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03-RCA-0181

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Addressees:

TRANSMITTAL OF THE FEASIBILITY STUDY FOR THE 200-CW-1 AND 200-CW-3 OPERABLE UNITS AND THE 200 NORTH AREA WASTE SITES, DOE/RL-2002-69, DRAFT A, AND THE PROPOSED PLAN FOR THE 200-CW-1 AND 200-CW-3 OPERABLE UNITS AND THE 200 NORTH AREA WASTE SITES, DOE/RL-2003-06, DRAFT A, AND PROPOSED RCRA PERMIT MODIFICATIONS, DRAFT A

The "Feasibility Study For the 200-CW-1 and 200-CW-3 Operable Units and the 200 North Area Waste Sites," DOE/RL-2002-69, Draft A, the "Proposed Plan For the 200-CW-1 and 200-CW-3 Operable Units and the 200 North Area Waste Sites," DOE/RL-2003-06, Draft A, and proposed RCRA Permit Modifications, Draft A, are attached in fulfillment of Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Interim Milestone M-015-38A due March 31, 2003.

A 45-day regulatory review of this report is scheduled from April 1, 2003, to May 15, 2003. If you have any questions on either document, please contact Bryan Foley, Waste Management Division, on (509) 376-7087, or Ellen Mattlin, of my staff, on (509) 376-2385.

Sincerely,

Joel Hebdon

Joel Hebdon, Director
Regulatory Compliance and Analysis Division

RCA:EMM

Attachment

cc: See page 2

cc w/o attach:
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G. M. Berg, FHI
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J. Price, Ecology
V. Crossman, EM-43
S. C. Golian, EM-22
Admin Record, H6-08 (200-CW-1, 200-CW-3, and 200 North)

# ATTACHMENT

# PART IV - UNIT SPECIFIC CONDITIONS FOR CORRECTIVE ACTION

# PART IV - UNIT SPECIFIC CONDITIONS FOR CORRECTIVE ACTION

## CHAPTER X
## 200-CW-1 Operable Unit and Miscellaneous 200 North Area *Resource Conservation and Recovery Act of 1976* Past-Practice Waste Sites

The 200-CW-1 Operable Unit includes liquid waste disposal sites that are undergoing corrective action. The 200 North Area includes several miscellaneous sites that are included with the 200-CW-1 Operable Unit remedial investigation/feasibility study process. As prescribed by Conditions II.Y. of this Permit, this Chapter sets forth the corrective action requirements for the 200-CW-1 Operable Unit (with the exception of the 216-B-3 Main Pond treatment, storage, and disposal unit [which consists of the 216-B-3 Pond and 216-B-3-3 Ditch] which is being included in the Permit through a separate Permit Modification document and the 216-B-3A, 216-B-3B, and 216-B-3C Expansion Ponds, which have been clean closed under the Permit) and for six waste sites in the 200 North Area (2607-N Septic Tank, 2607-P Septic Tank, 2607-R Septic Tank, 200-N-3 Ballast Pits, Unplanned Release UPR-200-N-1, and UPR-200-N-2).

### IV.X.A. COMPLIANCE WITH APPROVED PROPOSED PLAN

The Permittees shall comply with all requirements set forth in Attachment XX, pertinent sections of the *Proposed Plan for the 200-CW-1 Gable Mountain Pond/B Pond and Ditches Waste Group Operable Unit, the 200-CW-3 200 North Area Cooling Water Waste Group Operable Unit and the 200 North Area Waste Sites* (DOE/RL-2003-06).

Enforceable portions of the proposed plan are listed below:

1. Summary of Remediation Objectives

2. Summary of Remedial Alternatives

3. Evaluation of Alternatives

4. Summary of Preferred Alternatives

5. Table 1. Summary of Nonradionuclide Soil Preliminary Remediation Goals for all Pathways

6. Table 3. Preferred Remedial Alternatives for the 200-CW-1, 200-CW-3, and 200 North Area Waste Sites (this Permit modification does not include the 200-CW-3 sites, which are *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* past-practice sites)

**Attachment XX**

## SUMMARY OF REMEDIATION OBJECTIVES

Potential risks to human health and ecological receptors were evaluated in risk assessments for the representative sites, as documented in the FS (DOE/RL-2002-69).

The Tri-Parties believe that the preferred alternatives are necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment. Such a release, or threat of release, may present an imminent and substantial endangerment to public health, welfare, or the environment.

### Land Use

The reasonably anticipated future land use for the 200 Areas is continued industrial-exclusive activities. The reasonably anticipated land use for the areas outside the industrial-exclusive zone is conservation (mining). The DOE worked for several years with cooperating agencies and stakeholders to define land-use goals for the Hanford Site and develop future land-use plans (Drummond et al. 1992). The cooperating agencies and stakeholders included the National Park Service, Tribal Nations, states of Washington and Oregon, local county and city governments, economic and business development interests, environmental groups, and agricultural interests. These efforts culminated in the CLUP-EIS (DOE/EIS-0222-F) and the *Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (64 FR 61615), which were issued in 1999.

According to the CLUP-EIS, industrial (exclusive) land use would preserve DOE control of the continuing remediation activities and would use the existing compatible infrastructure required to support activities such as dangerous waste, radioactive waste, and mixed waste TSD facilities. The DOE and its contractors, and the U.S. Department of Defense and its contractors, could continue their Federal waste disposal missions, and the Northwest Low-Level Radioactive Waste Compact could continue using the U.S. Ecology site for commercial radioactive waste. Research supporting the dangerous waste, radioactive waste, and mixed waste TSD facilities also would be encouraged within this land-use designation. New uses of radioactive materials such as food irradiation could be developed and packaged for commercial distribution here under this land-use designation.

The conservation (mining) land use would enable the extraction of valuable near-surface geologic resources at some locations on the Hanford Site after obtaining NEPA, RCRA, CERCLA, or, where applicable, "State Environmental Policy Act" (SEPA) (*Revised Code of Washington* 43.21C) approval to protect NEPA-sensitive (e.g., biologic, geologic, historic, or cultural) resources. The Hanford Site has no proven reserve of any metallic ore bodies; therefore, heap/leach or open-pit mining methods would not be applicable.

In addition, the CLUP-EIS indicates that a notice-of-deed restriction would be placed in those areas where vadose zone contamination remained in place, according to the CERCLA ROD or Hanford Facility RCRA Permit, foreclosing the mining option. The

CLUP-EIS anticipates mining only for materials needed to build surface barriers as part of remedial actions and that mining would be precluded from contaminated areas. The conservation (mining) land use would afford protection of natural resources; however, other compatible uses, such as recreation or nonintrusive environmental research activities, also would be allowed, provided these activities are consistent with the purpose of the conservation land-use designation. Conservation would require active management practices to enhance or maintain the existing resources and to minimize or eliminate undesirable or non-native species.

The ROD (64 FR 61615) identifies conservation (mining) as an area reserved for the management and protection of archeological, cultural, ecological, and natural resources. Limited and managed mining (e.g., quarrying for sand, gravel, basalt, and topsoil for governmental purposes only) could occur as a special use (i.e., a permit would be required) within appropriate areas. Limited public access would be consistent with resource conservation. The ROD also indicates that mining would be restricted from contaminated areas.

The FS and the selection of remedial alternatives are based on the baseline assumption of industrial-exclusive and conservation land uses.

**Remedial Action Objectives**

**Remedial action objectives** (RAO) were developed based on the reasonably anticipated future land use, the conceptual site model, **applicable or relevant and appropriate requirements** (ARAR), and worker safety. The following RAOs were identified for these waste sites:

- **RAO 1** - Prevent or reduce risk to human health, ecological receptors, and natural resources associated with exposure to wastes or soil contaminated above ARARs or risk-based criteria
- **RAO 2** - Prevent migration of contaminants through the soil column to groundwater such that concentrations in groundwater are not predicted to exceed ARARs
- **RAO 3** - Prevent or reduce occupational health risks to workers performing remedial actions
- **RAO 4** - Minimize the general disruption of cultural resources and wildlife habitat and prevent adverse impacts to cultural resources and threatened or endangered species
- **RAO 5** - Provide conditions suitable for future industrial land use of the study area, including appropriate institutional controls and monitoring requirements to protect future users of remediated sites.

The RAOs provide the basis for determining the preliminary remediation goals for evaluation with the waste site contaminants and conceptual model. The RAOs will be finalized in the ROD for the OUs.

**Preliminary Remediation Goals**

Preliminary remediation goals were developed for a comprehensive list of **contaminants of potential concern** (COPC) to establish residual soil concentrations for individual contaminants that are protective of human health and the environment at a generic waste site. Following public comment, the PRGs will be issued in the ROD for these waste sites as remediation goals or cleanup levels.

Contaminant-specific cleanup levels may differ for individual waste sites based on site-specific conditions (e.g., size of the waste site, nature and extent of contamination in the soil column) or to achieve the overall RAOs for the waste sites (e.g., cumulative risk from multiple contaminants, protection of groundwater). Changes to contaminant-specific cleanup levels will require advanced approval by the EPA and documentation in the verification/closeout reports for individual waste sites.

Numeric soil PRGs were developed independently for the protection of human health, the protection of ecological receptors, and the protection of groundwater based on generic site parameters and subsequently were compared to each other to identify the most restrictive value and select a PRG that is protective of all pathways. The PRGs for nonradionuclides are presented in Table 1.

Based on historical 200 Areas operations and characterization information, a comprehensive list of potential contaminants was identified for the waste sites. Although PRGs were developed for each of the potential contaminants, it should be emphasized that these contaminants will not necessarily be found at each waste site. Some of the potential contaminants may not be found at any of the waste sites. A complete discussion of the PRGs is presented in the 200-CW-1 OU FS (DOE/RL-2002-69).

## SUMMARY OF REMEDIAL ALTERNATIVES

Remedial technologies were identified and evaluated in the FS (DOE/RL-2002-69) based on their ability to reduce potential risks to human health and the environment from the waste sites. Collective experience gained from previous studies and evaluation of cleanup methods at the Hanford Site were used to identify technologies that would be carried forward as remedial alternatives to address the RAOs. Four remedial alternatives were identified for detailed and comparative analyses.

**Common Elements.** Other than the No Action alternative, the remaining alternatives have several common elements.

- **Institutional Controls** are an integral component of each remaining alternative. These controls may include restrictions to prevent intrusion or cap integrity-altering activities, environmental monitoring, and/or deed restrictions.
- **Natural Attenuation** is an integral component of each remaining alternative through radioactive decay of constituents such as cesium-137 and strontium-90. Other natural attenuation processes may be occurring at the study sites, including biodegradation, sorption, and oxidation-reduction of the metals and PCBs.

- **Groundwater Monitoring** activities for the study area sites would be integrated into the 200-PO-1 and 200-BP-5 OU scopes, because these projects are responsible for groundwater monitoring.

- **Removal of Debris and Structures.** Because of the presence of aboveground and subsurface structures and void spaces associated with some of the study sites, removal of debris and structures may be required as a part of the remove-and-dispose and capping alternatives. Depending on the results and the plans for future use of the site, remediation of the structures could include abandoning them in place, removing them, or a combination. As an example, caps are designed for placement over generally smooth surfaces; structures would interfere with cap placement. Also, void space would require additional actions to ensure cap integrity.

The alternatives evaluated in the FS include the following.

- **Alternative 1: No Action**

- **Alternative 2: Maintenance of Existing Soil Covers, Institutional Controls, and Natural Attenuation.** Under this alternative, existing soil covers would be maintained as needed to provide protection from intrusion by biological receptors, along with legal and physical barriers to prevent human access to the site.

- **Alternative 3: Remove and Dispose.** Under this alternative, structures and soil with contaminant concentrations above PRGs would be excavated using conventional techniques and disposed to an approved disposal facility, most probably the ERDF. Contaminant concentrations exceeding the human health direct contact or ecological PRGs would require removal to a maximum depth of 4.6 m (15 ft). Conversely, if groundwater protection is required, removal may be required beyond the 4.6 m depth, as practicable, to ensure that groundwater protection PRGs are met.

- **Alternative 4: Capping.** Capping consists of constructing surface barriers over contaminated waste sites to prevent infiltration of water and/or to prevent intrusion by human or ecological receptors. Under this alternative, two capping construction options are considered commensurate with the environmental problem to be addressed. These include:

  - **4a – Simplified Soil Cap** for ecological protection, and human health protection when groundwater protection is already achieved

  - **4b – Modified RCRA C Cap** for groundwater and human health protection; also provides ecological protection from contaminants.

## EVALUATION OF ALTERNATIVES

The proposed plan provides the logic for determining which alternatives are applicable for representative sites and analogous waste site (see Figure 4, Appendix C, and Appendix D of DOE/RL-2003-06). The alternatives were evaluated against the following CERCLA criteria:

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

The first two criteria, overall protection of human health and the environment and compliance with ARARs, are threshold criteria. Alternatives that do not protect human health and the environment or that do not comply with ARARs (or justify a waiver) do not meet statutory requirements and are eliminated from further consideration in the FS. The next five criteria (long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost) are balancing criteria on which the remedy selection is based.

The CERCLA guidance for conducting feasibility studies lists appropriate questions to be answered when evaluating an alternative against the balancing criteria (EPA/540/G-89/004, *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*). The detailed analysis process presented in the FS addresses these questions, providing a consistent basis for the evaluation of each alternative. The final two criteria, state and community acceptance, are modifying criteria. The criterion of state acceptance is addressed through this proposed plan, which is prepared by the Tri-Parties. The proposed plan identifies the preferred remedies accepted by the Tri-Parties. The criterion of community acceptance will be evaluated following the public review and comment period for the proposed plan and this permit modification.

**Alternative 1 - No Action**

The no-action alternative is applicable to some waste sites because the overall protection of human health and the environment has already been achieved as noted below. No additional costs are required and ARARs have been achieved for the following sites:

- 200-N-3 Ballast Pits, which did not receive contaminated material
- 2706-N, -P, and -R Septic Tanks, which only serviced the guardhouses associated with the 200 North Area facilities and received only sanitary waste
- UPR-200-N-2, because recent site visits and radiological surveys did not identify any contamination.

**Alternative 2 – Maintenance of Existing Soil Covers, Institutional Controls, and Natural Attenuation**

This alternative would provide overall protection of human health and the environment for sites with existing clean soil covers. Generally the waste sites, with the exceptions of the structures, have been covered with clean surface stabilization soil to prevent direct contact and/or wind erosion. In addition, access to the waste sites is controlled through Hanford Site access control, with chain link fencing and/or signage. The Hanford Site has a thorough and comprehensive radiation area access control program operated by the Hanford Site contractors. Currently, the waste sites are in a surveillance and monitoring program. The program generally involves an annual surface radiation survey for sites that have been stabilized or a perimeter survey for sites that have not been stabilized. If the survey identifies areas of surface contamination, additional controls are applied to the affected area or the area is stabilized with clean soil or removed and properly disposed. Waste sites are kept clear of deep-rooted plant species, using herbicide and manual removal.

Groundwater impacts from the contaminants remaining in the vadose zone are not anticipated for Gable Mountain Pond, 216-B-3 Pond, or 216-B-3-3 Ditch because the contaminant concentrations are below groundwater protection PRGs or modeling has shown that the contamination does not reach groundwater in 1,000 years. For the 216-B-2-2 Ditch, the groundwater protection PRG is exceeded. At the 216-B-2-2 Ditch, PCBs are present at an average concentration that exceeds the groundwater protection PRG.

For sites without a soil cover or without a sufficiently thick cover, this alternative may not be protective.

This alternative complies with all ARARs for those waste sites with existing soil covers, because the pathways are broken. Those sites with above-grade structures or sites without existing soil covers may not meet ARARs.

This alternative would be an effective and permanent remedial action for the waste sites that will reach PRGs through natural attenuation within about 150 years. Beyond 150 years or so, more robust alternatives would be required. An extended length of institutional control and monitoring would be required to be effective.

**Alternative 3 – Remove and Dispose**

This alternative would remove contaminated waste and soil from waste sites to a depth of up to 4.6 m (15 ft) bgs to meet PRGs. This would eliminate the potential exposure pathways for receptors from soils located at depths between the surface and 4.6 m (15 ft) bgs. Depending on the depth of contamination, soils may be removed to protect human and ecological receptors (up to 4.6 m [15 ft]) from direct contact with contaminants or may be removed to greater depths if required and practicable to meet groundwater protection PRGs.

This alternative is implementable and considered protective of human health and the environment. However, the amount of risk reduction achieved by implementing this alternative is considered low because the sites currently are covered with clean soil fill, they are in a sitewide maintenance program, the estimated risks to terrestrial wildlife are

conservative, risks to human health and groundwater are at acceptable levels, and concentrations of radionuclides are low and decreasing with time and are estimated to meet PRG levels within a maximum of 268 years at 216-B-2-2 Ditch and much sooner at most of the other sites.

This alternative would comply with all ARARs by removing soil that exceeds PRGs, removing or abandoning structures, and implementing institutional controls to prevent exposure if contaminants remain below 4.6 m (15 ft).

For the excavated sites, this alternative would be effective over the long term and would be a permanent solution because soil with concentrations above acceptable levels would be removed from the waste sites. In addition, monitoring of the area performed as a part of the 200-PO-1 and 200-BP-5 OU groundwater-monitoring programs would verify that groundwater has been adequately protected.

The removal of contaminated soils and debris from the 200 Areas for redisposal on the Hanford Site at the ERDF transfers the long-term impact of contaminants from individual waste sites to one consolidated disposal facility. The ERDF is designed for long-term management of buried waste. Removal of soils from the waste sites would require expansion of the ERDF.

**Alternative 4 – Capping**

This alternative would reduce risks by breaking potential exposure pathways to receptors through placement of a surface barrier and institutional controls. Institution controls would be maintained at capped sites until PRGs are achieved through natural attenuation.

The simplified soil cap is commonly used on Hanford Site waste sites as part of the surveillance and maintenance program. A thick layer of clean soil is placed on top of a waste site to protect receptors from contacting the contaminants. The thickness of the simplified soil cap would vary from site to site, taking into account the thickness of the existing clean stabilization soil cover at each site and the additional thickness required to ensure an adequate barrier, based on potential intrusion depths of 1.9 m to 4.6 m (6 to 15 ft). The simplified soil cap would reduce ecological and human risks to acceptable levels, because direct exposure pathways to terrestrial plants and wildlife would be eliminated. Institutional controls would provide additional protection against human intrusion and would provide for groundwater monitoring as a means of identifying impacts to groundwater. The modified RCRA C cap would provide additional intrusion protection past the 150-year institutional controls period and also would provide infiltration control to protect groundwater.

This alternative would comply with all ARARs.

The capping alternative would be protective of human health and the environment by breaking exposure pathways and ensuring that the cover material is maintained to continue that protection. Ultimately, the long-term effectiveness depends on maintaining the barrier and associated institutional controls throughout the natural attenuation time frame to prevent exposure to potential receptors.

For sites that require a barrier for more than about 150 years, the modified RCRA C cap would be a more appropriate option because it provides additional human intrusion protection over the simplified soil cap. The assumption used is that institutional controls past 150 years or so would not necessarily be maintained and could fail.

Based on the results of the RI and risk assessment, the cap at the 216-B-2-2 Ditch would need to be maintained for 268 years for natural attenuation to effectively remediate the site to meet the ecological PRGs, based on the maximum concentration at that site. The U.S. Nuclear Regulatory Commission has defined 100 years after the remedial action as a time frame for which reliable institutional controls can be assumed at radioactive sites (10 CFR 61.59, "Licensing Requirements for the Land Disposal of Radioactive Waste"), less than one-half of the time required at some sites.

Therefore, a modified RCRA C cap would provide the additional protection as compared to the simplified soil cap. For sites near the 150-year time frame, additional surface layers of the barrier can be added near the end of the design life to further extend the performance period. In addition, DOE is expected to retain control of the 200 Areas for the foreseeable future because of the ERDF and because of the planned vitrified waste disposal/storage facility. Therefore, routine maintenance of the barriers and associated institutional controls can be assumed during most of the necessary natural attenuation periods.

**NEPA Values**

The NEPA process is intended to help Federal agencies make decisions that are based on understanding environmental consequences and then take actions that protect, restore, and enhance the environment. The *Secretarial Policy on the National Environmental Policy Act* (DOE 1994) and the *National Environmental Policy Act Compliance Program* (DOE Order 451.1A) require that CERCLA documents incorporate NEPA values, such as analysis of cumulative, offsite, ecological, and socioeconomic impacts, to the extent practicable, in lieu of preparing separate NEPA documentation for CERCLA activities.

The NEPA-related resources and values that have been considered for these waste sites support the CERCLA and RCRA decision-making process. These values include:

- 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.

Remedial actions at the 200 Areas waste sites would result in some impacts to public health and the environment. However, the overall environmental impacts under normal

operating conditions would not be very large, nor would they vary greatly among the remedial alternatives.

**SUMMARY OF PREFERRED ALTERNATIVES**

Four remedial alternatives were evaluated for the baseline case of industrial land-use of the 200-CW-1 OU, 200-CW-3 OU, and 200 North Area waste sites. The preferred remedial alternative for each of the waste sites considered is shown in Table 2. These remedial alternatives also were evaluated as a sensitivity analysis to the base case to account for changes associated with residential and recreational land uses. The sensitivity analysis was conduced in the FS to provide additional information to decision makers. The alternatives were evaluated against the CERCLA criteria; then they were evaluated against each other using the CERCLA criteria.

Based on the Waste Information Data System (WIDS), the 200-CW-1 OU RI, and other data collection activities, the no-action alternative meets RAOs for the following sites:

- 200-N-3 Ballast Pits
- 2607-N Septic Tank
- 2607-P Septic Tank
- 2607-R Septic Tank
- UPR-200-N-2.

The other waste sites require some form of remedial action. The alternatives evaluated provide varying levels of protection at a range of costs. The potential risks associated with the waste sites that have an existing soil cover are minimal. Maintenance of that soil cover is considered protective of human health and the environment for the time that contaminants are undergoing natural attenuation through radioactive decay. For sites that do not have an existing soil cover or that have contaminant concentrations that will be above PRGs beyond about 150 years, soil or engineered caps provide sufficient protection from biological and human intrusion, in combination with institutional controls. Removing contaminated soil provides the highest degree of protection but at the highest cost. The risk reductions associated with these actions are considered small because the starting risks are currently near RAOs.

Alternative 2 – Maintain Existing Soil Cover, Institutional Controls, and Natural Attenuation is the preferred alternative for the following waste sites:

- 216-B-3 Pond
- 216-C-9 Pond
- 216-B-3-1 Ditch
- 216-B-3-2 Ditch
- 216-B-3-3 Ditch
- 200-E PD Powerhouse Ditch
- 216-A-25 Gable Mountain Pond.

Alternative 3 – Remove and Dispose is the preferred alternative for the following waste sites:

- 200-E-118 Shack
- UPR-200-N-1
- 216-B-2-1 Ditch
- 216-B-2-2 Ditch
- 216-B-2-3 Ditch
- 216-A-9 Crib.

Alternative 4a – Simplified Soil Cap is the preferred alternative for the following waste sites:

- 207-B Retention Basin
- 216-A-40 Crib and UPR-200-E-59
- 216-A-42 Retention Basin and UPR-200-E-66
- 216-B-59 Trench and 216-B-59B Retention Basin
- 200-E-112 Pipeline
- 200-E-126 Pipeline
- 200-E-127 Pipeline.

Alternative 4b – Modified RCRA C Cap was not selected as the preferred alternative for any of the waste sites.

**REFERENCES**

64 FR 61615, "Hanford Comprehensive Land-Use Plan Environmental Impact Statement, Hanford Site, Richland, Washington; Record of Decision (ROD)," *Federal Register*, Vol. 64, No. 218, pp. 61615ff, November 12, 1999.

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DOE, 1994, *Secretarial Policy on the National Environmental Policy Act* (memorandum from H. R. O'Leary, Secretary of Energy, for Secretarial Officers and Heads of Field Elements, June 13), U.S. Department of Energy, Washington, D.C.

DOE/EIS-0222-F, 1999, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (CLUP-EIS), U. S. Department of Energy, Washington, D.C.

DOE Order 451.1A, *National Environmental Policy Act Compliance Program*, U.S. Department of Energy, Washington, D.C.

DOE/RL-2002-69, 2002, *Feasibility Study For the 200-CW-1 and 200-CW-3 Operable Units and the 200 North Area Waste Sites*, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2003-06, 2003, *Proposed Plan for the 200-CW-1 Gable Mountain Pond/B Pond and Ditches Waste Group Operable Unit, the 200-CW-3 North Area Cooling Water Waste Group Operable Unit, and the 200 North Area Waste Sites*, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

EPA/540/G-89/004, 1989, *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*, U.S. Environmental Protection Agency, Washington, D.C.

RCW 43.21C, "State Environmental Policy Act," Title 43, Chapter 21C, *Revised Code of Washingto*n, as amended, Washington State, Olympia, Washington.

**Table 1. Summary of Nonradionuclide Soil Preliminary Remediation Goals for All Pathways. (2 pages)**

| Constituent | Hanford Site Background[a] (mg/kg) | Direct Contact[b] (mg/kg) | Groundwater and Columbia River Protection[c] (mg/kg) | Terrestrial Wildlife Protection[d] (mg/kg) | Overall Preliminary RemediationGoal[e] (mg/kg) |
|---|---|---|---|---|---|
| 2-Butanone | -- | 2.10E+6 | 32.1 | -- | 32.1 |
| Acetone | -- | 350,000 | 3.21 | -- | 3.21 |
| Antimony | -- | 1,400 | 5.4 | 17.7 | 5.4 |
| Aroclor-1254 | -- | 70 | 0.99 | 0.937 | 0.937 |
| Aroclor-1260 | -- | 66 | 0.27 | 0.937 | 0.27 |
| Arsenic | 20 | 87.5 | 0.034 | 80.8 | 0.034 |
| Benzene | -- | 2,398 | 0.0045 | -- | 0.0045 |
| Benzo(a)anthracene | -- | 18 | 0.086 | -- | 0.086 |
| Benzo(a)pyrene | -- | 18 | 0.23 | -- | 0.23 |
| Benzo(b)fluoranthene | -- | 18 | 0.29 | -- | 0.29 |
| Benzo(ghi)perylene | -- | 105,000 | 37,042 | -- | 37,042 |
| Benzo(k)fluoranthene | -- | 18 | 0.29 | -- | 0.29 |
| Bis(2-ethylhexyl) phthalate | -- | 9,375 | 14 | -- | 14 |
| Butylbenzylphthalate | -- | 700,000 | 893 | -- | 893 |
| Cadmium | 1.0 | 3,500 | 0.69 | 20.3 | 1.0 |
| Chloride | -- | -- | 1,000 | -- | 1,000 |
| Chrysene | 18.5 | 18 | 0.096 | -- | 0.096 |
| Di-n-butylphthalate | -- | 350,000 | 56.5 | -- | 56.5 |
| Di-n-octylphthalate | -- | 70,000 | 532,000 | -- | 70,000 |
| Dibenzo(a,h)anthracene | -- | 18 | 0.43 | -- | 0.43 |
| Diesel Oil | -- | 2,000 | -- | -- | 2,000 |
| Diethylphthalate | -- | 700,000 | 72.2 | -- | 72.2 |
| Fluoranthene | -- | 140,000 | 631 | -- | 631 |
| Fluoride | -- | -- | 16 | -- | 16 |
| Indeno(1,2,3-cd)pyrene | -- | 18 | 0.83 | -- | 0.83 |
| Lead | 10 | 750 | 3,000 | -- | 10 |
| Mercury | 0.33 | 1,050 | 2.1 | -- | 0.33 |
| Methylene chloride | -- | 17,500 | 0.0254 | -- | 0.0254 |

**Table 1. Summary of Nonradionuclide Soil Preliminary Remediation Goals for All Pathways. (2 pages)**

| Constituent | Hanford Site Background[a] (mg/kg) | Direct Contact[b] (mg/kg) | Groundwater and Columbia River Protection[c] (mg/kg) | Terrestrial Wildlife Protection[d] (mg/kg) | Overall Preliminary RemediationGoal[e] (mg/kg) |
|---|---|---|---|---|---|
| Nitrate (as nitrogen) | 52 | 350,000 | 40 | -- | 52 |
| Nitrite | -- | 350,000 | 4 | -- | 4 |
| Phenanthrene | -- | 1.05E+06[f] | 240 | -- | 240 |
| Phenol | -- | 5.6E+06[f] | 43.9 | -- | 43.9 |
| Pyrene | -- | 105,000 | 655 | -- | 655 |
| Selenium | 0.78 | 17,500 | 5.2 | 2.99 | 2.99 |
| Silver | 0.73 | 17,500 | 13.6 | 110 | 13.6 |
| Sulfate | -- | -- | 1,000 | -- | 1,000 |
| Tetrachloroethene | -- | 2,574 | 0.0091 | -- | 0.0091 |
| Thallium | -- | 280 | 38 | 1.3 | 1.3 |
| Total Petroleum Hydrocarbons | -- | 1,000 | -- | -- | 1,000 |
| Uranium | 3.21 | 10,500 | 2.3 | -- | 3.21 |

NOTES: Shaded areas represent the pathway driver for the overall preliminary remediation goal (PRG).

[a] Background concentrations are 90th percentile values of the log normal distribution of site wide soil background data from the *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, DOE/RL-92-24, Rev. 3. Where the applicable PRG for a constituent is less than background, the background value is used as the PRG per WAC 173-340-700(6)(d).

[b] Direct contact values represent vadose zone concentrations that are protective of human and ecological receptors from direct contact with contaminated solids. Listed WAC 173-340 Method C cleanup standards for industrial soil are obtained from the Washington State Department of Ecology CLARC Version 3.1 tables (updated November 2001) and apply to the top 4.6 m (15 ft) (WAC 173-340-745).

[c] Values represent vadose zone soil concentrations that will be protective of groundwater and the Columbia River. Values are calculated using the WAC 173-340 three-phase model for protection of drinking water (WAC 173-340-747[4], amended February 12, 2001).

[d] Industrial soil levels protective of terrestrial wildlife are obtained from WAC 173-340-900, Table 749-3.

[e] Listed values apply to the top 4.6 m (15 ft) and represent the most restrictive soil PRG derived from evaluation of direct contact, groundwater and river protection, and terrestrial wildlife protection. Below 4.6 m (15 ft), alternate cleanup levels may be required to meet remedial action objectives based on verification of protectiveness of groundwater and the Columbia River during remedial actions.

[f] Direct contact cleanup levels for contaminated solids calculated using WAC 173-340-745, Method C result in values greater than pure material (e.g., >1 million parts per million).

-- = No value established.

**Table 2. Preferred Remedial Alternatives for the 200-CW-1 and 200 North Area Waste Sites. (3 pages)**

| Waste Site | Alternative 1 - No Action | Alternative 2 - Maintain Existing Soil Cover, Institutional Controls, and Natural Attenuation | Alternative 3 - Remove and Dispose | Alternative 4a – Simplified Soil Cap | Alternative 4b - Modified RCRA C Cap | Justification |
|---|---|---|---|---|---|---|
| **200-CW-1 OU Analogous wastes sites to be evaluated by the 216-B-3 Pond model** | | | | | | |
| 207 B Retention Basin | | | | X | | Surface structure with potential surface contamination, no existing cover; remove structure; install simplified soil cap; assumes no groundwater protection issues |
| 216-A-40 Crib | | | | X | | Depth of existing cover may not be sufficient to provide human and ecological protection |
| 216-A-42 Retention Basin | | | | X | | Depth of existing cover may not be sufficient to provide human and ecological protection |
| 216-B-59 Trench | To be addressed as part of 216-B-59B | | | | | See 216-B-59B |
| 216-B-59B Retention Basin | | | | X | | Surface structure with potential surface contamination, no existing cover; remove structure and contaminated soils to meet PRGs; assumes no groundwater protection issues |
| 216-C-9 Pond | | X | | | | Existing cover currently protective; radionuclide concentrations expected to be similar to 216-B-3 Pond. |
| UPR-200-E-66 | To be addressed as part of 216-A-42 | | | | | See 216-A-42 |
| UPR-200-E-59 | To be addressed as part of 216-A-40 | | | | | See 216-A-40 |
| **200 North Area Analogous wastes sites to be evaluated by the 216-B-3 Pond model** | | | | | | |
| 200-N-3 Ballast Pits | X | | | | | Gravel pits; no contaminants discharged to site. |
| 2607-N Septic Tank | X | | | | | Used for guardhouse; no contaminants discharged to site. |
| 2607-P Septic Tank | X | | | | | Used for guardhouse; no contaminants discharged to site. |
| 2607-R Septic Tank | X | | | | | Used for guardhouse; no contaminants discharged to site. |

**Table 2. Preferred Remedial Alternatives for the 200-CW-1 and 200 North Area Waste Sites. (3 pages)**

| Waste Site | Alternative 1 - No Action | Alternative 2 - Maintain Existing Soil Cover, Institutional Controls, and Natural Attenuation | Alternative 3 - Remove and Dispose | Alternative 4a – Simplified Soil Cap | Alternative 4b - Modified RCRA C Cap | Justification |
|---|---|---|---|---|---|---|
| **200-CW-1 OU Analogous wastes sites to be evaluated using the 216-B-3-3 Ditch model** | | | | | | |
| 216-B-3-1 Ditch | | X | | | | Existing cover currently protective; radionuclide concentrations expected to be similar to 216-B-3-3 Ditch. |
| 216-B-3-2 Ditch | | X | | | | Existing cover currently protective; radionuclide concentrations expected to be similar to 216-B-3-3 Ditch. |
| 200 E Powerhouse Ditch | | X | | | | Existing cover currently protective; radionuclide concentrations expected to be similar to 216-B-3-3 Ditch. |
| **200-CW-1 OU Analogous wastes sites with structures to be evaluated by the 216-B-3-3 Ditch model** | | | | | | |
| 200-E-112 | | | | X | | Depth of existing cover may not be sufficient to provide human and ecological protection. Some evidence of surface contamination. |
| 200-E-118 | | | X | | | Small shack and valve pit; has potential for surface contamination. Not a capping candidate site because of small size. |
| 200-E-126 | | | | X | | Depth of existing cover may not be sufficient to provide human and ecological protection. Some evidence of surface contamination. |
| 200-E-127 | | | | X | | Depth of existing cover may not be sufficient to provide human and ecological protection. Some evidence of surface contamination. |
| **200 North Area Analogous wastes sites with structures to be evaluated by the 216-B-3-3 Ditch model** | | | | | | |
| UPR-200-N-1 | | | X | | | Surface contamination of railroad tracks. |

**Table 2. Preferred Remedial Alternatives for the 200-CW-1 and 200 North Area Waste Sites. (3 pages)**

| Waste Site | Alternative 1 - No Action | Alternative 2 - Maintain Existing Soil Cover, Institutional Controls, and Natural Attenuation | Alternative 3 - Remove and Dispose | Alternative 4a – Simplified Soil Cap | Alternative 4b - Modified RCRA C Cap | Justification |
|---|---|---|---|---|---|---|
| UPR-200-N-2 | X | | | | | Valves for raw water; no radiological contamination detected on recent survey. Requires verification survey/sampling. |
| **Representative Site** | | | | | | |
| 216-B-2-2 Ditch | | | X | | | Highest contaminants of the representative sites; takes 268 years to reach ecological radiological PRGs. Only part of ditch is contaminated to unacceptable levels |
| **200-CW-1 OU Analogous wastes sites to be evaluated using the 216-B-2-2 Ditch model** | | | | | | |
| 216-A-9 Crib | | | X | | | Expected to be similar to 216-B-2-2 Ditch; confirmatory sampling required. |
| 216-B-2-1 Ditch | | | X | | | Expected to be similar to 216-B-2-2 Ditch |
| 216-B-2-3 Ditch | | | X | | | Expected to be similar to 216-B-2-2 Ditch |
| **Representative Site** | | | | | | |
| 216-A-25 Gable Mountain Pond | | X | | | | Existing cover currently protective; radionuclides decay in 136 years. |

# ATTACHMENT

# PART V - UNIT SPECIFIC CONDITIONS FOR CLOSURE

# PART V - UNIT SPECIFIC CONDITIONS FOR CLOSURE

## CHAPTER X

### 216-B-3 Main Pond

This Chapter sets forth the Conditions for closing the 216-B-3 Main Pond.

V.XA COMPLIANCE WITH APPROVED CLOSURE PLAN

The Permittees shall comply with all requirements set forth in Attachment XX, including the Amendments specified in Condition III.4.B, if any exist. Enforceable portions of the application are listed below; all subsections, figures, and tables included in these portions are also enforceable, unless stated otherwise:

Chapter 1.2 Closure Strategy

Chapter 2.4 RCRA Groundwater Monitoring

Chapter 3.0 Closure Performance Standards

Chapter 4.0 Closure Activities

Chapter 5.0 Postclosure Plan

# ATTACHMENT XX

## 1.0 INTRODUCTION

### 1.1 Permitting history

As a result of past dangerous waste discharges to the 216-B-3 Pond System, a RCRA Part A permit application (Part A), Form 3 (Rev. 0), was submitted to the Washington State Department of Ecology (Ecology) in 1986. The 216-B-3 Pond System consisted of four unlined, earthen ponds and the 216-B-3-3 Ditch. The Main Pond is designated as the 216-B-3 Pond. The Part A, Form 3, was revised several times between 1987 and 2000. The latest revision of the Part A, Form 3, Revision 6, is provided as Appendix C to the *200-CW-1 Operable Unit RI/FS Work Plan and 216-B-3 RCRA TSD Unit Sampling Plan* (DOE/RL-99-07) (Work Plan). The Part A, Form 3, was submitted under the single Dangerous Waste Permit Identification Number WA7890008976, issued to the Hanford Site by the U.S. Environmental Protection Agency (EPA) and Ecology. The Part A, Form 3, designates the 216-B-3 Pond System as a surface impoundment, subject to RCRA regulations for treatment, storage, and/or disposal (TSD) units.
In December 1993, the Part A, Form 3, was revised to separate the three Expansion Ponds (216-B-3A, 216-B-3B, and 216-B-3C) from the remainder of the unit (216-B-3 Pond and 216-B-3-3 Ditch). This modification was made to allow the option of clean closure under RCRA of the Expansion Ponds while integrating closure activities for the 216-B-3 Pond and the 216-B-3-3 Ditch with RCRA corrective action for the 200-BP-11 Operable Unit (OU).

The *216-B-3 Pond System Closure/Postclosure Plan* (DOE/RL-89-28) was submitted in 1990. Based on the 1990 closure plan strategy and sampling and analysis results, a decision was made to clean close the Expansion Ponds while integrating closure of the 216-B-3 Pond and 216-B-3-3 Ditch with the 200-BP-11 OU. Subsequent to this decision, the waste sites in the 200 Areas were realigned from 32 geographically based OUs to 23 process based OUs. The 216-B-3 Pond and the 216-B-3-3 Ditch were reassigned to the 200-CW-1 Gable Mountain Pond/B Pond Cooling Water Waste Group OU. The 216-B-3 Pond and 216-B-3-3 Ditch were investigated as part of the RI/FS process for the 200-CW-1 OU. The vadose zone beneath these sites has been determined to be clean through this investigation, which included 67 samples. Data from these samples are discussed in the *200-CW-1 Operable Unit Remedial Investigation Report* (DOE/RL-2000-35) and in the FS. This 216-B-3 Main Pond closure plan is based on the analysis from the RI and on process information and is being submitted to provide current site characterization information and closure strategy for the 216-B-3 Pond and 216-B-3-3 Ditch.

### 1.2 CLOSURE STRATEGY

The proposed strategy for the 216-B-3 Main Pond TSD unit, which consists of the 216-B-3 B Pond and the 216-B-3-3 Ditch, is clean closure. Clean closure, as used in this context, implies that no dangerous waste, dangerous waste constituents, dangerous constituents, leachate, contaminated runoff, or dangerous waste decomposition products remain in the vadose zone that originated from the disposal of dangerous waste to the

216-B-3-3 Ditch and the B Pond. Dangerous waste discharges identified in the Part A Permit for the 216-B-3 Main Pond TSD unit (DOE/RL-99-07, Appendix C) included corrosive and toxic dangerous waste resulting from the regeneration of demineralizer columns at the Plutonium-Uranium Extraction (PUREX) Plant and spills of dangerous or mixed waste at the PUREX Plant. Backwash from the regeneration of the demineralizer columns frequently was corrosive (D002) and sometimes contained toxic concentrations of chemicals used in the regeneration process, including nitric acid, sulfuric acid, sodium hydroxide, and potassium hydroxide (WT02). Spills at the PUREX Plant included hydrazine (U133), cadmium nitrate (WT01/D006), and ammonium fluoride/ammonium nitrate (WT01) (DOE/RL-99-07, Appendix C). Table 1 compares the maximum detected concentrations of these constituents (or their component constituents) to the Hanford Site background and the *Washington Administrative Code* (WAC) 173-340, *Model Toxics Control Act – Cleanup*, Method B soil cleanup levels. None of the dangerous waste constituents were identified above the Method B cleanup levels. In fact, all the nonradiological contaminants analyzed for at these two sites were below Method B cleanup levels. Ecology issued a contained-in ruling for the hydrazine for the TSD unit after sampling showed that the hydrazine was no longer present in the vadose zone soils.

Based on this information, clean closure can be obtained for the 216-B-3 Main Pond TSD unit soils without any remedial actions.

The groundwater beneath the TSD is currently in a detection-monitoring program for gross alpha, gross beta, arsenic, tritium, nitrate, cadmium, lead, mercury, and silver. For the nonradiological constituents, only nitrate has been detected; however, levels are below drinking water standards. The groundwater under the 216-B-3 Main Pond TSD unit is being addressed through the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) remedial investigation/feasibility study (RI/FS) process for the 200-BP-5 and 200-PO-1 OUs. Only cadmium and mercury exceeded WAC 173-340 Method B groundwater protection standards in the soils. The toxicity characteristic leaching potential (TCLP) analyses were conducted for the soils with elevated cadmium; results indicated that the cadmium is not leachable above levels of concern. The B Pond historically impacted groundwater by producing an elevated water table. This artificial water table has been receding since the discharges were discontinued. The current status of the groundwater meets drinking water standards for RCRA constituents. The *Hanford Site Groundwater Monitoring Report for Calendar Year 2001* (PNNL-13788) states that statistical evaluations of the indicator parameters in fiscal year 2001 indicated that the B Pond TSD has not adversely affected groundwater quality. Therefore, no postclosure requirements are specified for this RCRA TSD unit. The radionuclides present in the vadose zone are outside the RCRA closure; these will be addressed through the CERCLA RI/FS process for the 200-CW-1 OU. The groundwater will continue to be evaluated through the 200-BP-5 and 200-PO-1 OUs.

# 2.0 FACILITY DESCRIPTION AND LOCATION, PROCESS INFORMATION, WASTE CHARACTERISTICS, AND GROUNDWATER MONITORING

## 2.1 INTRODUCTION

As stated in DOE/RL-99-07 and in the *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program* (DOE/RL-98-28), the closure plan for the 216-B-3 Pond and the 216-B-3-3 Ditch is being integrated with the other RI/FS documentation for the 200-CW-1 OU.

Section 2.1 of the Work Plan (DOE/RL-99-07) provides closure plan facility description and location information in support of the closure plan. Section 2.2 of the Work Plan provides closure plan facility description and location and process information. Section 3.1 of the work plan provides closure plan facility description. Section 3.3 provides closure plan facility description and groundwater monitoring information. The information from these sections is summarized here.

## 2.2 FACILITY AND PROCESS INFORMATION

**216-B-3 Pond**. B Pond was located in a natural topographic depression and varied in size from about 6 to 19 ha (14 to 46 ac) (Figure 1). The pond operated from 1945 to 1994 and received cooling water and other 200 East Area effluents. Most of the effluent contained low concentrations of radionuclides and chemicals, but one known unplanned release, UPR-200-E14, is directly associated with this pond. This release occurred in 1958 when a dike on the east side of the pond ruptured and released contaminated water into a ravine east of the pond where the 216-B-3A Lobe is currently located. The contaminated area was covered with clean soil. The pond was also impacted by contaminants associated with three major unplanned releases: approximately 2,500 Ci of mixed fission products from UPR-200-E-34 in 1964, 15 kg of cadmium nitrate from UPR-200-E-51 in 1977, and 1,000 Ci of strontium-90 from UPR-200-E-138 in 1970. B Pond was decommissioned in 1994 by backfilling with coarse-grained material and then covering the pond with fine-grained sediment.

B Pond is an interim status RCRA TSD unit and, along with the 216-B-3-3 Ditch, operated under a Part A, Form 3 (Appendix C of DOE/RL-99-07). Dangerous waste discharges identified in the Part A, Form 3 for the 216-B-3 Main Pond TSD unit included corrosive and toxic dangerous waste resulting from the regeneration of demineralizer columns at the PUREX Plant and spills of dangerous or mixed waste at the PUREX Plant. Backwash from the regeneration of the demineralizer columns frequently was corrosive (D002) and sometimes contained toxic concentrations of chemicals used in the regeneration process, including nitric acid, sulfuric acid, sodium hydroxide, and potassium hydroxide (WT02). Spills at the PUREX Plant included hydrazine (U133), cadmium nitrate (WT01/D006), and ammonium fluoride/ammonium nitrate (WT01).

**216-B-3-3 Ditch**. The 216-B-3-3 Ditch was an open, unlined earthen ditch, approximately 6 m (20 ft) wide at ground level, 1.8 m (6 ft) deep, and 1,130 m (3,700 ft)

long (Figure 1). The ditch operated from 1970 to 1994 and received cooling water and other effluents from 200 East Area facilities. Cadmium nitrate (15 kg) was released to the ditch by UPR-200-E-51. The ditch was decommissioned and backfilled in conjunction with similar activities for B Pond in 1994. The 216-B-3-3 Ditch, pursuant to RCRA, is part of an interim status TSD unit with B Pond. Spills in the PUREX Plant were released to the 216-A-29 Ditch, which discharged to the 216-B-3-3 Ditch and ultimately to B Pond. The 216-A-29 Ditch is a TSD unit in the 200-CS-1 OU and is being addressed through the RI/FS process for that OU.

## 2.3 SOURCES OF WASTE AND WASTE DESCRIPTION

**Sources of Waste Contributions.** Exhaustive information regarding sources of waste contributions to the B Pond system is available in previously published documents. The majority of waste contributions to the B Pond system were from the PUREX Plant and B Plant. Known and suspected contamination to the B Pond system from these facilities is documented in the aggregate area management study reports for PUREX and B Pond (DOE/RL-92-04, *PUREX Source Aggregate Area Management Study Report*; DOE/RL-92-05, *B Plant Source Aggregate Area Management Study Report,* respectively). Further information is contained in DOE/RL-89-28, Rev. 0 and DOE/RL-89-28, Rev. 2, *216-B-3 Expansion Ponds Closure Plan.*

The largest contributing streams were the B Plant cooling water and steam condensate (nondangerous waste source), PUREX Plant cooling water (nondangerous waste source), the B Plant chemical sewer (potentially dangerous waste source), and the PUREX Plant chemical sewer (dangerous waste source). Additional routine sources of effluent originated from the 242-A Evaporator, 242-B Evaporator, 244-AR Vault, 244-BXR Vault, 244-CR Vault, BY Tank Farm, 241-A Aging Waste Ventilation System Complex, 283-E Water Treatment Facility, and 284-E Powerhouse. None of the effluent released from these additional sources was considered to be dangerous waste. More infrequent waste contributions came from unplanned releases, PUREX Plant steam condensate, and miscellaneous construction activities; all but the unplanned releases were probably nondangerous waste sources.

The PUREX chemical sewer was the major source of dangerous waste to the B Pond system and is the reason that B Pond is a TSD unit. Four mechanisms existed for the discharge of dangerous waste into the chemical sewer. These mechanisms were as follows.

- **Overflow of condensate from the acid fractionator** – Sporadic overflow of the acid fractionator may have resulted in an acidic waste (D002) discharge to the chemical sewer.

- **Effluent discharges from regeneration of the demineralizers** – Serial discharges of sulfuric acid and sodium hydroxide (both D002) routinely resulted in the discharge of effluent below a pH of 2 and above a pH of 12.5 to the chemical sewer. This practice continued until 1989 when a catch tank was placed in service to hold the regeneration effluents.

- **Disposal of out-of-tolerance chemical makeups** – Various chemicals, including hydrazine (U133) and state-only toxic mixtures (WT01, WT02), were discharged to the chemical sewer when adjustments to chemicals used in the PUREX Plant became out of tolerance to required plant specifications.

- **Accidental spills** – Equipment failures, misvalvings, and overflowing tanks resulted in accidental spills to the chemical sewer. The most significant was unplanned release UPR-200-E-51 that occurred in May 1977 and released 15 kg of cadmium nitrate (D006) to the chemical sewer.

A listing of chemicals released to the PUREX Plant chemical sewer from mid-1983 to 1987 is contained in Table 2. Before 1983, detailed release records were not maintained. The quantity identified represents the amount discharged at the point where the sewer line entered the 216-A-29 Ditch, but not necessarily the B Pond TSD unit. Chemicals and associated state dangerous waste designation codes identified in Table 2 are the same as those identified in the Part A, Form 3 for the B Pond system.

Unplanned releases of radiological contamination have impacted the B Pond system (DOE/RL-92-05). Unplanned release UPR-200-E-34 occurred in June 1964 and contaminated the 216-B-3-1 Ditch and B Pond with approximately 2,500 Ci of mixed fission products from PUREX. Following this release, bentonite was placed in the pond to adsorb the contamination. Unplanned release UPR-200-E-138 occurred in March 1970 when about 1,000 Ci of strontium-90 was released from B Plant to the 216-B-2-2 Ditch. This release has been shown to have impacted B Pond (DOE/RL-92-05).

**Maximum Inventory of Waste Managed at the 216-B-3 TSD Unit.** Discharges to B Pond ceased in April 1994 when all effluents were rerouted to the 216-B-3C Expansion Pond via a pipeline. Dangerous waste discharges ceased in 1987. Discharges to the B Pond system were at a maximum during 1988. Total discharge to the facility since 1945 is estimated to have exceeded 1 trillion L.

**Contained-In Determination for Hydrazine (U133).** Hydrazine product (U133) entered the 216-B-3-3 Ditch and B Pond from the PUREX Plant aqueous makeup unit tanks. As such, all environmental media and debris generated as waste during the characterization and remediation of these TSD units would be identified as listed hydrazine dangerous waste in accordance with WAC 173-303, "Dangerous Waste Regulations," Section 173-303-081(3). This presents a problem from the context of the TSD of soils and other debris generated from remediation of these units.

All substantive dangerous waste management standards will apply to generated soils and debris because they are defined as listed waste. Should environmental media only be regulated because of the hydrazine waste code, this requirement could unduly burden characterization and cleanup activities. Particularly problematic requirements are those associated with land disposal restrictions; U133 wastes must undergo treatment using one of the technologies prescribed in the 40 CFR 268, "Land Disposal Restrictions," Section 268.40 Table, "Treatment Standards for Hazardous Wastes." These technologies encompass mostly thermal or chemical destruction or extraction technologies and would

be required prior to disposal of any waste, soils, and/or debris generated at B Pond and the 216-B-3-3 Ditch.

In accordance with Ecology's contained-in policy for environmental media (Letter, Tom Eaton, Ecology, "Contained-in Policy," dated February 19, 1993) and the EPA's contained-in requirements for debris (40 CFR 261, "Identification and Listing of Hazardous Waste," Section 261.3[f]), the listed waste code can be removed from debris and media if levels of the compound for which the waste was listed are below risk-based action levels. Hydrazine rapidly oxidizes to form nontoxic nitrogen and water in the environment. Therefore, hydrazine discharged to the B Pond system in 1991 (the year the 216-A-29 Ditch stopped operating) could not be present in the B Pond system above detection or risk-based action levels. For these reasons, a contained-in determination for U133 hydrazine in soil and debris at the B Pond and 216-B-3-3 Ditch was sought from Ecology under separate documentation ("200 Area Hydrazine Contained-In Determination Request," 00-GWVZ-050). Samples were collected from the 216-B-3-3 Ditch where it intersects with the 216-A-29 Ditch and analyzed for hydrazine to support the contained-in determination. A contained-in determination was received from Ecology on June 22, 2000 (Approval of the Contained-In Determination Request for Hydrazine, Hedges 2000).

## 2.4 RCRA SITE GROUNDWATER MONITORING FOR THE 216-B-3 TREATMENT, STORAGE, AND DISPOSAL UNIT

This section presents descriptions and results of interim status groundwater monitoring at B Pond and the 216-B-3-3 Ditch. Interim status groundwater requirements are contained in WAC 173-303-400(3)(a) through (3)(c). This section incorporates by reference 40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," Subpart F, Ground-Water Monitoring (as implemented by Ecology), as the groundwater requirements that must be complied with during interim status.

The current interim status groundwater monitoring plan as required by WAC 173-303-400 and 40 CFR 265 Subpart F is contained in the *Groundwater Monitoring Plan for the Hanford Site 216-B-3 Pond RCRA Facility* (PNNL-13367 and PNNL-13367-ICN-1). Further details regarding the geology, hydrology, and the current groundwater monitoring program for the 216-B-3 Pond and 216-B-3-3 Ditch can be found in this document. In addition, DOE/RL-89-28, Rev. 2 contains information regarding the same RCRA interim status groundwater monitoring system, and annual reports (e.g., PNNL-13788) present the results from groundwater monitoring.

**History of RCRA Groundwater Monitoring at the B Pond System.** RCRA groundwater monitoring at the B Pond system began in 1988 with an interim status indicator parameter evaluation (detection-level) program. The program was elevated to an assessment-level program in 1990 because of isolated instances of elevated total organic halogens (TOX) and total organic carbons (TOC) levels in two downgradient wells. The results of the groundwater quality assessment, which concluded in 1996, are reported in *Results of RCRA Groundwater Quality Assessment at the 216-B-3 Pond Facility* (PNNL-11604). The results indicated that no source of contamination could be correlated to the TOX/TOC occurrences, and that the source of the isolated higher

concentrations may have been associated with well construction. Based on these findings, the facility was returned to contamination-indicator detection status in 1998. In late 2001, a new two-year trial approach to groundwater monitoring (PNNL-13367-ICN-1) was approved by Ecology; the regulators granted a variance for this purpose. This approach, placed into effect in December 2001, allows intrawell comparisons of successive analytical results on a semiannual basis for site-specific indicator constituents. The comparisons are based on methods prepared by the American Society for Testing and Materials (ASTM), and apply a combined Shewhart-Cumulative Sum (CUSUM) control chart method of statistical analysis. This approach allows the site-wide false-positive rate (the erroneous declaration of contamination) to be kept acceptably low in all wells for all constituents, while providing adequate statistical power to detect real contamination, should it occur.

**Aquifer Identification.** The uppermost or unconfined aquifer beneath the 216-B-3 Pond is contained primarily within sediments of the Ringold Formation and extends from the water table to the top of the basalt or, in some areas, the Lower Mud unit of the Ringold Formation. The aquifer is more than 152 m (500 ft) thick in some areas and thins to 0 m (0 ft) along the flanks of bordering bedrock or other impermeable units.

The measured hydraulic properties of the suprabasalt sediments are highly variable. The range of hydraulic conductivities varies over several orders of magnitude, with the sharpest contrast between the Hanford formation and the Ringold Formation. In general, hydraulic conductivities in the Ringold Formation are several orders of magnitude lower than those in the Hanford formation. The groundwater flow throughout the 200 East Area is along a zone of very high transmissivity and is apparently a result of the water table occurring in the very permeable gravels of the Hanford formation. In the region of the B Pond System, flow appears to be southwesterly from the Ringold confined aquifer into the unconfined Hanford formation.

**Well Location and Design.** The interim status groundwater monitoring network for the 216-B-3 Pond system and the 216-B-3-3 Ditch includes four wells constructed from 1987 through 1992. The locations of the monitoring wells are shown in Figure 2.

The point of compliance is defined in WAC 173-303-645(6)(a) as a "vertical surface" located at the hydraulically downgradient limit of the waste management area that extends down into the uppermost aquifer underlying the regulated unit. For the B Pond, the POC will consist of the monitoring wells illustrated in Figure 2. Three of these wells (699-42-42B, 699-43-44, and 699-43-45) are directly downgradient of the facility, including the regulated portion of the 216-B-3-3 Ditch. WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," was used to set the basic design requirements.

**Well Sampling and Analysis.** Sampling under this program occurs quarterly in accordance with 40 CFR 265.92, "Sampling and Analysis" and a variance authorized by Ecology, as allowed by this code. The B Pond facility will be monitored semiannually for specific conductance, gross alpha, and gross beta. Specific conductance will be

valuable in detecting complexants and ligands that are linked to B Pond operations. Annual sampling will occur for chloride, iron, manganese, phenols, sodium, and sulfate. Additional field parameters (i.e., pH, alkalinity, dissolved oxygen, temperature, and turbidity) will be sought as indicators of sample quality and general aquifer/well environmental conditions. Total and dissolved concentrations of cadmium, lead, mercury, and silver will be analyzed annually for four years. Analysis for these metals will be discontinued after four years if no anomalous concentrations or trends are revealed.

Gross alpha and gross beta are monitored semiannually as site-specific indicators, along with specific conductance. These indicators will be monitored to detect whether radiogenic elements from the regulated unit (especially strontium-90 and cesium-137—those having greatest potential for contributing to contamination at the B Pond) have impacted groundwater beneath the site. These indicator species can only provide an *indication* of the presence of radioactive constituents in the groundwater. The specific constituents would be identified and concentration limits would be set, should assessment or compliance monitoring be required.

Arsenic, iodine-129, nitrate, and tritium are also identified as contaminants of concern in groundwater that could be associated with B Pond operations. Because these constituents are associated with existing, widespread sitewide plumes, they are monitored on a *regional* scale by sitewide groundwater surveillance to the extent possible, and are not included specifically as constituents for B Pond.

**Results of Interim Status Groundwater Assessment.** The B Pond system was placed into an assessment-level groundwater-monitoring program in 1990 because of elevated TOX and TOC in two wells. From that time until 1996, comprehensive sampling and analysis was performed to determine the cause of these anomalies. The assessment report (PNNL-11604) concluded that elevated TOX and TOC were isolated occurrences and that no dangerous waste could be correlated to the results. One compound, tris (2-chloroethyl) phosphate (TRIS2CH), was found to have potentially contributed to elevated TOX concentrations. However, because of (1) this compound generally being at low concentrations below or near limits of quantitation, (2) the possibility that TRIS2CH may be a product of well construction, and (3) its low and diminishing concentrations along with TOX and TOC, no further investigation was determined to be justified. There is no record of TRIS2CH being discharged to the B Pond system. The assessment report concluded that interim status groundwater monitoring should revert to an indicator parameter evaluation program.

Chromium, iron, and manganese have historically exceeded drinking water standards in several wells. These concentrations have been attributed to well construction and oxidizing conditions in the aquifer. Arsenic has been detected at levels far below drinking water standards and is probably not attributable to operations of the B Pond system. Measurements of specific conductance have routinely produced results below Hanford Site background values for groundwater. Radionuclide activities have been very low at the B Pond system with the above-mentioned exception of tritium.

Operations at B Pond have impacted the groundwater; tritium (maximum 232,000 pCi/L) and nitrate (maximum 22,500 µg/L) are the only contaminants consistently detected in the groundwater that are attributable to the B Pond system. Tritium is not a dangerous waste constituent for the purposes of RCRA groundwater monitoring; however, it is discussed here for completeness regarding the remediation of the 216-B-3 Pond. Tritium occurred in concentrations above drinking water standards; however, nitrate is significantly below drinking water standards. Tritium and nitrate have generally trended downward in concentration since the beginning of interim status groundwater monitoring in 1988.

## 3.0 CLOSURE PERFORMANCE STANDARDS

The closure strategy is to clean close the 216-B-3 Pond and 216-B-3-3 Ditch. After clean closure, no dangerous waste or dangerous waste contaminated soil, structures, or equipment that pose a threat to human health or the environment will remain.

The closure performance standard in WAC 173-303-610(2)(a)(i) requires the owner or operator of a TSD facility to close the facility in a manner that minimizes the need for further maintenance. Because the 216-B-3 Pond and 216-B-3-3 Ditch are within the 200-CW-1 OU, facility maintenance, radiation monitoring, and groundwater monitoring activities must be continued until the 200-CW-1 OU remediation and 216-B-3 Main Pond closure have been completed. Groundwater monitoring wells within the OU must be maintained, at least through the RCRA past-practice OU activities, to ensure the continuity of groundwater monitoring. The types of activities that may be required to maintain the wells include inspection and repair of sample pumps and flushing of screens to ensure adequate flow of water into the wells. Maintenance of wells and the remediation of groundwater will be done through the 200-BP-5 and 200-PO-1 groundwater OUs.

The closure performance standard in WAC 173-303-610(2)(a)(ii) requires the owner or operator of a TSD facility to close the facility in a manner that controls, minimizes, or eliminates, to the extent necessary to protect human health and the environment, postclosure escape of dangerous waste, dangerous waste constituents, leachate, contaminated runoff, or dangerous waste decomposition products to the ground, surface water, groundwater, or the atmosphere. In addition, WAC 171-303-650(6)(a) requires the owner or operator to conduct the following.

- Remove or decontaminate all dangerous waste and dangerous waste residues, contaminated containment system components (e.g., liners), contaminated subsoils, and structures and equipment contaminated with dangerous waste and leachate and managed as dangerous waste.

- Close as a landfill by eliminating free liquids, stabilizing remaining waste, covering the surface impoundment with a final cover, and complying with postclosure requirements.

The following describe how the requirements of WAC 173-303-650(6)(a) and WAC 173-303-610(2)(a)(ii) will be accomplished.

The 216-B-3 Pond and 216-B-3-3 Ditch are to be clean closed. Consistent with this intent and strategy, the following actions will be or have been performed.

- Sample the subsoils to determine the specific nature and extent of residual dangerous waste constituents.

- Address final disposition of the structures (i.e., pipelines) at the time of the OU remediation.

Based on the results of the 200-CW-1 RI (DOE/RL-2000-35), the 216-B-3 Pond and the 216-B-3-3 Ditch are to be clean closed. These sampling efforts are described in this appendix. The results of the sampling efforts indicate that no constituents of concern are present in concentrations above action levels.

The closure performance standard in WAC 173-303-610(2)(a)(ii) requires the owner or operator of a TSD facility to close the facility in a manner that returns the land to the appearance and use of surrounding land areas to the degree possible, given the nature of the previous dangerous waste activity.

The future use of the pond and ditch are consistent with planned use of the surrounding area as identified in the *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (DOE/EIS-0222-F). The pond and ditch have been backfilled with clean soil and revegetated with native grasses. The pond and ditch will continue to be in the surveillance and maintenance program until final remediation is complete.

## 4.0 CLOSURE ACTIVITIES

### 4.1 Test Pit Excavation

Ten test pits were excavated and sampled within the boundaries of the 216-B-3 Pond and the 216-B-3-3 Ditch to collect soil samples to determine the nature and extent of contamination beneath the waste sites. Test pit excavation commenced October 6, 1999, and was completed October 28, 1999. Test pit locations are shown in Figure 1.
Test pit locations were prepared for the characterization by removing 0.3 to 0.6 m (1 to 2 ft) of topsoil from the site. The topsoil was pushed to one end of the test pit site and stock piled using a front-end loader. The newly exposed surface was surveyed for radiological contamination before excavation. Test pits were excavated and sampled

with a Caterpillar 245B[1] Series II Trackhoe with a 3.2-m (3.5-yd) bucket. The 245B trackhoe and bucket were selected as the sampling device because they were capable of reaching the maximum target test pit depth of 7.6 m (25 ft). Nine of the 10 test pits were excavated to a depth of 7.6 m (25 ft); one test pit in the 216-B-3-3 Ditch was halted at a depth of 2.7 m (9 ft) when a concrete structure was encountered. The structure is believed to be one of the three headwalls located at the head end of the 216-B-3-3 Ditch. Two samples were collected before encountering the structure in test pit TP-7A. The test pit was relocated approximately 45.7 m (150 ft) down the length of the ditch. The second test pit at this location is identified as test pit TP-7 on G-1.

Soil was segregated based on radiological contaminant levels detected with field-screening instruments. Soil with radiological readings greater than twice background was considered contaminated. Geologic descriptions and screening data were recorded on the geologic log (see Appendix A). All soils removed from the excavation were placed on plastic sheeting along the sides of the excavation. At the completion of the soil sampling, the plastic sheeting and soils were placed back into the test pit in the reverse order from which they had been excavated (i.e., contaminated materials excavated last were placed back in the test pit first). The front-end loader was then used to cover the site with soil. All sites were revegetated at the completion of the activity.

Test pits were excavated and backfilled in a manner that minimized the generation of dust. Water was sprayed over the site before and during the activity for dust control. The water source used for dust control was 200 East Area raw water from the Columbia River.

The trackhoe and bucket were decontaminated before initial use. The arm of the trackhoe and bucket were subsequently decontaminated between test pits. Decontamination was typically performed after the excavations were backfilled, but before clean soil was placed over the site.

### 4.2 Drilling, Well Construction, And Testing

One groundwater monitoring well (temporary well name B5758, permanent well name 699-43-44) was drilled through B Pond at the location shown on Figure 1. Groundwater monitoring well 699-43-44 was drilled using a cable-tool drill rig. Drilling commenced September 13, 1999, and was completed September 27, 1999. Well construction activities followed the drilling phase of this effort and were completed on October 5, 1999. The borehole was drilled to total depth using various methods to advance the hole. Drive barrels and split-spoon samplers were used for sampling and to advance the well from the surface to a depth of 58.6 m (192 ft). The hard tool was used mainly to drill from a depth of 58.6 m (192 ft) to a total depth of 64.3 m (211 ft). Approximately 760 L (200 gal) of water was added to the borehole to facilitate hard-tool drilling in this lower section of the well. Approximately 760 L (200 gal) of water was also removed below the water table. Depth to the water table during drilling and well construction varied between 53.7 m and 53 m (176.1 and 173.9 ft).

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[1] Caterpillar and 245B Series II are trademarks of Caterpillar, Inc., Peoria, Illinois.

A 29.526-cm- (11.625-in) OD casing string was set at 106 m (34.8 ft) bgs; 21.6-cm- (8.5-in.) OD casing was set at a depth of 61.3 m (200.9 ft). The third casing string consisted of 16.83-cm- (6.625-in.) OD casing and was set at a depth of 63.8 m (209.3 ft). All temporary casing was removed during well completion activities.

Well completion activities commenced on September 30, 1999. A 20-40 mesh silica sand was placed in the borehole to decommission the bottom of the well from 63.4 to 64.3 m (207.8 to 211 ft) bgs. A cement seal was placed on top of the sand from 62.9 to 58.3 m (206.2 to 192.4 ft) bgs. Schedule 5 type 3 or 4 stainless steel (SS304) permanent well materials were then placed in the borehole. A 0.025-cm (0.010-in.) slot continuous wire wrap screen with end cap was set from 52.1 to 58.5 m (171 to 191.4 ft) bgs. The permanent casing extends from a depth of 52.1 m (171 ft) to 0.64 m (2.1 ft) above ground surface. The 20-40 mesh sand pack was placed between the formation and the screen to a depth of 49.2 m (161.3 ft) bgs and was settled using a surge block. Bentonite crumbles were placed in the well annulus from 49.2 m (161.3 ft) to 3 m (10 ft) bgs. The surface seal consists of Portland cement grout to a depth of 3 m (10 ft). A cement pad with steel posts was installed for well protection. The well was developed after the installation.

Following completion and development of the well, four slug withdrawal tests were performed to derive hydraulic properties for the aquifer. For each test a slugging rod was submerged in the well and the water levels were allowed to equilibrate for up to 25 minutes. The rod was then quickly extracted, and the recovery of the water level was recorded by use of a pressure transducer and datalogger. These data were analyzed using one-dimensional models (e.g., Bouwer and Rice 1976, "A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells") to derive a near-borehole estimate of saturated hydraulic conductivity.
The first two tests, conducted January 28, 2000, were "low-stress-level" tests and involved insertion of a small slugging rod with a volume of 0.00035 $m^3$ (0.125 $ft^3$). Two "high-stress-level" tests, using a slugging rod with a volume of 0.0092 $m^3$ (0.329 $ft^3$), were performed on January 31, 2000.

## 4.3 SAMPLING AND ANALYSIS

### 4.3.1 Field Screening/Field pH

Soil samples were screened in the field before samples were collected for indications of contamination and to assist in selecting sample points, support worker health and safety, and monthly and shipping documentation. Samples were screened for volatile organic contamination, beta-gamma activity, alpha activity, and pH. Radiological screening was performed by a radiation control technician with an E-600 ratemeter with an SHP380-AB scintillation probe[2]. Radiological activity greater than two times background was used as an indicator of contamination. Background was determined by measuring the activity at ground surface adjacent to each excavation. Volatile organic screening was performed with a photoionization detector. Detection of volatile organic compounds above the

[2] E-600 and SHP380AB are trademarks of Thermo Eberline, a wholly owned business of Thermo Electron Corporation, Waltham, Massachusetts.

action level of 5 ppm was used as an indicator of contamination. The pH was determined in the field using pH paper, a pH meter, or both. Field screening results, pH readings, sample intervals, and sample numbers are included in BHI-01367, *200-CW-1 Operable Unit Borehole/Test Pit Summary Report.*

### 4.3.2 Test Pit and Borehole Soil Sampling and Analysis

Soil samples were collected for chemical and radiological analysis and determination of physical properties. All soil samples were collected according to BHI-EE-01, *Environmental Investigations Procedures,* Procedure 4.0, "Soil and Sediment Sampling." Split-spoon sampling was the primary sampling method used for borehole sample collection. However, particle size distribution and archive samples were occasionally collected from the contents of the drive barrel. Test-pit samples were collected directly from the track-hoe bucket using stainless steel sampling equipment. A total of 67 samples were collected from the 10 test pits, including 8 quality assurance (QA)/quality control (QC) samples. A total of 14 samples were collected from the borehole, including 2 QA/QC samples. RECRA Environmental Inc. of Richmond, California, and ThermoRetec Nuclear Services of Lionville, Pennsylvania, were the primary chemical and radiological laboratories, respectively. Quanterra Inc. of St. Louis, Missouri and Richland, Washington, was the split laboratory. Laboratory physical property analysis was performed by Maxim Technologies of St. Louis, Missouri.

Samples were collected relative to two measuring points (i.e., ground surface and depth below the bottom of the waste site). The sampling approach generally required the collection of continuous samples from the bottom of the waste site to a depth of 3 m (10 ft) below the bottom of the pond or ditch, then at 1.5-m (5-ft) intervals to 7.6 m (25 ft). Samples were always collected at depths of 4.6 and 7.6 m (15 and 25 ft bgs). Test pits were sampled to a maximum depth of 7.6 m (25 ft). Sample frequency was generally reduced to 7.6- to 15.2-m (25- to 50-ft) intervals below a depth of 7.6 m (25 ft) in boreholes and includes a high water-table mark soil sample, as well as a sample from the capillary fringe.

Samples were analyzed for volatile organic and semi-volatile organic compounds, including polychlorinated biphenyls, inorganics (metals), total petroleum hydrocarbons, general chemistry, and radionuclides. Samples were analyzed selectively for the following physical properties: field bulk density (BHI-EE-05, Procedure 3.9, "Determination of Field Bulk Density Using a Split-Spoon Sampler"), particle size distribution (ASTM D422, *Standard Test Method for Particle-Size Analysis of Soils*), and moisture content (ASTM D2216, *Standard Test Method for Laboratory Determination of Water [Moisture] Content of Soil and Rock by Mass*).

### 4.3.3 Groundwater Sampling and Analysis

Groundwater samples were scheduled for collection every 7.6 m (25 ft) from the water table to total depth of the borehole. The water table was encountered at approximately 54 m (177 ft) bgs. The borehole reached basalt, the bottom of the aquifer, at approximately 643 m (211 ft) bgs. Hence, groundwater samples were collected at only two intervals: 54 m (~177 ft) and 64 m (~210 ft), on September 22 and September 28,

1999, respectively. No perched water was encountered. Groundwater samples were collected with a portable submersible pump (Grundfos[3]) at the 64-m (210-ft) level and with a bailer at the 54-m (177-ft) level. Because of high turbidity, samples from the 54-m (177-ft) level were allowed to settle overnight and then decanted into sample bottles the following day using a low-flow peristaltic pump. A packer was set at 63.4 m (~208 ft) to isolate the lower 64-m (210-ft) sampling interval from groundwater above this level.

Field analyses were conducted for pH, conductivity, and turbidity during the time of collection for both sample intervals. Multiple readings were taken for each of these parameters at the 64-m (210-ft) interval, but only one reading per parameter was taken at the 54-m (177-ft) interval.

Laboratory analyses were conducted for anions, filtered and unfiltered metals (by inductively coupled plasma), phenols, gross alpha, gross beta, TOC, and TOX. These constituents and properties were selected to screen for contamination with the greatest potential for occurrence at the B Pond facility.

All wet chemistry, metals, and phenols analyses were performed by Quanterra, Inc. of St. Louis, Missouri. Radionuclide indicator analyses, gross alpha and gross beta, were performed by Quanterra's laboratory in Richland, Washington.

### 4.3.4 Borehole Geophysical Logging

Borehole geophysical logging, consisting of spectral gamma and neutron moisture surveys, was performed in well 699-43-44. Logging was performed between September and December 1999. A detailed report of logging operations is provided in BHI-01367.

The data collected during the investigation are summarized in Table 1. These data represent those constituents identified on the Part A, Form 3. Other constituents were analyzed; these data are presented in BHI-01367, DOE/RL-2000-35, and Appendix B of the FS.

Investigation-derived waste generated during the investigation was handled in accordance with a waste control plan approved by DOE, EPA, and Ecology. The waste was disposed to ERDF following waste designation. No wastes will be generated, because no remedial action is required to support the clean closure. Therefore, procedures for handling and disposing of waste are not applicable to this closure plan.

## 4.4 Schedule For Closure

The closure strategy for this TSD unit is clean closure. The sampling and analysis to support this strategy has been completed. No additional closure activities have been scheduled.

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[3] Grundfos Pumps Corporation, Fresno, California.

### 4.5 Amendment Of Closure Plan

As required by WAC 173-303-610(3)(b), the closure plan will be amended if, when conducting final closure activities, unexpected events require a modification of the approved closure plan. If an amendment to the approved closure plan is required, the DOE will follow the process contained in Permit Condition I.C.3.

### 4.6 Certification Of Closure

Within 60 days of closure of the TSD unit, the DOE will submit to the Benton County Auditor and the lead regulatory agency a certification of closure and a duly certified survey plat. The certification of closure will be signed by both the DOE and a independent Registered Professional Engineer, stating that the unit has been closed in accordance with the approved closure plan. The certification will be submitted by registered mail or an equivalent delivery service. Documentation supporting the independent registered professional engineer's certification will be placed in the Administrative Record.

## 5.0 POSTCLOSURE PLAN

The closure strategy for the 216-B-3 Pond and the 216-B-3-3 Ditch is clean closure. Therefore, no postclosure plan is needed for these sites. Activities associated with the corrective action of these sites under the CERCLA RI/FS process will continue as part of the 200-CW-1 OU activities for the vadose zone and the 200-BP-5 and 200-PO-1 groundwater OUs for the groundwater.

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Figure 1. Borehole and Test Pit Locations for the 216-B-3 Main Pond

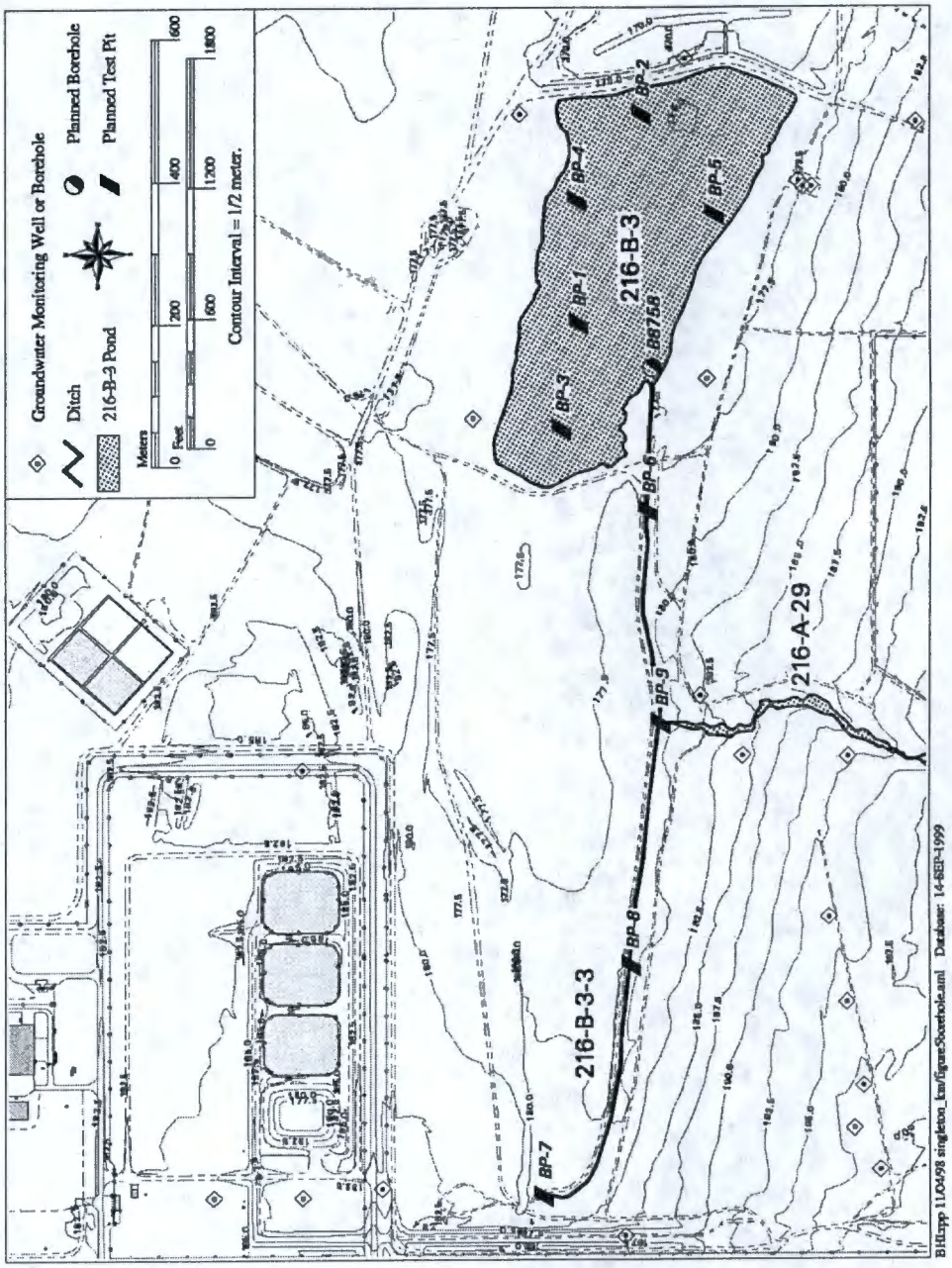

Figure 2. Groundwater Monitoring Network for 216-B-3 Main Pond

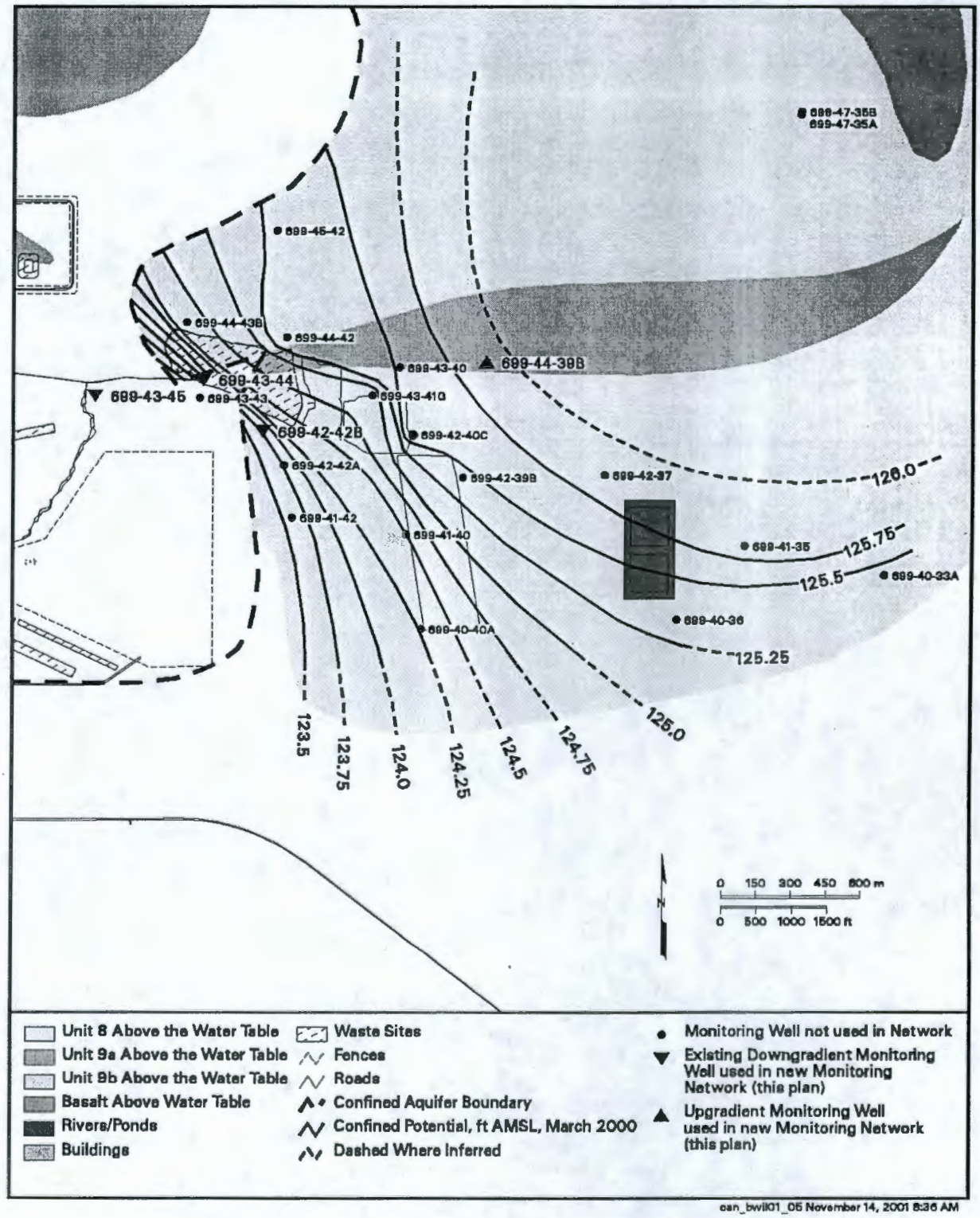


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Table 1. 216-B-3 Main Pond Treatment, Storage, and Disposal Unit Data.

| Analyte | Hanford Sitea Background Concentrations | WAC 173-340 Method B Soil Cleanup Level (mg/kg) | Maximum Concentration (mg/kg) | |
|---|---|---|---|---|
| | | | B Pond | 216-B-3-3 Ditch |
| Cadmium | 1.0 | 80 | 18 | 14.8 |
| Ammonia | 9.23 | 16,000 | 31.8 | 3.2 |
| Fluoride | 2.81 | 4,800 | ND | ND |
| Nitrate (as nitrogen) | 52 | 8,000 | 32 | 34 |
| Sulfate | 237 | NA | 1720 | 286 |
| PH | NA | NA | 9.7 (maximum)<br>4.6 (minimum) | 8.8 (maximum)<br>7.5 (minimum) |

Notes:
[a]*Hanford Site Soil Background: Part 1, Soil Background for Inorganics*, DOE/RL-92-24, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington.
mg/kg – milligram per kilogram.
NA – Not applicable.
ND – Not detected.
WAC 173-340 – "Model Toxics Control Act – Cleanup," *Washington Administrative Code.*

Table 2. Chemical Releases into the PUREX Plant Chemical Sewer Line from Mid-1983 to 1987 (modified from DOE/RL-89-28)

| Date | Chemical | Pounds | Waste Designation |
|---|---|---|---|
| 5/20/83 | Aluminum nitrate nonahydrate | 17,725 | None |
| 10/17/83 | Potassium permanganate<br>Sodium carbonate | 10,700<br>1,412 | None |
| 2/9/84 | Potassium hydroxide | 83,000 | D002 |
| 2/26/84 | Sodium hydroxide | 3,700 | D002, WT02 |
| 5/16/84 | Cadmium nitrate | 25 – 50 | D006, WT01 |
| 6/6/84 | Hydrazine<br>Hydroxylamine nitrate | 332<br>90 | U133 |
| 8/22/84 | Nitric acid | 9,000 | D002 |
| 10/2/84 | Hydrazine<br>Hydroxylamine nitrate | 280<br>407 | U133, WT02 |
| 11/1/84 | Sulfuric acid | 3,482 | None |
| 11/27/84 | Nitric acid<br>Ferrous sulfamate<br>Sulfamic acid | 349<br>43<br>68 | None |
| 12/2/84 | Potassium hydroxide | 150 | D002 |
| 12/2/84 | Potassium hydroxide | 62,683 | D002, WT02 |
| 1/10/85 | Hydroxylamine nitrate<br>Hydrazine<br>Nitric acid | 100<br>21<br>66 | U133 |
| 1/18/85 | Nitric acid | 6,236 | D002, WT02 |
| 2/8/85 | Sodium nitrate | 160 | None |
| 4/4/85 | Ferrous sulfamate<br>Nitric acid<br>Sulfamic acid | 52<br>269<br>132 | None |
| 5/14/85 | Nitric acid<br>Hydroxylamine nitrate<br>Hydrazine | 190<br>98<br>.4 | U133 |
| 5/27/85 | Nitric acid | 223 | None |
| 6/25/85 | Nitric acid | 24,189 | D002, WT02 |
| 7/1/85 | Ammonium fluoride<br>Ammonium nitrate | 5,368<br>1,016 | WT01 |
| 8/6/85 | Sodium hydroxide | 42,440 | D002, WT02 |

Table 2. Chemical Releases into the PUREX Plant Chemical Sewer Line from Mid-1983 to 1987 (modified from DOE/RL-89-28)

| Date | Chemical | Pounds | Waste Designation |
|---|---|---|---|
| 10/28/85 | Nitric acid | 1,181 | D002 |
| 12/18/85 | Cadmium nitrate | 35 | D006, WT01 |
| 12/28/85 | Aluminum nitrate nonahydrate | 650 – 730 | None |
| 2/12/86 | Nitric acid<br>Sulfuric acid | 42<br>276 | D002 |
| 2/13/86 | Sulfuric acid | 77 | D002 |
| 2/19/86 | Sodium hydroxide | <100 | D002, WT02 |
| 2/21/86 | Sulfuric acid | <100 | D002 |
| 3/24/86 | Sulfuric acid | <100 | D002 |
| 6/28/86 | Sulfuric acid | 121 | D002 |
| 7/7/86 | Hydrazine | 6 | U133 |
| 4/25/87 | Sodium nitrite | 1,275 | none |