DOE/RL-2005-64
Draft A

Proposed Plan for the 200-CS-1 Chemical Sewer Group Unit

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

United States Department of Energy
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United States Department of Energy

United States Environmental Protection Agency

Tri-Party Agreement

State of Washington Department of Ecology

PROPOSED PLAN FOR THE

200-CS-1 CHEMICAL SEWER GROUP OPERABLE UNIT

HANFORD SITE
RICHLAND, WASHINGTON

INTRODUCTION

The 200-CS-1 Operable Unit (OU), located on the Central Plateau of the Hanford Site, includes two ditches, a disposal trench, and two disposal ponds that pose a potential risk to human health and the environment. Remedial actions are being considered to reduce these risks. The 200-CS-1 OU waste sites received primarily liquid effluents with low concentrations of contaminants from Hanford Site processing operations in the 200 East and 200 West Areas (shown in Figure 1). The following five waste sites make up the 200-CS-1 OU:

- 216-A-29 Ditch
- 216-B-63 Trench
- 216-S-10 Ditch
- 216-S-10 Pond
- 216-S-11 Pond.

This document presents the Proposed Plan (Plan) for the 200-CS-1 OU, describes the cleanup alternatives that have been evaluated, and identifies the preferred remedial alternative for each waste site. Remedial actions are evaluated in accordance with the requirements of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA). Four of the five sites – 216-A-29 Ditch, 216-B-63 Trench, 216-S-10 Ditch, and 216-S-10 Pond – are *Resource Conservation and Recovery Act of 1976* (RCRA) treatment, storage, and/or disposal (TSD) units. This Plan also identifies how RCRA closure of these sites will be coordinated with the CERCLA remedial actions.

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 CERCLA and in accordance with the *Hanford Federal Facility Agreement and Consent Order*, also known as the Tri-Party Agreement (Ecology et al. 1989).

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 State of Washington 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.

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

RCRA
Resource Conservation and Recovery Act of 1976

DOE

U.S. Department of Energy

EPA

U.S. Environmental Protection Agency

Ecology

State of Washington Department of Ecology

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.

TSD Unit

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

ROD

Record of Decision

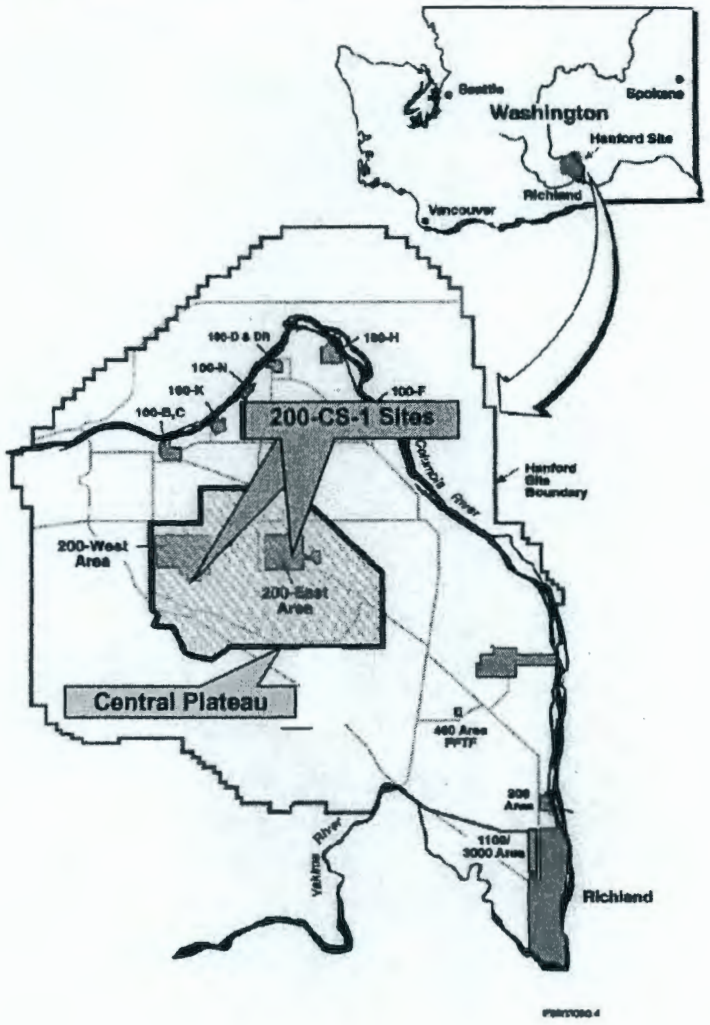
The document that sets forth the selected remedial measure and provides the rationale for its selection.

NEPA

National Environmental Policy Act of 1969

A Federal law that requires Federal agencies to evaluate the environmental, ecological, and socioeconomic impacts of proposed decisions and take action to mitigate where appropriate.

Figure 1. The Hanford Site and Location of the 200-CS-1 Operable Unit Sites.



The Tri-Parties are issuing this Plan as part of the public participation responsibilities under Section 117(a) of CERCLA and 40 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. Ecology is issuing draft permit modifications for closure of the RCRA TSD units as required by *Washington Administrative Code* (WAC) 173-303-840, "Procedures for Decision Making," in conjunction with this Plan. If requested, a combined public meeting/public hearing for the CERCLA Proposed Plan and RCRA draft Closure Plan will be held during the public comment period 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 Record of Decision (ROD).

Also incorporated into this Plan are elements necessary to meet DOE's responsibilities under the *National Environmental Policy Act of 1969* (NEPA).

Coordination of RCRA closure activities with the CERCLA remedial action will optimize timing and efficiency and is consistent with the provisions contained in the Tri-Party Agreement. In addition, because of similarities in design and construction requirements for the CERCLA remedy and the TSD unit closures, Ecology proposes to implement closure activities for these units by using the remedial design/remedial action work plan for the CERCLA remedies.

This Plan and the draft permit modification are based on key information that can be found in greater detail in the feasibility study (DOE/RL-2005-63, *Feasibility Study for the 200-CS-1 Chemical Sewer Group Operable Unit*) and other documents contained in the Administrative Record. These documents provide a more comprehensive record of the history, previous studies, and site descriptions considered in the evaluation of remedial alternatives and selection of preferred remedies.

Feasibility Study

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

Administrative Record

The files containing the documents used to select the remedial action. The Administrative Record can be accessed through the Information Repositories locations listed at the end of this plan.

OVERVIEW OF THE PROPOSED PLAN

This Plan proposes remedial actions for the 200-CS-1 OU waste sites. During the remedial investigation phase, four of the five waste sites (216-A-29 Ditch, 216-B-63 Trench, 216-S-10 Ditch, and 216-S-10 Pond) were chosen for comprehensive field investigation. One of these four sites, the 216-S-10 Pond, is very similar to the remaining site, 216-S-11 Pond. The 216-S-10 Pond serves as a representative site for the 216-S-11 Pond for the purposes of alternative evaluation and remedy selection.

Table 1 provides a summary of the key contaminant information known about the waste sites in this Plan, such as risk-based concerns, contaminants, maximum concentrations, and distribution below ground surface.

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 (MESC/MNA/IC)
- Alternative 3 – Removal, Treatment, and Disposal (RTD)
- Alternative 4 – Engineered Barrier (also known as the capping alternative) (includes Monitored Natural Attenuation for short-lived radioisotopes).

The alternatives were evaluated based on CERCLA-specified criteria. A preferred remedy was selected for each waste site based on this evaluation. Given the varied nature and extent of the contamination across the waste sites, no single alternative was selected as preferred for all waste sites. Table 2 identifies the selected alternative for each site.

The combined present-worth cost for implementing the 200-CS-1 OU preferred alternatives and the RCRA TSD Closure is estimated to be approximately $4.2 million.

Table 1. Summary of Contaminants and Risk Information from 200-CS-1 Operable Unit Sites.

Waste Site	Risk-Based Concern	Contaminant	Maximum Concentration and Depth Below Ground Surface[a]	Cleanup standards
216-A-29 Ditch	Groundwater protection	Nitrate/nitrite as N	423 mg/kg @ 7.5 – 8.5 ft	83 mg/kg
	Ecological impact	Selenium Silver PCBs	2.52 mg/kg @ 9 – 11 ft 42.2 mg/kg @ 4 – 5 ft 9400 µg/kg @ 4 – 5 ft	0.78 mg/kg 2 mg/kg 650 µg/kg
216-B-63 Trench	None	N/A	--	--
216-S-10 Ditch	Ecological impact	Chromium Silver PCBs	815 mg/kg @ 0 – 1.5 ft 30.4 mg/kg @ 0 – 1.5 ft 3700 mg/kg @ 0 – 1.5 ft	67 mg/kg 2 mg/kg 650 µg/kg
216-S-10 Pond[b]	None	N/A	--	--

a. Depth to groundwater is approximately 270 ft for samples collected in the 200 East Area and 200 ft for samples collected in the 200 West Area.

b. Contaminants and risks associated with 216-S-10 Pond are assumed to be similar to contaminants and risks from the 216-S-11 Pond.

PCB = polychlorinated biphenyl. RAO = remedial action objective.
N/A = not applicable; no contaminants of concern present.

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

- Background of the 200-CS-1 OU
- Scope and role of the proposed actions
- Site risks
- Remedial action objectives (RAO) and preliminary remediation goals (PRG)
- Summaries and evaluations of remedial alternatives
- Preferred alternatives for the different waste sites
- Strategies for streamlining future actions (plug-in approach)
- Integration with the RCRA TSD unit closure
- Public participation.

Investigation and evaluation of the 200-CS-1 OU waste sites were conducted in accordance with CERCLA. Actual or potential releases of hazardous substances could present an imminent and substantial danger to public health and welfare or the environment. Potential risks were evaluated to determine the need to take remedial action at these sites. The Tri-Parties believe that the remedial actions described in this Plan are necessary to protect public health and welfare and the environment.

Table 2. Preferred Alternatives for 200-CS-1 Operable Unit Waste Sites.

Waste Site	Alternative				Estimated cost[a,b] ($ in thousands)	Justification for Preferred Alternative
	① No Action	② MESC, MNA, IC	③ RTD	④ Engineered Barrier		
216-A-29 Ditch			☑		$2,759	The RTD alternative is as protective of groundwater and ecological receptors as the engineered barrier alternative and provides greater assurance of long-term effectiveness and permanence. The contaminants of concern are within the top 3 m (10 ft). Removal and disposal in the Environmental Restoration Disposal Facility represent an effective use of resources.
216-B-63 Trench	☑				$0	The no-action alternative meets the threshold criteria for overall protection of human health and the environment and compliance with ARARs because contaminants are within the 95% upper confidence limit for direct human contact, groundwater protection, or ecological receptors.
216-S-10 Ditch			☑		$1,679	The RTD alternative is as protective of groundwater and ecological receptors as the engineered barrier alternative and provides greater assurance of long-term effectiveness and permanence. The contaminants of concern are within the top 4.6 m (15 ft). Removal and disposal in Environmental Restoration Disposal Facility represent an effective use of resources.
216-S-10 Pond (representative site and analogous site 216-S-11 Pond)	☑				$0	The no-action alternative meets the threshold criteria for overall protection of human health and the environment and compliance with ARARs because no contaminants of concern are present above preliminary remediation goal levels established for direct human contact, groundwater protection, or ecological receptors.

a. Present-worth (discounted) estimates are a rough order of magnitude and can be 30% under or 50% over due to uncertainties.
b. The cost shown includes the RCRA treatment, storage, and/or disposal closure.

ARAR = applicable or relevant and appropriate requirement.
IC = institutional controls.
MESC = maintain existing soil cover.
MNA = monitored natural attenuation.
RCRA = *Resource Conservation and Recovery Act of 1976.*
RTD = removal, treatment, and disposal.

SITE BACKGROUND

Hanford Site

The Hanford Site (Figure 1) is a 1517 km² (586-mi²) federal facility located in southeastern Washington State along the Columbia River. From 1943 to 1989, the primary mission of the Hanford Site was the production of nuclear materials for national defense. The production mission resulted in the construction of many processing and support facilities along with the generation of large volumes of liquid and solid wastes that remain to be cleaned up. 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. Waste sites in the 200-CS-1 OU are located in the 200 Areas in the portion of the Hanford Site referred to as the Central Plateau.

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).

Central Plateau

The Central Plateau, occupying about 195 km² (75 mi²) in the central portion of the Hanford Site, served as the center for nuclear material processing. The Central Plateau 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

Central Plateau

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

products, and waste partitioning. The 200 North Area was used for the interim storage and staging of irradiated fuel. Major chemical processes in the Central Plateau resulted in delivery of high-activity waste streams to systems of large underground tanks. Low-activity liquid wastes were discharged to trenches, cribs, drains, and ponds. The groundwater is approximately 80 m (270 ft) below ground surface in the 200 East Area and approximately 60 m (200 ft) in the 200 West Area. The groundwater underlying the Central Plateau has been contaminated by a variety of past-practice activities during Hanford's operations.

200-CS-1 Operable Unit

The 200-CS-1 OU includes five soil waste sites resulting from discharges to chemical sewers from the Reduction-Oxidation Plant Canyon, the Plutonium-Uranium Extraction Plant, and the 1970s cesium/strontium recovery operations at B Plant. Chemical sewer streams were intended to serve nonradioactive operations in areas such as operating galleries, service areas, aqueous makeup galleries, and maintenance areas. The plants discharged out-of-specification chemical batches, noncontaminated floor drain waste liquids, nonradiological process wastes, non-process steam condensates, and noncontaminated vessel coil wastes, as well as raw water to dilute chemical additions. These streams became contaminated with generally low levels of radionuclides as a result of unspecified process upsets.

The two ponds were constructed from natural depressions that covered several acres allowing large volumes of liquid effluent to collect and gradually percolate into the soil column. The trench served the same purpose but was long, narrow, and relatively shallow. The ditches were long, narrow channels used to convey large volumes of liquid effluent to one of the ponds or another soil-based liquid disposal site. Additional information about these sites is contained in Table 3 and in Chapter 2.0 of the feasibility study (DOE/RL-2005-63).

Very low levels of fission products, plutonium, and small quantities of uranium were discharged to these sites, except for the 216-S-10 Ditch system where more than 215 kg of uranium were reportedly discharged. Contaminant inventories for these streams are not well documented because there were few requirements for sampling of nonradioactive effluent streams for most of the operating period of these sites. Chemical discharges reported to the 200-CS-1 OU waste sites included chemicals used in the plant processes, such as aluminum nitrate, hydrazine, sodium nitrate, sodium hydroxide, sodium phosphate, sodium fluoride, sodium carbonate, sodium nitrite, potassium chromate, potassium permanganate, potassium hydroxide, sulfuric acid, oxalic acid, nitric acid, hydrogen peroxide, and calcium nitrate. Various organic process chemicals were discharged into the sewer stream, although in small amounts.

The 200-CS-1 OU waste sites are not suspected to have contributed to the already contaminated groundwater. Monitoring and treatment of the groundwater is currently ongoing by the Groundwater Remediation Project.

Table 3. 200-CS-1 Operable Unit Waste Sites.

Waste site	Dimensions	Operating period	Effluent volume discharged to site	Background
216-A-29 Ditch	1220 m long 1.8 m wide 0.6 – 4.6 m deep — 4,000 ft long 6 ft wide 2 – 15 ft deep	1955 to 1991	Nominal 22,700,000 L/day — 6,000,000 gal/day	The 216-A-29 Ditch received liquid effluents from the Plutonium-Uranium Extraction Plant chemical sewer. The site includes the open unlined ditch, a concrete spillway covering the first 3 m (10 ft) of the ditch, a culvert that routed the ditch under a road, and a flow control structure near the ditch exit to the 216-B-3-3 Ditch (in the 200-CW-1 OU). Limited stabilization, consisting of pushing contaminated soils into the bottom of the ditch and backfilling the ditch with clean fill, was performed after the ditch was taken out of service.
216-B-63 Trench	427 m long 1.2 m wide 3 m deep — 1,400 ft long 4 ft wide 10 ft deep	1970 to 1992	378,000 – 1,400,000 ℓ/day — 100,000 – 400,000 gal/day	The 216-B-63 Trench received emergency cooling water and chemical sewer discharges from B Plant via the 207-B Retention basin (in the 200-CW-1 OU). The site includes the open, unlined trench with rock fill in the first 3 m (10 ft), a 1.5 m (5 ft) inlet pipe approximately 1 m (3 ft) below grade, and a wier box used for flow control at the inlet. Previous cleanup was performed in 1970 when the bottom and sides were dredged out. Contaminated soil from that dredging was disposed of in the 218-E-12B Burial Ground. The trench was backfilled with clean soil after it was taken out of service.
216-S-10 Ditch	686 m long 1.8 m wide 1.8 m deep — 2,250 ft long 6 ft wide 6 ft deep	1951 to 1991	Nominal maximum 568,000 L/day — 150,000 gal/day	The 216-S-10 Ditch received wastewater from Reduction-Oxidation Plant operations. The site includes the open, unlined ditch and several pits adjacent to the ditch used for disposal of contaminated sediment dredged from the ditch in 1955. The ditch was originally used as the disposal site for the wastewater from the Reduction-Oxidation Plant. The 216-S-10 and 216-S-11 Ponds were added in 1954 to provide additional capacity. The volume of wastewater generated subsided by 1984 so the additional ponds were no longer needed. Parts of the ditch were backfilled with clean soil in 1984.
Representative Site 216-S-10 Pond	Irregular shape Approximately 20,200 m^2 2.4 m deep — 5 acres 6 ft deep	1954 to 1984	Nominal maximum 568,000 L/day — 150,000 gal/day	The 216-S-10 Pond received Reduction-Oxidation Plant wastewater via the 216-S-10 Ditch. The pond is unlined and includes four finger-shaped trenches. The pond was backfilled with clean soil in 1984 concurrent with a portion of the 216-S-10 Ditch.
Analogous site 216-S-11 Pond	Irregular shape ~6,000 m^2 — 1.5 acres	1954 to 1965	Nominal maximum 568,000 L/day — 150,000 gal/day	The 216-S11 Pond received Reduction-Oxidation Plant wastewater via the 216-S-10 Ditch. The pond is unlined and consists of two interconnecting lobes. The south lobe was backfilled with clean soil in 1975. The entire site was surface stabilized in 1983.

SCOPE AND ROLE OF ACTION

This Plan presents proposed remedial actions for contaminated soils and components associated with liquid waste disposal sites in the 200-CS-1 OU. In accordance with CERCLA requirements, waste sites within the OU were investigated to determine contaminants of concern (COC) and the potential risk to human health and the environment associated with those contaminants. RAOs define the acceptable risk and were established based on reasonably anticipated future land use, applicable or relevant and appropriate requirements (ARAR), and site-specific considerations.

PRGs establish residual soil concentrations for COCs that meet the acceptable risk standards defined in the RAOs.

Alternative remedies are evaluated to determine the specific remedial action necessary to ensure that risks to human health and the environment meet the RAOs and are therefore protective of human health and the environment. The preferred alternative for each waste site is selected because it addresses existing and potential future threats to human health and the environment from waste site contaminants and best meets the CERCLA evaluation criteria.

COC

Contaminants of concern
A list of radioactive and/or chemical constituents that are a risk to human health or the environment.

Remedial actions for other waste sites adjacent to the 200-CS-1 OU sites are being evaluated in accordance with commitments established in the Tri-Party Agreement. Remediation of 200-CS-1 OU waste sites is a source control action that will protect the groundwater OUs (200-BP-5, 200-PO-1, and 200-UP-1) from future contamination. The scope of this Plan does not include remediation of the groundwater beneath these waste sites. Monitoring and treatment of the groundwater is currently ongoing as part of the Hanford Site Groundwater Remediation Project.

Investigation Approach

During the remedial investigation, four of the five waste sites – 216-A-29 Ditch, 216-B-63 Trench, 216-S-10 Ditch, and 216-S-10 Pond – were chosen for comprehensive field investigation. These sites are RCRA TSD sites and were characterized to comply with RCRA closure requirements. The 216-A-29 Ditch represented the anticipated "worst case" level and extent of contamination based on reported discharges and inventory. Detailed characterization data are contained in DOE/RL-2004-17, *Remedial Investigation Report for the 200-CS-1 Chemical Sewer Group Operable Unit.*

The 216-S-10 Pond is representative of the remaining site, 216-S-11 Pond, because it served the same function, is similar geologically, and received waste from the same source. Characteristics of 216-S-10 Pond, as well as the impact on human health and the environment, are considered to be representative of the characteristics and impact of 216-S-11 Pond. Findings and conclusions from the investigation of this representative site are used to evaluate remedial action alternatives for the similar, or analogous, waste sites. As discussed in DOE/RL-98-28, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program,* this analogous site approach streamlines the investigation process by grouping similar sites together.

Waste site sampling will be conducted during field implementation of the remedial action to demonstrate that RAOs are being met. Confirmatory samples will be taken at the analogous site, 216-S-11 Pond, where the remedy was selected based on conclusions drawn from the evaluation of the 216-S-10 Pond. For sites where removal, treatment, and disposal is the selected action, confirmatory data will be collected using the observational approach, meaning samples will be taken during excavation activities. Verification samples will be collected at the proposed end of the remedial action to demonstrate that PRGs have been achieved.

For sites where contaminated soils will remain in place, samples will be collected to confirm the assumptions used to analyze risks associated with that site, including determination of the nature and extent of contamination.

Land Use

The DOE is expected to continue industrial-exclusive land use activities on the Central Plateau 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." 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

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 known as the Core Zone. 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).

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

response to the 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 and not include contamination outside the 200 Area fences.

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 approximately 50 years
  - Industrial land use (non-DOE worker) for 100 years after that
  - 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 foreseeable future
  - Any selected remedy will not allow further degradation of groundwater from the 200-CS-1 OU waste sites
  - No drilling will be allowed for water or other purposes 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 150 years from now for information purposes.

Applicable or Relevant and Appropriate Requirements

ARARs are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated into Federal or state law or regulation 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 regulation can be used as a "To Be Considered" (TBC) criteria. A more detailed discussion of the potential ARARs and TBCs associated with the 200-CS-1 OU waste sites is found in Appendix B of the feasibility study. Key potential ARARs and TBCs used for the remedy selection for 200 CS-1 OU sites are as follows:

- WAC 173-340-745, "Soil Cleanup Standards for Industrial Properties," which identifies contaminant concentrations in soil that are protective of human health
- WAC 173-340-747, "Deriving Soil Concentrations for Groundwater Protection," which identifies contaminant concentrations in soils that are protective of groundwater
- OSWER Directive 9200.4-31P, *Radiological Risk Assessment at CERCLA Sites*, which identifies a dose rate limit of 15 mrem/yr above background to achieve the excess lifetime cancer risk threshold of $1x10^{-6}$ to $1x10^{-4}$
- DOE-STD-1153-2002, *A Graded Approach to Evaluating Radiation Doses to Aquatic and Terrestrial Biota*, which identifies radionuclide concentrations in soil that are protective of the ecological habitat

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

COPC

Contaminant of potential concern

The list of all hazardous substances potentially present at a waste site. This list drives the investigation approach and characterization methods. The final list of COCs is derived from the initial list of COPCs after evaluation of characterization data and risk assessment results.

- WAC 173-340-900, "Tables," Table 749-3, "Ecological Indicator Soil Concentrations for Protection of Terrestrial Plants and Animals," which identifies chemical concentrations in soil that are protective of ecological receptors.

SUMMARY OF SITE RISKS

As part of the remedial investigation process, contaminants of potential concern (COPC) were identified for the 200-CS-1 OU based on a review of process history, event reports, and available sampling data. A baseline risk assessment was conducted considering the COPCs to evaluate potential adverse impacts to human health and the environment in the absence of any remedial action. Screening levels for determination of potential risk were derived from applicable standards such as those identified in the previous section.

Contaminants that potentially contribute to risk to human health and the environment were more extensively evaluated in the feasibility study. A conceptual model was developed to define the exposure pathways that are considered during the feasibility study risk assessment. Exposure scenarios were based on these potential exposure pathways and reasonably anticipated future land uses. Risk analysis methods reflect the Tri-Parties' response to HAB Advice #132 and assume industrial use of the Central Plateau Core Zone. The risk assessment considers direct contact to the future industrial worker, groundwater protection, and ecological protection. The findings of the risk evaluation for the 200-CS-1 OU are summarized below. Table 4 provides a summary of site risks identified during the risk assessment using site-specific fate and transport analysis.

Table 4. Summary of Site Risks from 200-CS-1 Operable Unit Sites.

Waste site	Risk-based concern	Summary of risk	Basis for action
216-A-29 Ditch	Groundwater protection	Nitrate/nitrite concentrations exceed standards	Yes
	Ecological protection	Silver, selenium, and polychlorinated biphenyls exceed standards	
216-B-63 Trench	None	No risks identified	No
216-S-10 Ditch	Ecological protection	Total chromium, silver, polychlorinated biphenyls exceed standards	Yes
Representative Site 216-S-10 Pond and analogous site 216-S-11 Pond	None	No risks identified	No

- The 200-CS-1 OU sites are not highly contaminated. Contamination is not widespread, concentrations are not particularly elevated, and concentrations that are elevated are found in localized areas.
- Significant portions of the sites are not affected or exhibit constituent concentrations comparable to background.
- There are no unacceptable direct human exposure risks from any of the 200-CS-1 OU sites.
- Nitrite/nitrate from the 216-A-29 Ditch and 216-B-63 Trench has the potential to migrate through the vadose zone to impact groundwater and result in

concentrations exceeding federal groundwater standards. These impacts are predicted to occur after approximately 800 years.

- There are no unacceptable impacts to groundwater from the 216-S-10 Ditch or the 216-S-10 Pond and its analogous site, 216-S-11 Pond.
- Localized areas of elevated constituents are found at depths of about 1.5 to 3 m (5 to 10 ft) below ground surface at the 216-A-29 Ditch (selenium, silver, polychlorinated biphenyls [PCB]) that pose a slight threat to ecological receptors.
- Three constituents – total chromium, silver, and PCBs – may pose a limited threat to ecological receptors at one discrete location at the 216-S-10 Ditch.

In addition to the risk analysis required by CERCLA, the Tri-Parties have elected to evaluate potential risks to a postulated inadvertent intruder for information purposes. The inadvertent intruder scenario assumes that institutional controls could lapse 100 years following site closure. For this scenario, site closure is assumed to occur in approximately 50 years. Three inadvertent intruder scenarios were evaluated: a construction trench worker, a well driller, and a rural resident. An exposure scenario that accounts for traditional Native American activities was also evaluated. Intruder scenario evaluations were conducted for the 216-A-29 Ditch, 216-B-63 Trench, and 216-S-10 Ditch. Evaluation of the 216-S-10 Pond was not necessary because there are no COCs that exceed levels protective of human health and the environment. The results of the intruder scenario evaluations showed that there are no unacceptable risks to a potential future intruder for the 200-CS-1 OU sites.

Inadvertent Intruder Scenario

An exposure scenario in which the receptor could unknowingly be exposed to contamination in the waste site area. Scenarios evaluated include a construction trench worker, a well driller, and a rural resident.

Native American scenario

An exposure scenario that accounts for traditional Native American activities, such as hunting, gathering, and cultural and religious activities.

It is the Tri-Parties current judgement that action is necessary to protect human health and the environment from releases and potential releases of hazardous substances into the environment for the 216-A-29 Ditch, 216-B-63 Trench, and 216-S-10 Ditch based on the potential for exposure to groundwater and ecological receptors. For representative site 216-S-10 Pond and analogous site 216-S-11 Pond, no risks to human health and the environment have been identified. Remedial action alternatives for the 216-S-10 and 216-S-11 Ponds will be evaluated to complete the remedial investigation and feasibility study process.

REMEDIAL ACTION OBJECTIVES

The RAOs identified for the 200-CS-1 OU are based on the evaluation of reasonably anticipated futures land uses, conceptual models for exposure pathways, and ARARs. RAOs are general statements describing what the remedial action is expected to accomplish while protecting human health and the environment. They are defined as specifically as possible and consider the following variables:

- Media of interest (e.g., contaminated soil, solid waste)
- Types of contaminants (e.g., radionuclides, inorganic and organic chemicals)
- Potential receptors (e.g., humans, animals, plants)
- Possible exposure pathways (e.g., external radiation, ingestion)
- Levels of residual contaminants that may remain following remediation (i.e., contaminant levels below cleanup standards or below a range of levels for different exposure routes).

RAO 1

RAO 1 is satisfied if the following condition is met:

Soil concentrations of COCs do not exceed applicable thresholds for protection of ecological receptors.

RAO 2

RAO 2 is satisfied if the following conditions are met:

Terrestrial animal exposure rates do not exceed 0.1 rad/day

Waste is 15 ft or more below the ground surface.

RAO 3

RAO 3 is satisfied if the following conditions are met:

Soil concentrations are below WAC 173-340-747, "Deriving Soil Concentrations for Ground Water Protection," groundwater protection methods, or

The flux of contaminants into groundwater does not cause groundwater concentrations to exceed maximum contaminant levels, or

The flux of contaminants into groundwater is reduced or eliminated, based on a decreasing trend in the difference between the concentration of contaminants in up-gradient and down-gradient wells.

RAO 4

RAO 4 is satisfied if the following conditions are met:

RAOs 1, 2, and 3 are met

Cultural and ecological reviews are performed to evaluate the construction area for potential impacts (e.g., bird nesting grounds) and appropriate mitigative measures are implemented.

PRGs

Preliminary Remediation Goals

PRGs are developed during the CERCLA process to identify cleanup levels to be achieved during remediation. PRGs may be refined in the ROD to become final cleanup levels (i.e., the remedial action goals).

The RAOs identified for the 200-CS-1 OU are:

- RAO 1 – Prevent unacceptable risk to 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).
- RAO 2 – Provide cleanup protective for ecological receptors by:
  - Protecting ecological receptors based on a dose rate limit of 0.1 rad/day for terrestrial wildlife populations (DOE-STD-1153-2002), which is a TBC criteria.
- RAO 3[1] – 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," groundwater protection criteria so that no further degradation of the groundwater results from contaminant leaching from 200-CS-1 OU sites.
- RAO 4 –Prevent adverse impacts to cultural resources and threatened or endangered species and minimize wildlife habitat disruption.

The RAOs were used to develop the PRGs discussed below.

Preliminary Remediation Goals

PRGs were developed to establish residual soil concentrations for individual contaminants that are protective of human health and the environment. PRGs are established for each of the COCs to guide remedial action and demonstrate that the RAOs have been met. PRGs are developed considering the observed constituent concentrations at the waste sites compared to:

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

A detailed evaluation of the COPCs and COCs from which to derive the PRGs is contained in Chapter 3.0 of the feasibility study. Numeric soil PRGs 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-CS-1 OU waste sites will be issued in the ROD. Table 5 summarizes the PRGs developed for the 200-CS-1 OU.

[1]NOTE: Protection of the Columbia River from contaminants in this OU is achieved through RAO 3; there is no surface water in the immediate vicinity of the waste sites that requires a separate RAO.

Table 5. Preliminary Remediation Goals for the 200-CS-1 Operable Unit.

Constituent of concern	PRG_{soil}	Basis
Nitrate/nitrite as N	83 mg/kg	Protection of groundwater at 216-A-29 Ditch based on federal drinking water standard of 10 mg/L
Selenium	0.78 mg/kg	Protection of ecological receptors at 216-A-29 Ditch based on Ecology 94-115, *Natural Background Soil Metals Concentrations in Washington State*
Silver	2 mg/kg	Protection of ecological receptors at 216-A-29 and 216-S-10 Ditches based on WAC 173-340-900
Polychlorinated biphenyls	650 µg/kg	Protection of ecological receptors at 216-A-29 and 216-S-10 Ditches based on WAC 173-340-900
Total chromium	67 mg/kg	Protection of ecological receptors at 216-S-10 Ditch based on WAC 173-340-900
Strontium-90	22.5 pCi/g	Protection of ecological receptors at 216-B-63 Trench based on DOE-STD-1153-2002

pCi = picoCuries. WAC = *Washington Administrative Code.*

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. 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 feasibility study. The Tri-Parties believe that remedial action is necessary at two of the waste sites addressed by this Plan (216-A-29 Ditch, 216-S-10 Ditch) to protect human health and 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 and welfare or the environment. The Tri-Parties believe that remedial actions are not necessary at three of the waste sites addressed by this Plan (216-B-63 Ditch, 216-S-10 Pond, 216-S-11 Pond), because contamination levels are below levels considered protective of human health and the environment.

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-CS-1 OU. The contaminants, waste form, and waste location were all considered as part of this process. As discussed in Chapters 4.0 and 5.0 of the feasibility study, 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 feasibility study identified four remedial alternatives for detailed and comparative analyses:

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. In the no-action alternative, the existing contaminated 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.

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.

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 approved disposal facility, on or off the Hanford Site for disposal, as necessary.

ERDF

Environmental Restoration Disposal Facility

ERDF is the Hanford Site's disposal facility for most waste and contaminated environmental media generated as part of a CERCLA response action. The ERDF currently receives wastes from ongoing cleanup activities at the Hanford Site's 100, 200, and 300 Areas.

Evapotranspiration

The portion of precipitation returned to the air through direct evaporation and by transpiration of vegetation.

remains in place. Verification sampling is performed to confirm that the no-action decision is protective. The no-action alternative is generally not selected unless a site poses no unacceptable risk to human health and the environment.

Alternative 2 – **Maintain Existing Soil Cover, Monitored Natural Attenuation, and Institutional Controls.** Existing soil covers (e.g., the clean fill placed over the waste site to stabilize it) are maintained as needed to provide 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. The existing soil cover is relied upon to break the exposure pathway until monitored natural attenuation reduces contaminant levels 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. Active institutional controls will be maintained for at least 150 years or until no longer required due to natural attenuation of COCs.

Alternative 3 – **Removal, Treatment, and Disposal.** Structures and soils with contaminant concentrations exceeding the PRGs are excavated, treated as necessary, and disposed of in an approved disposal facility such as the Environmental Restoration Disposal Facility (ERDF) in accordance with established waste acceptance criteria. Some materials (e.g., non-hazardous debris) may be disposed of off the Hanford Site, as appropriate. 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 appropriate waste acceptance criteria. As the contaminated material is excavated, it is characterized and segregated before being transported for disposal. Excavation would continue until contaminated material exceeding the PRGs is removed and the site is backfilled with clean material. The surface would be recontoured and revegetated to be compatible with surrounding natural areas or other features.

Alternative 4 – **Engineered Barrier.** This alternative consists of constructing surface barriers over contaminated waste sites to control the amount of water that infiltrates into the site to reduce or eliminate contaminant leaching to groundwater. In addition to their hydrological performance, barriers can also function as physical barriers to prevent intrusion by human and ecological receptors, limit wind and water erosion, and provide radiation shielding. The preferred capping technology for the Hanford Site is an evapotranspiration (ET) barrier. ET barriers rely on the water-holding capacity of soil, evaporation from the near-surface, and plant transpiration to control water movement through the barrier. Site-specific designs will be developed as part of the remedial design process and will consider the RAOs and other requirements defined in the record of decision, regulatory design and performance standards, material availability, cost effectiveness, current surface barrier technology information, and site-specific hydrologic and physical performance requirements to ensure waste containment and to inhibit human and biotic intrusion if necessary. This alternative includes provisions for groundwater monitoring for those waste sites with contamination predicted to impact groundwater. 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. Active institutional controls will

be maintained for at least 150 years or until no longer required due to natural attenuation of COCs.

SUMMARY OF ALTERNATIVE EVALUATIONS AND PREFERRED ALTERNATIVES

The Tri-Parties expect the preferred alternative to satisfy the following statutory requirements of CERCLA §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.

CERCLA Evaluation Criteria

EPA has developed nine CERCLA criteria to address statutory requirements and the technical and policy considerations important for selecting remedial alternatives. These criteria, listed below, serve as the basis for conducting detailed and comparative analyses of the alternatives and for the subsequent selection of appropriate remedial actions.

Threshold criteria are those that must be met. Any alternative that does not meet these criteria is eliminated from further consideration.

- *Overall Protection of Human Health and the Environment* is the primary objective of the remedial action and addresses whether a remedial action provides adequate overall protection of human health and the environment. This criterion must be met for a remedial alternative to be eligible for consideration.
- *Compliance with Applicable or Relevant and Appropriate Requirements* addresses whether a remedial action will meet all of the applicable or relevant and appropriate requirements and other federal and state environmental statutes, or provides grounds for invoking a waiver of the requirements. This criterion must be met for a remedial alternative to be eligible for consideration.

Balancing criteria are used to weigh trade-offs among alternatives and are the basis for preferred alternative selection.

- *Long-Term Effectiveness and Permanence* refers to the magnitude of residual risk and the ability of a remedial action to maintain long-term, reliable protection of human health and the environment after remedial goals have been met.
- *Reduction of Toxicity, Mobility, or Volume Through Treatment* refers to an evaluation of the anticipated performance of the treatment technologies that may be employed in a remedy. Reduction of toxicity, mobility, and/or volume contributes toward overall protectiveness.
- *Short-Term Effectiveness* refers to the speed at which the remedy achieves protection. It also refers to the health and safety impacts to remediation workers and physical, biological, and cultural impacts that might result from construction and implementation of the remedial action.
- *Implementability* refers to the technical and administrative feasibility of a remedial action, including the availability of materials and services needed to implement the selected solution.

The 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.

- *Cost* refers to an evaluation of the capital, operation and maintenance, and monitoring costs for each alternative. Discounted or present-worth costs are used as a means to compare costs for different alternatives that may be implemented over long periods of time.

Modifying criteria are used to refine remedy selection. Community acceptance of a preferred alternative can only be determined following the public comment period.

- *State Acceptance* considers the issues and concerns of the State of Washington, as represented by Ecology, with the preferred alternative, based on review of the feasibility study and this Plan.
- *Community Acceptance* assesses the general public response to this Plan, following a review of the public comments received during the public comment period and open community meetings. The remedial action is selected only after consideration of this criterion.

Remedial Alternatives

Remedial 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

A cap also is known as an engineered barrier.

The next sections describe the evaluation conducted for each waste site in the 200-CS-1 OU. The evaluation includes a description of how the alternative performed against the nine CERCLA criteria and a rationale for selection of the preferred alternative. Additional detail is included in Chapters 6.0 and 7.0 of the feasibility study.

Under Alternative 1 – No Action, no remedial activities, including monitoring, would be performed.

Under Alternative 2 – MESC/MNA/IC, existing soil covers would be maintained to provide protection from intrusion by human and/or biological receptors. Legal and physical barriers also would be used to prevent unauthorized human access to the site. The existing soil covers would break the pathway between human and ecological receptors and the contaminants. Groundwater monitoring may be included in this alternative.

Alternative 3 – RTD includes removal of contaminated soil and debris (such as concrete or pipe associated with the sites), treatment as necessary to meet disposal facility waste acceptance criteria, and disposal at an approved waste disposal facility. Soil in the shallow zone would be removed to meet PRGs.

Alternative 4 – Engineered Barrier, includes stabilization of the existing site; excavation or importation, transportation, and placement of capping material; compaction of the cap, and long-term maintenance of the capping system. Institutional controls, including maintenance of the cap, use restrictions, and monitoring, would be instituted at capped sites for at least 150 years or until the PRGs are achieved through natural attenuation. The cap would be designed to address potential lapse of institutional controls. Long-term effectiveness depends on the proper construction and maintenance of the cap and associated institutional controls throughout the natural attenuation time frame to prevent exposure to potential receptors. Maintenance activities would include erosion repairs and possible vegetation maintenance. Subsidence is not considered a major factor in maintenance activities. Failure of the cap is unlikely if maintenance and institutional control activities continue. Caps would be designed and constructed to minimize maintenance requirements and impacts from the lapse of institutional controls.

Waste Site 216-A-29 Ditch

Based on current available information, the 216-A-29 Ditch exceeds groundwater protection standards for nitrate as nitrogen. Site-specific modeling shows that maximum nitrate as nitrogen concentrations in the groundwater are 14 mg/L, slightly in excess of federal drinking water standards of 10 mg/L. Concentrations of silver, selenium, and PCBs exceed ecological protection standards. Contaminants at this waste site do not exceed standards for direct human exposure. The contaminants exceeding PRGs are present in the shallow zone at depths to approximately 4 m (13 ft) in the southern-most 296 m (970 ft) portion of the ditch and at a depth of 3 m (10 ft) in the northern 780.5 m (2,560 ft) section of the entire 1220 m (4,000 ft) long the 216-A-29 Ditch.

COCs at 216-A-29 Ditch

Direct Exposure

None

Groundwater Protection

Nitrate/Nitrite

Ecological Protection

Silver

Selenium

PCBs

216-A-29 Ditch – Alternative Evaluations

The no-action alternative would fail to provide overall protection of human health and the environment because contaminants at concentrations above the PRGs would remain on site with no measures to prevent or monitor their migration to the groundwater or impact on ecological receptors. As a result, Alternative 1 would not meet the ARARs. Contaminants are predicted to reach the groundwater; therefore, the no-action alternative would not provide long-term effectiveness and permanence for groundwater protection. Reduction of toxicity, mobility, or volume would occur to some extent in the form of natural attenuation, but the heavy metals and PCBs are persistent in the environment and require a long period to attenuate naturally. Because of the concentrations of contaminants and the substantial length of time required for natural attenuation processes to meet PRGs, the no-action alternative fails to reduce the toxicity, mobility, or volume of contaminants. No short-term risks to humans would be associated with the no-action alternative because no remedial activities would be conducted. Current risks to workers are not an issue because no activity would occur directly in connection with the ditch and appropriate safety measures are taken for work activities in nearby areas. Contaminants at the 216-A-29 Ditch exceed ecological protection standards that would not be mitigated in the no-action alternative. Therefore, it fails to meet the criterion for short-term effectiveness. The no-action alternative could be implemented immediately and would involve no cost.

The MESC/MNA/IC alternative is not protective of human health and the environment because contaminants exceed both groundwater and ecological PRGs in the 0 to 4.6 m (0 to 15-ft) zone. As a result, this alternative does not comply with ARARs. This alternative does not provide long-term effectiveness because contaminants still would be predicted to reach the groundwater at levels above the drinking water standards and potential risks to burrowing animals and deep-rooted plants would continue to exist. Limited reduction of toxicity, mobility, or volume would occur in the form of natural attenuation, but the heavy metals and PCBs are persistent in the environment and require a long period to attenuate naturally. Because of the concentrations of contaminants and the substantial length of time required for natural attenuation processes to meet PRGs, this alternative fails to reduce the toxicity, mobility or volume of contaminants. Only minimal short-term risks to worker are expected, associated with monitoring and maintenance activities. Experienced workers using appropriate safety precautions would conduct these activities. As such, the risk to workers is qualitatively identified as low. The short-term impacts to the

Shallow Zone

The part of the waste site from ground surface to 4.6 m (15 ft) below ground surface.

environment are expected to be low because the site has already been highly disturbed. The MESC/MNA/IC alternative is similar to ongoing surveillance and maintenance programs on the site and could be readily implemented. The total discounted cost is approximately $868,000 and includes at least 150 years of periodic surveillance for evidence of contamination and biologic intrusion; emplacement of vegetation, herbicide application, or other activities to control deep-rooted plants; control of deep burrowing animals; maintenance of signs and/or fencing; maintenance of the existing soil cover (including an assumed periodic addition of soil); administrative controls; and site reviews.

In the RTD alternative, removal of the contaminated soil would provide overall protection of human health and the environment by eliminating the risk to the groundwater and ecological receptors because contamination above PRGs occurs only in the shallow zone (<4.6 m [15 ft]). The RTD alternative also complies with ARARs. The RTD alternative meets the long-term effectiveness and permanence criterion because it removes the contaminants from the vadose zone and eliminates the potential risk to groundwater and ecological receptors. Excavation and transportation of contaminated soil would disturb areas beyond the waste site boundaries during the implementation period. These areas would need to be revegetated after disturbance and would require activities to control intrusion by non-native, noxious plants. This should not adversely affect the alternative in the long term. No specific treatment has been identified for contaminated soils from the 216-A-29 Ditch, but movement of the waste to an approved disposal facility is expected to result in reduction of mobility and protection against remobilization of contaminants over their current location. The levels of contamination in the 216-A-29 Ditch do not pose a significant dose threat to workers. As such, shielded excavation equipment for these wastes should not be required. Excavation with dust suppression and health and safety controls has been proven effective in excavating soil sites. Physical disruption of the waste sites during excavation, increased human activity, and noise, in addition to the generation of fugitive dust, affect local biological resources. The surface area disturbed during excavation and construction activities at 216-A-29 Ditch will be 1.3 ha (3.2 acres). Design activities and remediation would take approximately 18 months and remove approximately 1,835.6 m^3 (2,399 yd^3). Once completed, all long-term RAOs will be met, protecting groundwater and reducing risk to ecological receptors. The non-discounted cost for implementation of the RTD alternative at the 216-A-29 Ditch is approximately $2.8 million.

In the capping alternative, the capping system would break potential exposure pathways to receptors through placement of a surface barrier to limit infiltration and intrusion and would be protective of human health and the environment. The cap would limit migration of contaminants to the groundwater and provide additional distance and barriers between potential ecological receptors beyond the existing soil cover. This alternative would comply with all ARARs by breaking the pathways for exposure and emplacing caps that meet the intent of the regulations. In addition, this alternative would meet the long-term effectiveness and permanence criterion by reducing the ability of contaminants to move from the shallow zone to the groundwater and by physically separating contaminants from ecological receptors. Modeling with the cap in place shows no impact to the groundwater in 1,000 years. Reduction of toxicity, mobility, or volume is achieved by substantially reducing the

moisture movement through the waste site and, as a result, reducing the mobility of contaminants through the vadose zone. For this alternative, only moderate short-term risks are expected. The capping alternative would not require excavation of contaminated soils, so the risks to workers would primarily be associated with general construction activities at the borrow sites and placement of the cap. Worker risk would be controlled through adherence to site health and safety procedures. Physical disruption of the waste sites during cap construction, increased human activity and noise, and the generation of fugitive dust affect local biological resources. Short-term impacts to vegetation and animals at these sites would be low because these sites currently are poor wildlife habitats. This alternative is considered readily implementable. Construction of the caps would follow standard procedures that have been thoroughly field-tested. Remedial design and construction of the cap for this waste site would take approximately 18 months with a final cap area of 3.28 ha (8.1 acres). The total discounted cost for the 216-A-29 Ditch is approximately $9.5 million and includes placement of the ET barrier and at least 150 years of long-term operations and maintenance consisting of site inspection/surveillance, periodic radiation site surveys of surface soil, biotic control, maintenance of signs and markers, cover maintenance, and site reviews.

216-A-29 Ditch – Preferred Alternatives Selection Rationale

Preferred alternative for 216-A-29 Ditch

Alternative 3

Removal, Treatment & Disposal

The preferred alternative for the 216-A-29 Ditch is Alternative 3 – Removal, Treatment, and Disposal – to mitigate risks associated with contaminants that exceed PRGs for protection of groundwater and ecological receptors. The no-action and MESC/MNA/IC alternatives do not meet threshold criteria for overall protection of human health and the environment or compliance with ARARs. The RTD alternative will provide the same level of protection to the groundwater and ecological receptors as the capping alternative because the excavated material will be disposed of in ERDF, an approved land disposal facility that will also be protected by an engineered surface barrier. The RTD alternative provides long-term effectiveness and permanence of the remedy equivalent to the capping alternative. Excavation to the depth of the contaminants at this site (3.3 m [11 ft]) is readily achievable with minimal risk to remediation workers. The RTD alternative also is the most cost effective of the alternatives that meet the threshold criteria. Table 6 summarizes the analysis of alternatives supporting the selection of the preferred alternative.

Capital costs

Costs associated with construction or implementation of the remedial action, including remedial design, excavation, barrier placement, installation of monitoring equipment, etc.

Non-discounted costs

Costs associated with long-term operations and maintenance, including surveillance, maintenance, barrier maintenance after initial installation, groundwater monitoring, etc.

Present-worth costs

Technique used to compare different costs by computing the current value, whether the costs occur in the present or in the future.

COCs at 216-B-63 Trench

Direct Exposure

None

Groundwater Protection

Nitrate/nitrite

Ecological Protection

Strontium-90

Table 6. Comparison of Alternatives for the 216-A-29 Ditch.

CERCLA Criteria for Evaluation	Alternatives			
	① No Action	② MESC, MNA, IC	③ RTD	④ Engineered Barrier
216-A-29 Ditch			☑	
Threshold Criteria				
Overall protection	☐	☐	☑	☑
Compliance with ARARs	☐	☐	☑	☑
Balancing Criteria				
Long-term effectiveness	◇	◇	◆	◈
Short-term effectiveness	◈	◆	◈	◈
Reduction in TMV	◇	◇	◇	◇
Implementability	◆	◈	◆	◆
Cost (in thousands)				
Capital costs	$0	$35,400	$2,759,317	$3,587,527
Non-discounted costs	$0	$4,031,232		$25,954,293,
Total present worth	$0	$868,340	$2,759,317	$9,488,213

☑ = Indicates the preferred alternative.
☑ = Yes, meets criterion.
☐ = No, does not meet criterion.
◆ = High: best satisfies evaluation guidelines.
◈ = Moderate: partially satisfies evaluation guidelines.
◇ = Low: least satisfies evaluation guidelines.

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.

The choice of the preferred alternative is based on information available at the writing of the feasibility study (DOE/RL-2005-63) and this Plan and may be revised if new information becomes available.

Waste Site 216-B-63 Trench

Based on current information, contaminants in soils surrounding the 216-B-63 Trench do not exceed levels protective of human health, groundwater, or ecological receptors.

216-B-63 Trench – Alternative Evaluations

The no-action alternative provides overall protection of human health and the environment because contaminants are below PRG values for direct human contact, groundwater protection, and ecological receptors. As a result, Alternative 1 meets the ARARs and provides long-term effectiveness and permanence for protection of human health and the environment. Reduction of toxicity, mobility, or volume is not necessary because the no-action alternative meets the threshold criteria for overall protection of human health and the environment and compliance with ARARs because COCs are within the 95% upper confidence limit for direct human contact, groundwater protection, or ecological receptors. Current risks to workers are not an issue because of the low levels of contamination. No disturbance of surface soils is required; therefore, potential short-term risk to the environment is limited. The no-action alternative could be implemented immediately and would involve no cost.

Alternatives 2 through 4 are not necessary because there are no COCs to monitor, remove, or cap. These alternatives were not further considered for the 216-B-63 Trench.

216-B-63 Trench – Preferred Alternative Selection Rationale

The preferred alternative for the representative site 216-B-63 Trench is Alternative 1 - No Action. No COCs are present above PRG levels established for direct human contact, groundwater protection, or ecological receptors. The no-action alternative meets the threshold criteria for overall protection of human health and the environment and compliance with ARARs. Table 7 summarizes the analysis of alternatives supporting the selection of the preferred alternative.

Preferred Alternative for 216-B-63 Trench

Alternative 1

No Action

Table 7. Comparison of Alternatives for the 216-B-63 Trench.

CERCLA Criteria for Evaluation	Alternatives			
	① No Action	② MESC, MNA, IC	③ RTD	④ Engineered Barrier
216-B-63 Trench	☑			
Threshold Criteria				
Overall protection	☑	N/A	N/A	N/A
Compliance with ARARs	☑	N/A	N/A	N/A
Balancing Criteria				
Long-term effectiveness	◆	N/A	N/A	N/A
Short-term effectiveness	◆	N/A	N/A	N/A
Reduction in TMV	◆	N/A	N/A	N/A
Implementability	◆	N/A	N/A	N/A
Cost (in thousands)				
Capital costs	N/A	N/A	N/A	N/A
Non-discounted costs	N/A	N/A	N/A	N/A
Total present worth	N/A	N/A	N/A	N/A

☑ = Indicates the preferred alternative.
☑ = Yes, meets criterion.
☐ = No, does not meet criterion.
◆ = High: best satisfies evaluation guidelines.
◈ = Moderate: partially satisfies evaluation guidelines.
◇ = Low: least satisfies evaluation guidelines.

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.

The choice of the preferred alternative is based on information available at the writing of the feasibility study (DOE/RL-2005-63) and this Plan and may be revised if new information becomes available in the future.

COCs at 216-S-10 Ditch

Direct Exposure

None

Groundwater Protection

None

Ecological Protection

Total chromium

Silver

PCBs

Representative Waste Site 216-S-10 Ditch

Based on current information, contaminants in near-surface soils surrounding the 216-S-10 Ditch exceed levels protective of ecological receptors for total chromium, silver, and PCBs. Contaminants at this waste site do not exceed standards for direct human exposure or groundwater protection. The contaminants exceeding PRGs are present in the shallow zone at depths to approximately 1.2 m (4 ft) along the northeastern 290 m (960 ft) of the 685 m (2,250 ft) long ditch.

Waste Site 216-S-10 Ditch Alternative Evaluations

Alternative 1, the no-action alternative, would fail to provide overall protection of human health and the environment because contaminants at concentrations above the PRGs would remain on site with no measures to prevent or monitor their impact on ecological receptors. As a result, Alternative 1 would not meet the ARARs and would not provide long-term effectiveness and permanence for ecological protection. Reduction of toxicity, mobility, or volume would be minimal because heavy metals and PCBs are persistent in the environment and require a long time to attenuate naturally. No short-term risks to humans would be associated with the no-action alternative because no remedial activities would be conducted. Current risks to workers are not an issue because no activity would occur directly in connection with the ditch and appropriate safety measures are taken for work activities in nearby areas. Contaminants at the 216-S-10 Ditch exceed ecological protection standards and would not be mitigated in the no-action alternative. Therefore, it fails to meet the criterion for short-term effectiveness. The no-action alternative could be implemented immediately and would involve no cost.

The MESC/MNA/IC alternative is not protective of human health and the environment because contaminants exceed ecological PRGs in the shallow zone (<4.6 m [15 ft]). As a result, this alternative does not comply with ARARs and does not provide long-term effectiveness for ecological protection because potential risks to burrowing animals and deep-rooted plants are still present. Reduction of toxicity, mobility, or volume would be minimal because heavy metals and PCBs are persistent in the environment and require a long time to attenuate naturally. Minor short-term worker risks are expected associated with monitoring and maintenance activities. Experienced workers using appropriate safety precautions would conduct these activities. As such, the risk to workers is qualitatively identified as low. The short-term impacts to the environment are expected to be low because the site has already been highly disturbed. The MESC/MNA/IC alternative is similar to ongoing surveillance and maintenance programs on the site and could be readily implemented. The total discounted cost is approximately $875,000 and includes at least 150 years of periodic surveillance for evidence of contamination and biologic intrusion; emplacement of vegetation, herbicide application, or other activities to control deep-rooted plants; control of deep burrowing animals; maintenance of signs and/or fencing; maintenance of the existing soil cover (including an assumed periodic addition of soil); administrative controls; and site reviews.

In the RTD alternative, removal of the contaminated soil would provide overall protection of human health and the environment by eliminating the risk to ecological receptors because contamination at the 216-S-10 Ditch above PRGs

occurs only in the near the surface (4.6 m [15 ft]). The RTD alternative also complies with ARARs. The RTD alternative meets the long-term effectiveness and permanence criterion because it removes the contaminants from the shallow zone and eliminates the potential risk to ecological receptors. Excavation and transportation of contaminated soil would disturb areas beyond the waste site boundaries during the implementation period. These areas would need to be revegetated after disturbance and would require activities to control intrusion by non-native, noxious plants. This should not adversely affect the alternative in the long term. No specific treatment has been identified for contaminated soils from the 216-S-10 Ditch, but movement of the waste to an approved disposal facility that includes a RCRA compliant liner and an engineered barrier is expected to result in reduction of mobility and protection against remobilization of contaminants over their current location. The levels of contamination in the 216-S-10 Ditch do not pose a significant dose threat to workers. As such, shielded excavation equipment for these wastes should not be required. Excavation with dust suppression and health and safety controls has been proven effective in remediating soil sites. Physical disruption of the waste sites during excavation, increased human activity, and noise, in addition to the generation of fugitive dust, affect local biological resources. The surface area disturbed during excavation and construction activities at 216-S-10 Ditch will be 0.49 ha (1.2 acres). Design activities and remediation would take approximately 14 months and remove approximately 2,498.2 m^3 (3,265 yd^3) of contaminated soil. Once completed, all long-term RAOs will be met, reducing risk to ecological receptors. The discounted cost for implementation of the RTD alternative at the 216-S-10 Ditch is approximately $1.7 million.

In the capping alternative, the capping system would break potential exposure pathways to receptors through placement of a surface barrier to limit intrusion and would be protective of human health and the environment. The cap would provide additional distance between potential ecological receptors beyond the existing soil cover. Alternative 4 would comply with all ARARs by breaking the pathways for exposure and emplacing caps that meet the intent of the regulations. The capping alternative would meet the long-term effectiveness and permanence criterion by physically separating contaminants from ecological receptors. Reduction of toxicity, mobility, or volume is achieved by limiting the ability of the ecological receptors to come in contact with the contaminants. For Alternative 4, only moderate short-term risks are expected. The capping alternative would not require excavation of contaminated soils, so the risks to workers primarily would be associated with general construction activities at the borrow sites and placement of the cap. Worker risk would be controlled through adherence to site health and safety procedures. Physical disruption of the waste sites during cap construction, increased human activity and noise, and the generation of fugitive dust affect local biological resources. Short-term impacts to vegetation and animals at these sites would be low because these sites currently are poor wildlife habitats. The capping alternative is considered readily implementable. Construction of the caps would follow standard procedures that have been thoroughly field-tested. Design and construction of the cap for this waste site would take approximately 15 months with a final cap covering 0.93 ha (2.3 acres). The total discounted cost for the 216-S-10 Ditch is approximately $3.6 million and includes placement of the ET barrier and at least 150 years of long-term operations and maintenance consisting of site

inspection/surveillance, periodic radiation site surveys of surface soil, biotic control, maintenance of signs and markers, cover maintenance, and site reviews.

216-S-10 Ditch – Preferred Alternative Selection Rationale

Preferred Alternative for 216-S-10 Ditch

Alternative 3

Removal, Treatment, and Disposal

The preferred alternative for the 216-S-10 Ditch is Alternative 3 – Removal, Treatment, and Disposal – to mitigate risks associated with contaminants that exceed PRGs for protection of ecological receptors. The no-action and MESC/MNA/IC alternatives do not meet threshold criteria for overall protection of human health and the environment and compliance with ARARs. The RTD alternative provides long-term effectiveness and permanence of the remedy equivalent to the capping alternative. The RTD alternative will provide the same level of protection to ecological receptors as the capping alternative because the excavated material will be disposed of in an approved land disposal facility that will also be protected by an engineered surface barrier. Excavation to the depth of the contaminants at this site (1.2 m [4 ft]) is readily achievable with minimal risk to remediation workers. The RTD alternative is also the most cost effective of the alternatives that meet the threshold criteria. Table 8 summarizes the analysis of alternatives supporting the selection of the preferred alternative.

Table 8. Comparison of Alternatives for the 216-S-10 Ditch.

CERCLA Criteria for Evaluation	Alternatives			
	① No Action	② MESC, MNA, IC	③ RTD	④ Engineered Barrier
216-S-10 Ditch			☑	
Threshold Criteria				
Overall protection	☐	☐	☑	☑
Compliance with ARARs	☐	☐	☑	☑
Balancing Criteria				
Long-term effectiveness	◇	◇	◆	◈
Short-term effectiveness	◈	◇	◈	◈
Reduction in TMV	◇	◇	◇	◇
Implementability	◆	◈	◆	◈
Cost (in thousands)				
Capital costs	$0	$35,400	$1,679,178	1,647,518
Non-discounted costs	$0	$4,077,514		$8,456,185
Total present worth	$0	$876,538	$1,679,178	$3,573,574

☑ = Indicates the preferred alternative.
☑ = Yes, meets criterion.
☐ = No, does not meet criterion.
◆ = High: best satisfies evaluation guidelines.
◈ = Moderate: partially satisfies evaluation guidelines.
◇ = Low: least satisfies evaluation guidelines.

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.

The choice of the preferred alternative is based on information available at the writing of the feasibility study (DOE/RL-2005-63) and this Plan and may be revised if new information becomes available in the future.

Representative Waste Site 216-S-10 Pond and Analogous Site 216-S-11 Pond

Based on current information, contaminants in soils surrounding representative site 216-S-10 Pond and analogous site 216-S-11 Pond do not exceed levels protective of human health, groundwater, or ecological receptors.

COCs at 216-S-10 Pond and 216-S-11 Pond

Direct Exposure

None

Groundwater Protection

None

Ecological Protection

None

216-S-10/216-S-11 Ponds – Alternatives Evaluation

Alternative 1, the no-action alternative, provides overall protection of human health and the environment because contaminants are below PRG values for direct human contact, groundwater protection, and ecological receptors. As a result, Alternative 1 meets the ARARs and provides long-term effectiveness and permanence for protection of human health and the environment. Reduction of toxicity, mobility, or volume is not necessary because there are no COCs. Minimal short-term risks to humans would be associated with the no-action alternative because no remedial activities would be conducted except for confirmatory sampling at 216-S-11 Pond. Current risks to workers are not an issue because of the low-levels of contamination. No disturbance of surface soils except to take confirmatory samples is required; therefore, potential short-term risk to the environment is limited. The no-action alternative could be implemented immediately and would involve no cost except for sampling.

Alternatives 2 through 4 are not necessary because there are no COCs to monitor, remove, or cap. These alternatives were not further considered for the 216-S-10 Pond and its analogous site, 216-S-11 Pond.

216-S-10/216-S-11 Ponds – Preferred Alternative Selection Rationale

The preferred alternative for the representative site 216-S-10 Pond and analogous site 216-S-11 Pond is Alternative 1 – No Action. No COCs are present above PRG levels established for direct human contact, groundwater protection, or ecological receptors. The no-action alternative meets the threshold criteria for overall protection of human health and the environment and compliance with ARARs. Sampling will be required at 216-S-11 Pond to confirm the conclusions drawn from evaluation of 216-S-10 Pond are valid. Tables 9 and 10 summarize the analysis of alternatives supporting the selection of the preferred alternative.

Preferred Alternative for 216-S-10 Pond and 216-S-11 Pond

Alternative 1

No Action

Table 9. Comparison of Alternatives for the 216-S-10 Pond.

CERCLA Criteria for Evaluation	Alternatives			
	① No Action	② MESC, MNA, IC	③ RTD	④ Engineered Barrier
Representative Site 216-S-10 Pond	☑			
Threshold Criteria				
Overall protection	☑	N/A	N/A	N/A
Compliance with ARARs	☑	N/A	N/A	N/A
Balancing Criteria				
Long-term effectiveness	◆	N/A	N/A	N/A
Short-term effectiveness	◆	N/A	N/A	N/A
Reduction in TMV	◆	N/A	N/A	N/A
Implementability	◆	N/A	N/A	N/A
Cost (in thousands)		N/A	N/A	N/A
Capital costs	N/A	N/A	N/A	N/A
Non-discounted costs	N/A	N/A	N/A	N/A
Total present worth	N/A	N/A	N/A	N/A

☑ = Indicates the preferred alternative.
☑ = Yes, meets criterion.
☐ = No, does not meet criterion.
◆ = High: best satisfies evaluation guidelines.
◈ = Moderate: partially satisfies evaluation guidelines.
◇ = Low: least satisfies evaluation guidelines.

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.

The choice of the preferred alternative is based on information at the writing of the feasibility study (DOE/RL-2005-63) and this Plan and may be revised if new information becomes available in the future.

Table 10. Comparison of Alternatives for the 216-11 Pond.

Comparison of Alternatives - Representative Site 216-S-11 Pond				
Criteria for Representative and Analogous Waste Sites	Alternatives			
	① No Action	② MESC, MNA, IC	③ RTD	④ Engineered Barrier
Representative Site 216-S-11 Pond	☑			
Threshold Criteria				
Overall protection	☑	N/A	N/A	N/A
Compliance with ARARs	☑	N/A	N/A	N/A
Balancing Criteria				
Long-term effectiveness	◆	N/A	N/A	N/A
Reduction in TMV	◆	N/A	N/A	N/A
Short-term effectiveness	◆	N/A	N/A	N/A
Implementability	◆	N/A	N/A	N/A
Cost (in thousands)				
Capital costs	N/A	N/A	N/A	N/A
Non-discounted costs	N/A	N/A	N/A	N/A
Total present worth	N/A	N/A	N/A	N/A

☑ = Indicates the preferred alternative.
☑ = Yes, meets criterion.
☐ = No, does not meet criterion.
◆ = High: best satisfies evaluation guidelines.
◈ = Moderate: satisfies evaluation guidelines.
◇ = Low: least satisfies evaluation guidelines.

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.

The choice of the preferred alternative is based on information at the writing of the feasibility study (DOE/RL-2005-63). The preferred alternative may be revised based on future characterization efforts at the analogous sites.

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 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 and take actions that protect, restore, and enhance the environment.

The NEPA-related resources and values considered for the 200-CS-1 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) for disturbed industrial areas that have low- to marginal-habitat quality. Long-term impacts identified for the remedies evaluated include potential aesthetic and visual impacts should the backfill after remediation 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.

NEPA

National Environmental Policy Act of 1969

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.

Summary of Alternatives Evaluation

Preferred Alternatives for 200-CS-1 Operable Unit Waste Sites

216-A-29 Ditch

Alternative 3 – Removal, Treatment, and Disposal

216-B-63 Trench

Alternative 1 – No Action

216-S-10 Ditch

Alternative 3 – Removal, Treatment, and Disposal

Representative site 216-S-10 Pond and analogous site 216-S-11 Pond

Alternative 1 – No Action.

The range of potential alternatives for the 200-CS-1 OU was evaluated to determine their ability to protect human health and the environment. The preferred alternatives for the waste sites are as follows:

- 216-A-29 Ditch – Alternative 3, Removal/Treatment/Disposal
- 216-B-63 Trench – Alternative 1, No Action
- 216-S-10 Ditch – Alternative 3, Removal/Treatment/Disposal
- Representative site 216-S-10 Pond and analogous site 216-S-11 Pond – Alternative 1, No Action.

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 risk analysis and alternatives evaluation shows the preferred alternatives satisfy the following statutory requirements of CERCLA §121(b):

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

PLUG-IN FOR FUTURE 200-CS-1 OPERABLE UNIT 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 similar to those evaluated in this Plan that are discovered in the future
- Known waste sites that could be reassigned from another OU
- Sites where 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.

The benefit of a plug-in approach is to expeditiously clean up waste sites within the Central Plateau. 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 feasibility study and this Plan to be applied to similar waste sites. Building off 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.

- Establish 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.

- Establish 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.
- Establish 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 feasibility study, 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

Two 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 impact groundwater).

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

- Waste sites where no hazardous material was disposed of or where contaminants in the soil currently meet the PRGs. The standard remedy is defined as Alternative 1 – No Action.
- Waste sites where limited contamination exists, there is no potential for groundwater contamination above applicable standards, and contaminants will meet PRGs for direct exposure to humans and ecological receptors with the active institutional control period of approximately 150 years. Contaminated environmental media include soil and underground structures (e.g., timbers and distribution pipes) associated with the waste sites. The standard remedy is defined as Alternative 2 – Maintain Existing Soil Cover/Monitored Natural Attenuation/Institutional Controls.
- Waste sites where contaminants exceed the RAOs and contamination is shallow, low volume, and can be cost effectively remedied through removal, treatment, and disposal. These contaminants may exceed the human health, groundwater, or ecological PRGs. Contaminated environmental media include soil and underground structures (e.g., timbers and distribution pipes) associated with the waste sites. The standard remedy is defined as Alternative 3 – Removal, Treatment, and Disposal.

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 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 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).

Significant Changes

Significant Changes generally involve a change to a component of a remedy that does not fundamentally alter the overall cleanup approach.

ESD

Explanation of significant differences must describe to the public the nature of the significant changes, summarize the information that led to making the changes, and affirm that the revised remedy complies with CERCLA.

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.

RCRA TSD UNIT CLOSURE PERFORMANCE STANDARDS AND CLOSURE STRATEGY

The RCRA TSD units within the 200-CS-1 OU include the 216-A-29 Ditch, the 216-B-63 Trench, and the 216-S-10 Pond and Ditch (two waste sites are combined into one TSD unit). These TSD units will undergo closure following the requirements of the Hanford Federal Facility Agreement and Consent Order (Ecology et al. 1989) (Tri-Party Agreement); WA7890008967, Hanford Facility Resource Conservation and Recovery Act Permit, ; and Washington Administrative Code (WAC) 173-303-610, "Dangerous Waste Regulations," "Closure and Post-Closure." Characterization sampling of these TSD units occurred in conjunction with the CERCLA remedial action for the 200-CS-1 OU.

The closure plans for 216-B-63 Trench and 216-S-10 Pond and Ditch TSD units state that the soils and structures can be clean closed as is without any need to coordinate remedial activities with the 200-CS-1 OU. The closure plan for the 216-A-29 Ditch is contained in the FS because closure is dependent on 200-CS-1 OU remedial activities. Public review and approval of the 216-A-29 Ditch closure plan is anticipated to occur concurrently with the review of this Proposed Plan. Public review and approval for the 216-B-63 Trench and 216-S-10 Pond and Ditch closure plans will occur separately from this Proposed Plan. The Hanford Facility RCRA Permit modification process will be determined based on the timing of the public review and approval process which is when the TSD units will be incorporated into the Hanford Facility RCRA Permit. RCRA/CERCLA integration of closure plan activities with the 200-CS-1 OU remedial actions is only needed for the 216-A-29 Ditch closure plan. The proposed closure strategy for each of these TSD units is as follows:

- 216-A-29 Ditch. Based on analytical data obtained during the remedial investigation and review of *Hanford Environmental Information System* (HEIS) data, all elements of this unit (soil and groundwater) are expected to qualify for clean closure in accordance with WAC 173-303-610(2) after remediation of

the soils. A plan for clean closure of this unit is provided in Appendix E of the feasibility study. A RCRA final status groundwater monitoring plan will not be required for this unit.

- 216-B-63 Trench. Based on analytical data obtained during the remedial investigation and review of HEIS data, all elements of this unit (soils, structures, and groundwater) qualify for clean closure in accordance with WAC 173-303-610(2) without further physical closure activities. A plan for clean closure of this unit is provided in DOE/RL-2006-11, *Hanford Facility Dangerous Waste Closure Plan for 216-B-63 Trench*. A RCRA final status groundwater monitoring plan will not be required for this unit.
- 216-S-10 Pond and Ditch. Based on analytical data obtained during the remedial investigation, the soils for this unit qualify for clean closure in accordance with WAC 173-303-610(2) without further physical closure activities. Based on review of HEIS data, the groundwater associated with this TSD unit does not meet the clean-closure levels and will require postclosure monitoring. A plan for clean closure of the soils associated with this unit is provided in DOE/RL-2006-12, *Hanford Facility Dangerous Waste Closure/Postclosure Plan for the 216-S-10 Pond and Ditch*. A RCRA final status groundwater-monitoring plan has been prepared separately from the closure plan.

PUBLIC PARTICIPATION

Public Involvement

Tribal nations, stakeholders, and the general public are encouraged to review and provide comments on the 200-CS-1 OU Proposed Plan during the 45-day public comment period that runs from TBD through TBD.

Public Meeting

Submitting Comments

The Tri-Parties will accept written comments on this Plan from TBD through 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 99354-1670
- fax: (509) 372-7971
- email: jpri461@ecy.wa.gov

If requested, a public meeting will be held to answer questions and take comments. To request a public meeting, contact John Price before TBD. The public meeting will be held during the public comment period and will be announced in the *Tri-City Herald*.

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.

This 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 this 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

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