) for Cs-137, the radionuclide that was screened. Using the 30 year decay was determined to still be protective for ecological receptors, which have protective concentration guidelines of 20.8 pCi/g for Cs-137 and 22.5 pCi/g for Sr-90. The conclusion of the characterization results for the BC Controlled Area shows that Cs-137 and Sr-90 are the only known radioactive contaminants of concern. The map in Attachment 2 of the EE/CA (DOE/RL-2007-51) shows varying isopleths of contamination that justify splitting the northern BC Controlled Area into Zone A and Zone B. Zone A is identified in this Action Memorandum as the area with continuous radiological contamination over the PRGs and presents the greatest risk to human health and the environment. Zone A is located directly south of the BC Cribs and Trenches area. Zone B contains discrete areas of contamination above PRG levels; these areas are not continuous throughout the zone and therefore require a different removal action strategy. For Zone A, the results showed that the majority of contamination is contained in the upper 15.2 cm (6 in.). For Zone B, the contamination primarily resides in the top 2.5 cm (1 in.) of soil.

Samples were taken in 2005 and 2007 to determine if nonradioactive contamination existed above action levels in the BC Controlled Area. All average and maximum concentrations for metals and other chemical constituents were below the limits for human and ecological risk identified in *Washington Administrative Code* (WAC) 173-340-740, "Unrestricted Land Use Soil Cleanup Standards", with one maximum detection value for selenium exceeding the ecological screening values. However, these values were consistent with Hanford Site background for selenium, which is above the ecological screening values from WAC 173-340-740. Therefore, no nonradioactive constituents of concern were identified for the northern part of the BC Controlled Area for this removal action. The 200-UR-1 OU feasibility study will evaluate the selenium value and site specific data at the BC Controlled Area to determine if there is a threat to human health and the environment.

The results of the characterization efforts through 2007 are summarized in Table 2-1 for the known contaminants of concern for the northern BC Controlled Area. The half-life for Cs-137 and Sr-90 is approximately 30 years; preliminary evaluations have estimated that the Cs-137 and Sr-90 levels will not decay to below unrestricted exposure levels for at least 130 years, and beyond for areas with the maximum detected values of contamination.

Table 2-1. Summary of 200-UR-1 OU BC Controlled Area Radioactive Contamination.

Average and Maximum Detected Values for Radionuclides above 1 pCi/g in BC Controlled Area Zone A			
		Cs-137	Sr-90
Detected Values	Number of Detected Values	30	29
	Average	164.5 pCi/g	303.2 pCi/g
	Maximum	1,820 pCi/g	4,700 pCi/g
200-UR-1 OU Preliminary Remediation Goals	Human Health Unrestricted Exposure	12.4 pCi/g ¹	9 pCi/g ¹
	Human Health Industrial Exposure	25 pCi/g	2,500 pCi/g
	Ecological Biota Concentration Guidelines	20.8 pCi/g	22.5 pCi/g

¹The PRGs for Cs-137 and Sr-90 are based on two times the unrestricted exposure levels. These PRGs were based on using one 30-year decay period for both contaminants.

Waste Sites in the 200-UR-1 OU are currently being evaluated via the CERCLA RI/FS process for final remedial decision, and final remedial action goals are not yet established. Therefore, this removal action will use the 200-UR-1 OU radionuclide soil cleanup PRGs identified in DOE/RL-2006-50, which are consistent with the CERCLA exposure of 10^{-4} to 10^{-6} . As an operational guideline, the standard of 15 mrem/yr above background is in agreement with the U.S. Environmental Protection Agency's (EPA) radionuclide soil cleanup guidance as described in OSWER Directive 9200.4-18, *Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination* (EPA 1997).

The PRG levels based on the 200-UR-1 OU work plan (DOE/RL-2004-39) and sampling and analysis plan (DOE/RL-2006-50) are included for comparison in Table 2-1. Final remedial action goals (cleanup levels) for the BC Controlled Area will be established in future 200-UR-1 OU remedial decision documents.

Recently, radiological surveys concluded that contamination levels within the southern part of the BC Controlled Area, and specifically within the sand dunes, were not sufficient to warrant classification as a Soil Contamination Area (SCA) and demonstrated that the SCA posting may be removed. These radiological downposting requirements were consistent with the 200-UR-1 OU PRGs for protection of human health and the environment. Therefore, this action memorandum does not address the southern part of the BC Controlled Area; the southern part of the BC Controlled Area final remedial alternatives will be evaluated in the 200-UR-1 OU remedial investigation/feasibility study (RI/FS) process.

2.4 DISCUSSION OF RELEASE THREAT

Severe weather and wind erosion can result in radiological releases. The existing contamination in the soil could cause a threat to human health and the environment. There is a possibility of direct exposure to

nearby humans/animals, the environment, and exposure to the public from airborne radioactive contaminants.

Without removal of the contaminated soil in the northern part of the BC Controlled Area weather conditions such as wind and rainfall, etc., could contribute to the spread of contamination outside of the BC Controlled Area boundaries. Summer wildfires that occur in the region could also further spread contamination in the area. In addition, the primary spread of contamination in the BC Controlled Area from the BC Cribs and Trenches was by animal intrusion. If contamination is present above ecological protection levels, ecological receptors may be contaminated by ingesting contaminated material. Additional biological discharges from contaminated animals could further contribute to the spread of contamination.

This document describes hazards associated with the BC Controlled Area waste site and the associated release/threat of release. Therefore, in addition to serving as a non-time-critical removal action memorandum, this document also serves as a removal site evaluation per 40 Code of Federal Regulations (CFR) 300.410.

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3.0 THREATS TO HUMAN HEALTH OR THE ENVIRONMENT

Conditions persist wherein threats to the public health or the environment exist.

The *National Oil and Hazardous Substances Pollution Contingency Plan* (NCP), 40 CFR Section 300.415(b)(2), establishes factors to be considered in determining the appropriateness of a removal action. One factor identifies weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released. Hazardous substances in the northern part of the BC Controlled Area are present as radiological contamination at and below the surface soils. Severe weather and wind erosion can result in radiological releases. This could cause a threat to human health and the environment by direct exposure to nearby humans/animals and the environment, and exposure to the public through possibly airborne radioactive contaminants.

Without removal of some of the contaminated soil in the northern part of the BC Controlled Area weather conditions such as wind and rainfall, etc., could contribute to the spread of contamination outside of the BC Controlled Area boundaries. Summer wildfires that occur in the region could also further spread contamination in the area. In addition, the primary spread of contamination in the BC Controlled Area from the BC Cribs and Trenches was by animal intrusion. If contamination is present above ecological protection levels, ecological receptors may be contaminated by ingesting contaminated material. Additional biological discharges from contaminated animals could further contribute to the spread of contamination.

A potential for the spread of hazardous substances from the northern part of the BC Controlled Area that could result in an increased radiation, inhalation, and ingestion risk justify this CERCLA removal action.

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4.0 ENDANGERMENT DETERMINATION

The response action proposed is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances, including radioactive substances from the northern part of the BC Controlled Area.

U.S. Department of Energy (DOE) may utilize CERCLA response authority whenever a hazardous substance is released, or there is a substantial threat of release, into the environment, and response is necessary to protect public health, welfare, or the environment. DOE Order 5400.4 requires DOE to respond to any release or substantial threat of a release of a hazardous substance into the environment in a manner consistent with CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan, regardless of whether or not the release or threatened release is from a site listed on the National Priorities List.

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5.0 PROPOSED ACTIONS AND ESTIMATED COSTS

Proposed actions and estimated costs are presented in the following sections.

5.1 PROPOSED ACTION

An EE/CA was prepared to develop removal action alternatives for the northern part of the BC Controlled Area. The removal action alternatives evaluated for the BC Controlled Area must meet the removal action objectives. The removal action objectives were developed in conjunction with the proposed remediation objectives for the 200-UR-1 OU, reasonable anticipated land use³, contaminants of concern, potential ARARs, and potential exposure pathways.

The following removal action objectives (RAO) were developed for this removal action, which were based on the preliminary remedial action objectives for the 200-UR-1 OU:

- Removal Action Objective 1 – Provide conditions suitable for the reasonable anticipated future land use and protect human health and ecological receptors, respectively, by
 - Preventing exposure to radiological constituents at levels that exceed the CERCLA risk exposure of 10^{-4} to 10^{-6} . As an operational guideline, the standard of 15 mrem/yr above background is in agreement with the EPA's radionuclide soil cleanup guidance, as described in OSWER Directive 9200.4-18, *Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination* (EPA 1997).
 - Protecting ecological receptors based on a dose rate limit of 0.1 rad/day for terrestrial wildlife populations [DOE-STD-1153-2002, *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota*, which is a to-be-considered criteria].
- Removal Action Objective 2 – Prevent adverse impacts to cultural resources and threatened or endangered species, and minimize wildlife habitat disruption.

Based on these considerations, the following three removal action alternatives were identified in the EE/CA for the BC Controlled Area (DOE/RL-2007-51):

- Alternative One: No Action
- Alternative Two: Monitored Natural Attenuation/Institutional Controls (MNA/IC)
- Alternative Three: Remove, Treat, and Dispose (RTD)

The following sections summarize the alternatives evaluated in the EE/CA.

5.1.1 Alternative One: No Action

The no-action alternative is required as a baseline for evaluating removal action alternatives. The no-action alternative represents a situation where no legal restrictions, institutional controls (IC), access controls, or active removal action measures are applied to the waste site. No surveillance, maintenance or other activities are instituted or continued. Because no removal action activities would be

³ While both industrial (inside the Core Zone) and conservation/mining (outside the Core Zone) land use scenarios apply to the northern part of the BC Controlled Area, final cleanup levels have not been established for the BC Controlled Area and the 200-UR-1 OU. Therefore, the preliminary removal goals (PRGs) for human health and environmental protection will be based on the 200-UR-1 OU PRGs, consistent with unrestricted land use, to preclude the need for additional cleanup in the future.

implemented with the no-action alternative, human health and environmental risks from the northern part of the BC Controlled Area would remain until the final remedial actions for the 200-UR-1 OU are completed.

5.1.2 Alternative Two: Monitored Natural Attenuation/Institutional Controls

Natural attenuation relies on natural processes to lower contaminant concentrations, while preventing migration of the contaminants until cleanup levels are met. Annual perimeter surveys would be conducted to verify that contaminants are attenuating as expected and source control is being maintained. Sign maintenance is required as part of the ICs.

The *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions* (DOE/RL-2001-41) describes how the ICs are implemented and maintained and serves as a reference for the selection of ICs in the future. ICs generally include non-engineered restrictions on activities and access to land, groundwater, surface water, waste sites, waste-disposal areas, and other areas or media that contain hazardous substances. This is to minimize the potential for human exposure to the substances. Common types of ICs include procedural restrictions for access, warning notices, permits, easements, deed notifications, leases and contracts, and land-use controls. This alternative does not include maintaining existing clean soil cover, as the BC Controlled Area does not currently have a clean soil cover over the contamination. Also, soil stabilization fixatives are not included; the large size of this area makes this stabilization technique ineffective and repeated applications could cause increased damage to the environment.

The MNA/ICs alternative applies to the entire northern part of the BC Controlled Area, including Zone A. This alternative, which represents continuing activities as currently performed, is estimated to have a 50-year project duration based on an active IC period of no less than 50 years, consistent with the *Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP EIS) (DOE/EIS-0222-F). A period of passive ICs may follow this 50 year active IC period; however, the costs for passive ICs are not included in the cost estimate for Alternative Two.

5.1.3 Alternative Three: Remove, Treat, and Dispose

Under this alternative, contaminated soil above identified PRGs would be removed (by conventional excavation equipment) and transported in direct haul trucks. It is planned to dispose of the waste at an appropriate onsite facility [i.e., Environmental Restoration Disposal Facility (ERDF)]. It is not expected that the contaminated soil will require treatment to meet disposal facility waste acceptance criteria. Soil removal would be guided by the observational approach: a method of planning, designing, and implementing a removal action that relies on information (e.g., samples, field screening) collected during the removal to guide the direction and scope of the activity. The data collected would be compared against the PRGs to determine if the removal action has met its objectives.

For this alternative, it is assumed that for Zone A, removal of contaminated soil is anticipated to a depth of approximately 15 cm (6 in.) or to PRGs, to the extent practicable. For Zone B, targeted removals of higher contamination areas are considered where contamination above screening levels is localized in known locations [see Attachment 2 of the EE/CA (DOE/RL-2007-51) for radiological survey information that identifies these areas].

The RTD alternative applies to the entire Zone A and to the areas of elevated radioactivity above the PRGs in Zone B of the BC Controlled Area. Near surface soil excavations must consider old-growth conservation and avoid destruction of existing plant life by using the smallest footprint for sizing equipment whenever possible. Clean backfill would be provided where necessary. Once the removal is

complete, the affected areas within the northern part of the BC Controlled Area will be contoured and re-vegetated. Re-vegetation of the northern part of the BC Controlled Area, as an upland late-successional shrub-steppe, will follow the requirements in *Hanford Site Biological Resources Mitigation Strategy Plan* (DOE/RL-96-88). Prior to initiation of the removal action, an evaluation will be performed to determine the quality level of habitat disturbed and the compensatory mitigation required.

Also, surveillance and maintenance of the northern part of the BC Controlled Area will continue until final remediation decisions are implemented.

5.2 COMMON ELEMENTS

With the exception of the No Action alternative, the other two alternatives would result in generation of waste (MNA/ICs to a lesser extent). The majority of the contaminated debris likely would be designated as low-level waste (LLW); however, quantities of mixed waste, dangerous waste, and solid waste not contaminated with hazardous substances may be generated. Waste management applicable or relevant and appropriate requirements (ARARs) are discussed in Section 5.3.1.

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

Contaminated waste for which no reuse, recycle, or decontamination option is identified would be assigned an appropriate waste designation (e.g., solid, radioactive, dangerous, or mixed) and disposed of at an approved disposal location. For the purposes of the cost analysis performed in this document, most of the contaminated waste generated during implementation of these alternatives is assumed to be disposed onsite at the Environmental Restoration Disposal Facility (ERDF) in the 200 West Area. Alternate potential disposal locations may be considered when the removal action is performed if a suitable and cost effective location is identified. Alternate potential disposal locations will be evaluated using appropriate performance standards to assure that they are adequately protective of human health and the environment and contribute to efficient performance of possible remedial actions.

ERDF is an engineered facility that provides a high degree of protection to human health and the environment and meets *Resource Conservation and Recovery Act* (RCRA) of 1976 minimum technical requirements for landfills, including standards for a double liner, a leachate collection system, leak detection, monitoring, and final cover. Construction and operation of ERDF was authorized using a separate CERCLA ROD (EPA et al. 1995). The *U.S. Department of Energy Hanford Environmental Restoration Disposal Facility, Hanford Site, Benton County, Washington, Explanation of Significant Differences* (ESD) (EPA et al. 1996) modified the ERDF ROD (EPA et al. 1995 and 2002) to clarify the eligibility of waste generated during cleanup of the Hanford Site. Per the ESD, ERDF is eligible for disposal of any LLW, mixed waste, and hazardous/dangerous waste generated as a result of cleanup actions (e.g., deactivation & decommissioning (D&D) waste and investigation-derived waste), provided that the waste meets ERDF waste acceptance criteria and that appropriate CERCLA decision documents are in place.

The waste that would be generated under these alternative CERCLA removal actions would fall within the definition of waste eligible for disposal at ERDF established in the ERDF ROD and subsequent ESD. Some waste may require treatment to meet ERDF waste acceptance criteria or RCRA land disposal restrictions. The type and location of treatment would be documented in treatment plans developed as needed for each waste stream requiring treatment. Solidification, encapsulation, neutralization, and size reduction/compaction could be employed to treat various waste types.

If other suitable locations for disposal of wastes are identified prior to the completion of implementation of the selected alternative (e.g. rubble from the demolished structures used as fill for nearby remedial actions), the alternate waste disposal location would be evaluated in accordance with the Removal Action Objectives and the selected ARARs, and the waste management plan would be modified as appropriate.

While most waste that would be generated during the proposed removal action alternatives likely would meet ERDF waste acceptance criteria, some waste might not meet or might not be able to be treated to meet ERDF acceptance criteria. Specifically, this would include low-level radioactive and nonradioactive liquid waste that might be encountered or generated. Liquid waste containing levels of radioactive and/or nonradioactive hazardous substances meeting the 200 Areas Effluent Treatment Facility (ETF) waste acceptance criteria would be transferred to ETF and treated to meet ETF waste discharge criteria. Liquids that do not meet ETF waste acceptance criteria would be solidified and either disposed at ERDF (if ERDF waste acceptance criteria are met) or stored at the Central Waste Complex (CWC) subject to final disposition under CERCLA. Clean water (e.g., nonradioactive and nonhazardous) could be used for dust suppression.

ERDF is considered to be onsite for management and/or disposal of waste from removal actions proposed in this document⁴. There is no requirement to obtain a permit to manage or dispose of CERCLA waste at the ERDF. It is expected that the great majority of the waste generated during the removal action proposed in this document can be disposed onsite at ERDF. For waste that must be sent offsite, EPA would make a determination in accordance with 40 CFR 300.440 as to the acceptability of the proposed disposal site for receiving this CERCLA removal action waste.

5.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND OTHER CRITERIA, ADVISORIES, OR GUIDANCE TO BE CONSIDERED

For a site where material will remain on-site after completion of a CERCLA action, the level or standard of control that must be met for the hazardous substance, pollutant, or contaminant is at least that of any applicable or relevant and appropriate standard, requirement, criteria, or limitation under any Federal environmental law, or any more stringent standard, requirement, criteria, or limitation promulgated pursuant to a State environmental statute. An applicable requirement is one with which a private party would have to comply by law if the same action was being undertaken apart from CERCLA authority. All jurisdictional prerequisites of the requirement must be met in order for the requirement to be applicable. A requirement that is relevant and appropriate may "miss" on one or more jurisdictional prerequisites for applicability but still make sense at the site, given the circumstances of the site and release.

Response actions are required to comply with the substantive aspects of ARARs, not with corresponding administrative requirements. That is, permit applications and other administrative procedures, such as

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

administrative reviews, and reporting and recordkeeping requirements, are considered administrative for actions conducted entirely onsite [40 CFR 300.400(e)] and therefore not required.

For the removal action being addressed in this document, implementation of any selected alternative will be designed to comply with the ARARs cited in this section to the extent practicable. ARARs are selected from promulgated environmental regulations that have been evaluated to potentially be pertinent to the removal action. Response actions are required to comply with the substantive aspects of ARARs, not with corresponding administrative requirements. That is, permit applications and other administrative procedures, such as administrative reviews, and reporting and recordkeeping requirements, are considered administrative for actions conducted entirely onsite [40 CFR 300.400(e)] and therefore not required. The purpose of this section is to identify the key ARARs proposed for the alternatives addressed in this Action Memorandum. ARARs, which will be complied with during implementation of the selected removal action, will be documented in the CERCLA Action Memorandum. The proposed ARARs are discussed generally in the following sections and are documented in detail in Tables 5-1 and 5-2. In addition, To-Be-Considered information consists of nonpromulgated advisories or guidance issued by federal or state governments that are not binding legally and do not have the status of potential ARARs. As appropriate, To-Be-Considered should be considered in determining the removal action necessary for protection of human health and the environment.

5.3.1 Waste Management Standards

It is anticipated that most of the waste will designate as low-level waste (LLW) in a solid form.

Radioactive waste is governed 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 RCRA. The State of Washington, which implements RCRA requirements under WAC 173-303, has been authorized by the EPA to implement the RCRA program. The dangerous waste standards for generation and storage will apply to the management of any dangerous or mixed waste generated at the northern part of the BC Controlled Area. Treatment standards for dangerous or mixed waste subject to RCRA land disposal restrictions are specified in WAC 173-303-140, which incorporates 40 CFR 268 by reference.

Waste that is designated as LLW that meets ERDF acceptance criteria is assumed to be disposed at ERDF, which is engineered to meet appropriate performance standards. Alternate potential disposal locations may be considered when the removal action occurs if a suitable and cost effective location is identified. Any potential alternate disposal location will be evaluated for appropriate performance standards to assure that it is adequately protective of human health and the environment.

Waste designated as dangerous or mixed waste would be treated as appropriate to meet land disposal restrictions and ERDF acceptance criteria and disposed at ERDF. ERDF is engineered to meet minimum technical requirements for landfills under WAC 173-303-665. Applicable packaging and pre-transportation requirements for dangerous or mixed waste generated at the northern part of the BC Controlled Area would be identified and implemented before movement of any waste.

It is anticipated that Alternatives Two and Three can be performed in compliance with the waste management ARARs identified in Tables 5-1 and 5-2. Waste streams will be evaluated, designated, and managed in compliance with the potential ARAR requirements. Before disposal, waste will be managed in a protective manner to prevent releases to the environment or unnecessary exposure to personnel.

5.3.2 Standards Controlling Emissions to the Environment

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

The Revised Code of Washington (RCW) 70.94, "Washington Clean Air Act," requires regulation of radioactive air pollutants. The state implementing regulation WAC 173-480, "Ambient Air Quality Standards and Emission Limits for Radionuclides," sets standards that are as stringent or more so than the federal *Clean Air Act of 1990* and Amendments (42 United States Code 7401 et seq.), and under the federal implementing regulation, 40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities." EPA's partial delegation of the 40 CFR 61 authority to the State of Washington includes all substantive emissions monitoring, abatement, and reporting aspects of the federal regulation. The state standards protect the public by conservatively establishing exposure standards applicable to even the maximally exposed public individual. Under the Washington Administrative Code (WAC 246-247-030(15), the "Maximally exposed individual" (MEI) is any member of the public (real or hypothetical) who abides or resides in an unrestricted area, and may receive the highest total effective dose equivalent (TEDE) from the emission unit(s) under consideration, taking into account all exposure pathways affected by the radioactive air emissions. All combined radionuclide airborne emissions from the DOE Hanford Site "facility" are not to exceed amounts that would cause an exposure to any member of the public of greater than 10 mrem/yr effective dose equivalent. The state implementing regulation WAC 246-247, "Radiation Protection – Air Emissions," which adopts the WAC 173-480 standards and the 40 CFR 61, Subpart H standard, requires verification of compliance with the 10 mrem/yr standard, and would potentially be applicable to the removal action.

The WAC 246-247 further addresses emission sources emitting radioactive airborne emissions by requiring monitoring of such sources. Such monitoring requires physical measurement of the effluent or ambient air. The substantive provisions of WAC 246-247 that require monitoring of radioactive airborne emissions would potentially be applicable to the removal action.

The above state implementing regulations further address control of radioactive airborne emissions where economically and technologically feasible [WAC 246-247-040(3) and -040(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 addressed 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 reasonable and effective methods.

Table 5-1. Identification of Potential Federal Applicable or Relevant and Appropriate Requirements and To Be Considered for the Removal Action.

	ARAR or TBC	Requirement	Rationale for Use
<i>National Archaeological and Historic Preservation Act of 1976</i> 16 USC 469aa-mm	ARAR	Requires that removal actions at 200-UR-1 OU waste sites do 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 waste site.	Archeological and historic sites have been identified within the 100 and 200 Areas, therefore the substantive requirements of this act are potentially applicable to actions that might disturb these sites. This requirement is location-specific.

Table 5-1. Identification of Potential Federal Applicable or Relevant and Appropriate Requirements and To Be Considered for the Removal Action.

	ARAR or TBC	Requirement	Rationale for Use
<i>National Historic Preservation Act of 1966</i> 16 USC 470, Section 106	ARAR	Requires federal agencies to consider the impacts of their undertaking on cultural properties through identification, evaluation and mitigation processes, and consultation with interested parties.	Cultural and historic sites have been identified within the 100 and 200 Areas, and therefore the substantive requirements of this act are potentially applicable to actions that might disturb these types of sites. This requirement is location-specific.
<i>Native American Graves Protection and Repatriation Act,</i> 25 USC 3001, et seq.	ARAR	Establishes federal agency responsibility for discovery of human remains, associated and unassociated funerary objects, sacred objects and items of cultural patrimony.	Substantive requirements of this act are potentially applicable if remains and sacred objects are found during remediation and will require Native American Tribal consultation in the event of discovery. This requirement is location-specific.
<i>Endangered Species Act of 1973</i> 16 USC 1531 et seq, subsection 16 USC 1536(c)	ARAR	Prohibits actions by federal agencies that are likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification or critical habitat. If remediation is within critical habitat or buffer zones surrounding threatened or endangered species, mitigation measures must be taken to protect the resource.	Substantive requirements of this act are potentially applicable if threatened or endangered species are identified in areas where removal actions will occur. This requirement is location-specific.
<i>National Primary Drinking Water Standards, 40 CFR 141</i>			
"Maximum Contaminant Levels for Organic Contaminants," 40 CFR 141.61	ARAR	Establishes MCLs that are drinking water criteria designed to protect human health from the potential adverse effects of organic contaminants in drinking water.	The groundwater underlying the 200-UR-1 OU is not currently used for drinking water. However, Central Plateau groundwater may be considered a potential drinking water source and because the groundwater discharges to the Columbia River (which is used for drinking water), the substantive requirements in 40 CFR 141.61 for organic constituents are potentially relevant and appropriate. This requirement is chemical-specific.
"Maximum Contaminant Levels for Inorganic Contaminants," 40 CFR 141.62	ARAR	Establishes MCLs that are drinking water criteria designed to protect human health from the potential adverse effects of inorganic contaminants in drinking water.	The groundwater underlying the 200-UR-1 OU is not currently used for drinking water. However, Central Plateau groundwater may be considered a potential drinking water source and because the groundwater discharges to the Columbia River (which is used for drinking water), the substantive requirements in 40 CFR 141.62 for inorganic constituents are potentially relevant and appropriate. This requirement is chemical-specific.
"Maximum Contaminant Levels for Radionuclides," 40 CFR 141.66	ARAR	Establishes MCLs that are drinking water criteria designed to protect human health from the potential adverse effects of radionuclides in drinking water.	The groundwater underlying the 200-UR-1 OU is not currently used for drinking water. However, Central Plateau groundwater may be considered a potential drinking water source and because the groundwater discharges to the Columbia River (which is used for drinking water), the substantive requirements in 40 CFR 141.66 for radionuclides are potentially relevant and appropriate. This requirement is chemical-specific.
To-Be-Considered pursuant to risk evaluation			
<i>Hanford Site End State Vision (DOE/RL-2005-57,)</i>	TBC	Identifies the Core Zone area in the Central Plateau to evaluate risk based on future land use scenarios.	The BC Controlled Area primarily resides in areas outside the Core Zone, in areas identified for conservation/mining future land use.
To-Be-Considered pursuant to establishing radiological cleanup levels			

Table 5-1. Identification of Potential Federal Applicable or Relevant and Appropriate Requirements and To Be Considered for the Removal Action.

	ARAR or TBC	Requirement	Rationale for Use
OSWER Directive 9200.4-31P, EPA/540/R-99/006, <i>Radiation Risk Assessment At CERCLA Sites: Q & A</i> (EPA 1999)	TBC	Identifies radiological levels that will be protective for human health	Provides basis for establishing PRGs for the BC Controlled Area for Cs-137 and Sr-90 that is protective for human receptors
DOE-STD-1153-2002, <i>A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota</i>	TBC	Identifies radiological levels that will be protective for ecological receptors based on a dose rate limit of 0.1 rad/day	Provides basis for establishing PRGs for the BC Controlled Area for Cs-137 and Sr-90 that is protective for ecological receptors
Regulations pursuant to the <i>Resource Conservation and Recovery Act of 1976</i> and implemented through WAC 173-303, "Dangerous Waste Regulations".			
40 CFR 61, "National Emission Standards for Hazardous Air Pollutants."			
40 CFR 141, "National Primary Drinking Water Standards."			
ARAR = applicable or relevant and appropriate requirement.		OU	= operable unit.
CFR = <i>Code of Federal Regulations</i> .		PRG	= preliminary removal goal
MCL = maximum contaminant level.		TBC	= to-be-considered.

Table 5-2. Identification of Potential State Applicable or Relevant and Appropriate Requirements and To Be Considered for the Removal Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
Regulations pursuant to the <i>Resource Conservation and Recovery Act of 1976</i> and implemented through WAC 173-303, "Dangerous Waste Regulations".			
"Identifying Solid Waste," WAC 173-303-016	ARAR	Identifies those materials that are and are not solid waste.	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 removal action potentially would be subject to the procedures for identifying solid waste to ensure proper management. This requirement is action-specific.
"Designation of Dangerous Waste," WAC 173-303-070(3)	ARAR	Establishes the method for determining whether a solid waste is or is not a dangerous waste or an extremely hazardous waste.	Substantive requirements of these regulations are potentially applicable to materials encountered during the removal action. Specifically, solid waste generated for removal from the CERCLA site during this removal action potentially would be subject to the dangerous waste designation procedures to ensure proper management. This requirement is action-specific.
"Excluded Categories of Waste," WAC 173-303-071	ARAR	Describes those waste categories that are excluded from the requirements of WAC 173-303 (excluding WAC 173-303-050).	The conditions of this requirement are potentially applicable to removal actions identified in WAC 173-303-071 be encountered. This requirement is action-specific.

Table 5-2. Identification of Potential State Applicable or Relevant and Appropriate Requirements and To Be Considered for the Removal Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
"Conditional Exclusion of Special Wastes," WAC 173-303-073	ARAR	Establishes the conditional exclusion and the management requirements of special waste, as defined in WAC 173-303-040.	Substantive requirements of these regulations are potentially applicable to materials encountered during the removal action. Specifically, the substantive standards for management of special waste are potentially applicable to the interim management of certain waste that will be generated during the removal action. This requirement is action-specific.
"Requirements for Universal Waste," WAC 173-303-077	ARAR	Identifies waste exempted from regulation under WAC 173-303-140 and WAC 173-303-170 through 173-303-9907 (excluding WAC 173-303-960). This waste is subject to regulation under WAC 173-303-573.	Substantive requirements of these regulations are potentially applicable to materials encountered during the removal action. Specifically, the substantive standards for management of universal waste are potentially applicable to the interim management of certain waste that will be generated during the removal action. This requirement is action-specific.
"Land Disposal Restrictions," WAC 173-303-140(4)	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).	The substantive requirements of this regulation are potentially applicable to materials encountered during the removal action. Specifically, dangerous and/or mixed waste generated and removed from the CERCLA site during the removal action for offsite (as defined by CERCLA) land disposal potentially would be subject to the identification of applicable land-disposal restrictions at the point of waste generation. The actual offsite treatment of such waste would not be ARAR to this removal action, but potentially would be subject to all applicable laws and regulations. This requirement is action-specific.
"Requirements for Generators of Dangerous Waste," WAC 173-303-170	ARAR	Establishes the requirements for dangerous waste generators.	Substantive requirements of these regulations are potentially applicable to materials encountered during the removal action. Specifically, the substantive standards for management of dangerous and/or mixed waste are potentially applicable to the interim management of certain waste that will be generated during the removal action. For purposes of this removal action, WAC 173-303-170(3) includes the substantive provisions of WAC 173-303-200 by reference. WAC 173-303-200 further includes certain substantive standards from WAC 173-303-630 and -640 by reference. This requirement is action-specific.

Table 5-2. Identification of Potential State Applicable or Relevant and Appropriate Requirements and To Be Considered for the Removal Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
<i>General Regulations for Air Pollution Sources, WAC 173-400</i>			
Washington Clean Air Act of 1967, Ch. 70.94 and Ch. 43.21A RCW General Regulations for Air Pollution, WAC 173-400 Specific subsection: WAC 173-400-040	ARAR	The regulation requires that all sources of air contaminants meet emission standards for visible, particulate, fugitive, odors, and hazardous air emissions. This section requires that all emission units use reasonably available control technology, which may be determined for some source categories to be more stringent than the emission limitations listed in this chapter.	Substantive requirements of the general standards for control of fugitive emissions are potentially applicable to removal actions at the site due to the generation of fugitive dust that occurs during excavation or other types of construction activities. These requirements are action-specific.
Specific subsection: WAC 173-400-113	ARAR	This regulation requires that methods of controls be employed to minimize the release of air contaminants resulting from new or modified sources of regulated emissions. Emissions are to be minimized through application of best available control technology.	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 removal action. This requirement is action-specific.
Controls for New Sources of Toxic Air Pollutants, WAC 173-460 Specific subsections: WAC 173-460-030 WAC 173-460-060 WAC 173-460-070	ARAR	This regulation requires that emissions of toxic air contaminants listed in the regulation be quantified, and ambient impacts evaluated. Best available control technology for toxics shall be used as determined by the lead agency to protect human health and the environment.	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 removal action. These requirements are action-specific.
<i>Radiation Protection -- Air Emissions, WAC 246-247</i>			
"Radiation Protection -- Air Emissions," WAC 246-247-035(1)(a)(ii)	ARAR	This regulation establishes requirements equivalent to 40 CFR 61, Subpart H, by reference. Radionuclide airborne emissions from the waste site shall be controlled so as not to exceed amounts that would cause an exposure to any member of the public of greater than 10 millirem per year effective dose equivalent.	Substantive requirements of this standard are potentially applicable because this removal action may include activities such as excavation, decontamination and stabilization of contaminated areas and equipment, each of which may provide airborne emissions of radioactive particulates to unrestricted areas. As a result, requirements limiting emissions potentially apply. This is a risk-based standard for the purposes of protecting human health and the environment. This requirement is action-specific.
"Radiation Protection -- Air Emissions," "Standards," WAC 246-247-040(3) WAC 246-247-040(4)	ARAR	Emissions shall be controlled to ensure that emission standards are not exceeded. Actions creating new sources or significantly modified sources shall apply best available controls. All other actions shall apply reasonably achievable controls.	Substantive requirements of this standard are potentially applicable because fugitive, diffuse and point source emissions of radionuclides to the ambient air may result from activities, such as excavation of contaminated soils and operation of exhausters and vacuums, performed during the removal action. This standard exists to ensure compliance with emission standards. These requirements are action-specific.
"Monitoring, testing, and quality assurance," "WAC 246-247-075(1) and -(2) and -(4)"	ARAR	Establishes the monitoring, testing, and quality assurance requirements for radioactive air emissions from major sources. Effluent flow rate measurements shall be made and the effluent stream shall be directly monitored continuously with an in-line detector or representative samples of the effluent stream shall be withdrawn continuously from the sampling site following the	Substantive requirements of this standard are potentially applicable because fugitive and nonpoint source emissions of radionuclides to the ambient air may result from activities, such as excavation of contaminated soils and operation of exhausters and vacuums, performed during the removal action. This standard exists to

Table 5-2. Identification of Potential State Applicable or Relevant and Appropriate Requirements and To Be Considered for the Removal Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
		<p>specified guidance. The requirements for continuous sampling are applicable to batch processes when the unit is in operation. Periodic sampling (grab samples) may be used only with lead agency prior approval. Such approval may be granted in cases where continuous sampling is not practical and radionuclide emission rates are relatively constant. In such cases, grab samples shall be collected with sufficient frequency so as to provide a representative sample of the emissions. When it is impractical to measure the effluent flow rate at a source in accordance with the requirements or to monitor or sample an effluent stream at a source in accordance with the site selection and sample extraction requirements, the waste site owner or operator may use alternative effluent flow rate measurement procedures or site selection and sample extraction procedures as approved by the lead agency.</p> <p>Emissions from nonpoint and fugitive sources of airborne radioactive material shall be measured.</p> <p>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.</p>	ensure compliance with emission standards. These requirements are action-specific.
"Monitoring, testing, and quality assurance," WAC 246-247-075(3)	ARAR	Methods to implement periodic confirmatory monitoring for minor sources may include estimating the emissions or other methods as approved by the lead agency.	Fugitive and diffuse emissions from the excavation and related activities potentially will require periodic confirmatory measurements to verify low emissions. This requirement is action-specific.
"Monitoring, testing, and quality assurance," WAC 246-247-075(8)	ARAR	Site emissions resulting from non-point and fugitive sources of airborne radioactive material shall be measured. Measurement techniques may include ambient air measurements, or in-line radiation detector or withdrawal of representative samples from the effluent stream, or other methods as determined by the lead agency.	Fugitive and diffuse emissions of airborne radioactive material due to excavation and related activities potentially will require measurement. This requirement is action-specific.
"General Standards," WAC 246-247-040(4) and "General Standards for Maximum Permissible Emissions," WAC 173-480-050(1)	ARAR	At a minimum all emission units shall make every reasonable effort to maintain radioactive materials in effluents to unrestricted areas, as low as reasonably achievable (ALARA). Control equipment of sites operating under ALARA shall be defined as reasonably available control technology and as low as reasonably achievable control technology.	The potential for fugitive and diffuse emissions due to excavation and related activities potentially will require efforts to minimize those emissions. This requirement is action-specific.
"Emission Monitoring and Compliance Procedures," WAC 173-480-070(2)	ARAR	Determine compliance with the public dose standard by calculating exposure at the point of maximum annual air concentration in an unrestricted area where any member of the public may be.	Fugitive and diffuse emissions resulting from excavation and related activities potentially will require assessment and reporting. This requirement is action-specific.
To-Be-Considered pursuant to relevant waste site acceptance criteria			
<i>Environmental Restoration Disposal Facility Waste Acceptance Criteria</i> (WCH-191)	TBC	This document establishes waste acceptance criteria for the Environmental Restoration Disposal Facility.	Waste destined for management at Environmental Restoration Disposal Facility must meet acceptance criteria to ensure proper disposal.

Table 5-2. Identification of Potential State Applicable or Relevant and Appropriate Requirements and To Be Considered for the Removal Action.

ARAR Citation	ARAR or TBC	Requirement	Rationale for Use
40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities."			
40 CFR 268, "Land Disposal Restrictions."			
WAC 173-303, "Dangerous Waste Regulations."			
WAC 173-340, "Model Toxics Control Act -- Cleanup."			
WAC 173-400, "General Regulations for Air Pollution Sources."			
WAC 173-460, "Controls for New Sources of Toxic Air Pollutants."			
WAC 173-480, "Ambient Air Quality Standards and Emission Limits for Radionuclides."			
WAC 246-247, "Radiation Protection -- Air Emissions."			
ARAR	=	applicable or relevant and appropriate requirement.	TBC = to be considered. WAC = Washington Administrative Code.
CERCLA	=	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980.</i>	
CFR	=	<i>Code of Federal Regulations.</i>	

5.4 ESTIMATED COSTS

This criterion considers the relative cost of the alternatives, to the extent that the costs can be quantified.

Total costs for each alternative are presented in Table 5-3.

Table 5-3. Total Costs for the Northern Part of the BC Controlled Area Removal Action Alternatives.

Alternative	Total Cost (\$1,000)	
	Present worth	Nondiscounted
One -- No action	0	0
Two -- Monitor Natural Attenuation/Institutional Controls	976	1,875
Three -- Remove, Treat, and Dispose	36,584	38,361

5.5 PROJECT SCHEDULE

The northern part of the BC Controlled Area removal action is scheduled to begin in August 2008.

The BC Controlled Area removal action work plan, which includes air emission information and a waste management plan will be submitted to Washington State Department of Ecology (Ecology) during project activities for review and approval.

6.0 EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Severe weather and vegetation growth can create waste site conditions amenable to radiological releases. These conditions could result in an unplanned release. This may cause a threat to human health and the environment by direct exposure to nearby personnel and the environment, and exposure to the public through airborne radioactive contaminants.

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7.0 OUTSTANDING POLICY ISSUES

There are no outstanding policy issues for this removal action.

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8.0 SELECTED ALTERNATIVE

The recommended removal action alternative for the northern part of the BC Controlled Area is Alternative Three – Remove, Treat, and Dispose. This alternative would provide the best balance of protecting human health and the environment associated with the hazardous substance inventory within the northern part of the BC Controlled Area, meeting the removal action objectives, and provides long term cost-effective option. The duration of contaminated soil removal and re-vegetation activities is approximately 990 days or four years.

Alternative One does not provide overall protection to human health and the environment. Alternative Two provides adequate overall protection of human health and the environment in the short-term, but would not remove radioactive hazardous substance inventory within the northern part of the BC Controlled Area. Furthermore, the risk to human health and the environment from uncontrolled migration of contaminants increases over time. Alternatives One and Two are both less costly than Alternative Three, but only in the short term as future remediation would still be required which could result in similar costs as estimated for Alternative Three. Therefore, neither of these alternatives is selected.

Based on the evaluation criteria, as well as other considerations, Alternative Three was judged to provide better long-term protectiveness as removal of the contaminated soils substantially reduces the potential exposure threat to human health and the environment. Removal of contaminated soil would also reduce the risk to ecological receptors by removing soil that is above ecological protection criteria. In addition, this removal action would significantly reduce the footprint of contamination in the 200 Area. With removal of contaminated soils, conditions suitable for the reasonably anticipated future land use could be attained. Finally, implementation of Alternative Three would contribute to the expedited cleanup of contaminated areas within the Hanford Site by providing the ERDF with contaminated soil to meet its operating requirements, thus preserving clean fill for other clean construction and backfill applications.

Table 8-1. Cost Estimate for Alternative Three: Remove, Treat, and Dispose.

Item	Estimated cost (\$1,000)
Nondiscounted	38,400
Present-Worth (Discounted)	36,600

Note: Details on the removal alternative estimates are discussed in D&D-35703.

This decision document represents the selected removal action alternative as remove, treat, and dispose for the northern part of the BC Controlled Area based on the evaluation presented in the EE/CA and public comments. This alternative removes the potential for a release of hazardous substances that could pose a threat to public health and the environment, is protective of workers, and minimizes disposal costs. To the extent possible, by removing sources of contamination, this action will contribute to the efficient performance of any long term remedial actions taken in this area. This proposal was developed in accordance with CERCLA, as amended by the *Superfund Amendments and Reauthorization Act* and is not inconsistent with the *National Oil and Hazardous Substance Pollution Prevention Contingency Plan*. This decision is based on the information provided in the Administrative Record for this project.

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Nuclear waste vitrification efficiency: cold cap reactions

Prepared for the U.S. Department of Energy
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