ADMINISTRATIVE DOCUMENT PROCESSING AND APPROVAL

Sheet 1 of 1

DOCUMENT TITLE:	OWNING ORGANIZATION/FACILITY:
Proposed Plan for the 200-PW-2 Uranium-Rich Process Waste Group and 200-PW-4 General Process Condensate Waste Group Operable Units, Hanford Site, ichland, Washington	Waste Site Remediation
Document Number: DOE/RL-2004-86, Draft A	Revision/Change Number:

DOCUMENT TYPE *(Check Applicable)*

○ Plan ◉ Report ○ Study ○ Description Document ○ Other

DOCUMENT ACTION ◉ New ○ Revision ○ Cancellation

RESPONSIBLE CONTACTS

	Name	Phone Number
Author:	M. W. Benecke	376-0002
Manager:	M. E. Todd-Robertson	373-3720

DOCUMENT CONTROL

Does document contain scientific or technical information intended for public use? ◉ Yes ○ No

Does document contain controlled-use information? ○ Yes ◉ No

("Yes" requires information clearance review in accordance with HNF-PRO-184)

DOCUMENT REVISION SUMMARY

NOTE: Provide a brief description or summary of the changes for the document listed.

REVIEWERS

Others

Name *(print)*		Organization
F. A. Ruck	5/4/06	Environmental Protection
W. R. Thackaberry	4/28/06	Environ. Quality Assurance
S. J. Giamberardini	5-2-06	D&D Engineering

APPROVAL SIGNATURES

Author:	5/8/06	5/04/06
Name: (Print) M. W. Benecke		Date
Responsible Manager:		5/4/06
Name: (Print) M. E. Todd-Robertson		Date
Other:		
Name: (Print)		Date

RELEASE / ISSUE

MAY 08 2006

DATE:

STA: 15

HANFORD RELEASE

ID: 20

Date Received for Clearance Process (MM/DD/YYYY)
05/08/2006

INFORMATION CLEARANCE FORM

8

A. Information Category

- ☐ Abstract
- ☐ Summary
- ☐ Visual Aid
- ☐ Full Paper
- ☐ Journal Article
- ☐ Internet
- ☐ Software
- ☒ Report
- ☐ Other _____

B. Document Number: DOE/RL-2004-86, Draft A

C. Title: Proposed Plan for the 200-PW-2 Uranium-Rich Process Waste Group and 200-PW-4 General Process Condensate Waste Group Operable Units, Hanford Site, Richland, Washington

D. Internet Address

E. Required Information (MANDATORY)

1. Is document potentially Classified? ◉ No ○ Yes
   Manager Required (Print and Sign): Mary E. Todd-Robertson MARY E. TODD-ROBERTSON
   If Yes: N A Homan ◉ No ○ Yes Classified
   ADC Required (Print and Sign)
2. Official Use Only ◉ No ○ Yes Exemption No. ____
3. Export Controlled Information ◉ No ○ Yes OUO Exemption No. 3
4. UCNI ◉ No ○ Yes
5. Applied Technology ◉ No ○ Yes
6. Other (Specify) _____

7. Does Information Contain the Following:
   a. New or Novel FH (Patentable) Subject Matter? ◉ No ○ Yes
      If "Yes", OUO Exemption No. 3
      If "Yes", Disclosure No.: _____
   b. Commercial Proprietary Information Received in Confidence, Such as Proprietary and/or Inventions? ◉ No ○ Yes If "Yes", OUO Exemption No. 4
   c. Corporate Privileged Information? ◉ No ○ Yes
      If "Yes", OUO Exemption No. 4
   d. Government Privileged Information? ◉ No ○ Yes
      If "Yes", Exemption No. 5
   e. Copyrights? ◉ No ○ Yes If "Yes", Attach Permission.
   f. Trademarks? ◉ No ○ Yes If "Yes", Identify in Document.
8. Is information requiring submission to OSTI? ◉ No ○ Yes
9. Release Level? ◉ Public ○ Limited

F. Complete for a Journal Article

1. Title of Journal N/A

G. Complete for a Presentation

1. Title for Conference or Meeting _____
2. Group Sponsoring _____
3. Date of Conference _____
4. City/State _____
5. Will Information be Published in Proceedings? ○ No ○ Yes
6. Will Material be Handed Out? ○ No ○ Yes

H. Author/Requestor
M. W. Benecke M W Benecke
(Print and Sign)

Responsible Manager
M. E. Todd-Robertson Mary E Todd-Robertson
(Print and Sign)

Approval by Direct Report to FH President (Speech/Articles Only) _____
(Print and Sign)

I. Reviewers	Yes	Print	Signature	Public Y/N (If N, complete J)
General Counsel	☒	E Hiskey	E Hiskey	Y / N
Office of External Affairs	☐			Y / N
DOE-RL	☒	Bryan Foley	Bryan T. Foley	(Y) / N
Other OUO	☒	Nancy Homan	Nancy Homan 5/8/06	(Y) / N
Other	☒	J. D. Aardal	Jan D Aardal	(Y) / N

Information Clearance Approval

APPROVED FOR RELEASE OFFICIAL DOCUMENT jda Date 5/12/2006

J. If Additional Comments, Please Attach Separate Sheet

A-6001-401 (02/06)

DOE/RL-2004-86
Draft A

Proposed Plan for the 200-PW-2 Uranium-Rich Process Waste Group and 200-PW-4 General Process Condensate Waste Group Operable Units, Hanford Site, Richland, Washington

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

DOE/RL-2004-86
Draft A

Proposed Plan for the 200-PW-2 Uranium-Rich Process Waste Group and 200-PW-4 General Process Condensate Waste Group Operable Units, Hanford Site, Richland, Washington

Date Published
May 2006

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

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

J. D. Ausbal 05/02/2006
Release Approval Date

Approved for Public Release;
Further Dissemination Unlimited

This page intentionally left blank.

DOE/RL-2004-86
DRAFT A
MAY 2006

United States
Department of Energy

United States
Environmental Protection Agency

State of Washington
Department of Ecology

Tri-Party Agreement

PROPOSED PLAN FOR THE

200-PW-2/4 OPERABLE UNIT

HANFORD SITE
RICHLAND, WASHINGTON

INTRODUCTION

The waste sites for the 200-PW-2 Uranium-Rich Process Waste Group and 200-PW-4 General Process Condensate Waste Group (200-PW-2/4) Operable Units (OU) are located on the Central Plateau of the Hanford Site. These waste sites pose a potential risk to human health and the environment. To reduce these risks, the waste sites will be cleaned up (i.e., remedial actions will be implemented). Geographically, the 200-PW-2/4 OU waste sites are located in both the 200 East and 200 West Areas (Figures 1 through 5).

This document presents the Proposed Plan (PP) for the 200-PW-2/4 OU, which includes 38 soil waste sites that were primarily liquid-waste disposal sites. Remedial actions are recommended, which will be subject to public review before finalization in the Record of Decision (ROD).

The 38 waste sites have been categorized into seven groups based on having received similar waste streams and having similar contamination distribution. This Plan describes how five cleanup alternatives were evaluated and identifies the preferred alternative for each waste site within the seven groups. In some cases, individual preferred alternatives were identified for individual sites. The preferred alternatives for the sites have been consolidated into this single cleanup proposal. The evaluations of the five alternatives provide the basis for future "plug-in" approaches, which would apply when:

- Unknown waste sites are discovered in the future
- Known waste sites could be reassigned from another OU
- Confirmatory sampling indicates variations from the defined site conceptual model such that the selected alternative is no longer protective and a different alternative must be selected.

HOW YOU CAN PARTICIPATE

The Tri-Parties will accept written comments on the Proposed Plan from TBD through TBD, 2006. Comments or requests for a public meeting should be sent to John Price at the Washington State Department of Ecology via:

- **mail: ATTN: Mr. John Price, 3100 Port of Benton Blvd., Richland, WA 99354-1670**
- **fax: (509) 372-7971**
- **email: jpri461@ecy.wa.gov**

The "Public Participation" section of this document provides additional information regarding public involvement.

Section **Page**

Proposed Plan

The plan provided by the responsible parties that presents the preferred alternatives for remedial action of waste sites and other alternatives analyzed to the public. The proposed plan is based on the feasibility study.

OU

Operable Unit

A group of sites that are evaluated for remedial action.

ROD

Record of Decision

The document that sets forth the selected remedial measure and provides the rationale for its selection.

Figure 1. Hanford Site and the General Location of 200-PW-2 and 200-PW-4 Operable Unit Waste Sites.

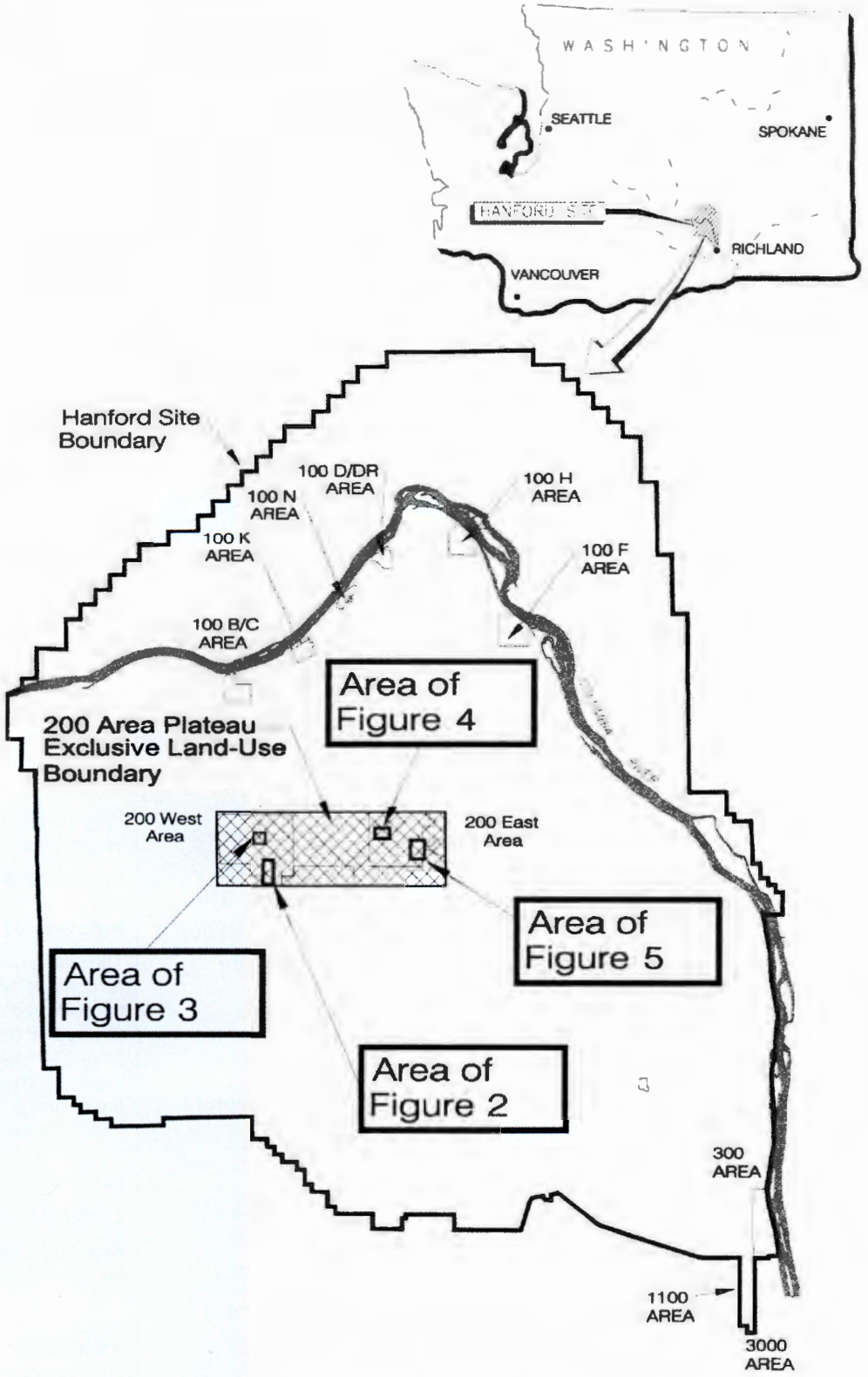


Figure 2. 200-PW-2 and 200-PW-4 Operable Unit Waste Sites Inside the 200 West Area.

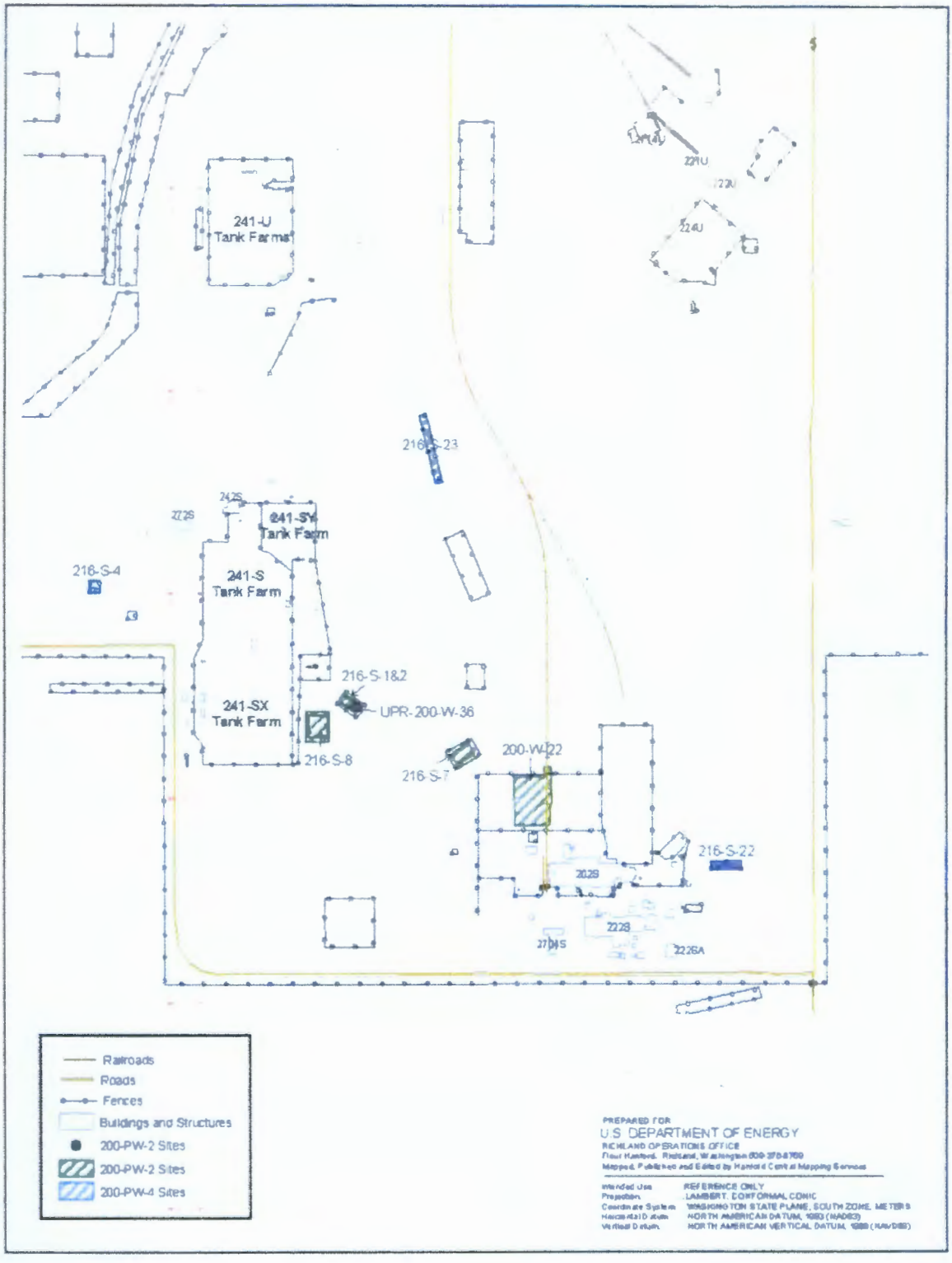


Figure 3. Additional 200-PW-4 Operable Unit Waste Site Inside the 200 West Area.

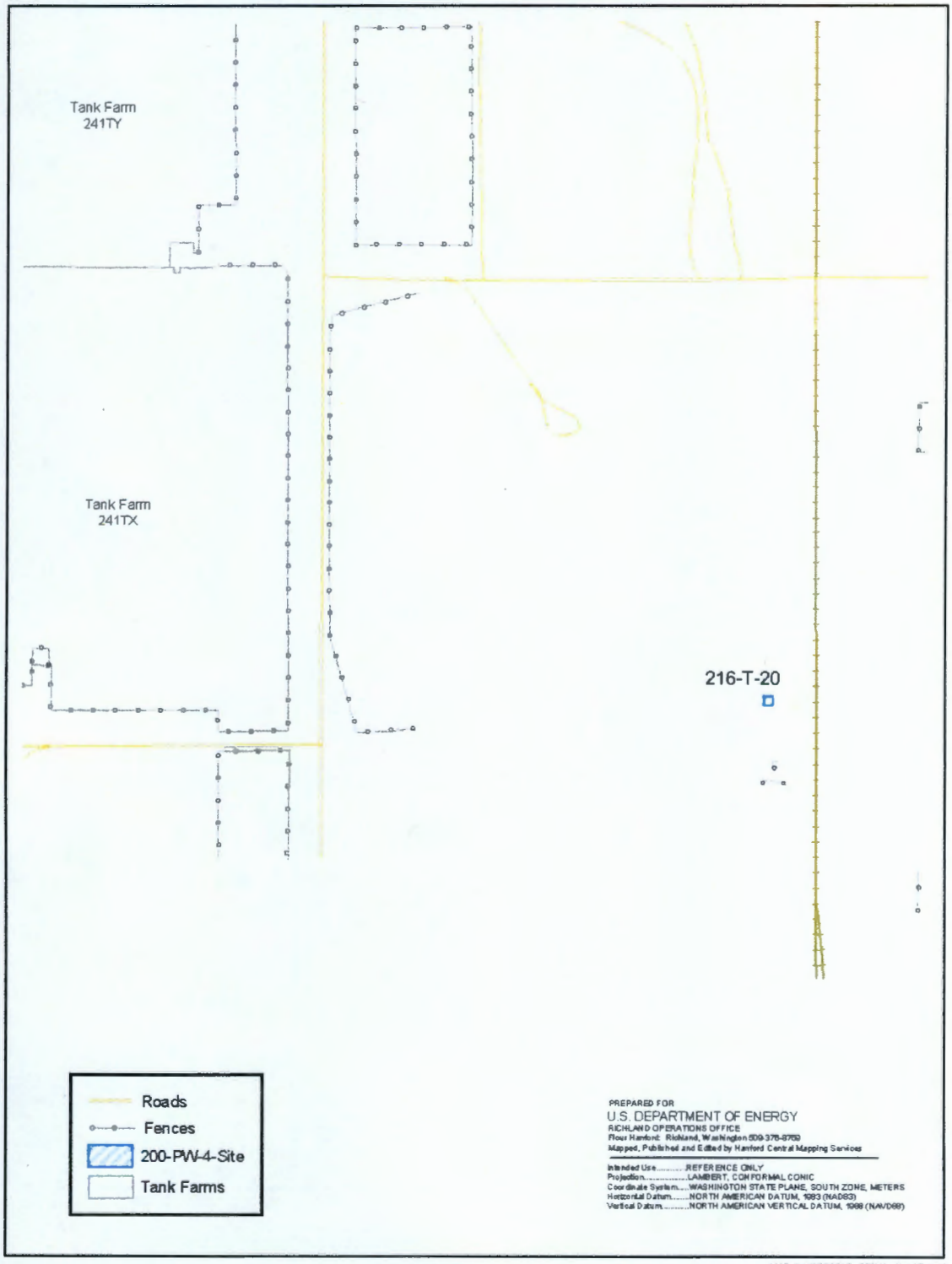


Figure 4. 200-PW-2 Operable Unit Waste Sites in the 200 East Area (West Side).

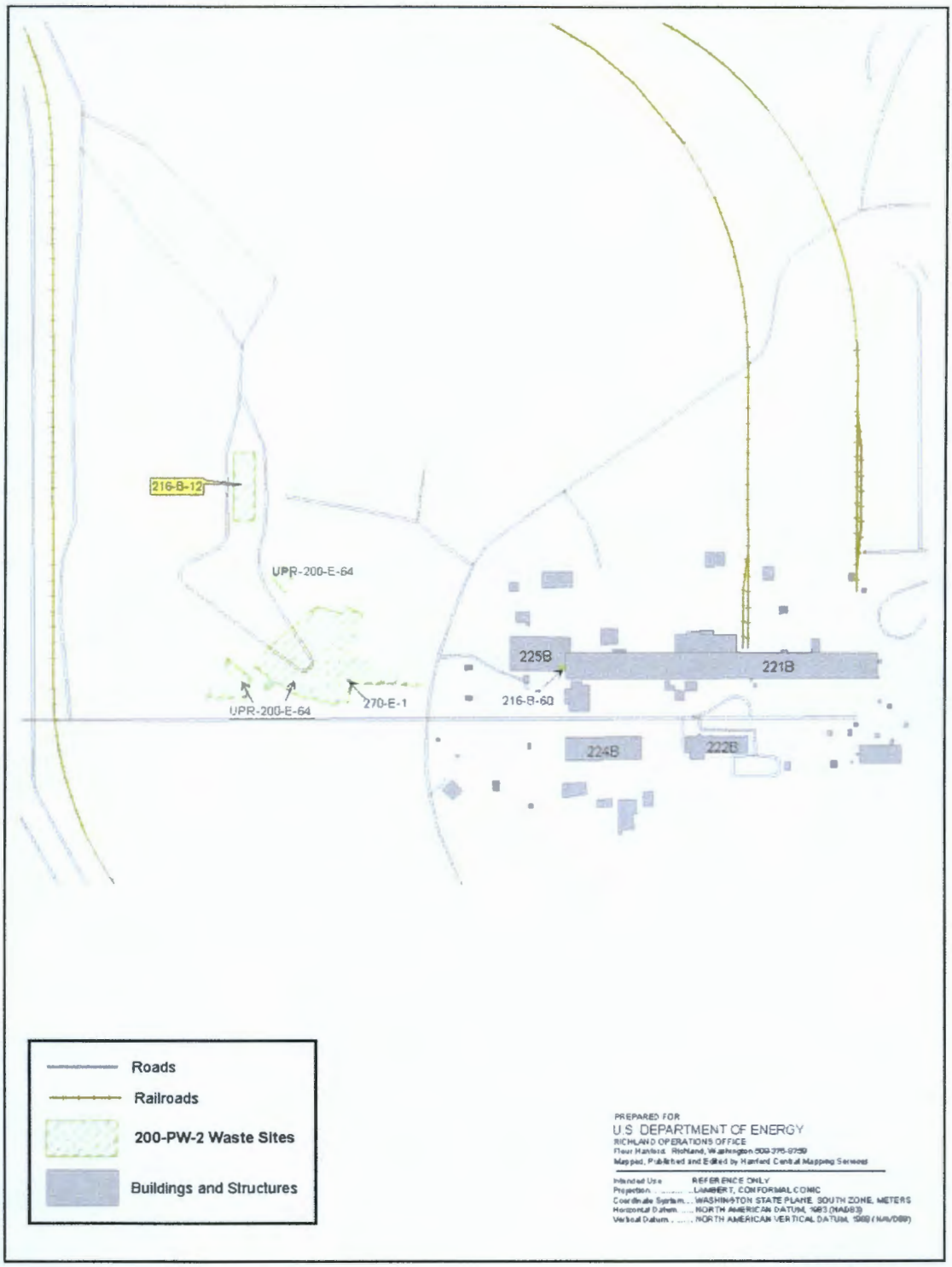
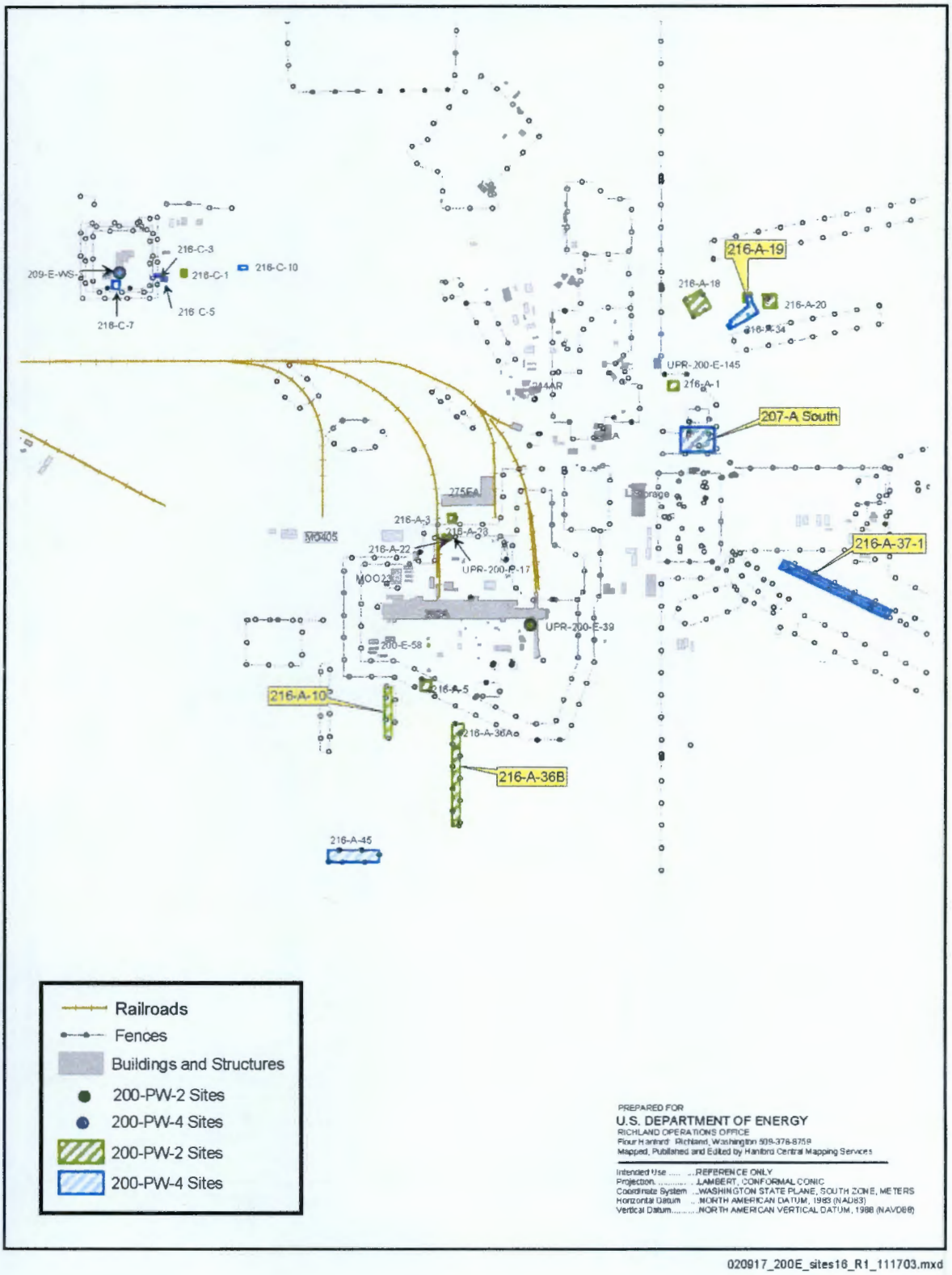


Figure 5. 200-PW-2 and 200-PW-4 Operable Unit Waste Sites on the East Side of the 200 East Area.



This Plan is issued by the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology (Ecology), and the U.S. Department of Energy (DOE). These three agencies – collectively known as the Tri-Parties – are proposing the preferred remedies for these waste sites under the authority of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), and in accordance with the *Hanford Federal Facility Agreement and Consent Order*, also known as the Tri-Party Agreement (Ecology et al. 1989). Also incorporated into this Plan are elements necessary to meet DOE's responsibilities under the *National Environmental Policy Act of 1969* (NEPA).

The Tri-Parties are issuing this Plan as part of the public participation responsibilities under Section 117(a) of CERCLA and 40 *Code of Federal Regulations* (CFR) 300.430(f)(3), "Selection of Remedy." Final remedies will be selected only after the public comment period has ended and the comments received have been reviewed and considered. The public is encouraged to review and comment on all of the alternatives presented in this Plan. The Tri-Parties will hold a public meeting to explain the content of this Plan and to obtain additional comments. Responses to comments will be presented in a responsiveness summary that will be part of the ROD.

This Plan references or highlights key information that can be found in detail in the feasibility study (FS) (DOE/RL-2004-85, *Feasibility Study for the 200-PW-2 Uranium-Rich Process Waste Group and the 200-PW-4 General Process Condensate Group Operable Units*) and other documents contained in the Administrative Record. These documents provide a more comprehensive understanding of the history, previous studies, and site descriptions considered in the evaluation of remedial alternatives and selection of preferred remedies.

The Tri-Party Agreement states that CERCLA and *Resource Conservation and Recovery Act of 1976* (RCRA) requirements should be integrated to achieve compliance with CERCLA and the corrective action requirements of *Washington Administrative Code* (WAC) 173-303, "Dangerous Waste Regulations," and will meet or exceed applicable or relevant and appropriate federal and stated requirements to the extent required by CERCLA.

OVERVIEW OF THE PROPOSED PLAN

This Plan proposes remedial actions for the 200-PW-2/4 OU liquid-waste storage and disposal sites. These sites include cribs, trenches, ditches, basins, tanks, french drains, septic systems, unplanned release sites, and one retention basin. The scope of these remedial actions does not include the remediation of groundwater beneath these waste sites.

Table 1 provides a summary of the key contaminant information associated with several of the waste sites, which have been determined to be representative of the remaining sites. Table 1 includes information on risk-based concerns, contaminants, their maximum concentrations, and distribution below ground surface (bgs).

Confirmatory Sampling

Sampling before or after the ROD, but before the remedial design is completed, to confirm the accuracy of the site conceptual model used for remedial decision making.

EPA

U.S. Environmental Protection Agency

Ecology

Washington State Department of Ecology

DOE

U.S. Department of Energy

CERCLA

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, commonly known as Superfund.

Tri-Party Agreement

Hanford Federal Facility Agreement and Consent Order

An agreement and consent order between DOE, EPA, and Ecology that details the processes to be used to address CERCLA, RCRA, and other requirements for cleaning up the Hanford Site.

NEPA

National Environmental Policy Act of 1969

A Federal law that establishes a program to help prevent or eliminate damage to the environment. NEPA values encompass a range of environmental concerns:

- Transportation impacts
- Air quality
- Natural, cultural, and historical resources
- Noise, visual, and aesthetic effects
- Socioeconomic impacts
- Environmental justice
- Cumulative impacts (direct and indirect)
- Mitigation
- Irreversible and irretrievable commitment of resources.

Administrative Record

The files containing the documents used to select the remedial action. The Administrative Record can be accessed through the Information Repositories (IR). For IR locations, see the Public Participation Section of this Plan.

Feasibility Study

The study documenting the evaluation of the remedial alternatives and rationale for the selection of a preferred alternative.

RCRA

Resource Conservation and Recovery Act of 1976.

Crib

A near-surface underground structure designed to receive liquid waste that can percolate directly into the soil.

Institutional Controls

Nonengineered controls (e.g., administrative and/or legal controls) that minimize the potential for exposure to contamination by limiting land or other resource uses. The State of Washington also considers physical controls, such as fencing and signs, to be institutional controls.

Partial Removal, Treatment, and Disposal with Engineered Surface Barrier

Excavation of near-surface contamination combined with a barrier to protect groundwater.

Table 1. Summary of Contaminants and Risk Information from Representative Sites.

Waste Site	Risk-Based Concern	Contaminant	Maximum Concentration and Associated Depth Below Ground Surface		Maximum Depth of Contaminant Below Ground Surface (ft)
			(pCi/g or mg/kg)*	(ft)	
207-A South Retention Basin	No contaminants of concern	Not applicable	Not applicable	Not applicable	Not applicable
216-A-10 Crib	Groundwater protection	Iodine-129	38.8	62.5	317
216-A-19 Trench	Groundwater protection	Nitrate and nitrite as N, Uranium	9,860 130	62.5	317
	Ecological protection	Uranium	129	14.5	Not applicable
216-A-36B Crib	Groundwater protection	Technetium-99, nitrate and nitrite as N, Uranium	41.9 287 36.8	25 53.5 30	318.5
216-A-37-1 Crib	Groundwater protection	Nitrate and nitrite as N	385	12.5	272
216-B-12 Crib	Groundwater protection	Uranium, nitrate and nitrite as N	165 28	50 35.5	302
216-S-7 Crib	Groundwater protection	Nitrate and nitrite as N, Uranium	53 463	127 25	225

*pCi/g applies to radionuclide concentration; mg/kg applies to chemical concentration.

To select preferred remedies, the Tri-Parties evaluated the following alternatives:

- Alternative 1 – No Action
- Alternative 2 – Maintain Existing Soil Cover, Monitored Natural Attenuation, and Institutional Controls
- Alternative 3 – Removal, Treatment, and Disposal
- Alternative 4 – Engineered Surface Barrier
- Alternative 5 – Partial Removal, Treatment, and Disposal with Engineered Surface Barrier.

These alternatives are described later in this Plan. This Plan presents a preferred remedy, or a combination of remedies, for each waste site. The evaluation of alternatives was conducted based on the CERCLA criteria. Given the varied nature and extent of the contamination across the waste sites, no single alternative was selected as preferred for all the waste sites.

Table 2 provides an overview of the selected alternative for each site along with estimated present-worth costs.

The combined present-worth cost for implementing the 200-PW-2/4 OU preferred alternative is estimated to be approximately $84 million, based on the CERCLA requirement of +50%/-30% accuracy.

UPR
Unplanned release

Table 2. Preferred Alternatives for Individual Waste Sites.

Alternative 3 – Removal, Treatment, and Disposal		
Number of waste sites associated with the Preferred Remedy		22
Associated Waste Sites		
216-C-1 Crib	216-C-5 Crib	
216-C-3 Crib	216-C-7 Crib	
216-C-10 Crib	216-A-3 Crib	
216-A-1 Crib	216-A-20 Trench	
216-A-18 Trench	216-A-22 French Drain / UPR-200-E-17	
216-A-28 Crib	216-S-4 French Drain	
216-A-19 Trench	216-T-20 Trench	
216-S-22 Crib	270-E-1 Neutralization Tank	
209-E-WS-3 Valve Pit & Hold-Up Tank	UPR-200-E-145	
200-E-58 Neutralization Tank	UPR-200-E-39	
200-W-22 Site Group		
Alternative 4 – Engineered Surface Barrier		
Number of waste sites associated with the Preferred Remedy		6
Associated Waste Sites		
216-A-10 Crib	216-A-5 Crib	
216-A-45 Crib	216-S-1&2 Cribs	
216-B-12 Crib	UPR-200-W-36	
Alternative 2 – Maintain Existing Soil Cover, Monitored Natural Attenuation, and Institutional Controls		
Number of waste sites associated with the Preferred Remedy		6
Associated Waste Sites		
216-A-37-1 Crib	216-S-23 Crib	
216-B-60 Crib	216-S-8 Trench	
216-A-34 Ditch	UPR-200-E-64	
Alternative 5 – Partial Removal, Treatment, and Disposal with Engineered Surface Barrier		
Number of waste sites associated with the Preferred Remedy		3
216-A-36B Crib	216-A-36A Crib	
216-S-7 Crib		
Alternative 1 – No Action		
Number of waste sites associated with the Preferred Remedy		1
Associated Waste Sites		
207-A South Retention Basin		

TSD = treatment, storage, and/or disposal (unit).
UPR = unplanned release.

The remaining sections of this Plan provide information on the following:

- Background of the 200-PW-2/4 OU
- Scope and role of the proposed actions, including strategies used to characterize the waste sites, and regulatory requirements and goals for the remedial actions
- Site risks
- Summaries and evaluations of remedial alternatives
- Preferred alternatives for the different waste sites
- Strategies for streamlining future actions at other potential process waste sites (plug-in approach)
- Public participation.

NPL

National Priorities List

A list of releases/priority hazardous waste sites in the United States that are eligible for investigation and cleanup under Superfund (40 CFR 300, Appendix B).

SITE BACKGROUND

Hanford Site

The Hanford Site (Figure 1) is a 1517 km^2 (586 mi^2) Federal facility located in southeastern Washington State along the Columbia River. From 1943 to 1990, the primary mission of the Hanford Site was the production of nuclear materials for national defense. In July 1989, the 100, 200, 300, and 1100 Areas of the Hanford Site were placed on the National Priorities List (NPL) (40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," Appendix B, "National Priorities List") pursuant to CERCLA.

Central Plateau

Central Plateau

The central portion of the Hanford Site where most of the nuclear materials processing and waste management activities occurred.

The Central Plateau is located in the central portion of the Hanford Site and is divided into three areas: 200 East Area, 200 West Area, and 200 North Area. Operations in the 200 East and 200 West Areas were related to chemical separation, plutonium and uranium recovery, processing of fission products, and waste partitioning. Major chemical processes in the Central Plateau resulted in delivery of high-activity waste streams to systems of large underground tanks called "tank farms." The liquid wastes often were neutralized before being sent to the tanks and later evaporated (concentrated). The storage tanks were used to allow the heavier constituents to settle from the liquid effluents, forming sludge. Low-activity liquid wastes were discharged to trenches, cribs, drains, and ponds, most of which were unlined. The 200 North Area formerly was used for the interim storage and staging of irradiated fuel.

200-PW-2/4 Operable Unit

As noted, the 200-PW-2/4 OU addresses 38 soil waste sites. These sites range from being small (approximate surface area of 10 ft^2 and 20 ft in depth) to medium (approximate surface area of 14,000 ft^2 and 45 ft in depth). There are contaminants at depth that exceed soil concentrations that are protective of groundwater.

The groundwater underlying these waste sites is located approximately 255 to 320 ft bgs. The groundwater currently has elevated levels of nitrates, tritium, technetium-99, uranium, and carbon tetrachloride. Some of this contamination could have come from the 200-PW-2/4 OU waste sites.

SCOPE AND ROLE OF ACTION

Characterization

Identification of the characteristics of a site through review of existing site information and/or sampling and analysis of environmental media and materials, to determine the nature and extent of contamination so that informed decisions can be made as to the level of risk presented by the site, and the protective remedial action that is needed.

This Plan presents remedial actions for contaminated soils, structures (e.g., concrete, tanks), and debris (e.g., timbers) associated with liquid-waste storage and disposal sites in the 200-PW-2/4 OU. The preferred remedial actions identify and address existing and potential future threats to human health and the environment from waste site contaminants. This is a source control action that will protect groundwater from future contamination. The scope of this Plan does not include remediation of the groundwater beneath these waste sites, which will be addressed separately.

Characterization Approach

An analogous site approach was used in the characterization of the waste sites discussed in this Plan. As discussed in DOE/RL-98-28, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program* (Implementation Plan), the analogous site approach streamlines the investigation process by grouping similar sites together. This approach generally is implemented by selecting representative sites for comprehensive evaluation by site investigation. The representative sites are selected based on process and characterization data such as effluent volume, contaminant inventory, and contaminant distribution. Because of how the representative waste sites have been selected, the data typically suggest greater environmental impact and risk relative to other similar OU waste sites. Thus, representative sites generally are considered worst case relative to similar OU waste sites. Findings from the site investigation are used to assess information and develop site conceptual models at other OU sites with similar disposal histories. Confirmatory site investigations (additional sampling and analysis) are conducted through the remedial design/remedial action to confirm the accuracy of the site conceptual models/site conditions.

Representative Waste Sites and Site Conceptual Models

The site conceptual models used to describe the waste distribution were developed using sample data from representative waste sites. The representative sites are the 216-A-19 Trench, 216-B-12 Crib, 216-A-10 Crib, 216-A-36B Crib, 207-A South Retention Basin, 216-A-37-1 Crib, and 216-S-7 Crib.

Table 3 identifies the representative sites, the analogous sites, and the rationale for applying the representative waste site conceptual models to the analogous sites. Information that is more detailed is presented in Chapter 2.0 of the FS (DOE/RL-2004-85).

Land Use

Site risks were evaluated based on a reasonably anticipated future land use for the Central Plateau. These evaluations were based on the criteria presented in, and are consistent with, the Tri-Party's response to Hanford Advisory Boards (HAB) Advice (*Consensus Advice #132: Exposure Scenarios Task Force on the 200 Area*). The HAB acknowledged that some waste will remain in the Core Zone when cleanup of the Central Plateau is completed and advised that the Core Zone be as small as possible.

The DOE is expected to continue industrial-exclusive land use activities within the Core Zone for at least 50 years, in accordance with DOE/EIS-0222-F, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, and 64 FR 61615, "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement."

Analogous Site Approach

Source sites can be similar geologically, have similar process and waste disposal histories, and have similar contaminant inventories. Based on these similarities, the site conceptual model is expected to be similar or analogous. In these situations, the analogous site concept is used to reduce the amount of site characterization and evaluation required to support remedial action decision making. Within each group of similar sites, a representative site(s) is selected for comprehensive field investigations, including sampling and analyses. Findings from site investigations at representative sites are used to develop a site conceptual model that is applied to other "analogous" sites that were not sampled.

It is assumed that the nature and extent of contamination at analogous sites are similar to the nature and extent of contamination described by the site conceptual model for representative site(s) that were sampled. The site conceptual model, along with other site-specific knowledge, then is used as the basis for evaluating and identifying the preferred remedy (as accomplished in this Plan). Confirmatory investigations are conducted through the remedial design/remedial action to confirm the accuracy of the site conceptual model with respect to the analogous site.

Characterization of Waste Sites

Waste sites within the 200-PW-2/4 OU have been characterized through a series of three investigations:

1. A scoping level investigation using available information including process knowledge

2. A limited field investigation included drilling and geophysical logging of boreholes, sampling of borehole soils, sampling of concrete basin material, and installation of drive points for geophysical logging and sampling.

3. The application of the analogous sites approach (DOE/RL-2004-85, *Feasibility Study for the 200-PW-2 Uranium Rich Process Waste Group and the 200-PW-4 General Process Condensate Group Operable Units).*

HAB

Hanford Advisory Board.

HAB Advice #132

Advice

http://www.hanford.gov/public/boards/hab/advice/habadv-132.pdf

Response

http://www.hanford.gov/public/boards/hab/advice/habresp-132.pdf

Industrial-Exclusive

A land-use designation under DOE/EIS-0222-F, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, that applies to a portion of the Central Plateau. Under this land-use designation, waste management activities would continue. This land use assumes an industrial worker scenario—an exposure scenario in which the receptor works on site on a full-time basis (i.e., worker spends 2,000 h/yr over the duration of his or her entire career). The evaluation assumes that the Central Plateau exposure pathways include direct exposure to radiation, incidental ingestion of soil, and inhalation of resuspended dust and volatile constituents (exposure to groundwater is not considered).

Table 3. Representative Waste Sites and Conceptual Model Rationale.

Representative Waste Site	Analogous Sites	Rationale for Assignment of Analogous Sites
Group 1 207-A South Retention Basin*	200-W-22 Site Group (potentially contaminated belowground concrete, metal, and structures associated with demolished Reduction-Oxidation Plant ancillary buildings, and soil contaminated by unplanned releases)	• Both are below-grade radiologically contaminated concrete structures • Neither site was a liquid waste disposal unit.
Group 2 216-A-10 Crib*	216-A-5 Crib 216-A-45 Crib 216-C-1 Crib 200-E-58 Neutralization Tank	• The waste sites received the similar wastes. • The volume and magnitude of effluent discharged to the 216-A-10 Crib is greater than that of the analogous sites.
Group 3 216-A-19 Trench	216-A-1 Crib 216-A-3 Crib 216-A-18 Trench 216-A-20 Trench 216-A-22 Crib UPR-200-E-17 216-A-28 Crib 216-A-34 Ditch 216-S-8 Trench UPR-200-E-145	• Similarities exist in the contaminant inventories, release depths, and distributions. • The volume and magnitude of effluent discharged to the 216-A-19 Trench is greater than that of the analogous sites.
Group 4 216-A-36B Crib*	216-A-36A UPR-200-E-39	• 216-A-36B was constructed similarly. • Each waste site received similar wastes.
Group 5 216-A-37-1 Crib*	None	• No other similar waste site.
Group 6 216-B-12 Crib	216-B-60 Crib 216-C-3 Crib 216-C-5 Crib 216-C-7 Crib 216-C-10 Crib 209-E-WS-3 Valve Pit and Hold-Up Tank 270-E-1 Neutralization Tank UPR-200-E-64	• Similar depth of discharge and contaminate distribution. • Volume and magnitude of effluent discharged to 216-B-12 Crib is greater than the analogous sites.
Group 7 216-S-7 Crib	216-S-1&2 Cribs UPR-200-W-36 216-S-4 French Drain 216-S-22 Crib 216-S-23 Crib 216-T-20 Trench	• Similar depth of discharge and contaminant distribution, except for the unplanned releases. • Volume and magnitude of effluent discharged to the 216-S-7 Crib is greater than the analogous sites.

*The primary reason for characterization was to support treatment, storage, and disposal closure.

Based on this documentation and current Central Plateau assumptions, the alternative evaluations considered the following anticipated land-use requirements.

- The Core Zone will have an industrial scenario for the foreseeable future. The evaluation considers the following uses:
  - Industrial-exclusive use for the next 50 years (through 2050)
  - Industrial land use (non-DOE worker) for 100 years after 2050 (through 2150)
  - Industrial land use post-150 years.
- Groundwater contamination under the Core Zone will preclude beneficial use for the foreseeable future. This evaluation considers the following:
  - No consumptive use of groundwater for the next 150 years, based on the expected period of waste management
  - Any selected remedy will provide for no further degradation of groundwater from the 200-PW-2/4 OU waste sites
  - No drilling for water or other purposes will be allowed in the Core Zone, except as part of an EPA- and Ecology-approved monitoring or cleanup plan.

In addition, risks were calculated considering the possibility of intruders after 150 years from now (2150), to support the detailed analysis of alternatives.

Applicable or Relevant and Appropriate Requirements

Applicable or relevant and appropriate requirements (ARAR) are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations placed into Federal or state law that:

- Specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, or
- Address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site.

Additional standards that have not been promulgated into law or regulations can be used as "To be Considered" (TBC) criteria. A more detailed discussion of the potential ARARs and TBCs associated with the 200-PW-2/4 OU waste sites is found in the FS (DOE/RL-2004-85). These potential ARARs are incorporated into the remedial action objectives (RAO) and preliminary remediation goals (PRG) that drive the evaluation of alternatives and the selection of preferred remedies.

ARARs

Applicable or relevant and appropriate requirements

Those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, or that address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

TBC

"To Be Considered" criteria.

Remedial Action Objectives

RAOs have been developed taking into consideration information currently available for the 200-PW-2/4 OU and the Central Plateau. The development of the RAOs has not taken into consideration the cumulative impact of remedies for other OUs (which have yet to be determined) and potential implications from the remediation/closure of the whole Central Plateau. The RAOs identified for the waste sites are based on evaluations of reasonably anticipated future land use, site conceptual models, potential ARARs, and To Be Considered criteria. The following four RAOs were identified for the 200-PW-2/4 OU.

RAOs

Remedial action objectives

General descriptions of what the remedial action will accomplish (such as prevent groundwater contamination).

RAO 1

RAO 1 is to protect human health and ecological receptors from nonradiological contaminants.

RAO 2

RAO 2 is to protect human health and ecological receptors from radiological contaminants.

RAO 3

RAO 3 is to protect groundwater.

RAO 4

RAO 4 is to protect cultural resources, threatened or endangered species, and minimize wildlife habitat destruction.

WAC

Washington Administrative Code

- RAO 1 – Prevent unacceptable risk to human health and ecological receptors by exposure to nonradiological constituents in soils and debris at concentrations above the industrial-use criteria, as defined in WAC 173-340-745(5), "Soil Cleanup Standards for Industrial Properties," "Method C Industrial Soil Cleanup Levels," and WAC 173-340-900, "Tables," Table 749-3 for ecological receptors.
- RAO 2 – Prevent unacceptable risk to human health and ecological receptors by exposure to radiological constituents in soils and debris, by performing the following.
  - Prevent exposure to radiological constituents at concentrations that will cause a dose greater than 15 mrem/yr above background for industrial workers (EPA/540/R-99/006, *Radiation Risk Assessment at CERCLA Sites: Q&A, Directive 9200.4-31P*). A dose rate limit of 15 mrem/yr above background generally achieves the EPA excess lifetime cancer risk threshold, which ranges from 1×10^{-6} to 1×10^{-4}.
  - Protect 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 criterion).
- RAO 3 – Prevent migration of contaminants through the soil column to groundwater or reduce soil concentrations below WAC 173-340-747, "Deriving Soil Concentrations for Ground Water Protection," and 40 CFR 141.66, "Maximum Contaminant Levels for Radionuclides," groundwater protection criteria so that no further degradation of the groundwater results from contaminant leaching from the 200-PW-2/4 OU waste sites.
- RAO 4 – Prevent adverse impacts to cultural resources and threatened or endangered species and minimize wildlife habitat disruption.

These four RAOs were used to develop the PRGs discussed below, and may be finalized as remediation goals in the 200-PW-2/4 OU ROD.

PRG

Preliminary remediation goal

PRGs are developed during the CERCLA process, and may be refined in the ROD to become final cleanup levels (i.e., the remedial action goals). A complete discussion of the PRGs is presented in the FS (DOE/RL-2004-85, *Feasibility Study for the 200-PW-2 Uranium-Rich Process Waste Group and the 200-PW-4 General Process Condensate Group Operable Units*).

Preliminary Remediation Goals

As described in the FS, PRGs were developed to establish residual soil concentrations for individual contaminants that are protective of human health and the environment. The FS screening process compared the observed constituent concentrations at the waste sites to the following concentrations:

- Naturally occurring levels
- Radiological dose exposure limits
- Cleanup levels consistent with the RAOs.

The comprehensive list of contaminants of potential concern developed for the waste sites was based on historical Central Plateau operations and characterization information. Constituents that exceeded one or more of the RAOs will be retained as contaminants of concern (COC).

COC

Contaminant of concern

The list of all hazardous substances at a waste site that pose a threat to human health and the environment.

Table 4 summarizes the PRGs for the COCs included in the evaluation of alternatives in the FS. It should be noted that this table does not include contaminants having potential to contribute to potential intruder risk resulting from loss of institutional controls after 150 years, because intruder risk is not included in the baseline risk assessment and is not an RAO with associated PRGs. The intruder issue becomes significant when evaluating remedial alternatives for their long-term effectiveness and permanence.

Table 4. Summary of Soil Preliminary Remediation Goals.

Constituent[a, c]	Overall Preliminary Remediation Goal[b] (mg/kg)	Constituent	Overall Preliminary Remediation Goal[b] (mg/kg)
Nonradioactive Contaminants of Concern			
Nitrogen in nitrite and nitrate	40-TBD	Uranium	3.21-TBD
(pCi/g)			
Radioactive Contaminants of Concern			
Iodine-129	0.00373-TBD	Technetium-99	5.01-TBD
Tritium	290-TBD		

[a]This table does not include constituents that were eliminated through the contaminants of potential concern screening process described in Appendix D of the feasibility study (DOE/RL-2004-85, *Feasibility Study for the 200-PW-2 Uranium-Rich Process Waste Group and the 200-PW-4 General Process Condensate Group Operable Units*). Screening criteria include the identification of detected constituents, frequency of detection, essential nutrients, comparison to background, and availability of toxicity values.

[b]Revised preliminary remediation goal values will be defined, in part, by site-specific fate and transport modeling to develop soil concentrations that are protective of groundwater. Final preliminary remediation goal will represent the most restrictive value derived from evaluation of direct-contact, groundwater protection, and terrestrial wildlife protection. Definitive values shown are calculated using the conservative *Washington Administrative Code* three-phase model for protection of drinking water (WAC 173-340-747[4], amended February 12, 2001). These values are used for initial remedy evaluation purposes.

[c]High concentration contaminants (e.g., Cs-137, Sr-90, Am-241, plutonium) that were not shown by the formal baseline risk assessment to impact human health and the environment based on their location in site soils, were eliminated from further consideration as COCs and were not assigned a PRG value. At sites where such contaminants could potentially impact an inadvertent intruder, the impact was evaluated through the CERCLA long-term effectiveness and permanence criterion.

pCi/g = picocurie/gram.
TBD = to be determined.

A detailed evaluation of the COCs is contained in the FS (Chapter 2.0 and Appendix D). Numeric soil PRGs were developed to address protection of human health, ecological receptors, and groundwater. The most restrictive (lowest) PRG was selected to determine if site remediation was needed, because it would be protective of all exposure pathways. Following the consideration of comments received during the public comment period, the final remedial action goals or cleanup levels for the 200-PW-2/4 OU waste sites will be issued in the ROD.

Summary of Remediation Objectives

The human health and ecological risk assessments, which are fundamental to the scope and role of the actions in this Plan, were performed in accordance with CERCLA. DOE has integrated natural resource concerns in this Plan in accordance with DOE policies. A site conceptual model was developed for the waste sites, and potential risks to human health and ecological receptors were evaluated in a risk assessment for the representative sites, as discussed in the FS. The Tri-Parties believe that remedial action is necessary at the waste sites addressed by this Plan to protect public health and welfare and/or the environment from actual or potential releases of hazardous substances. Such releases, or potential releases, could present an imminent and substantial danger to public health, welfare, or the environment.

SUMMARY OF SITE RISKS

Inadvertent Intruder Scenario

An exposure scenario in which the receptor (e.g., construction trench worker or driller) has drilled or trenched into the contaminated soil and is therefore exposed. The scenario assumes that, after 150 years of institutional controls, the intruder unknowingly could be exposed to contamination in the waste site area.

Estimated risks were based on current site information and reflect the Tri-Parties' response to HAB Advice #132 (Klein et al. 2002). The Tri-Parties will use an industrial-exposure scenario to assess risks in the Core Zone of the Central Plateau. This exposure scenario includes the assumption that groundwater under the Central Plateau will not be used for 150 years. This exposure scenario does not preclude remedial decisions for groundwater OUs that may establish a different restoration timeframe. The findings of the risk evaluation for the 200-PW-2/4 OU are summarized below. Table 5 provides a summary of the risk assessment found in the FS (DOE/RL-2004-85), and provides a basis for action under CERCLA.

- Nonradionuclide and radionuclide contaminants associated with the representative waste sites meet RAO 1 and RAO 2 for human and ecological receptors, with the exception of the 216-A-19 Trench, which possesses uranium concentrations that exceed ecological risk-based concentrations.
- RAO 3, groundwater protection, is not met for the 216-A-19 Trench and 216-A-10, 216-A-36B, 216-A-37-1, 216-B-12, and 216-S-7 Cribs. Constituents in exceedance include uranium (metal), technetium-99, iodine-129, tritium, and nitrogen (measured as nitrate and nitrite).

Potential risks to an inadvertent intruder from exposure to radioactive COCs were evaluated, as identified in the Tri-Parties' response to HAB Advice #132 to assist in the evaluation of the CERCLA long-term effectiveness and permanence criterion. This inadvertent intruder scenario assumes that institutional controls could be lost. Intruder scenarios are evaluated in detail in Appendix D of the FS.

The Tri-Parties believe that action is necessary to protect human health and the environment from releases and potential releases of hazardous substances into the environment.

Table 5. Summary of Waste Site Risks and Basis for Action.

Waste Site	Risk-Based Concern	Summary of Waste Site Risks	Basis for Action?
216-A-19	Direct Contact	All nonradionuclide and radionuclide constituents meet the RAO.	No
	Ecological Contact	All nonradionuclide and radionuclide constituents meet the RAO.	No
	Groundwater Protection	Nitrogen as nitrate/nitrite and uranium predicted to exceed groundwater protection standards within 1000 years.	Yes
	Intruder Protection	Analysis predicts potential intruder doses are less than 15 mrem/yr.	No
216-B-12	Direct Contact	All nonradionuclide and radionuclide constituents meet the RAO.	No
	Ecological Contact	All nonradionuclide and radionuclide constituents meet the RAO.	No
	Groundwater Protection	Uranium and nitrogen as nitrate and nitrite are predicted to exceed groundwater protection standards within 1,000 years.	Yes
	Intruder Protection	Analysis predicts cesium-137 contributes to excessive potential intruder dose.	Maybe*
216-A-10	Direct Contact	All nonradionuclide and radionuclide constituents meet the RAO.	No
	Ecological Contact	All nonradionuclide and radionuclide constituents meet the RAO.	No
	Groundwater Protection	Iodine-129 is predicted to exceed groundwater protection standards at year 1193.	Yes
	Intruder Protection	Analysis predicts cesium-137 and plutonium-239 contribute to excessive potential intruder dose.	Maybe*
216-A-36B	Direct Contact	All nonradionuclide and radionuclide constituents meet the RAO.	No
	Ecological Contact	All nonradionuclide and radionuclide constituents meet the RAO.	No
	Groundwater Protection	Nitrogen and nitrate/nitrite and uranium are predicted to exceed groundwater protection standards within 1,000 years with technetium-99 exceeding groundwater protection standards from approximately 1025 to 1100 years.	Yes
	Intruder Protection	Analysis predicts cesium-137 contributes to excessive potential intruder dose.	Maybe*
207-A South Retention Basin	Direct Contact	All nonradionuclide and radiological constituents meet the RAO.	No
	Ecological Contact	All nonradionuclide and radiological constituents meet the RAO.	No
	Groundwater Protection	All nonradionuclide and radiological constituents meet the RAO.	No
	Intruder Protection	Not applicable, because essentially no contamination exists.	No
216-A-37-1	Direct Contact	All nonradionuclide and radionuclide constituents meet the RAO.	No
	Ecological Contact	All nonradionuclide and radionuclide constituents meet the RAO.	No
	Groundwater Protection	Nitrogen as nitrate/nitrite is predicted to exceed groundwater protection standards within 1,000 years.	Yes
	Intruder Protection	Analysis predicts potential intruder doses are less than 15 mrem/yr.	No
216-S-7	Direct Contact	All nonradionuclide and radionuclide constituents meet the RAO.	No
	Ecological Contact	All nonradionuclide and radionuclide constituents meet the RAO.	No
	Groundwater Protection	Nitrogen as nitrate/nitrite, uranium and tritium are predicted to exceed groundwater protection standards within 1,000 years. with the tritium exceedance occurring at year 30. Technetium-99 will exceed groundwater protection standards at year 1250.	Yes
	Intruder Protection	Analysis predicts cesium-137 and plutonium-239 contribute to excessive potential intruder dose.	Maybe(1)

*Not an RAO; is used to evaluate long-term effectiveness and permanence.

RESRAD (RESidual RADioactivity [dose model]) modeling performed to assess potential groundwater impact.

RAO = remedial action objective.

SUMMARY OF REMEDIAL ALTERNATIVES

Significant analyses and evaluations have contributed to defining applicable technologies and process options to address the waste sites associated with the 200-PW-2/4 OU. The contaminants, waste form, and waste location were all considered as part of this process. As discussed in the FS (DOE/RL-2004-85), technologies and process options were identified and evaluated based on their ability to reduce potential risks to human health and the environment at the waste sites.

Collective experience gained from previous studies and evaluations of cleanup methods at the Hanford Site was used to identify technologies that could be carried forward as remedial alternatives to address the RAOs. The FS identified five remedial alternatives for detailed and comparative analyses:

Monitored Natural Attenuation

A decrease in the concentration of a contaminant because of natural processes such as radioactive decay, oxidation/reduction, biodegradation, and/or sorption. Monitoring of natural attenuation will occur to determine if additional cleanup activities are warranted.

Observational Approach

The selective sampling of areas where potential or suspected soil contamination can be expected to be found if a release of hazardous substance has occurred. Information that is gathered during the remedial action phase is used to make real time decisions to guide the remedial action. For many sites, this method is more cost and time effective than traditional methods that require large amounts of initial data to make detailed plans and designs for remedial actions.

- **Alternative 1 – No Action.** The no-action alternative represents a situation where no legal restrictions, access controls, or active remedial measures are applied to the site. No action implies "walking away" from the waste site and allowing the wastes to remain in place.
- **Alternative 2 – Maintain Existing Soil Cover, Monitored Natural Attenuation, and Institutional Controls.** Existing soil covers (e.g., the clean soils placed over the waste site to stabilize it, as well as the clean fill placed during construction of the waste site) are maintained as needed to provide continuous protection from intrusion by plants and burrowing animals (e.g., badgers). In addition, institutional controls (e.g., deed restrictions, land-use zoning, and excavation permits) are put in place to prevent human access to the site. Monitored natural attenuation also is an important element of this alternative. The process reduces contaminant level in place by physical, biological, and/or chemical processes such as radioactive decay. Monitoring would be conducted to demonstrate that natural attenuation is occurring and that contamination is remaining in place as concentrations decrease. It will be necessary to maintain the institutional controls for at least 150 years, unless natural attenuation (i.e., radioactivity decay) achieves RAOs before then.
- **Alternative 3 – Removal, Treatment, and Disposal.** Structures and soil with contaminant concentrations exceeding the RAOs are excavated, using available data and the observational approach and conventional excavation techniques, followed by verification sampling. As noted in the FS, the 200-PW-2/4 OU waste sites range in depth from 1 m (3 ft) to approximately 60 m (200 ft) bgs. For some waste sites, contamination exists at significant depth (approximately 60 m [200 ft] bgs) and would require an engineered excavation such as benching (similar to open pit-mining operations). These benches are assumed to be 3 m (10 ft) in width and are planned at depth intervals of 8 m (25 ft) to ensure safe operations and excavation access. At the remaining waste sites, the excavation will use standard approaches similar to other excavations occurring on the Hanford Site. Excavated material above the RAOs will be disposed of in an approved location or facility in accordance with that facility's established waste acceptance criteria. Other materials (e.g., non-hazardous debris) may be disposed of off the Hanford Site, as appropriate. The onsite Environmental Restoration Disposal Facility (ERDF) is very close (0.4 km [0.7 mile]) to the waste sites and is being used for disposal of remediation wastes on the Hanford Site.

Any material that exceeds the disposal facility waste acceptance criteria would be stored on the Hanford Site (consistent with storage requirements) until the material was treated to meet facility waste acceptance criteria. As the contaminated material is excavated, it is characterized and segregated before being transported to the disposal facility. Excavation would continue until all contaminated material exceeding the RAOs is removed and the site is backfilled with suitable material.

- **Alternative 4 – Engineered Surface Barrier**. An engineered surface barrier (e.g., evapotranspiration barrier) is built over the contaminated waste sites, thus "capping" the site to prevent or limit water from infiltrating into the waste and to prevent intrusion by human or ecological receptors. Deploying an evapotranspiration barrier in this arid climate takes advantage of several natural systems. Specifically, an annual precipitation rate of approximately 7 in/yr, a near-zero water recharge for fine-grained soils associated with the barrier (e.g., silts and silt loam soils), deep-rooted vegetation, and a potential evapotranspiration rate of approximately 50 in/yr result in severely limiting vadose zone contaminant migration. Natural soil analogs (natural soil deposits that have long-term exposure to meteorological, geological, pedological, and biological processes) present on the Hanford Site provide an indication of the long-term stability and effectiveness of evapotranspiration barriers that would exploit such locally available soil. These barriers would be monitored to evaluate their performance. This performance monitoring (e.g., moisture monitoring within the engineered barrier) will allow for corrective measures (e.g., cap thickening) to be planned and implemented before any increased impact to the environment. The engineered barrier alternative uses the barrier for groundwater and human health protection, as well as ecological protection by preventing intrusion by plants and burrowing animals. Institutional controls (e.g., deed restrictions, land-use zoning, and excavation permits) would be required to minimize the potential for exposure to contamination or compromising the effectiveness of the barrier. It will be necessary to maintain institutional controls for 150 years, or longer, to ensure that human and biological intruders do not breach the barriers to create pathways for contamination.
- **Alternative 5 – Partial Removal, Treatment, and Disposal with Engineered Surface Barrier**. Under Alternative 5, near-surface contaminants generally are removed to reduce potential intruder risk. These depths are generally protective of human health from direct contact and intruder scenarios and protective to ecological receptors. Following excavation, the waste site is backfilled with suitable material and an engineered surface barrier is installed as discussed previously. These activities remove a significant fraction of the near-surface contamination load. The removal, treatment, disposal, and barrier activities are similar to those described in the preceding sections. However, removal activities are not aimed at removing all contaminants in the vadose zone. Activities are aimed at reducing the mass of contamination associated with the bottom of the waste site, which in turn reduces the potential intruder risk. The disposal option is the same. The required barrier may be less rigorous than if these contaminants are left in place because the inadvertent intruder risk is significantly reduced. For example, instead of a Hanford Barrier, a monofill soil barrier might be appropriate. The actual design of the barrier is determined through the remedial design process.

Removal, Treatment, and Disposal

A cleanup method where soil and debris are excavated in such a way that no contaminants above the approved remedial action goals for direct exposure and groundwater protection remain at the Site. Excavated material is treated (as necessary) and sent to an on Hanford Site or off Hanford Site engineered facility for disposal, as necessary.

Engineered Surface Barrier

A containment method where a barrier is placed over residual waste. Barriers typically prevent precipitation from infiltrating into the waste. The barrier also may restrict human and biological intrusion.

Partial Removal, Treatment, and Disposal with Engineered Surface Barrier

A combination cleanup/containment method that removes near-surface contaminants representing potential intruder risk or a significant source term for future groundwater contamination, and a barrier to prevent precipitation from infiltrating into residual waste.

- If contaminants are not in the 0 to 4.6 m (0 to 15 ft) zone (the point of compliance for direct exposure), the resulting risk to humans and ecological receptors from direct contact to shallow-zone contamination is zero. However, contaminants affecting the groundwater and potential intruders might be located deeper in the vadose zone. Therefore, the removal of contaminants to mitigate the direct contact and intruder human-health risk might not significantly change the risk to groundwater. The barrier activity provided in this alternative addresses protection of groundwater from the remaining contaminants in the vadose zone. Institutional controls are an additional requirement for this alternative, because contamination above PRGs is left on site.

It is possible in some cases, that the level of contamination in the vadose zone below the level of excavation is not a threat to groundwater, in which case a barrier is not required (i.e., Alternatives 3 and 5 are identical).

Nine CERCLA Criteria

Threshold Criteria:

- Overall protection of human health and the environment
- Compliance with ARARs

Balancing Criteria:

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost

Modifying Criteria:

- State acceptance
- Community acceptance.

CERCLA EVALUATION CRITERIA AND PROCESS

The Tri-Parties expect the preferred alternative to satisfy the following statutory requirements of CERCLA Section 121(b).

- Be protective of human health and the environment.
- Comply with potential ARARs.
- Be cost-effective.
- Use permanent solution and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.
- Satisfy the preference for treatment as a principal element.

As a critical part of the evaluation process, the alternatives are evaluated against the following nine CERCLA criteria:

- Overall protection of human health and the environment
- Compliance with ARARs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost
- State acceptance
- Community acceptance.

The first two criteria (overall protection of human health and the environment and compliance with ARARs) are threshold criteria. Alternatives that do not protect human health and the environment or do not comply with ARARs (or justify a waiver) do not meet statutory requirements and are eliminated from further consideration in the FS (DOE/RL-2004-85).

The next five criteria (long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost) are balancing criteria on which the remedy selection is based.

The final two criteria (state and community acceptance) are **modifying criteria**. The State of Washington concurs with the proposed alternatives outlined, and the preferred remedies identified are acceptable to the Tri-Parties. Community acceptance of a preferred alternative, however, only can be determined following the public comment period.

The general approach for selecting the remedial alternative is as follows:

- **Alternative 1**: Preferred where no/inconsequential contamination is identified
- **Alternative 2**: Preferred for sites with minimal contamination that will decay/attenuate to acceptable levels within the institutional control period
- **Alternative 3**: Preferred where the bulk of the contamination is accessible
- **Alternative 4**: Preferred where contaminants exist at significant depth that could impact groundwater
- **Alternative 5**: Preferred for sites with shallow and deep contamination, when risk from the shallow contamination is significant and long-term (otherwise, Alternative 3).

NEPA VALUES

The *Secretarial Policy on the National Environmental Policy Act* (DOE 1994) and DOE O 451.1B, *National Environmental Policy Act Compliance Program*, require that CERCLA documents incorporate NEPA values (e.g., analysis of cumulative, off-site, ecological, and socioeconomic impacts) to the extent practicable, in lieu of preparing separate NEPA documentation for CERCLA activities.

The NEPA process is intended to help Federal agencies:

- Make decisions that are based on understanding environmental consequences
- Take actions that protect, restore, and enhance the environment.

The NEPA-related resources and values considered for the 200-PW-2/4 OU waste sites support the CERCLA decision-making processes. For the remedies evaluated, NEPA impacts include temporary short-term disturbance (e.g., increased traffic, noise levels, and fugitive dust) of approximately 1.3 km^2 (0.5 mi^2) for a disturbed industrial area that has low- to marginal-habitat quality. Appropriate borrow source material source areas were analyzed in DOE/EA-1403, *Environmental Assessment, Use of Existing Borrow Areas, Hanford Site, Richland, Washington.*

Long-term impacts identified for the remedies evaluated include potential aesthetic and visual impacts should the caps not be adequately contoured and vegetated to blend with the surrounding area. Minimal or no impacts are expected for air quality; natural, cultural, and historical resources; transportation; socioeconomics; environmental justice; irreversible and irretrievable commitment of resources; or cumulative impacts.

TSD Unit

A facility used for treatment, storage, and/or disposal (TSD) of dangerous wastes.

SUMMARY OF ALTERNATIVE EVALUATIONS AND PREFERRED ALTERNATIVES

Five remedial alternatives were developed for evaluation:

- Alternative 1 – No Action
- Alternative 2 – Maintain Existing Soil Cover, Monitored Natural Attenuation, and Institutional Controls
- Alternative 3 – Removal, Treatment, and Disposal
- Alternative 4 – Engineered Surface Barrier
- Alternative 5 – Partial Removal, Treatment, and Disposal with Engineered Surface Barrier.

Because CERCLA requires the evaluation of a "no-action" alternative as a baseline for comparison to other alternatives, this alternative is evaluated for all waste sites. Given that the Central Plateau is expected to support waste management for the foreseeable future, the evaluations use an industrial-exposure scenario.

The alternatives are evaluated based on the representative waste site Groups 1 through 7 and associated analogous waste sites in Table 3. A summary of the findings after evaluating the alternative against the CERCLA threshold and balancing criteria are contained in Tables 6 through 12.

Group 1 – Representative Waste Sites 207-A South Retention Basin and Analogous Sites

The 207-A South Retention Basin, located administratively within the 200-PW-4 OU, is the representative site for the following waste site:

- 200-W-22 Site Group.

Contaminant concentrations at the 207-A South Retention Basin do not exceed any PRGs. Closure of this site as a RCRA treatment, storage, and/or disposal (TSD) unit is discussed later. The preferred CERCLA alternative for this representative site is Alternative 1 – No Action because this alternative meets all RAOs and is the most cost-effective.

For the 200-W-22 Site Group, which is a collection of potentially contaminated belowground concrete, metal, and structures associated with demolished Reduction-Oxidation Plant ancillary buildings and soil contaminated by unplanned releases, the preferred remedy is Alternative 3 – Removal, Treatment, and Disposal for the subgrade structures and associated unplanned releases. Alternative 3 removes all contaminants necessary to meet PRGs and is protective of human health and the environment, groundwater; is implementable with minimal worker risk; and provides the best long-term effectiveness for the cost.

Group 2 – Representative Waste Site 216-A-10 Crib and Analogous Sites

The 216-A-10 Crib, located administratively within the 200-PW-2 OU, is the representative site for the following analogous waste sites:

- 216-A-5 Crib
- 216-A-45 Crib

- 216-C-1 Crib
- 200-E-58 Neutralization Tank.

Currently, the 216-A-10 Crib exceeds groundwater protection PRGs because elevated contaminant concentrations are found throughout the soil column to approximately 19 m (63 ft) bgs. The preferred CERCLA alternative for this representative site is Alternative 4 – Engineered Surface Barrier because this alternative is protective of human health, the environment, and groundwater; complies with applicable or relevant and appropriate requirements (ARAR); is implementable with minimal worker risk; and is cost-effective.

For the 216-A-5 and 216-A-45 Cribs, which are expected to possess deep mobile contamination, the preferred remedy also is Alternative 4 – Engineered Surface Barrier. Alternative 4 is protective of human health, the environment, and groundwater; complies with ARARs; is implementable with minimal worker risk; and is cost-effective.

For the relatively shallow 216-C-1 Crib, the preferred remedy is Alternative 3 – Removal, Treatment, and Disposal. Alternative 3 removes all contaminants exceeding PRGs, and is cost-effective.

For the 200-E-58 Neutralization Tank, the preferred remedy also is Alternative 3 – Removal, Treatment, and Disposal. Alternative 3 removes all contaminants necessary to meet PRGs and therefore is protective of human health, the environment, and groundwater; is implementable with minimal worker risk; and is cost-effective.

Table 7 provides a summary of the analysis of alternatives supporting the selection of the preferred alternatives for this group of waste sites.

Group 3 – Representative Waste Site 216-A-19 Trench and Analogous Sites

The 216-A-19 Trench, located administratively within the 200-PW-2 OU, is the representative site for the following analogous waste sites:

- 216-A-1 Crib
- 216-A-3 Crib
- 216-A-18 Trench
- 216-A-20 Trench
- 216-A-22 French Drain
- UPR-200-E-17
- 216-A-28 Crib
- 216-A-34 Ditch
- 216-S-8 Trench
- UPR-200-E-145.

Currently, the 216-A-19 Trench exceeds groundwater protection and ecological wildlife PRGs for total uranium and groundwater protection PRGs for nitrates. These constituents are found throughout the soil column with elevated concentrations to a depth of approximately 14 m (47 ft) bgs. The preferred remedy for this representative site is Alternative 3 – Removal, Treatment, and Disposal. This alternative is protective of human health, the environment, and groundwater; complies with ARARs; is implementable with manageable worker risk; and is cost-effective.

For the 216-A-1, 216-A-3, 216-A-20, 216-A-22, UPR-200-E-17, 216-A-28, and UPR-200-E-145 analogous waste sites, which have accessible contamination, i.e., generally less than 40 ft deep, the preferred remedy also is Alternative 3 – Removal, Treatment, and Disposal. Alternative 3 removes all contaminants necessary to meet PRGs and therefore is protective of human health, the environment, and groundwater; is implementable with manageable worker risk; and is cost-effective.

For the 216-A-18 Trench, the preferred remedy also is Alternative 3, despite its cost being substantially greater. This waste contains a large quantity of uranium (682 kg, according to RPP-26744, *Hanford Soil Inventory*), which eventually could reach groundwater.

For the 216-S-8 Trench, the preferred remedy is Alternative 2 – Maintain Existing Soil Cover, Monitored Natural Attenuation, and Institutional Controls. Recent estimate (RPP-26744) predicts minimal uranium and radionuclide inventories. The only significant contaminant is nitrate, which may not reach groundwater in concentrations exceeding requirements. This alternative includes groundwater monitoring to ensure groundwater remains protected.

For the 216-A-34 Ditch, the preferred remedy is Alternative 2 – Maintain Existing Soil Cover, Monitored Natural Attenuation, and Institutional Controls. This waste site has no reported contaminant inventory, but is known to have received low-activity cooling water waste. Any contamination is expected to minor, which would decay to acceptable levels within a few decades.

Table 8 provides a summary of the analysis of alternatives supporting the selection of the preferred alternatives for this group of waste sites.

Group 4 – Representative Waste Sites 216-A-36B Crib and Analogous Sites

The 216-A-36B Crib, located administratively within the 200-PW-2 OU, is the representative site for the following waste sites:

- 216-A-36A Crib
- UPR-200-E-39.

Currently, the 216-A-36B Crib exceeds total uranium, nitrate, and technetium-99 groundwater protection PRGs because elevated concentrations are found throughout the soil column to approximately 92 m (303 ft) bgs. The preferred CERCLA alternative for this representative site is Alternative 5 – Partial Removal, Treatment, and Disposal with Engineered Surface Barrier because this alternative is protective of human health, the environment, and groundwater; complies with ARARs; is implementable with manageable worker risk; and is cost-effective. This alternative will remove transuranic constituents at potentially TRU[1] waste concentrations located approximately 25 ft deep and is recommended despite coincident high concentrations of cesium-137, which have potential to result in high remediation worker dose if not managed properly.

[1]Waste materials contaminated with more than 100 nCi/g of transuranic materials having half-lives longer than 20 years.

For the 216-A-36A Crib, which is contiguous with the 216-A-36B Crib, the preferred remedy also is Alternative 5 – Partial Removal, Treatment, and Disposal with Engineered Surface Barrier. Alternative 5 is protective of human health, the environment, and groundwater; complies with ARARs, is implementable with manageable worker risk; and is cost-effective.

For the UPR-200-E-39 waste site, the preferred remedy is Alternative 3 – Removal, Treatment, and Disposal despite its proximity to the Plutonium-Uranium Extraction (PUREX) Plant. Although this waste site could be incorporated under a barrier associated with remediation of PUREX, implementation of Alternative 3 represents a near-term cost-effective remedy that is protective of human health, groundwater, and the environment.

Table 9 provides a summary of the analysis of alternatives supporting the selection of the preferred alternatives for this group of waste sites.

Group 5 – Waste Site 216-A-37-1 Crib

The 216-A-37-1 Crib, located administratively within the 200-PW-4 OU, currently is not a representative site for any analogous waste sites. This site is a RCRA TSD unit and was characterized to facilitate RCRA closure/postclosure.

Currently, the 216-A-37-1 Crib exceeds groundwater soil-screening levels only for nitrate to approximately 8 m (25 ft) bgs. Although the PRG is exceeded, the bulk of the contamination is shallow where it should not adversely impact groundwater. The preferred CERCLA alternative for this representative site is Alternative 2 – Maintain Existing Soil Cover, Monitored Natural Attenuation, and Institutional Controls. This alternative is protective of human health, the environment, and groundwater; complies with ARARs; is implementable with minimal worker risk; and is cost-effective.

Table 10 provides a summary of the analysis of alternatives supporting the selection of the preferred alternative for this waste site.

Group 6 – Representative Waste Sites 216-B-12 Crib and Analogous Sites

The 216-B-12 Crib, located administratively within the 200-PW-2 OU, is the representative site for the following waste sites:

- 216-B-60 Crib
- 216-C-3 Crib
- 216-C-5 Crib
- 216-C-7 Crib
- 216-C-10 Crib
- 209-E-WS-3 Valve Pit and Hold-Up Tank
- 270-E-1 Neutralization Tank
- UPR-200-E-64.

Currently, the 216-B-12 Crib exceeds groundwater protection PRGs for nitrates and total uranium because elevated concentrations are found throughout the soil column to approximately 59 m (192 ft) bgs. The preferred remedy for this representative site is Alternative 4 – Engineered Surface Barriers because this alternative is protective of human health, the environment, and groundwater;

complies with ARARs; is implementable with minimal worker risk; and is cost-effective.

For the 216-C-3, 216-C-5, 216-C-7, 216-C-10, 209-E-WS-3, and 270-E-1 waste sites, the preferred remedy is Alternative 3 – Removal, Treatment, and Disposal, because the majority of the contamination is accessible. Alternative 3 removes all contaminants necessary to meet PRGs and therefore is protective of human health, the environment, and groundwater; is implementable with manageable worker risk; and is cost-effective.

For the 216-B-60 Crib, the preferred remedy is Alternative 2 – Maintain Existing Soil Cover, Monitored Natural Attenuation, and Institutional Controls. This deep waste site is beneath the 225-B (Waste Encapsulation and Storage Facility) and its inventory is believed to be mostly solid material that is confined to the waste site structure. Furthermore, the most recent inventory estimate indicates minimal contaminant presence (RPP-26744).

For the UPR-200-E-64 waste site, where speck contamination has been spread by ants and wind, the preferred remedy is Alternative 2 – Maintain Existing Soil Cover, Monitored Natural Attenuation, and Institutional Controls. This 8,100 m^3 (2-acre) site is contaminated with low concentrations of cesium-137 and strontium-90 that are expected to decay to acceptable levels in a few decades. Excavation of the 270-E-1 Neutralization Tank, as recommended above, will remove the source of contamination for the UPR-200-E-64 site.

Table 11 provides a summary of the analysis of alternatives supporting the selection of the preferred alternatives for this group of waste sites.

Group 7 – Representative Waste Sites 216-S-7 Crib and Analogous Sites

The 216-S-7 Crib, located administratively within the 200-PW-2 OU, is the representative site for the following waste sites:

- 216-S-1&2 Cribs
- UPR-200-W-36
- 216-S-4 French Drain
- 216-S-22 Crib
- 216-S-23 Crib
- 216-T-20 Trench.

Currently, the 216-S-7 Crib exceeds groundwater protection PRGs for nitrate and total uranium because elevated concentrations are found throughout the soil column to approximately 69 m (226 ft) bgs. The preferred remedy for this representative site is Alternative 5 – Partial Removal, Treatment, and Disposal with Engineered Surface Barrier. This alternative is protective of human health, the environment, and groundwater; complies with ARARs; and is implementable with manageable worker risk. Although more costly than Alternative 4, the RTD portion of this remedy removes high concentrations of cesium-137, plutonium, and americium-241 that represent a potential intruder risk and removes much of the uranium inventory representing potential groundwater risk. Groundwater risk from deeper constituents would remain preserving the need for a barrier, but after excavation, such a barrier could be less robust.

For the 216-S-1&2 Cribs and associated UPR-200-W-36 waste sites, the preferred remedy is Alternative 4 – Engineered Surface Barrier. Alternative 4 is protective of human health, the environment, and groundwater; complies with ARARs; is implementable with minimal worker risk; and is cost-effective.

For the 216-S-4, 216-S-22, and 216-T-20 waste sites, the preferred remedy is Alternative 3 – Removal, Treatment, and Disposal. Alternative 3 removes all contaminants necessary to meet PRGs and therefore is protective of human health, the environment, and groundwater; is implementable at the waste site, and is cost-effective.

For the 216-S-23 Crib, the preferred remedy is Alternative 2 – Maintain Existing Soil Cover, Monitored Natural Attenuation, and Institutional Controls. This relatively deep (8.5 m [28 ft]) waste site is reported to have received only minor inventory that should decay to acceptable levels in a few decades.

Table 12 provides a summary of the analysis of alternatives supporting the selection of the preferred alternatives for this group of waste sites.

Groups 1 Through 7 and Analogous Sites

Based on information currently available, the Tri-Parties believe the preferred alternatives described above meet the threshold criteria and provide the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Tri-Parties expect the preferred alternatives to satisfy the following statutory requirements of CERCLA Section 121(b):

- Be protective of human health and the environment
- Comply with ARARs
- Be cost-effective
- Use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable
- Satisfy the preference for treatment as a principal element.

Table 6. Preferred Alternative for the Representative Site 207-A South Retention Basin and its Analogous Waste Site[e] (costs in $1,000).

Comparison of Alternatives - Representative Site 207-A South Retention Basin and Associated Analogous Site					
Criteria for Representative and Analogous Waste Sites	Alternatives				
	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barrier	⑤ RTD/ Barrier[d]
Representative Site 207-A South Retention Basin	☑				
Threshold Criteria					
Overall protection	☑	☑	☑	☑	N/A
Compliance with ARARs	☑	☑	☑	☑	N/A
Balancing Criteria					
Long-term effectiveness	Best	Best	Best	Best	N/A
Short-term effectiveness	Best	Moderate	Moderate	Moderate	N/A
Reduction in TMV[c]	Least	Least	Least	Least	N/A
Implementability	Best	Moderate	Moderate	Moderate	N/A
Cost (in thousands)					
Capital costs	$0	$35	$724	$738	N/A
Operating and maintenance costs	$0	$4,000	$0	$3,996	N/A
Non-discounted costs	$0	$4,031	$724	$4,733	N/A
Total present worth	$0	$868	$724	$1,571	N/A
Analogous Site 200-W-22 Site Group, Including Subgrade Structures			☑		
Threshold Criteria					
Overall protection	☐	☑	☑	☑	N/A
Compliance with ARARs	☐	☑	☑	☑	N/A
Balancing Criteria					
Long-term effectiveness	Least	Best	Best	Best	N/A
Short-term effectiveness	Least	Best	Best	Moderate	N/A
Reduction in TMV	Least	Least	Least	Least	N/A
Implementability	Best	Best	Moderate	Moderate	N/A
Cost (in thousands)					
Capital costs	$0	$35	$2,070	$1,829	N/A
Operating and maintenance costs	$0	$888	$0	$7,362	N/A
Non-discounted costs	$0	$4,923	$2,070	$9,191	N/A
Total present worth	$0	$1,057	$2,070	$3,378	N/A

[a] Maintain existing soil cover, monitored natural attenuation, and institutional controls.

[b] Removal, treatment, and disposal.

[c] Toxicity, mobility, or volume through treatment.

[d] Partial removal, treatment, and disposal with barrier.

[e] The choice of the preferred alternative is based on information at the writing of this feasibility study. The preferred alternative may be revised based on future characterization activities at the analogous sites.

☑ = Indicates the preferred alternative (e).
☑ = Yes, meets threshold criterion.
☐ = No, does not meet threshold criterion.

ARAR = applicable or relevant and appropriate requirement.
IC = institutional controls.
MESC = maintain existing soil cover.
MNA = monitored natural attenuation.
N/A = not applicable.
RTD = removal, treatment, and disposal.
TMV = toxicity, mobility, or volume through treatment.

Table 7. Preferred Alternative for the Representative Site 216-A-10 Crib and its Analogous Waste Sites[e] (costs in $1,000). (2 Pages)

Comparison of Alternatives - Representative Site 216-A-10 Crib and Associated Analogous Sites					
Criteria for Representative and Analogous Waste Sites	Alternatives				
	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barrier	⑤ RTD/ Barrier[d]
Representative Site 216-A-10 Crib				☑	
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Best	Moderate	Least	Moderate	Moderate
Reduction in TMV[c]	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$11,215	$747	$9,111
Operating and maintenance costs	$0	$3,984	$0	$4,149	$4,168
Non-discounted costs	$0	$4,020	$11,215	$4,896	$13,279
Total present worth	$0	$866	$11,215	$1,613	$9,980
Analogous Site 216-A-5 Crib				☑	
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Best	Moderate	Least	Moderate	Moderate
Reduction in TMV[c]	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$2,714	$483	$2,228
Operating and maintenance costs	$0	$3,984	$0	$3,984	$4,004
Non-discounted costs	$0	$4,020	$2,714	$4,468	$6,232
Total present worth	$0	$866	$2,714	$1,314	$3,062
Analogous Site 216-A-45 Crib				☑	
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Best	Moderate
Short-term effectiveness	Best	Moderate	Least	Moderate	Moderate
Reduction in TMV[c]	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$15,810	$850	$9,131
Operating and maintenance costs	$0	$3,984	$0	$4,686	$4,004
Non-discounted costs	$0	$4,020	$15,810	$5,535	$13,135
Total present worth	$0	$866	$15,810	$1,830	$9,965
Analogous Site 216-C-1 Crib			☑		
Threshold Criteria					

Table 7. Preferred Alternative for the Representative Site 216-A-10 Crib and its Analogous Waste Sites[e] (costs in $1,000). (2 Pages)

Comparison of Alternatives - Representative Site 216-A-10 Crib and Associated Analogous Sites					
Criteria for Representative and Analogous Waste Sites	**Alternatives**				
	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barrier	⑤ RTD/ Barrier[d]
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Best	Moderate	Least	Moderate	Least
Reduction in TMV[c]	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$1,677	$460	$1,190
Operating and maintenance costs	$0	$4,042	$0	$4,042	$4,042
Non-discounted costs	$0	$4,078	$1,677	$4,502	$5,232
Total present worth	$0	$877	$1,677	$1,301	$2,031
Analogous Site 200-E-58 Neutralization Tank			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	☑	N/A
Compliance with ARARs	☐	☐	☑	☑	N/A
Balancing Criteria					
Long-term effectiveness	Least	Moderate	Best	Moderate	N/A
Short-term effectiveness	Best	Moderate	Least	Moderate	N/A
Reduction in TMV	Least	Least	Least	Least	N/A
Implementability	Best	Moderate	Moderate	Moderate	N/A
Cost (in thousands)					
Capital costs	$0	$35	$812	$463	N/A
Operating and maintenance costs	$0	$3,984	$0	$3,984	N/A
Non-discounted costs	$0	$4,020	$812	$4,447	N/A
Total present worth	$0	$866	$812	$1,294	N/A

[a] Maintain existing soil cover, monitored natural attenuation, and institutional controls.

[b] Removal, treatment, and disposal.

[c] Toxicity, mobility, or volume through treatment.

[d] Partial removal, treatment, and disposal with barrier.

[e] The choice of the preferred alternative is based on information at the writing of this feasibility study. The preferred alternative may be revised based on future characterization activities at the analogous sites.

☑ = Indicates the preferred alternative (e).
☑ = Yes, meets threshold criterion.
☐ = No, does not meet threshold criterion.

ARAR = applicable or relevant and appropriate requirement.
IC = institutional controls.
MESC = maintain existing soil cover.
MNA = monitored natural attenuation.
N/A = not applicable.
RTD = removal, treatment, and disposal.
TMV = toxicity, mobility, or volume through treatment.

Table 8. Preferred Alternatives for the Representative Site 216-A-19 Trench and its Analogous Waste Sites[e] (costs in $1,000). (4 Pages)

Comparison of Alternatives - Representative Site 216-A-19 Trench and Associated Analogous Sites					
Criteria for Representative and Analogous Waste Sites	Alternatives				
	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barriers	⑤ RTD/ Barrier[d]
Representative Site 216-A-19 Trench			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Best	Least	Moderate	Moderate
Reduction in TMV[c]	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$3,368	$469	$1,566
Operating and maintenance costs	$0	$3,996	$0	$3,996	$3,996
Non-discounted costs	$0	$4,031	$3,368	$4,465	$5,561
Total present worth	$0	$868	$3,368	$1,302	$2,399
Analogous Site 216-A-1 Crib			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Best	Least	Moderate	Moderate
Reduction in TMV	Least	Least	Least	Least	Least
Implementability	Best	Moderate	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$2,265	$476	$1,361
Operating and maintenance costs	$0	$3,996	$0	$3,996	$3.996
Non-discounted costs	$0	$4,031	$2,265	$4,472	$5,357
Total present worth	$0	$868	$2,265	$1,309	$2,194
Analogous Site 216-A-3 Crib			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Moderate	Least	Moderate	Moderate
Reduction in TMV	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$2,394	$461	$1,283
Operating and maintenance costs	$0	$3,984	$0	$3,984	$3,984
Non-discounted costs	$0	$4,020	$2,394	$4,446	$5,268
Total present worth	$0	$866	$2,394	$1,292	$2,114

Table 8. Preferred Alternatives for the Representative Site 216-A-19 Trench and its Analogous Waste Sites[e] (costs in $1,000). (4 Pages)

Comparison of Alternatives - Representative Site 216-A-19 Trench and Associated Analogous Sites					
Criteria for Representative and Analogous Waste Sites	Alternatives				
	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barriers	⑤ RTD/ Barrier[d]
Analogous Site 216-A-18 Trench			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Best	Best	Least	Moderate	Least
Reduction in TMV	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Least
Cost (in thousands)					
Capital costs	$0	$35	$7,336	$587	$3,132
Operating and maintenance costs	$0	$3,994	$0	$3,996	$3,996
Non-discounted costs	$0	$4,031	$7,336	$4,582	$7,127
Total present worth	$0	$868	$7,336	$1,420	$3,964
Analogous Site 216-A-20 Trench (Includes Overflow Area)			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Best
Short-term effectiveness	Moderate	Moderate	Least	Moderate	Moderate
Reduction in TMV	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$2,404	$815	$1,661
Operating and maintenance costs	$0	$3,996	$0	$4,512	$4,512
Non-discounted costs	$0	$4,031	$2,404	$5,327	$6,173
Total present worth	$0	$868	$2,404	$1,758	$2,604
Analogous Site 216-A-22 French Drain and UPR-200-E-17			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Moderate	Least	Moderate	Moderate
Reduction in TMV	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$1,722	$434	$1,031
Operating and maintenance costs	$0	$3,984	$0	$3,984	$3,984
Non-discounted costs	$0	$4,020	$1,722	$4,419	$5,016
Total present worth	$0	$866	$1,722	$1,265	$1,862

Table 8. Preferred Alternatives for the Representative Site 216-A-19 Trench and its Analogous Waste Sites[e] (costs in $1,000). (4 Pages)

Comparison of Alternatives - Representative Site 216-A-19 Trench and Associated Analogous Sites					
Criteria for Representative and Analogous Waste Sites	Alternatives				
	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barriers	⑤ RTD/ Barrier[d]
Analogous Site 216-A-28 Crib			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Best	Least	Moderate	Moderate
Reduction in TMV	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$1,365	$439	$947
Operating and maintenance costs	$0	$3,984	$0	$3,984	$3,984
Non-discounted costs	$0	$4,020	$1,365	$4,424	$4,932
Total present worth	$0	$866	$1,365	$1,270	$1,778
Analogous Site 216-A-34 Ditch		☑			
Threshold Criteria					
Overall protection	☐	☑	☑	☑	☑
Compliance with ARARs	☐	☑	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Moderate	Best	Moderate	Moderate
Short-term effectiveness	Best	Best	Least	Moderate	Moderate
Reduction in TMV	Least	Least	Least	Least	Least
Implementability	Best	Moderate	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$12,565	$1,015	$4,872
Operating and maintenance costs	$0	$3,996	$0	$5,657	$5,657
Non-discounted costs	$0	$4,031	$12,565	$6,671	$10,529
Total present worth	$0	$868	$12,565	$2,201	$6,058
Analogous Site 216-S-8 Trench		☑			
Threshold Criteria					
Overall protection	☐	☑[f]	☑	☑	☑
Compliance with ARARs	☐	☑[f]	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Best	Moderate	Least	Moderate	Moderate
Reduction in TMV	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$8,431	$585	$4,580
Operating and maintenance costs	$0	$4,004	$0	$4,004	$4,004
Non-discounted costs	$0	$4,039	$8,431	$4,589	$8,584
Total present worth	$0	$870	$8,431	$1,419	$5,414

Table 8. Preferred Alternatives for the Representative Site 216-A-19 Trench and its Analogous Waste Sites[e] (costs in $1,000). (4 Pages)

Comparison of Alternatives - Representative Site 216-A-19 Trench and Associated Analogous Sites					
Criteria for Representative and Analogous Waste Sites	Alternatives				
	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barriers	⑤ RTD/ Barrier[d]
Analogous Site UPR-200-E-145			☑		
Threshold Criteria					
Overall protection	☐	☑	☑	☑	N/A
Compliance with ARARs	☐	☑	☑	☑	N/A
Balancing Criteria					
Long-term effectiveness	Least	Moderate	Best	Moderate	N/A
Short-term effectiveness	Best	Moderate	Least	Moderate	N/A
Reduction in TMV	Least	Least	Least	Least	N/A
Implementability	Best	Best	Moderate	Moderate	N/A
Cost (in thousands)					
Capital costs	$0	$35	$671	$464	N/A
Operating and maintenance costs	$0	$3,996	$0	$3,996	N/A
Non-discounted costs	$0	$4,031	$671	$4,460	N/A
Total present worth	$0	$868	$671	$1,297	N/A

[a] Maintain existing soil cover, monitored natural attenuation, and institutional controls.

[b] Removal, treatment, and disposal.

[c] Toxicity, mobility, or volume through treatment.

[d] Partial removal, treatment, and disposal with barrier.

[e] The choice of the preferred alternative is based on information at the writing of this feasibility study. The preferred alternative may be revised based on future characterization activities at the analogous sites.

[f] Most recent inventory estimate indicates minimal uranium and fission products (RPP-26744, *Hanford Soil Inventory*).

☑ = Indicates the preferred alternative (e).
☑ = Yes, meets threshold criterion.
☐ = No, does not meet threshold criterion.

ARAR = applicable or relevant and appropriate requirement.
IC = institutional controls.
MESC = maintain existing soil cover.
MNA = monitored natural attenuation.
N/A = not applicable.
RTD = removal, treatment, and disposal.
TMV = toxicity, mobility, or volume through treatment.

Table 9. Preferred Alternative for the Representative Site 216-A-36B Crib and its Analogous Waste Sites[e] (costs in $1,000). (2 Pages)

Comparison of Alternatives - Representative Site 216-A-36B Crib and Associated Analogous Sites					
	Alternatives				
Criteria for Representative and Analogous Waste Sites	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barrier	⑤ RTD/ Barrier[d]
Representative Site 216-A-36B Crib[f]					☑
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Best
Short-term effectiveness	Moderate	Moderate	Least	Moderate	Least
Reduction in TMV[c]	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Least
Cost (in thousands)					
Capital costs	$0	$35	$100,070	$4,260	$16,957
Operating and maintenance costs	$0	$3,984	$0	$4,649	$4,649
Non-discounted costs	$0	$4,020	$100,070	$8,909	$21,607
Total present worth	$0	$866	$100,070	$5,232	$17,930
Analogous Site 216-A-36A Crib[g]					☑
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Best	Least	Moderate	Least
Reduction in TMV[c]	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Least
Cost (in thousands)					
Capital costs	$0	$35	$70,124	$3,391	$5,454
Operating and maintenance costs	$0	$3,984	$0	$3,984	$3,984
Non-discounted costs	$0	$4,020	$70,124	$7,376	$9,438
Total present worth	$0	$866	$70,124	$4,222	$6,285
Analogous Site UPR-200-E-39[h]			☑		
Threshold Criteria					
Overall protection	☐	☑	☑	☑	NA
Compliance with ARARs	☐	☑	☑	☑	NA
Balancing Criteria					
Long-term effectiveness	Least	Moderate	Best	Moderate	NA
Short-term effectiveness	Moderate	Best	Moderate	Moderate	NA
Reduction in TMV	Least	Least	Least	Least	NA
Implementability	Best	Best	Moderate	Moderate	NA
Cost (in thousands)					
Capital costs	$0	$35	$667	$677	N/A
Operating and maintenance costs	$0	$517	$0	$3,984	N/A
Non-discounted costs	$0	$552	$667	$4,661	N/A
Total present worth	$0	$421	$667	$1,508	N/A

Table 9. Preferred Alternative for the Representative Site 216-A-36B Crib and its Analogous Waste Sites[e] (costs in $1,000). (2 Pages)

Comparison of Alternatives - Representative Site 216-A-36B Crib and Associated Analogous Sites					
	Alternatives				
Criteria for Representative and Analogous Waste Sites	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barrier	⑤ RTD/ Barrier[d]

[a] Maintain existing soil cover, monitored natural attenuation, and institutional controls.

[b] Removal, treatment, and disposal.

[c] Toxicity, mobility, or volume through treatment.

[d] Partial removal, treatment, and disposal with barrier.

[e] The choice of the preferred alternative is based on information at the writing of this feasibility study. The preferred alternative may be revised based on future characterization activities at the analogous sites.

[f] Without TRU waste removal and shipment to WIPP, Alternative 3 costs for 216-A-36B are as follows: capital cost is $94,186K, non-discounted cost is $94,186K, and present-worth cost is $87,383K.

[g] Without TRU waste removal and shipment to WIPP, Alternative 3 costs for 216-A-36A are as follows: capital cost is $65,711K, non-discounted cost is $65,711K, and present-worth cost is $61,876K.

[h] Alternative 2 costs are based on installation of a PUREX zone engineered barrier within 20 years. Without installation of the PUREX barrier, Alternative 2 costs for UPR-200-E-39 are as follows: capital cost is $35K, operating and maintenance costs are $3,984K, non-discounted cost is $4,020K, and present-worth cost is $866K.

☑ = Indicates the preferred alternative (f).
☑ = Yes, meets threshold criterion.
☐ = No, does not meet threshold criterion.

ARAR = applicable or relevant and appropriate requirement.
IC = institutional controls.
MESC = maintain existing soil cover.
MNA = monitored natural attenuation.
N/A = not applicable.
PUREX = Plutonium-Uranium Extraction (Plant).
RTD = removal, treatment, and disposal.
TMV = toxicity, mobility, or volume through treatment.
TRU = waste materials contaminated with more than 100 nCi/g of transuranic materials having half-lives longer than 20 years.
WIPP = Waste Isolation Pilot Plant.

Table 10. Preferred Alternative for the Waste Site 216-A-37-1 Crib[e] (costs in $1,000). (2 Pages)

Comparison of Alternatives - Waste Site 216-A-37-1 Crib					
	Alternatives				
Criteria for Representative and Analogous Waste Sites	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barrier	⑤ RTD/ Barrier[d]
Representative Site 216-A-37-1 Crib		☑			
Threshold Criteria					
Overall protection	☐	☑	☑	☑	☑
Compliance with ARARs	☐	☑	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Moderate	Best	Moderate	Moderate
Short-term effectiveness	Best	Best	Least	Moderate	Least
Reduction in TMV[c]	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$6,355	$1,029	$3,489
Operating and maintenance costs	$0	$3,984	$0	$5,551	$5,551
Non-discounted costs	$0	$4,020	$6,355	$6,580	$9,041
Total present worth	$0	$866	$6,355	$2,193	$4,654

Table 10. Preferred Alternative for the Waste Site 216-A-37-1 Crib[e] (costs in $1,000). (2 Pages)

Comparison of Alternatives - Waste Site 216-A-37-1 Crib					
	Alternatives				
Criteria for Representative and Analogous Waste Sites	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barrier	⑤ RTD/ Barrier[d]

[a] Maintain existing soil cover, monitored natural attenuation, and institutional controls.

[b] Removal, treatment, and disposal.

[c] Toxicity, mobility, or volume through treatment.

[d] Partial removal, treatment, and disposal with barrier.

[e] The choice of the preferred alternative is based on information at the writing of this feasibility study. The preferred alternative may be revised based on future characterization activities at the analogous sites.

☑ = Indicates the preferred alternative (e).
☑ = Yes, meets threshold criterion.
☐ = No, does not meet threshold criterion.

ARAR = applicable or relevant and appropriate requirement.
IC = institutional controls.
MESC = maintain existing soil cover.
MNA = monitored natural attenuation.
RTD = removal, treatment, and disposal.
TMV = toxicity, mobility, or volume through treatment.

Table 11. Preferred Alternative for the Representative Site 216-B-12 Crib and its Analogous Waste Sites[e] (costs in $1,000). (4 Pages)

Comparison of Alternatives - Representative Site 216-B-12 Crib and Associated Analogous Sites					
	Alternatives				
Criteria for Representative and Analogous Waste Sites	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barrier	⑤ RTD/ Barrier[d]
Representative Site 216-B-12 Crib				☑	
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Best	Least	Moderate	Moderate
Reduction in TMV[c]	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$41,231	$637	$15,988
Operating and maintenance costs	$0	$3,995	$0	$3,995	$3,996
Non-discounted costs	$0	$4,030	$41,231	$4,632	$19,983
Total present worth	$0	$868	$41,231	$1,470	$16,821
Analogous Site 216-B-60 Crib		☑			
Threshold Criteria					
Overall protection	☐	☑[f]	☑	☑	☑
Compliance with ARARs	☐	☑[f]	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Best	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Best	Least	Moderate	Moderate
Reduction in TMV	Least	Least	Least	Least	Least
Implementability	Best	Best	Least	Least	Least
Cost (in thousands)					

Table 11. Preferred Alternative for the Representative Site 216-B-12 Crib and its Analogous Waste Sites[e] (costs in $1,000). (4 Pages)

Comparison of Alternatives - Representative Site 216-B-12 Crib and Associated Analogous Sites					
	Alternatives				
Criteria for Representative and Analogous Waste Sites	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barrier	⑤ RTD/ Barrier[d]
Capital costs	$0	$35	$5,433	$464	$4,556
Operating and maintenance costs	$0	$3,995	$0	$3,995	$3,996
Non-discounted costs	$0	$4,030	$5,433	$4,459	$8,552
Total present worth	$0	$868	$5,433	$1,297	$5,389
Analogous Site 216-C-3 Crib			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Best	Least	Moderate	Moderate
Reduction in TMV	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$2,718	$474	$1,215
Operating and maintenance costs	$0	$4,042	$0	$4,042	$3,965
Non-discounted costs	$0	$4,078	$2,718	$4,516	$5,179
Total present worth	$0	$877	$2,718	$1,315	$2,043
Analogous Site 216-C-5 Crib			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Best	Least	Moderate	Moderate
Reduction in TMV	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$2,622	$447	$1,238
Operating and maintenance costs	$0	$4,042	$0	$4,042	$4,042
Non-discounted costs	$0	$4,078	$2,622	$4,490	$5,280
Total present worth	$0	$877	$2,622	$1,289	$2,079
Analogous Site 216-C-7 Crib			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Best	Least	Moderate	Moderate
Reduction in TMV	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$2,681	$462	$1,207
Operating and maintenance costs	$0	$4,042	$0	$4,042	$4,042

Table 11. Preferred Alternative for the Representative Site 216-B-12 Crib and its Analogous Waste Sites[e] (costs in $1,000). (4 Pages)

Comparison of Alternatives - Representative Site 216-B-12 Crib and Associated Analogous Sites					
	Alternatives				
Criteria for Representative and Analogous Waste Sites	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barrier	⑤ RTD/ Barrier[d]
Non-discounted costs	$0	$4,078	$2,681	$4,504	$5,249
Total present worth	$0	$877	$2,681	$1,303	$2,048
Analogous Site 216-C-10 Crib			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Best	Least	Moderate	Moderate
Reduction in TMV	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$2,470	$451	$1,041
Operating and maintenance costs	$0	$4,042	$0	$4.042	$4,042
Non-discounted costs	$0	$4,078	$2,470	$4,493	$5,083
Total present worth	$0	$877	$2,470	$1,292	$1,882
Analogous Site 209-E-WS-3 Valve Pit and Hold-Up Tank			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	N/A	N/A
Compliance with ARARs	☐	☐	☑	N/A	N/A
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	N/A
Short-term effectiveness	Moderate	Best	Least	Moderate	N/A
Reduction in TMV	Least	Least	Least	Least	N/A
Implementability	Best	Best	Moderate	Moderate	N/A
Cost (in thousands)					
Capital costs	$0	$35	$684	N/A	N/A
Operating and maintenance costs	$0	$4,042	$0	N/A	N/A
Non-discounted costs	$0	$4,078	$684	N/A	N/A
Total present worth	$0	$877	$684	N/A	N/A
Analogous Site 270-E-1 Neutralization Tank			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	☑	N/A
Compliance with ARARs	☐	☐	☑	☑	N/A
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	N/A
Short-term effectiveness	Moderate	Best	Least	Moderate	N/A
Reduction in TMV	Least	Least	Least	Least	N/A
Implementability	Best	Best	Moderate	Moderate	N/A
Cost (in thousands)					
Capital costs	$0	$35	$824	$472	N/A
Operating and maintenance costs	$0	$3,995	$0	$3,994	N/A
Non-discounted costs	$0	$4,040	$824	$4,467	N/A
Total present worth	$0	$868	$824	$1,305	N/A

Table 11. Preferred Alternative for the Representative Site 216-B-12 Crib and its Analogous Waste Sites[e] (costs in $1,000). (4 Pages)

Comparison of Alternatives - Representative Site 216-B-12 Crib and Associated Analogous Sites					
	Alternatives				
Criteria for Representative and Analogous Waste Sites	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barrier	⑤ RTD/ Barrier[d]
Analogous Site UPR-200-E-64		☑			
Threshold Criteria					
Overall protection	☐	☑	☑	☑	N/A
Compliance with ARARs	☐	☑	☑	☑	N/A
Balancing Criteria					
Long-term effectiveness	Least	Moderate	Best	Moderate	N/A
Short-term effectiveness	Moderate	Best	Least	Moderate	N/A
Reduction in TMV	Least	Least	Least	Least	N/A
Implementability	Best	Best	Moderate	Moderate	N/A
Cost (in thousands)					
Capital costs	$0	$35	$1,528	$972	N/A
Operating and maintenance costs	$0	$3,995	$0	$7,683	N/A
Non-discounted costs	$0	$4,030	$1,528	$8,655	N/A
Total present worth	$0	$868	$1,528	$2,590	N/A

[a]Maintain existing soil cover, monitored natural attenuation, and institutional controls.

[b]Removal, treatment, and disposal.

[c]Toxicity, mobility, or volume through treatment.

[d]Partial removal, treatment, and disposal with barrier.

[e]The choice of the preferred alternative is based on information at the writing of this feasibility study. The preferred alternative may be revised based on future characterization activities at the analogous sites.

[f]RPP-26744, *Hanford Soil Inventory*, predicts minimal contaminant inventory for this deep (~40 ft) waste site, which is beneath the Waste Encapsulation and Storage Facility (225-B Facility).

☑ = Indicates the preferred alternative (e).
☑ = Yes, meets threshold criterion.
☐ = No, does not meet threshold criterion.

ARAR = applicable or relevant and appropriate requirement.
IC = institutional controls.
MESC = maintain existing soil cover.
MNA = monitored natural attenuation.
N/A = not applicable.
RTD = removal, treatment, and disposal.
TMV = toxicity, mobility, or volume through treatment.

Table 12. Preferred Alternative for the Representative Site 216-S-7 Crib and its Analogous Waste Sites[e] (costs in $1,000). (3 Pages)

Comparison of Alternatives - Representative Site 216-S-7 Crib and Associated Analogous Sites					
	Alternatives				
Criteria for Representative and Analogous Waste Sites	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barrier	⑤ RTD/ Barrier[d]
Representative Site 216-S-7 Crib					☑
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Best	Least	Moderate	Moderate
Reduction in TMV[c]	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$45,747	$567	$2,431
Operating and maintenance costs	$0	$4,004	$0	$4004	$4,042
Non-discounted costs	$0	$4,040	$45,747	$4,571	$6,473
Total present worth	$0	$870	$45,747	$1,402	$3,272
Analogous Site 216-S-1&2 Cribs and UPR-200-W-36				☑	
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Least	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Best	Least	Moderate	Moderate
Reduction in TMV[c]	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$46,708	$546	$2,680
Operating and maintenance costs	$0	$4,004	$0	$4,004	$4,042
Non-discounted costs	$0	$4,040	$46,708	$4,550	$6,722
Total present worth	$0	$870	$46,708	$1,380	$3,521
Analogous Site 216-S-4 French Drain			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Moderate	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Best	Least	Moderate	Moderate
Reduction in TMV	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate

Table 12. Preferred Alternative for the Representative Site 216-S-7 Crib and its Analogous Waste Sites[e] (costs in $1,000). (3 Pages)

Comparison of Alternatives - Representative Site 216-S-7 Crib and Associated Analogous Sites					
	Alternatives				
Criteria for Representative and Analogous Waste Sites	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barrier	⑤ RTD/ Barrier[d]
Cost (in thousands)					
Capital costs	$0	$35	$2,068	$433	$1,179
Operating and maintenance costs	$0	$4,042	$0	$4,042	$4,042
Non-discounted costs	$0	$4,078	$2,068	$4,475	$5,221
Total present worth	$0	$877	$2,068	$1,274	$2,020
Analogous Site 216-S-22 Crib			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Moderate	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Best	Least	Moderate	Moderate
Reduction in TMV	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$1,812	$504	$1,129
Operating and maintenance costs	$0	$4,004	$0	$4,004	$4,004
Non-discounted costs	$0	$4,040	$1,812	$4,508	$5,113
Total present worth	$0	$870	$1,812	$1,338	$1,964
Representative Site 216-S-23 Crib		☑			
Threshold Criteria					
Overall protection	☐	☑	☑	☑	☑
Compliance with ARARs	☐	☑	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Moderate	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Best	Least	Moderate	Moderate
Reduction in TMV[c]	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$5,564	$715	$3,377
Operating and maintenance costs	$0	$4,017	$0	$4,017	$4,004
Non-discounted costs	$0	$4,053	$5,564	$4,732	$7,381
Total present worth	$0	$872	$5,564	$1,552	$4,,212

Table 12. Preferred Alternative for the Representative Site 216-S-7 Crib and its Analogous Waste Sites[e] (costs in $1,000). (3 Pages)

Comparison of Alternatives - Representative Site 216-S-7 Crib and Associated Analogous Sites					
	Alternatives				
Criteria for Representative and Analogous Waste Sites	① No Action	② MESC, MNA, IC[a]	③ RTD[b]	④ Barrier	⑤ RTD/ Barrier[d]
Analogous Site 216-T-20 Trench			☑		
Threshold Criteria					
Overall protection	☐	☐	☑	☑	☑
Compliance with ARARs	☐	☐	☑	☑	☑
Balancing Criteria					
Long-term effectiveness	Least	Moderate	Best	Moderate	Moderate
Short-term effectiveness	Moderate	Best	Least	Moderate	Moderate
Reduction in TMV	Least	Least	Least	Least	Least
Implementability	Best	Best	Moderate	Moderate	Moderate
Cost (in thousands)					
Capital costs	$0	$35	$976	$439	$860
Operating and maintenance costs	$0	$3,993	$0	$3,993	$3,993
Non-discounted costs	$0	$4,029	$976	$4,432	$4,853
Total present worth	$0	$868	$976	$1,271	$1,693

[a] Maintain existing soil cover, monitored natural attenuation, and institutional controls.

[b] Removal, treatment, and disposal.

[c] Toxicity, mobility, or volume through treatment.

[d] Partial removal, treatment, and disposal with barrier.

[e] The choice of the preferred alternative is based on information at the writing of this feasibility study. The preferred alternative may be revised based on future characterization activities at the analogous sites.

☑ = Indicates the preferred alternative (e).
☑ = Yes, meets threshold criterion.
☐ = No, does not meet threshold criterion.

ARAR = applicable or relevant and appropriate requirement.
IC = institutional controls.
MESC = maintain existing soil cover.
MNA = monitored natural attenuation.
RTD = removal, treatment, and disposal.
TMV = toxicity, mobility, or volume through treatment.

Plug-in Approach

Under this approach, a standard remedy is selected that applies to waste sites with similar attributes, rather than to a specific waste site.

PLUG-IN OF 200-PW-2/4 OU SOIL WASTE SITES

The plug-in approach is a process that will help the Tri-Parties make remedial action decisions for waste sites that have not been addressed in this Plan, using these existing CERCLA evaluations. The agencies propose that the plug-in approach be used in future remedy decisions for three types of waste sites:

- Unknown waste sites that are discovered in the future
- Known waste sites that could be reassigned from another OU
- Confirmatory sampling that indicates variations from the defined site conceptual model such that the selected alternative is no longer protective and a different alternative must be selected.

The benefit of a plug-in approach focus is to expeditiously clean up waste sites that are similar to the 200-PW-2/4 OU waste sites. The traditional CERCLA approach for remedy selection requires the development of many proposed plans and RODs. The proposed plug-in approach would allow analyses, evaluations, and selection of preferred alternatives identified in the 200-PW-2/4 OU FS (DOE/RL-2004-85) and this Plan to be applied to similar waste sites. Building off of existing work allows remedial actions to begin earlier and streamlines a costly and often redundant remedy selection process.

Three elements/criteria are required to successfully use a plug-in approach.

- Establishing the Conceptual Model. Multiple analogous waste sites must be identified that share common physical and contaminant characteristics. These characteristics are known as the site conceptual model.
- Establishing the Standard Remedy. A remedial (cleanup) alternative, or standard remedy, must be established that has been shown to be protective and cost-effective for sites that share the common site conceptual model.
- Establishing Need for Remedial Action. Sites sharing a common site conceptual model must be shown to require remedial action because of contaminant concentrations that pose a risk to human health and the environment.

To use the plug-in approach for a waste site not evaluated in the FS, the site must fit the defined conceptual model and must be shown to require remedial action. The site then can be "plugged in" to the standard remedy. The following section describes how the plug-in approach would be used for remedy selection.

Establishing the Site Conceptual Model and Associated Standard Remedies

Four site conceptual models were defined, based on the following site characteristics:

- Type of contaminant at the waste site (e.g., radionuclides, nonradionuclides)
- Concentration of contaminant at the waste site
- Types of contaminated environmental media (e.g., soil) or material (e.g., concrete, metal, wood)
- Extent of contamination within the environment (i.e., the depth of discharge, the expected contaminant distributions (both lateral and vertical), and the potential for contaminant to affect groundwater).

Based on the representative sites evaluated in the FS, the following five site conceptual models were developed and the associated standard remedies were identified:

- Waste sites where no hazardous material was disposed of or where contaminants disposed of currently meet the RAOs. The standard remedy is defined as Alternative 1 – No Action.
- Waste sites where limited contamination exists, there is no potential for groundwater contamination, and contaminants are expected to meet the RAOs within the period of institutional controls. Contaminated environmental media include soil and solid waste, including debris and materials (e.g., timbers and vent pipes), associated with the waste sites. The standard remedy is defined as Alternative 2 – Maintain Existing Soil Cover, Monitored Natural Attenuation, and Institutional Controls.
- Waste sites where contaminants exceed the RAOs and contamination is relatively shallow and can be cost effectively remedied through removal, treatment, and disposal. Typically, these contaminants exceed the human health and ecological PRGs. Contaminated environmental media include soil and solid waste, including debris and materials (e.g., timbers and vent pipes), associated with the waste sites. The standard remedy is defined as Alternative 3 – Removal, Treatment, and Disposal.
- Waste sites where contaminants exceed the RAOs and the contaminants have a potential to adversely affect groundwater because of contaminants at significant depth. Contaminated environmental media include soil and solid waste, including debris and materials (e.g., timbers and vent pipes), associated with the waste sites. The standard remedy is defined as Alternative 4 – Engineered Surface Barrier.
- Waste sites where readily accessible contaminants exceed the human health RAOs or represent a significant potential intruder threat, and where the contaminants having potential to adversely affect groundwater are at significant depth. This is not applicable to sites where contaminants are in the shallow layer with no deep component or where contamination is very deep with no shallow component. Contaminated environmental media include soil, solid waste, debris, and materials (e.g., timbers and vent pipes) associated with the waste sites. The standard remedy is defined as Alternative 5 – Partial Removal, Treatment, and Disposal with Engineered Surface Barrier.

Establishing the Need for Remedial Action

Waste sites that share a common site conceptual model will "plug in" to the standard remedy if it is determined that remedial action is required because of the risk to human health and the environment. The risks for newly discovered waste sites will be evaluated following data evaluation. Remedial action will be required for sites that contain radioactive contaminants that exceed the RAOs. For sites that do not exceed these criteria, no further action is proposed.

Public Involvement in the Plug-in Approach

To ensure that the public is involved meaningfully when the plug-in approach is used, the Tri-Parties propose to publish these post-ROD changes as explanations of significant differences (ESD), consistent with EPA guidance. The

Public Comment Period:
TBD through TBD

Public Meetings:
To be scheduled during the public comment period.

Information Repositories:
This Proposed Plan is available for viewing at the following public information repositories:

University of Washington
Government Publications
Suzzallo Library
Seattle, Washington 98195
206/543-4664
ATTN: Eleanor Chase
email:
echase@u.washington.edu

Gonzaga University
Foley Center
East 502 Boone
Spokane, Washington 99258
509/323-6110
ATTN: Linda Pierce
email: pierce@gonzaga.edu

Portland State University
Branford Price Millar Library
934 SW Harrison
Portland, Oregon 97207-1151
503/725-4126
ATTN: Judy Andrews
email: andrewsj@pdx.edu

Washington State University
Public Reading Room
CIC, Room 101L
2770 University Drive
Richland, Washington 99352
509/372-7443
ATTN: Janice Parthtree
email: reading_room@pnl.gov

ESD includes a 30-day public comment period. The ESD must describe the nature of the significant changes, summarize the information that leads to making the changes, and affirm that the revised remedy complies with CERCLA and 40 CFR 300 (including ARARs).

These post-ROD changes will be evaluated at the following points in the plug-in process:

- When newly discovered waste sites are proven through sampling and analysis to be above remediation goals and can plug in to a standard remedy
- When confirmatory sampling indicates variations from the defined site conceptual model such that the selected alternative is no longer protective and a different standard remedy must be selected.

PUBLIC PARTICIPATION

Public Involvement

Tribal nations, stakeholders, and the general public are encouraged to review and provide comments on the 200-PW-2/4 OU Proposed Plan during the 45-day public comment period that runs from TBD to TBD.

Public Meeting

If requested, a public meeting will be held on this Plan. The public meeting will be held during the public comment period and will be announced in the *Tri-City Herald*.

Submitting Comments

The Tri-Parties will accept written comments on this Plan from TBD to TBD. Comments should be sent to John Price at the Washington State Department of Ecology via:

mail: ATTN: Mr. John Price, 3100 Port of Benton Blvd., Richland, WA 99352.
Richland, WA 99354-1670
fax: (509) 372-7971
email: jpri461@ecy.wa.gov

Hanford Public Information Repository Locations

Copies of this Plan are available at the Hanford Public Information Repositories located at the University of Washington in Seattle, Washington; Gonzaga University in Spokane, Washington; Portland State University in Portland, Oregon; and Washington State University in Richland, Washington.

The Proposed Plan also is available electronically at http://www.hanford.gov/public/calendar/ under the Public Comment Period section.

The Administrative Record also contains copies of the Proposed Plan and supporting documents. The Administrative Record is located at 2440 Stevens Center Place, Room 1101; Richland, Washington 99352. This information can be accessed electronically at http://www2.hanford.gov/arpir.

Points of Contact

Washington State Department of Ecology
John Price, Project Manager
(509) 372-7921

U.S. Environmental Protection Agency
Hanford Project Office
Craig Cameron, Project Manager
(509) 376-8665

U.S. Department of Energy Representative
Bryan Foley, Project Manager
(509) 373-7285

This page intentionally left blank.

DISTRIBUTION

Onsite		
1	U.S. Department of Energy Richland Operations Office	
	DOE Public Reading Room	H2-53
1	Pacific Northwest National Laboratory	
	Hanford Technical Library	P8-55
1	Lockheed Martin Information Technology	
	Document Clearance	H6-08

This page intentionally left blank.