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Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

14-AMRP-0210

JUN 23 2014

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EDMC

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

Dear Ms. Hedges:

REVISED CLOSURE PLANS TO SUPPORT TREATMENT, STORAGE, AND DISPOSAL (TSD) UNIT CLOSURE

This letter provides the following revised closure plans to the State of Washington Department of Ecology (Ecology) to meet Tri-Party Agreement Interim Milestone M-037-02:

- 216-A-37-1 Crib Closure Plan (D-2-10), DOE/RL-2005-88, Revision 0
- 207-A South Retention Basin Closure Plan (S-2-7), DOE/RL-2005-89, Revision 0
- 216-A-36B Crib Closure Plan (D-2-4), DOE/RL-2005-90, Revision 0
- 216-B-63 Trench Closure Plan (D-2-6), DOE/RL-2006-11, Revision 1
- 216-A-29 Ditch Closure Plan (D-2-3), DOE/RL-2008-53, Revision 1

Tri-Party Agreement Interim Milestone M-037-02 requires submittal to Ecology by June 30, 2014, of revised closure plans to support closure for five TSD Units.

If you have any questions please contact me or you may contact Ray Corey, Assistant Manager for the River and Plateau, on (509) 373-9971.

Sincerely,

Stacy Charboneau for

Doug S. Shoop
Acting Manager

AMRP:JOA

Attachments

cc: See page 2

M-037-02
1222502 0072997 1222504

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DOE/RL-2005-88
Revision 0

216-A-37-1 CRIB CLOSURE PLAN (D-2-10)

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

U.S. DEPARTMENT OF ENERGY | Richland Operations Office
P.O. Box 550
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DOE/RL-2005-88
Revision 0

216-A-37-1 CRIB CLOSURE PLAN (D-2-10)

Date Published
June 2014

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

U.S. DEPARTMENT OF ENERGY | Richland Operations Office
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APPROVED
By Janis D. Aardal at 2:11 pm, Jun 17, 2014

Release Approval | Date

Contents

Figures

Tables

Terms

AEA	*Atomic Energy Act of 1954*
bgs	below ground surface
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	*Code of Federal Regulations*
DOE	U.S. Department of Energy
DST	double-shell tank
DWS	drinking water standard
Ecology	Washington State Department of Ecology
FS	feasibility study
FY	fiscal year
GCL	groundwater cleanup level
HEIS	Hanford Environmental Information System
HHE	human health and the environment
HWMA	Hazardous Waste Management Act (RCW 70.105)
IQRPE	Independent Quality Registered Professional Engineer
IDF	Integrated Disposal Facility
NA	not applicable
OU	operable unit
PUREX	plutonium-uranium extraction
RCRA	*Resource Conservation and Recovery Act of 1976*
RCW	*Revised Code of Washington*
RI	remedial investigation
SAP	sampling and analysis plan
TOC	total organic carbon
TOX	total organic halides
TPA	Tri-Party Agreement
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TSD	treatment, storage, and/or disposal (unit)
WAC	*Washington Administrative Code*

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1 Introduction

The purpose of this plan is to explain the *Resource Conservation and Recovery Act of 1976* (RCRA) (42 USC 6901) closure process for the 216-A-37-1 Crib treatment, storage, and/or disposal (TSD) unit.

This closure plan is being submitted in accordance with the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989a), also known as the Tri-Party Agreement (TPA) Interim Milestone M-037-02, which requires submittal of revised closure plans to the Washington State Department of Ecology (Ecology) to support TSD unit closure for five TSD units: 207-A South Retention Basin, 216-A-29 Ditch, 216-A-36B Crib, 216-A-37-1 Crib, and 216-B-63 Trench by June 30, 2014.

Based on the analytical data previously collected, closure for the 216-A-37-1 Crib and soil is clean closure in accordance *Washington Administrative Code* (WAC) 173-303, "Dangerous Waste Regulations," specifically WAC 173-303-610, "Closure and Post-Closure." This strategy is based on analytical data summarized in DOE/RL-2004-25, *Remedial Investigation Report for the 200-PW-2 Uranium-Rich Process Waste Group and the 200-PW-4 General Process Condensate Group Operable Units*, showing that the TSD unit meets clean closure performance standards for TSD unit dangerous waste constituents without further physical closure activities. Because the clean closure strategy is based on results of completed sampling and analysis described in this closure plan and all verification sampling to confirm clean closure has been completed, no further closure activities are expected to be performed. Therefore, no sampling and analysis plan is included in this closure plan. The data also show that TSD unit operations and TSD unit constituents did not impact groundwater, so groundwater contamination does not preclude TSD unit clean closure. Consequently, after final closure, a RCRA final status groundwater monitoring plan will not be required for monitoring of TSD unit constituents.

Contaminants other than the TSD unit constituents are present in the soil and groundwater. This past-practice contamination may pose a threat to human health and the environment (HHE) and will be addressed through the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) (42 USC 9601) remedial action process for the 200-EA-1 Operable Unit (OU).

1.1 Unit Description

1.1.1 Overview

The 216-A-37-1 Crib began operations in March 1977 and was used to dispose of 242-A Evaporator process condensate to the soil column. The 242-A Evaporator process condensate, disposed at this crib, was received from the 207-A South Retention Basin where it was stored while awaiting process parameter sample results before being disposed. Discharge to the crib was terminated on April 12, 1989. 242-A Evaporator process condensate was determined to be dangerous waste under WAC 173-303. A *Dangerous Waste Permit Application* for the 216-A-37-1 Crib (WA7890008967, Part V, Closure Unit 13) (Part A Form) was submitted to Ecology in 1987. The latest revision was submitted in October 2008 designating the 216-A-37-1 Crib as a landfill subject to RCRA regulations governing interim status TSD units. Figure 1 provides a timeline that summarizes the operations and regulatory milestones associated with the 216-A-37-1 Crib. Operations milestones are shown below the timeline, and regulatory milestones are shown above the timeline.

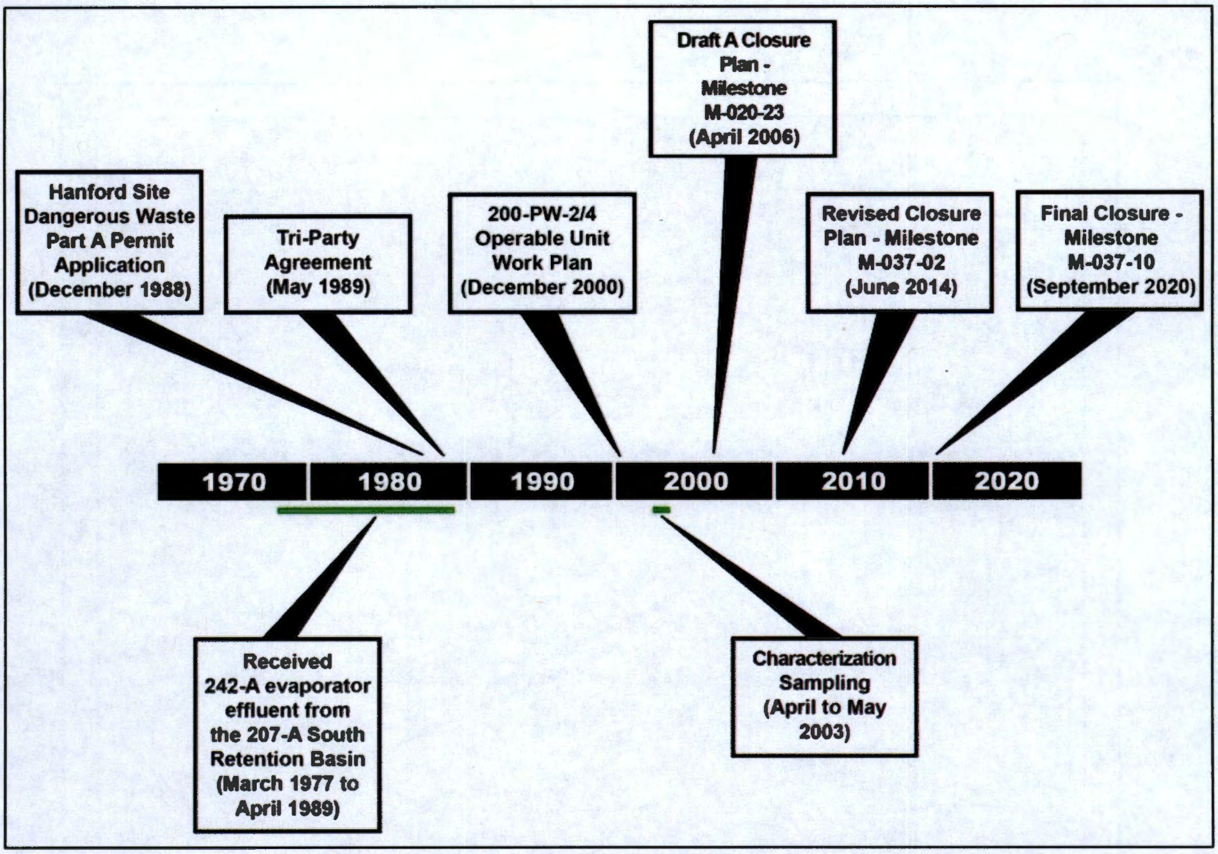

Figure 1. Timeline for the 216-A-37-1 Crib

The 242-A Evaporator process condensate is a mixed waste. That means the process condensate is a mixture of both hazardous/dangerous waste, as defined in RCRA and *Revised Code of Washington* (RCW) 70.105, "Hazardous Waste Management," also known as the Washington State Hazardous Waste Management Act (HWMA); and radionuclide "source, special nuclear, and byproduct materials" as defined in the *Atomic Energy Act of 1954* (AEA) (42 USC 2011). Per the AEA, these materials are regulated at U.S. Department of Energy (DOE) facilities exclusively by the DOE, acting pursuant to its AEA authority. These radionuclide materials are not hazardous/dangerous wastes and, therefore, are not subject to regulation by the State of Washington under RCRA and HWMA. All information contained herein and related to, or describing AEA-regulated materials and processes in any manner, may not be used to create conditions or other restrictions set forth in any permit, license, order, or any other enforceable instrument. Information contained herein on radionuclides is provided for process description purposes only.

1.1.2 Physical Description

The 216-A-37-1 Crib is an engineered, subsurface liquid effluent disposal facility (landfill) that was constructed to dispose of 242-A Evaporator process condensate. The 216-A-37-1 Crib is located outside the 200 East Area perimeter fence about 610 m (2,000 ft) east of the 202-A (plutonium-uranium extraction [PUREX]) Building (Figure 2). Figure 3 is a construction diagram of the 216-A-37-1 Crib. The gravel-filled crib is 213 m (700 ft) long and 3 m (10 ft) wide at the bottom.

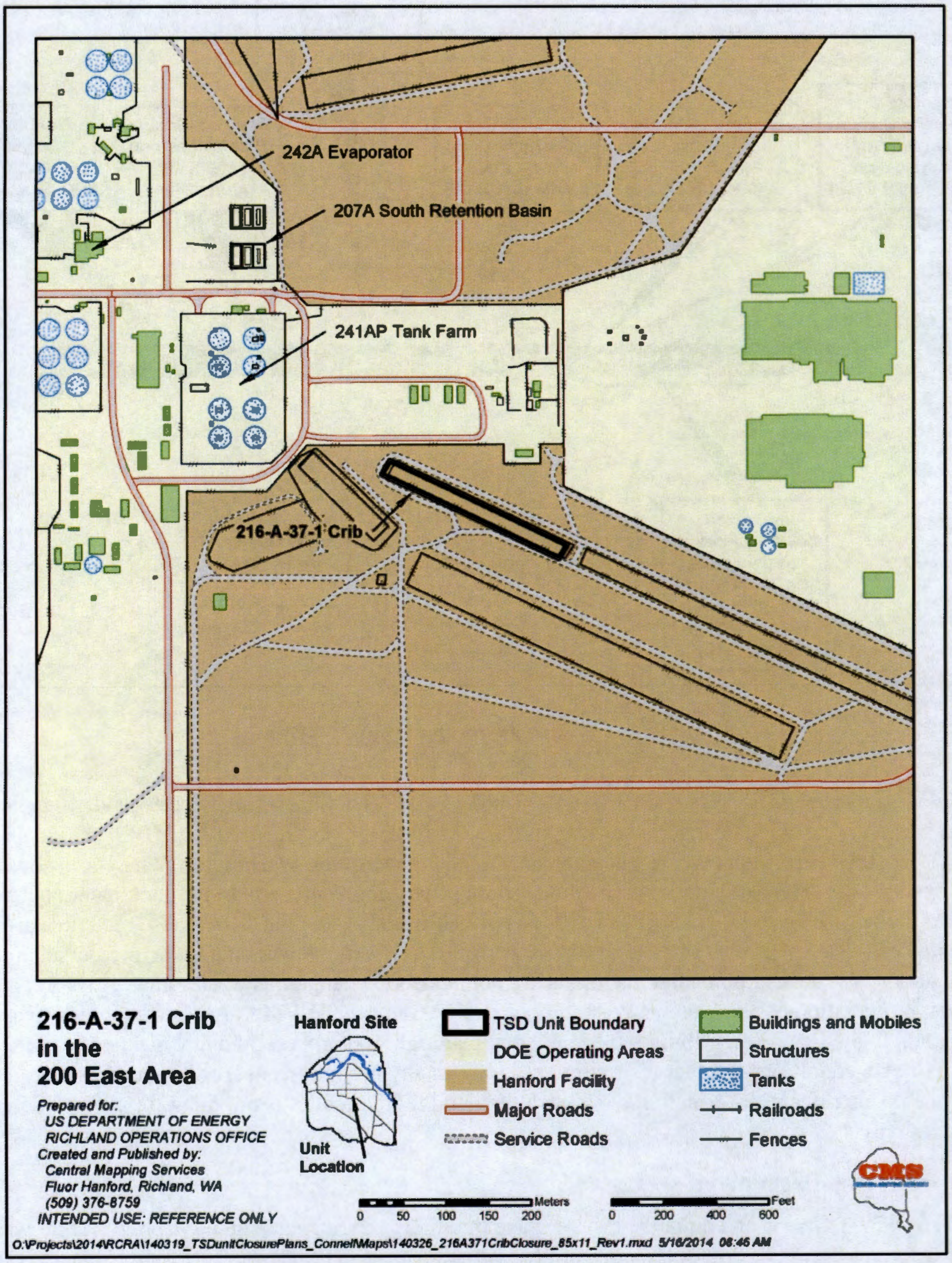

Figure 2. 216-A-37-1 Crib Site Plan

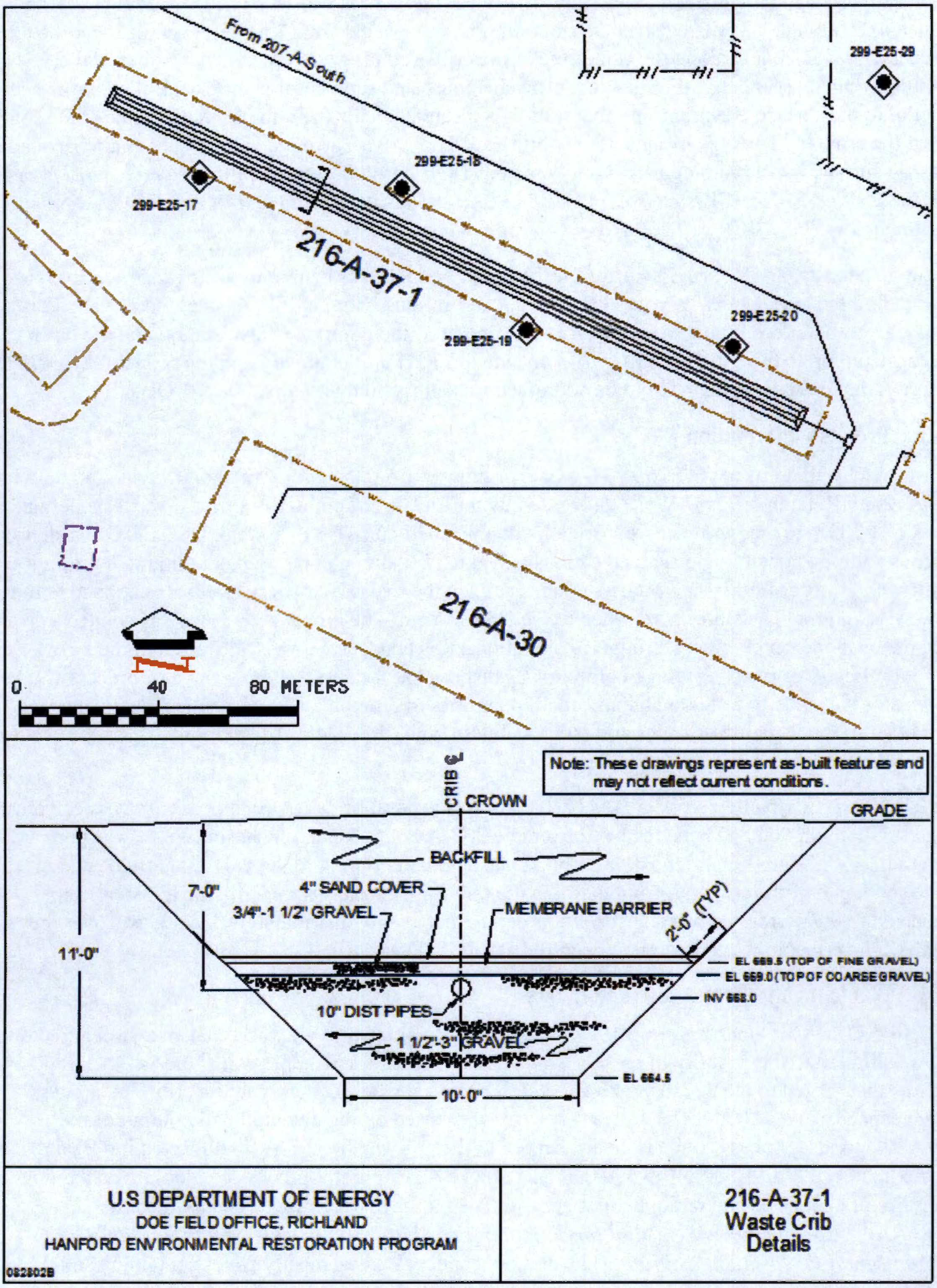

Figure 3. Construction Diagram for the 216-A-37-1 Crib

When actively receiving effluent, the crib was about 2.4 to 4.3 m (8 to 14 ft) deep. A 25.4 cm (10 in.) diameter perforated, galvanized steel distribution pipe was placed 2 m (7 ft) below grade, near the top of the coarse gravel fill and along the centerline of the crib. The pipe was covered with finer gravel, membrane barrier (generally thin-gauge plastic sheeting), and sand before being backfilled with clean material to the surface elevation. A valve station is located outside the crib perimeter fence at the south end of the crib, and a vent is located at the north end. The crib is surrounded by a light chain barricade. The crib surface is not radiologically contaminated (DOE/RL-2000-60, *Uranium-Rich/General Process Condensate and Process Waste Group Operable Units RI/FS Work Plan and RCRA TSD Unit Sampling Plan Includes: 200-PW- 2 and 200-PW-4 Operable Units*).

The unit-specific Part A Form identifies the TSD unit boundary as beginning inside the security fence surrounding the crib. Under WAC 173-303-040, "Definitions," for landfill, this unit has no ancillary piping. The waste feed piping from the 242-A Evaporator, including the valve station and the basin discharge piping to the 216-A-37-1 Crib, is outside the TSD unit boundary and the scope of TSD unit closure. This piping is anticipated to be addressed in conjunction with the 200-IS-1 OU.

1.1.3 Process Information

All waste contributions to the 216-A-37-1 Crib originated from the 242-A Evaporator via the 207-A South Retention Basin. Waste processed by the 242-A Evaporator is a mixed waste as defined in WAC 173-303-040 that was received from the double-shell tank (DST) system. DST mixed waste is an aqueous solution containing dissolved cations and anions, sodium, potassium, aluminum, hydroxides, nitrates, and nitrites. Slurry and process condensate are the two mixed waste streams generated at the 242-A Evaporator. The slurry is returned to the DST system. The process condensate is condensed vapor from the evaporation process. During crib operations, this condensate was transferred to the 207-A South Retention Basin for interim storage before it was disposed at the 216-A-37-1 Crib. The process condensate was mostly water containing small quantities of ammonia and inorganic constituents and trace quantities of volatile organics and radionuclides (WHC-EP-0342, Addendum 15, *242-A Evaporator Process Condensate Stream-Specific Report*).

The 216-A-37-1 Crib operated as a land based unit for disposal of 242-A Evaporator process condensate to the soil column that had been received from the 207-A South Retention Basin. Waste was pumped from the 207-A South Retention Basin through waste transfer piping to the valve station located outside of the south end of the crib and, from there, to the crib for disposal. At the crib, the transfer piping connected to the perforated waste distribution piping that evenly distributed effluent waste over the length of the crib. No waste treatment occurred at this TSD unit.

1.1.4 Waste Inventory and Characteristics

The 216-A-37-1 Crib operated from 1977 to 1989. The total quantity of waste that was discharged to the crib was limited to the quantity of process condensate effluent waste generated at the 242-A Evaporator that was discharged to the 207-A South Retention Basins and subsequently to the crib. The process design capacity of 327,000 L (86,400 gal) per day was based on the potential daily output of the 242-A Evaporator process condensate discharged to the crib via the 207-A South Retention Basin. Approximately 377,011,000 L (99,590,000 gal) of 242-A Evaporator process condensate containing trace quantities of chemicals and radionuclides are estimated to have been discharged to this crib (DOE/RL-98-28, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program*). The process condensate was mostly water containing small quantities of ammonia and inorganic constituents and trace quantities of volatile organics and radionuclides (WHC-EP-0342, Addendum 15).

The 242-A Evaporator process condensate was designated as mixed waste (WAC 173-303-040) because it was derived from waste containing spent halogenated and nonhalogenated solvents (WAC 173-303, dangerous waste numbers F001, F002, F003, F004, and F005) and because of the toxicity of ammonia (WT02, state-only, toxic, dangerous waste). The Part A Form identifies the dangerous waste numbers potentially managed at this unit. The constituents associated with these dangerous waste numbers are identified in Table 1 and represent the potential TSD unit constituents in waste remaining at the unit.

1.1.5 Security Information

The 216-A-37-1 Crib is located in the 200 East Area and therefore, security information pertaining to the 200 Areas applies to this TSD unit. Changes to security are expected to occur during the course of 200 East Area deactivation and decommissioning activities. Security measures will remain in place that limit entry to authorized personnel and that preclude unknowing access by unauthorized individuals until closure of the TSD unit.

2 Groundwater Monitoring

The 216-A-37-1 Crib groundwater closure approach is clean closure in accordance with the *Hanford Federal Facility Agreement and Consent Order Action Plan* (Ecology et al. 1989b, Section 6.3.l) where any TSD unit is eligible for clean closure at the Hanford Site. The clean closure approach is based on data gathered from the monitoring network (DOE/RL-2010-92, *Interim Status Groundwater Monitoring Plan for the 216-A-31-1 PUREX Plant Crib*), groundwater data contained in the Hanford Environmental Information System (HEIS), and text provided in DOE/RL-2013-22, *Hanford Site Groundwater Monitoring Report for 2012*. Groundwater monitoring will be continued, as appropriate, in the 200-PO-1 Groundwater OU for past-practice discharges. The clean closure levels for groundwater are the calculated overall groundwater cleanup levels. Following clean closure certification of the TSD unit, the TSD unit groundwater monitoring program will be discontinued.

After clean closure, no RCRA final status groundwater monitoring program will be required for this TSD unit. Groundwater remediation, if required, will be accomplished through the 200-PO-1 Groundwater OU remedial action. Regional monitoring will continue for the 200-PO-1 Groundwater OU for all contaminants of concern to groundwater.

2.1 History of RCRA Groundwater Monitoring at the 216-A-37-1 Crib

Before three PUREX cribs (216-A-10, 216-A-36B, and 216-A-37-1) were combined into one RCRA monitoring plan in June 1997, the 216-A-10 and 216-A-36B Cribs were monitored under separate, interim status RCRA programs, and the 216-A-37-1 Crib was not monitored under RCRA but was monitored since July 1983 under the AEA. In 1996, it was recognized that the 216-A-37-1 Crib required groundwater monitoring under RCRA. At that time, the three cribs were combined into a single groundwater monitoring plan (PNNL-11523, *Interim-Status RCRA Groundwater Monitoring Plan for the 216-A-10, 216-A-36B, and 216-A-37-1 PUREX Cribs*) based on their proximity to one another, similar construction and waste disposal constituents, and similar hydrogeologic characteristics.

From 1997 to 2005, the cribs were monitored, per PNNL-11523, to assess groundwater contamination and evaluate contamination extending from the cribs beyond the extent of the previous monitoring networks and included an expanded monitoring well network consisting of 11 wells in the immediate vicinity of the cribs and 57 other wells. Specific conductance in one of the cribs (216-A-36B) was significantly higher in downgradient wells, as compared to upgradient wells, indicating that the cribs may have contributed to groundwater contamination. Other contaminants identified above drinking water standards (DWS) in the vicinity of the cribs included arsenic, gross alpha, iodine-129, strontium-90, and tritium.

Table 1. Comparison of 216-A-37-1 Crib Treatment, Storage, and Disposal Unit Constituent Soil Concentrations to Clean-Closure Levels

Treatment, Storage, and Disposal Unit Constituents	Maximum Soil Concentration			Hanford Site Soil Background (mg/kg)[c] 90%	Cleanup Levels				Clean-Closure Require-ment[f]	Meet Clean Closure Standard?
	All Soils		Shallow Zone Only[b]		Soil Cleanup Level for Human Health Carcinogen Contact[a] (mg/kg)	Soil Cleanup Level for Human Health Non-Carcinogen Contact[a] (mg/kg)	Soil Concentration Protective of Groundwater[d] (mg/kg)	Ecological[e]		
	Concen-tration (mg/kg)	Depth (ft bgs)	Concen-tration (mg/kg)							
Ammonia[g]	266	12.5	266	9.23	NA	NA	NA	--	NA	Yes
Acetone[h]	0.015	97.5	0.013	NA	NA	72,000	28.9	--	Groundwater Protection	Yes
Cresol-m[h, i]	0.12U	NA	0.12U	NA	NA	4,000	2.3	--	Groundwater Protection	Yes
Cresol-o[h, i]	0.36U	NA	0.36U	NA	NA	4,000	2.3	--	Groundwater Protection	Yes
Cresol-p[h, i]	0.36U	NA	0.36U	NA	NA	8,000	8.0	--	Groundwater Protection	Yes
Methylene Chloride[h]	0.0060U	NA	0.0060U	NA	500	480	0.022	--	Groundwater Protection	Yes
Methyl Ethyl Ketone[h, i]	0.012U	NA	0.011U	NA	NA	48,000	20	--	Groundwater Protection	Yes
Methyl Isobutyl Ketone[h, i]	0.012U	NA	0.011U	NA	NA	6,400	2.7	--	Groundwater Protection	Yes
Trichloroethane[h]	0.0060U	NA	0.0060U	NA	NA	16,000	1.6	--	Groundwater Protection	Yes

a. WAC I 73-340-740(3)(b)(iii)(B), "Unrestricted Land Use Soil Cleanup Standards," "Method B Soil Cleanup Levels for Unrestricted Land Use," "Standard Method B Soil Cleanup Levels," "Human Health Protection," "Soil Direct Contact," equations found in Tables 740-1 (carcinogens) and 740-2 (noncarcinogens) for human-health direct contact. Point of compliance is 4.6 m (15 ft) (WAC 173-340-740(6), "Unrestricted Land Use Soil Cleanup Standards," "Point of Compliance").

b. Shallow zone = <4.6 m (15 ft) bgs.

c. DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*.

d. WAC 173-340-740(3)(b)(iii)(A) directs establishment of soil cleanup levels protective of groundwater using methods described in WAC 173-340-747. "Deriving Soil Concentrations for Ground Water Protection." Point of compliance is soils throughout the site WAC 173-340-740(6)).

e. Not applicable to treatment, storage, and disposal unit closure

f. Listed values represent the n1ost restrictive level of the direct exposure and groundwater protection pathways after evaluation of this value to ensure that it is not less than natural background and for analytical considerations as indicated in WAC 173-340-700(6)(d), "Overview of Cleanup Standards," "Requirements for Setting Cleanup Levels," "Natural Background and Analytical Considerations."

g. Ammonia not regulated under WAC 173-340, "Model Toxics Control Act- Cleanup," and no identified cleanup level exists.

h. F001-F005 listed constituents in 242-A Evaporator waste as the sole source of 216-A-37-1 Crib waste.

i. Constituents reported under the following synonyms: Cresol-m reported as 3-methylphenol; Cresol-o reported as 2-methylphenol; Creosol-p reported as 4 methylphenol; Methyl ethyl ketone reported as 2-butanone; Methyl isobutyl ketone reported as 4 methyl-2 pentanone (hexone).

bgs = below ground surface.
NA = not applicable.
U = not detected.

From 2005 to 2011, the cribs were monitored under a revision of the original plan (PNNL-11523) that included a smaller monitoring network consisting of 11 wells (2 upgradient and 9 downgradient wells) in the vicinity of the cribs. Monitoring of other wells in the 200-PO-1 OU was included in a separate monitoring plan (DOE/RL-2003-04, *Sampling and Analysis Plan for the 200-PO-1 Groundwater Operable Unit*). The primary contaminant of interest was identified as nitrate. Arsenic was no longer monitored because it was detected below groundwater background concentrations, and radionuclides were not included in the revised RCRA specific monitoring.

In 2010, per agreement between Ecology and DOE (Davis 2010, "Protective Filing Disposition of the 216-A-10 Crib (Treatment, Storage and Disposal [TSD]: D-2-2"), the 216-A-10 Crib was reclassified from a RCRA TSD to a CERCLA past-practice site and is no longer subject to RCRA requirements. At that time, since dangerous wastes in groundwater were not identified for the 216-A-37-1 Crib, the 216-A-37-1 Crib was returned to interim status monitoring, and a separate monitoring plan (DOE/RL-2010-92, Rev. 0) was written then revised in June 2011 (DOE/RL-2010-92, Rev. 1) to provide more detail pertaining to the constituent list and sampling frequency. The current monitoring plan for the site is DOE/RL-2010-92, Rev. 1.

As a regulated unit (i.e., landfill) under the definitions of WAC 173-303-040, this unit must meet interim status groundwater requirements contained in WAC 173-303-400(3)(a) through (3)(c), "Interim Status Facility Standards," incorporating Title 40 *Code of Federal Regulations* (CFR) Part 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 per WAC 173-303-400). The objective of RCRA monitoring for this crib is to determine impacts (if any) of the site on groundwater quality including monitoring of contamination indicators (40 CFR 265.92, "Sampling and Analysis").

Near the PUREX Plant, including the two RCRA TSD unit cribs (216-A-36B and 216-A-37-1), are other past-practice cribs. These cribs are located in the southeast part of the 200 East Area and are within the 200-PO-1 Groundwater OU. Groundwater underneath the PUREX cribs is monitored on a regional basis. Monitoring requirements and results for these cribs are reported together because the cribs received similar constituents, and determining the contributions of the individual cribs to the groundwater plumes is difficult. This region has significant tritium, nitrate, and iodine-129 groundwater contamination plumes that exceed DWSs, the largest of which is the tritium plume. Groundwater monitoring specific to the 200-PO-1 Groundwater OU is currently monitored per DOE/RL-2003-04 and modified by TPA-CN-205, *Change Notice for Modifying Approved Documents/Workplans In Accordance with the Tri-Party Agreement Action Plan, Section 9.0, Documentation and Records: DOE/RL-2003-4, Revision 1, Sampling and Analysis Plan for the 200-PO-1 Operable Unit*. The 200-PO-l Groundwater OU boundary generally is defined as the extent of the region's tritium plume.

2.2 Aquifer Identification

The uppermost or unconfined aquifer near the 216-A-37-1 Crib occurs within Hanford formation and Cold Creek unit gravels. Depth to water is approximately 85 m (280 ft) below ground surface (bgs), and the aquifer is approximately 22 m (72 ft) thick. Near the 216-A-37-1 Crib, groundwater flow is estimated to be toward the southeast. Flow directions are influenced by a northwest-southeast trending paleochannel with high permeability Hanford formation sediments near the crib, the Ringold lower mud unit at the water table east of the 200 East Area, and the higher water table elevations to the west and north. These flow directions are supported mainly by the distribution of plumes emanating from near these cribs and recent efforts to improve the accuracy of water level measurements in the southeastern portion of the 200 East Area (DOE/RL-2013-22).

Beginning in 2008, efforts have been undertaken to improve the accuracy of water level measurements and resultant estimates of groundwater gradient near the PUREX plant and associated waste sites. The results of the data collection and analysis effort indicate that the groundwater flow direction changed near the PUREX cribs and the Integrated Disposal Facility (IDF) slightly during 2012. Trend surface analysis of water level measurements, from June 16, 2008 through March 18, 2011, indicated an average hydraulic gradient magnitude of 2.2×10^{-5} ($\pm 0.3 \times 10^{-5}$) meter per meter with a northeast direction (64 (±12) degrees azimuth). Measurements between June 20, 2011 and December 31, 2012, indicated an average hydraulic gradient magnitude of 2.4×10^{-5} ($\pm 0.2 \times 10^{-5}$) meter per meter with an easterly direction (95 (±5) degrees azimuth), indicating a change in flow from east-northeast to east. The well network for the trend surface analyses extended from the west side of IDF to east and southeast of the 216-A-36B Crib. The trend surface analysis results, indicating an east flow direction, represent the average hydraulic gradient beneath this region. However, near the edge of the study area, the groundwater flow appears to be rotating toward the southeast. Therefore, near the 216-A-37-1 Crib, the groundwater flow direction is less certain and may be southeast. The groundwater flow rate ranges between 0.001 and 0.7 m/day (Table 3-1 in SGW-55438, *Hanford Site Groundwater Monitoring for 2012: Supporting Information*).

2.3 Well Location and Design

Per the current groundwater monitoring plan (DOE/RL-2010-92, Rev. 1) for the 216-A-37-1 Crib, one upgradient (299-E25-47) and three downgradient (299-E25-17, 299-E15-19, and 299-E25-20) wells are sampled (Figure 4). Well details are provided in Table 2. Wells that constitute the groundwater monitoring network were selected to comply with 40 CFR 265.91, "Ground-Water Monitoring System."

2.4 Results of Interim Status Groundwater Monitoring

The most current (fiscal year [FY] 2012) groundwater monitoring results are presented in DOE/RL-2013-22. RCRA indicator parameters did not exceed the 2012 critical mean values for specific conductance, total organic carbon (TOC), and total organic halides (TOX) (Table 3-12 in SGW-55438). Additional details regarding calculation of the 2011 critical mean values are provided in DOE/RL-2011-118, Appendix B, *Hanford Site Groundwater Monitoring for 2011*.

With respect to pH, the mean of the quadruplicate pH measurements in downgradient well 299-E25-19 from the October 2012 sampling event was below the critical mean value. Verification sampling was performed in November 2012. The verification sampling did not confirm that the pH measured in the well is below the critical mean range. The site remains in interim status monitoring based on results of the verification sampling. The highest specific conductance and pH results in 2012 were from upgradient well 299-E25-47. The highest TOC and TOX results for 2012 were associated with downgradient well 299-E25-19.

Groundwater quality constituents monitored for the site include chloride, iron, manganese, nitrate, phenols, sodium, and sulfate. Iron continues to exceed the secondary maximum contaminant level (MCL) intermittently, and manganese continues to exceed the MCL in well 299-E25-19. Nitrate concentrations continue to exceed the MCL in well 299-E25-20. Semiannual statistical evaluations with respect to RCRA monitoring have not directly shown that groundwater quality has been impacted from waste discharged into the 216-A-37-1 Crib.

Figure 4. RCRA Monitoring Wells and Flow Direction for the 216-A-37-1 Crib

Table 2. RCRA Monitoring Well Details

Well Name	Year Installed	Water Depth (ft bgs)	Water Level Date	Water Table Elevation (MSL NAVD 88_ft)	Screen Top (ft bgs)	Screen Bottom (ft bgs)	Remaining Water Column (ft)	Location
299-E25-17*	1976	280	7/9/13	400	273	295	15	Downgradient
299-E25-19*	1976	281.7	7/25/13	399	270	295	13.3	Downgradient
299-E25-20*	1976	280.6	7/18/13	399.3	269	294	13.4	Downgradient
299-E25-47	1992	277.6	7/15/13	399.5	263	283.2	5.6	Upgradient

Source: NAVD88, *North American Vertical Datum of 1988.*
* perforated well
bgs = below ground surface.

A remedial investigation (RI), completed for the 200-PO-1 in 2012 (DOE/RL-2009-85, *Remedial Investigation Report for the 200-PO-1 Groundwater Operable Unit*), identified six contaminants of potential concern in the near field area: iodine-129, technetium-99, strontium-90, tritium, trichloroethene, and nitrate. The report recommended that the OU should advance to the next step in the CERCLA process, which is a feasibility study (FS) to develop alternatives for remediation of groundwater contamination. Relatively large plumes of iodine-129, tritium, and nitrate remain in the vicinity of the 216-A-37-1 Crib.

Although monitoring results (including process knowledge and discharge records) indicate that the impact to groundwater also originates from other facilities as well as from PUREX cribs, individual constituents known to have been received by the PUREX cribs have been detected in groundwater above MCL or DWSs. However, with regard to TSD unit constituents, ammonia (ammonium ion) was detected in groundwater only in micrograms per liter (parts per billion) (Table 3) and has no federal DWS (MCL). All other TSD unit constituents either were not detected or were reported only in low micrograms per liter (Table 3) and below clean closure standards.

Table 3. Comparison of 216-A-37-1 Crib Groundwater Data to Clean Closure Levels

Treatment, Storage, and Disposal Unit Constituents	Maximum Concentration in Groundwater (µg/L)	Hanford Site Groundwater Background (µg/L) (90% Log Normal Distribution)	Groundwater Cleanup Level (µg/L)	Clean Closure Driver	Meet Clean Closure Standard?
Ammonia	126 (299-E25-19 in 1997)	113	NA	Not regulated	Yes
Acetone	100 U	NA	7,200	GCL	Yes

Source: DOE/RL-96-61, *Hanford Site Background: Part 3, Groundwater Background.*
Notes: There are no background concentrations for the organic compounds.
Listed values represent the most restrictive level of the groundwater pathways after evaluation of this value, to ensure that it is not less than natural background and for analytical considerations as indicated in WAC 173-340-700(6)(d), "Overview of Cleanup Standards," "Requirements for Setting Cleanup Levels," "Natural Background m1d Analytical Considerations."
All values are reported as undetected with variable detection limits ranging from 10 to 1.44 µg/L.
All values are reported as undetected with variable detection limits ranging from 10 to 1.3 µg/L.
All values are reported as undetected with variable detection limits ranging from 10 to 0.077 µg/L.
All values are reported as undetected with variable detection limits ranging from 10 to 0.58 µg/L.
GCL is in accordance with WAC 173-340-720(4), "Groundwater Cleanup Standards," "Method B Cleanup Levels for Potable Ground Water."
GCL = groundwater cleanup level.
MCL = maximum contaminant level.
NA = not applicable.
U = undetected.

3 Closure Performance Standards

The 216-A-37-1 Crib will be clean closed. This section identifies TSD unit clean closure performance standards and unit soil and material clean closure requirements.

3.1 Treatment, Storage, and Disposal Unit Closure Performance Standards

The standards for closure of this TSD unit are in accordance with the requirements of the TPA Action Plan (Ecology et al. 1989b, Section 5.3) directing that Hanford Site interim status TSD unit closures meet cleanup requirements established in accordance with WAC 173-303-610. As required by the TPA (Ecology et al. 1989a, Section 6.3.1), clean closure for disposal units must demonstrate that TSD unit operations did not adversely impact soil or groundwater. The closure performance standards of WAC 173-303-610(2)(a) require the owner or operator of a TSD facility to close the facility in a manner that accomplishes the following objectives:

- Minimize the need for further maintenance.
- Control, minimize, or eliminate post-closure escape of dangerous waste, dangerous waste constituents, leachate, contaminated runoff, or dangerous waste decomposition products to the ground, surface water, groundwater, or the atmosphere to the extent necessary to protect HHE.
- Return the land to the appearance and use of surrounding land areas.

Clean closure will eliminate the need for future post-closure inspections, monitoring, and maintenance resulting from contamination from TSD unit constituents. Clean closure based on completed sampling and analysis demonstrates the absence of chemical contamination at the 216-A-37-1 Crib that could escape during a post-closure period. After clean closure, the appearance of the land will be consistent with future land-use determinations for adjacent portions of the 200 Areas as an industrial-exclusive portion of the Hanford Site. This land use is consistent with the formal determination made for this portion of the 200 Area as described in 64 FR 61615, "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS)."

3.2 Soil Closure Standards

The clean closure standards for soil are action levels established to meet the closure performance standards of WAC 173-303-610(2)(a) and the clean closure requirements of WAC 173-303-610(2)(b)(i) and WAC 173-303-650(6)(a), "Surface Impoundments." Soil clean closure levels for TSD unit constituents are numeric cleanup levels prescribed by WAC 173-303-610(2)(b)(i) to be calculated using the formulas of WAC 173-340-740(3), "Unrestricted Land Use Soil Cleanup Standards," or are Hanford Site background concentrations (DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*), whichever is least restrictive. No TSD unit constituent in soil has been shown by RI sampling to exceed these action levels. Therefore, TSD unit soil meets clean closure requirements without further remediation for TSD unit constituents (see Table 1).

Ammonia is a 216-A-37-1 Crib TSD unit constituent but only because of its designation as a state-only (WT02) waste. Ammonia is not regulated under WAC 173-340-740(3). Consequently, no WAC 173-340-740(3) human health direct contact soil or groundwater protection cleanup level exists for ammonia, and no treatment standard exists for state-only (WT02) ammonia wastes. Given the absence of an established regulatory cleanup level for ammonia in soil, the clean closure requirement will be the dangerous waste designation level for ammonia as a state-only toxicity criteria (WT02) waste, calculated in accordance with WAC 173-303-100, "Dangerous Waste Criteria" (i.e., greater than 1 wt% of the waste stream). Because this concentration is greater than Hanford Site background values for ammonia of

9.23 mg/kg (DOE/RL-92-24), its use will not direct cleanup to below background. For ammonia, the maximum concentration in soil of 266 mg/kg (3.8 m or 12.5 ft) bgs is not sufficient to designate soil as a state-only WT02 dangerous waste (if removed); therefore, TSD unit soil meets clean closure requirements without further remediation for ammonia.

Along with human health protection requirements with regard to TSD unit constituents, cleanup to WAC 173-340-740(3) incorporates requirements for consideration of ecological protection (WAC 173-340-740(3)(b)(ii)), soil vapor ambient air contamination control (WAC 173-340-740(3)(b)(iii)(C)), and groundwater protection requirements (WAC 173-340-740(3)(b)(iii)(A)). However, these requirements are not applicable to this TSD unit closure. Soil vapor ambient air protection requirements for protection from exposure to volatile organic constituent vapors do not apply because volatile organic constituents were not detected in site soils. Ecological protection requirements do not apply based on WAC 173-340-7493(2)(a)(i), "Site-Specific Terrestrial Ecological Evaluation Procedures"; beyond that, no ecological indicator soil concentration (WAC 173-340-900, "Tables," Table 749-3) exists for any detected TSD unit constituent. Groundwater protection requires no further consideration because TSD unit constituents either are not in groundwater above MCLs or, as in the case of ammonia, are monitored but have no MCL (see Table 3).

3.3 Clean Closure Standard for Piping and Materials

The clean closure standard for crib piping and materials is established in accordance with WAC 173-303-610(2)(b)(ii). Materials in this TSD unit include waste distribution piping within the TSD unit boundary and the membrane overlaying the distribution piping as a moisture barrier. For the listed waste constituents regulated under WAC 173-340-740(3) (Table 1), this standard would be the same concentration as for soils; however, for ammonia, this standard is the dangerous waste designation level for ammonia as a state-only WT02 waste, calculated in accordance with WAC 173-303-100 (i.e., greater than 1 wt% of the waste stream). Achievement of this standard for these materials will be demonstrated through use of process knowledge and knowledge of waste characteristics.

Belowgrade piping and membrane material were not sampled as a portion of the RI activities. However, these materials meet clean closure requirements without further investigation because they are not reasonably expected to be contaminated with TSD unit constituents above clean closure levels. The waste distribution piping is considered to be empty. No liquid has been discharged though the piping since 1989, and piping was sloped and perforated to facilitate complete drainage, thereby precluding liquid from remaining in the piping. The membrane was placed above waste distribution piping that was perforated on the bottom and drained downward directly to coarse gravel, making membrane contact with waste unlikely.

Dangerous waste residues would not reasonably exist on internal piping surfaces or on the fabric membrane (even if contacted by waste), given that the effluent primarily was water and was very low in solids and that waste stream constituents (volatiles and ammonia) are not prone to residue deposition. Thus, no reasonable potential exists for ammonia or the listed volatile organic constituents (which were not detected in crib soils) to exist in piping as effluent or on piping or membrane surfaces as residues at levels that could reasonably exceed their respective dangerous waste designation or WAC 173-340-740(3) clean closure requirements.

4 Closure Strategy

The 216-A-37-1 Crib TSD unit, which includes soils and crib piping and materials, will be clean closed without further physical closure actions. Because the clean closure approach is based on the results of completed sampling and analysis and the clean closure justification discussion presented in this plan, approval of the plan will constitute approval of clean closure. Non-TSD unit constituents, including radionuclides, will be dispositioned through past-practice processes for the 200-EA-1 OU identified in the TPA (Ecology et al. 1989a, Chapter 7.0). These activities will satisfy RCRA corrective requirements under WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*, Condition II.Y.

The 216-A-37-1 Crib was assigned to the process-based 200-PW-4 RCRA Past-Practice General Process Condensate Waste Group OU for characterization and remedial decision making following the CERCLA RI/FS process. This waste group includes sites that did not have high concentrations of contaminants and, therefore, did not qualify for inclusion in other more contaminated waste groups. Because of various similarities of process and waste, this waste group was consolidated with the 200-PW-2 OU for characterization (DOE/RL-98-28). Crib characterization data were collected in accordance with DOE/RL-2000-60.

In 2004, TSD unit characterization sampling was completed as a portion of the 200-PW-2/4 OU CERCLA RI/FS process. Results of 200-PW-2/4 RI sampling and analysis, as identified in the following sections, indicate that no dangerous waste constituents disposed during the period of TSD unit operations (TSD unit constituents) exist in crib soils or crib materials above analytical clean closure standard(s) established in accordance with WAC 173-303-610(2)(b)(i) and (ii). Any further physical activities necessary to complete waste site disposition of non-TSD unit constituents (e.g., radionuclides and past-practice chemical constituents) will occur in conjunction with 200-EA-1 OU CERCLA remedial action activities. These activities are described in the TPA (Ecology et al. 1989a, Chapter 7.0) as past-practice processes that are outside the scope of TSD unit closure and that satisfy RCRA corrective action requirements under WA7890008967.

Because the 216-A-37-1 Crib RCRA TSD unit is not responsible for contaminants in groundwater (Section 2.4), their presence in groundwater above DWSs does not preclude TSD unit clean closure before completion of groundwater cleanup. After clean closure, groundwater will continue to be monitored by the 200-PO-1 Groundwater OU under a RCRA groundwater assessment program for past-practice (corrective action) constituents (DOE/RL-2000-60).

Closure activities, including sampling and analysis, to verify clean closure were conducted as part of the 200-PW-2/4 OU RI. An analysis of the analytical data previously collected demonstrated that clean closure levels for this TSD unit have been achieved. No additional closure activities are anticipated for this unit to achieve clean closure.

4.1 Previous Closure Activities

Clean closure activities for the 216-A-37-1 Crib were performed as part of the 200-PW-2/4 OU remediation process. These activities included TSD unit physical isolation, borehole drilling, and soil verification sampling and analysis.

4.2 Treatment, Storage, and Disposal Unit Physical Isolation

In 1989, to preclude any further discharges to this crib and in support of TSD unit closure, the 207-A South Retention Basin, the sole upstream source of 216-A-37-1 Crib waste, was physically isolated from receipt of 242-A Evaporator process condensate effluent. Operations at the 242-A Evaporator were halted in 1989 to begin facility upgrades that would preclude discharges to the ground, including disposal to the soil column at the 216-A-37-1 Crib. At that time, waste began being transferred to the Liquid Effluent Retention Facility basins for storage and treatment at the 200 Areas Effluent Treatment Facility. This action permanently isolated the downstream 216-A-37-1 Crib from any further waste additions.

4.3 Verification Sampling and Analysis

This section summarizes completed TSD unit closure characterization activities, comprising borehole drilling, geophysical logging, field screening, and sampling and analysis of borehole soils. These actions were performed in FY 2003 and FY 2004, as a portion of the 200-PW-2/4 OU RI, to identify the nature and extent of chemical and radiological contamination at the TSD unit in support of remedial decision making and RCRA unit closure. Work plan sampling and analysis requirements for TSD unit characterization were determined using a data quality objectives process documented in CP-14176, *Remedial Investigation Data Quality Objectives Summary Report for the 200-PW-4 Operable Unit.* The RI was conducted in accordance with the SAP in the RI/FS work plan (DOE/RL-2000-60, Appendix B). Data collected from the crib are presented in the RI report (DOE/RL-2004-25, Appendix B).

4.3.1 Borehole Drilling

Drilling of Borehole C4106 (Figure 5) began on April 28, 2003 and was completed on May 13, 2003, for characterization of the 216-A-37-1 Crib. The borehole activities for this crib are described in detail in CP-18666, *200-PW-2 and 200-PW-4 Operable Unit Borehole Summary Report*. The borehole was drilled at a worst case location, to a total depth of 84.8 m (278 ft) bgs, and the water table was found at 84.1 m (277.5 ft) bgs. The borehole was drilled to the top of groundwater using a cable tool drill rig and was advanced to total depth using drive barrels and split-spoon samplers. Split-spoon samplers generally were used as the primary sampling device for collecting chemical, radiological, and physical property samples, but occasionally the drive barrel was used to collect moisture samples. After reaching total depth, each borehole was decommissioned by removing the temporary casings and backfilling the borehole with silica sand from the bottom to the water table, with granular bentonite up to 0.3 to 1 m (1 to 3 ft) bgs, and with a concrete surface seal in accordance with WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells."

4.3.2 Soil Sampling and Analysis

Borehole soil samples were taken and underwent field screening and laboratory analysis, as summarized in this section and described in detail in CP-18666. Data collected are presented in the RI report (DOE/RL-2004-25, Appendix B). Thirty soil samples were collected from Borehole C4106 vadose zone material. A spilt-spoon sampler was the primary sampling device used to collect the samples from the boreholes. Two were quality control samples (equipment blanks), and the remaining 28 were obtained from borehole material from 0.2 to 83.1 m (0.5 to 272.5 ft) bgs for chemical and radiological analysis and determination of physical properties.

Borehole soil samples were analyzed for ammonia, anions, hexavalent chromium, total cyanide, metals, nitrate/nitrite, oil and grease, pesticides and herbicides, pH, polychlorinated biphenyls, semivolatile organics, total petroleum hydrocarbons, radionuclides, volatile organics, moisture content, particle-size distribution, and bulk density (DOE/RL-2004-25, Table 2-2). These parameters included all listed waste TSD unit constituents identified in Table 1. Physical property samples were collected at major lithologic changes and as determined by the site geologist. Sample collection was guided by the sample schedule in the RI/FS work plan (DOE/RL-2000-60). The RI report (DOE/RL-2004-25, Table 2-2) provides sample information (e.g., HEIS sample number, date, depth, and analyses performed) for Borehole C4106 soil samples. Analytical results are presented in the RI report (DOE/RL-2004-25, Appendix B).

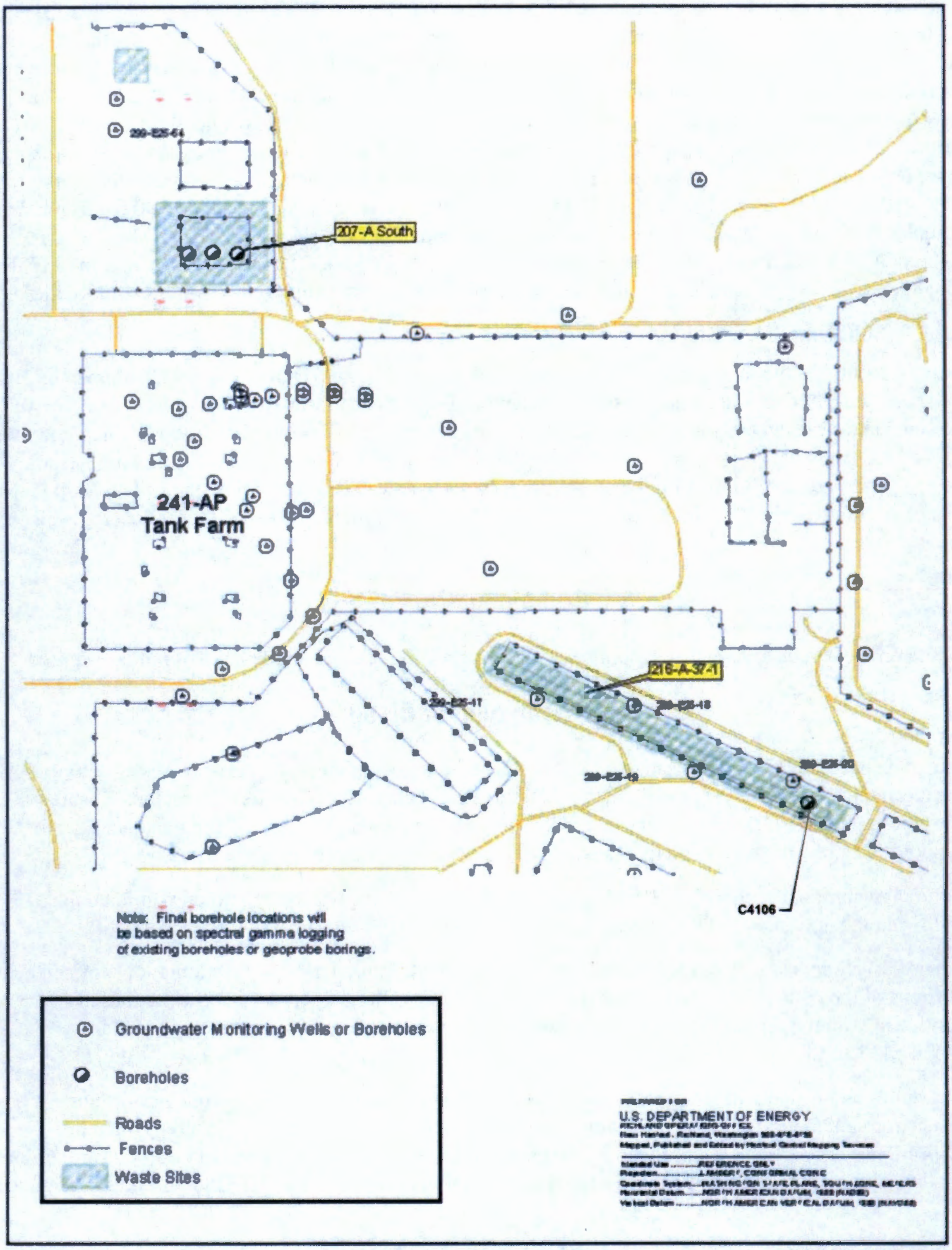

Figure 5. Borehole C4106 and Groundwater Monitoring Well Locations for the 216-A-37-1 Crib

The sampling approach generally required a greater sample frequency near the base of each waste site, which usually is the area of highest contamination. Sample collection was attempted at depths of 4.6 m (or less) and 7.6 m (15 and 25 ft) bgs to define contamination profiles for remedial designs. Surface soils were tested for pesticides and herbicides used to kill insects and vegetation at 0.15 m (0.5 ft) bgs for investigation-derived waste characterization of near-surface soils. Samples to a depth of 4.6 m (15 ft) are critical for evaluation of human health direct exposure and terrestrial wildlife scenarios, whereas deeper samples are applicable to groundwater protection considerations. Sample intervals generally increased below depths of about 15.2 to 27.4 m (50 to 90 ft) to intervals of 15.2 to 30 m (50 to 100 ft). Borehole samples were taken at 11 elevations: 3.8 m (12.5 ft), 5.3 m (17.5 ft), 8.4 m (27.5 ft), 11.4 m (37.5 ft), 14.5 m (47.5 ft), 22.1 m (72.5 ft), 29.7 m (97.5 ft), 44.9 m (147.5 ft), 60.2 m (197.5 ft), 72.2 m (237 ft), and 83 m (272 ft) bgs. One liner from selected sample intervals was analyzed for physical properties.

4.3.3 Soil Sample Results

Table 1 identified the maximum concentration listed in the RI report (DOE/RL-2004-25, Appendix B) for TSD unit constituents and compares these concentrations to clean closure levels. Ammonia (as N) was detected and reported at a maximum concentration of 266 mg/kg at 38.1 m (125 ft) bgs, which does not exceed the ammonia clean closure level (10,000 mg/kg). Of the remaining TSD unit constituents, only acetone was detected at 0.014 mg/kg at 29.7 m (97.5 ft) bgs, which is well below the soil cleanup levels protective of groundwater. No concentration of TSD unit constituents exceeded clean closure levels in soils.

5 Contingent Closure Plan

Based on the results to date that support clean closure, a contingent closure plan will not be required.

6 Schedule for Closure

The unit specific closure requirements for this TSD unit are complete. The only remaining activity for the clean closure of this TSD is certification of closure as described in Section 7. Previous closure activities for this TSD unit, including unit isolation and closure verification sampling and analysis to support this strategy, are complete. No additional physical closure activities are planned.

Following approval of this plan. a certification of closure package will be submitted within 90 days following the due date for TPA Interim Milestone M-037-10.

After closure, appearance of the land will be consistent with future land-use determinations for adjacent portions of the 200 Areas as an industrial-exclusive portion of the Hanford Site. This land use is consistent with the formal determination made for this portion of the 200 Area as described in 64 FR 61615.

The duties associated with TSD unit dangerous waste management activities include performing inspections and notifying Ecology of any potential threats to HHE. Until final closure, TSD unit inspections will continue as approved by Ecology. Following Ecology approval of clean closure, training for dangerous waste management activities and inspections at the 216-A-37-1 Crib will be discontinued.

7 Certification of Closure

This TSD unit received its final volume of waste in 1989. Closure activities included borehole drilling and soil sampling and analysis were completed in 2004 in conjunction with the 200-PW-2/4 OU

CERCLA RI/FS process (DOE/RL-2004-25). This sampling demonstrated the absence of chemical contamination in TSD unit soils above clean closure levels.

In accordance with WAC 173-303-610(6), DOE will submit to the lead regulatory agency (Ecology) a certification of closure and subsequent permit modification documentation. Both DOE and the Co-Operator identified on the current Part A Form will sign the certification of closure, and an Independent Qualified Registered Professional Engineer (IQRPE) will state 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 IQRPE's certification will be placed in the Administrative Record.

8 Post-Closure Plan

The closure strategy for the 216-A-37-1 Crib is clean closure with regard to RCRA contaminants from TSD unit operations; therefore, no post-closure plan or activities for purposes of addressing RCRA contaminants are needed for this site.

9 Amendment of Closure Plan

As required by WAC 173-303-610(3)(b), the closure plan will be amended if changes to closure activities require a modification of the approved closure plan; however, closure activities are complete. If an amendment to the approved closure plan is required, DOE will follow the process contained in RCRA Permit Condition I.C.3.

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DOE/RL-2005-89
Revision 0

207-A SOUTH RETENTION BASIN CLOSURE PLAN (S-2-7)

Prepared for the U.S. Department of Energy
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207-A SOUTH RETENTION BASIN CLOSURE PLAN (S-2-7)

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Contents

Figures

Tables

Terms

AEA	*Atomic Energy Act of 1954*
bgs	below ground surface
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	*Code of Federal Regulations*
DOE	U.S. Department of Energy
DST	double-shell tank
Ecology	Washington State Department of Ecology
FR	*Federal Register*
FS	feasibility study
HHE	human health and the environment
HWMA	Hazardous Waste Management Act
IQRPE	Independent Quality Registered Professional Engineer
NA	not applicable
OU	operable unit
RCRA	*Resource Conservation and Recovery Act of 1976*
RCW	*Revised Code of Washington*
RI	remedial investigation
SAP	sampling and analysis plan
TPA	Tri-Party Agreement
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TSD	treatment, storage, and/or disposal
WAC	*Washington Administrative Code*

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1 Introduction

The purpose of this plan is to explain the *Resource Conservation and Recovery Act of 1976* (RCRA) (42 USC 6901) closure process for the 207-A South Retention Basin treatment, storage, and/or disposal (TSD) unit.

This closure plan is being submitted in accordance with the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989a), also known as the Tri-Party Agreement (TPA), Interim Milestone M-037-02, which requires submittal of revised closure plans to the Washington State Department of Ecology (Ecology) to support TSD unit closure for five TSD units: 207-A South Retention Basin, 216-A-29 Ditch, 216-A-36B Crib, 216-A-37-1 Crib, and 216-B-63 Trench, by June 30, 2014.

Based on analytical data previously collected, closure for the 207-A South Retention Basin structures and soil is clean closure in accordance with *Washington Administrative Code* (WAC) 173-303-610, "Closure and Post-Closure." This strategy is based on analytical data provided and summarized in the 200-PW-2/4 Operable Unit (OU) *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) (42 USC 9601) remedial investigation (RI)/feasibility study (FS) work plan (DOE/RL-2000-60, *Uranium-Rich/General Process Condensate and Process Waste Group Operable Units RI/FS Work Plan and RCRA TSD Unit Sampling Plan Includes: 200-PW-2 and 200-PW-4 Operable Units*), showing that TSD unit vadose zone soil and concrete structures meet clean closure performance standards (Section 3) for TSD unit dangerous waste constituents without further physical closure activities. Clean closure is based on the sampling and analysis results described in this closure plan and all verification sampling to confirm the clean closure has been completed, no further closure activities are expected to be performed. Therefore, no sampling and analysis plan (SAP) is included in this closure plan. There is no evidence of any releases from this TSD unit; therefore, no post-closure activities are needed, and a post-closure monitoring plan is not included.

1.1 Unit Description

1.1.1 Overview

The 207-A South Retention Basin, an interim status surface impoundment, was used for interim storage of 242-A Evaporator process condensate for sampling and analysis before the condensate was discharged to the 216-A-37-1 Crib for disposal to the soil column. The basin began storage operations in 1977. The 242-A Evaporator discharge to the basin was terminated on April 12, 1989, and the basin has been inactive since that date. Because the 242-A Evaporator process condensate was designated as dangerous waste under WAC 173-303, "Dangerous Waste Regulations," a *Dangerous Waste Permit Application* for the 207-A South Retention Basin (WA7 89000 8967, Part V, Closure Unit 9) (Part A Form) was submitted to Ecology in 1986 with the latest revision on October 1, 2008. Figure 1 provides a timeline that summarizes the operations and regulatory milestone associated with the 207-A South Retention Basin. Operations milestones are shown below the timeline, and regulatory milestones are shown above the timeline.

The 242-A Evaporator process condensate is a mixed waste, which means that the process condensate is a mixture of both hazardous/dangerous waste, as defined in RCRA and *Revised Code of Washington* (RCW) 70.105, "Hazardous Waste Management," also known as the Washington State Hazardous Waste Management Act (HWMA), and also radionuclide "source, special nuclear, and byproduct materials" as defined in the *Atomic Energy Act of 1954* (AEA). Both RCRA and AEA state that these radionuclide materials are regulated at U.S. Department of Energy (DOE) facilities exclusively by the DOE, acting pursuant to its AEA authority. These radionuclide materials are not hazardous/dangerous wastes and, therefore, are not subject to regulation by the State of Washington under RCRA and HWMA.

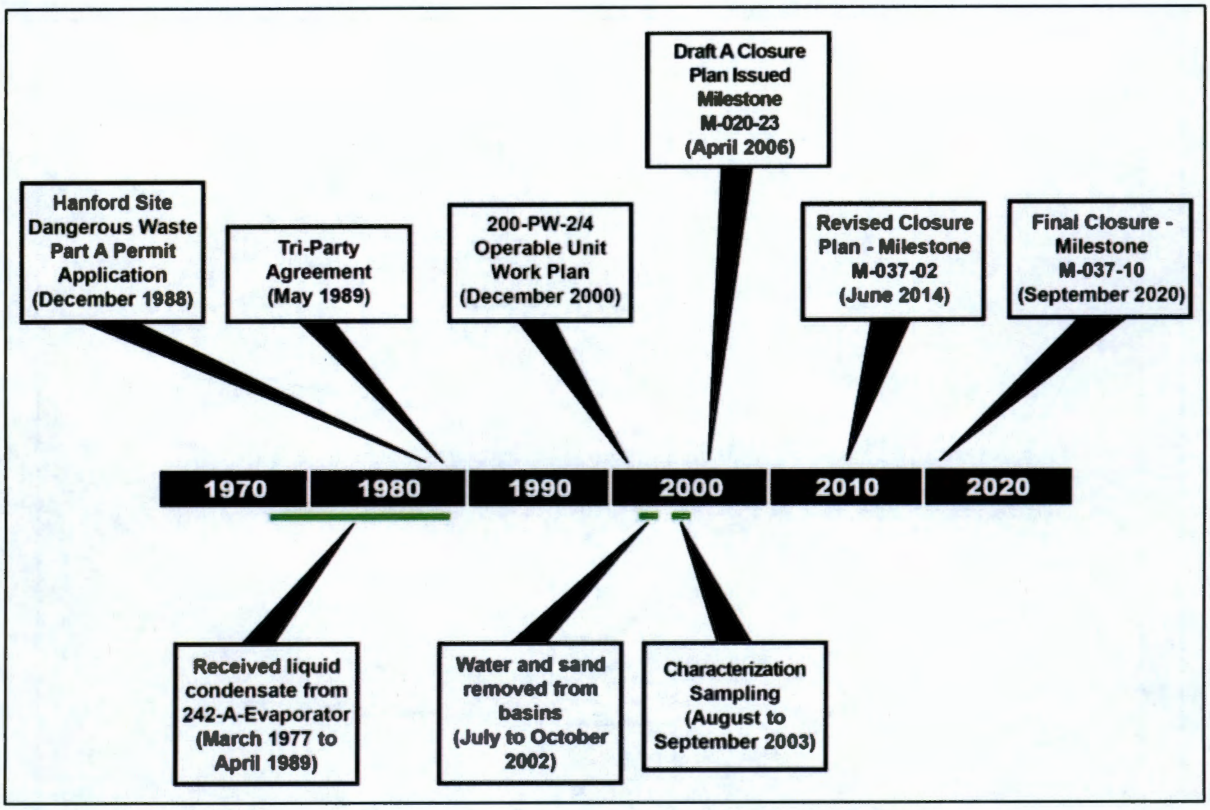

Figure 1. Timeline for the 207-A South Retention Basin

All information contained herein and related to, or describing, AEA-regulated materials and processes in any manner, may not be used to create conditions or other restrictions set forth in any permit, license, order, or any other enforceable instrument. Information contained herein on radionuclides is provided for process description purposes only.

1.1.2 Physical Description

The 207-A South Retention Basin is located in the 200 East Area (Figure 2) directly east of the 242-A Evaporator. The 207-A South Retention Basin, also known as Process Condensate Basins 1, 2, and 3 (i.e., PC-1, PC-2, and PC-3), began operations in March 1977. The 207-A South Retention Basin consists of three separate open liquid effluent storage cells constructed of concrete that operated as a surface impoundment. Figure 3 provides a construction diagram of the 207-A South Retention Basin. Each of the three cells had a 264,979 L (70,000 gal) design capacity for a total capacity of 794,937 L (210,000 gal). Each cell is 16.8 m (55 ft) long, 3.0 m (10 ft) wide at the bottom, and 2.1 m (7 ft) deep. The bottom of each basin cell slopes toward a drain located at the south end of the cell. In 1982, all three concrete cells were coated with an elastomeric coating to prevent waste contaminants from penetrating the concrete.

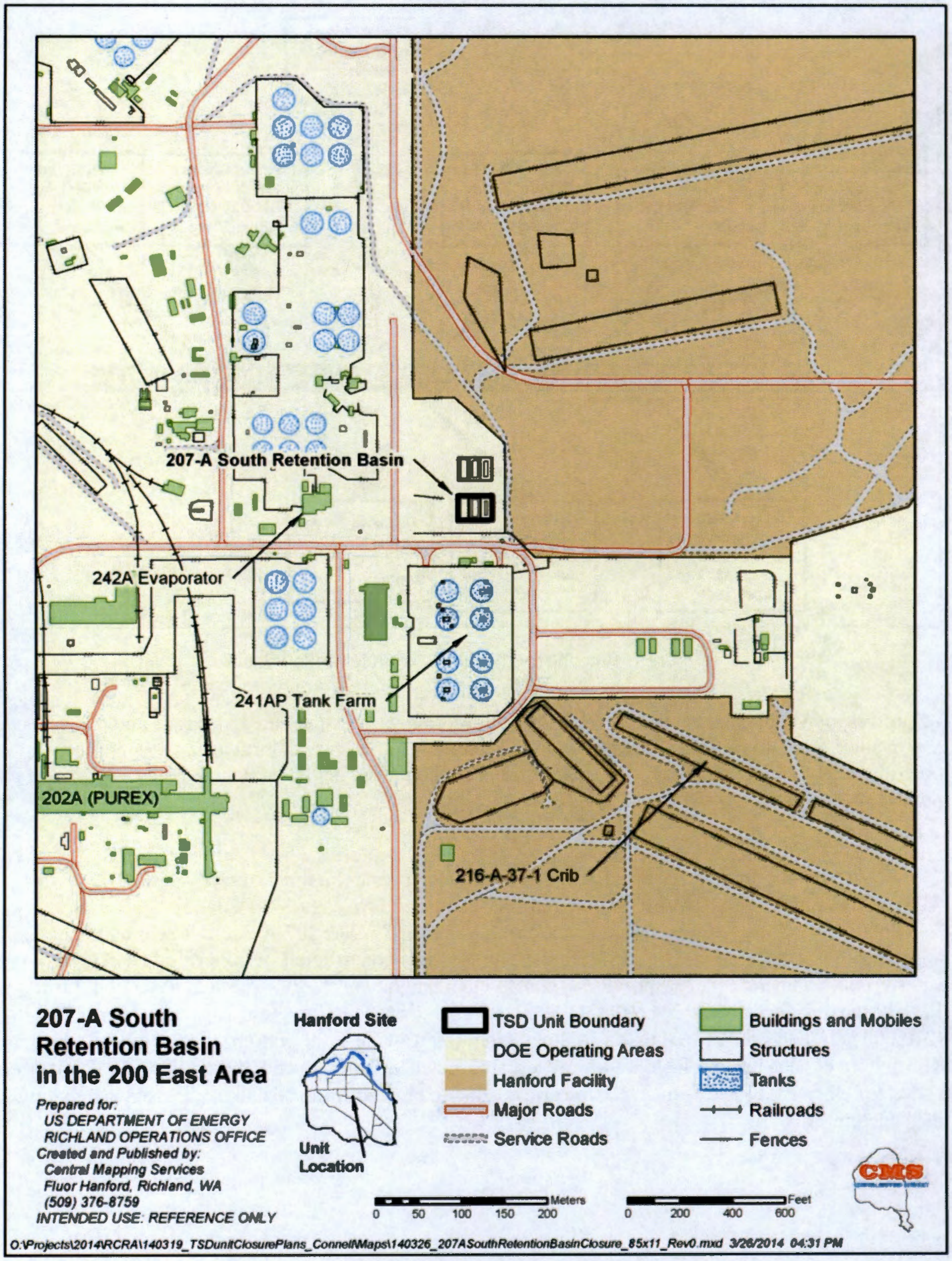

Figure 2. 207-A South Retention Basin Site Plan

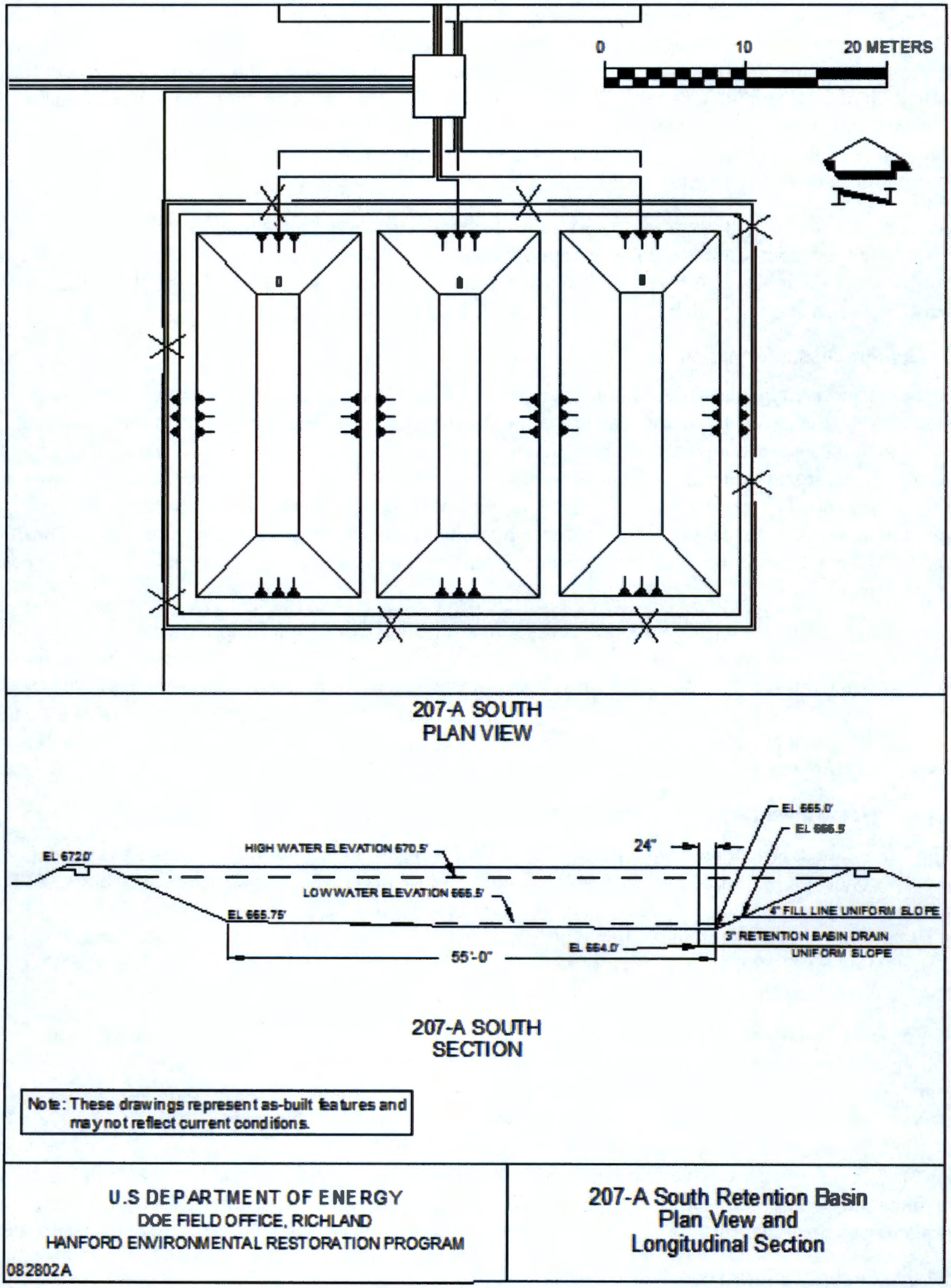

Figure 3. 207-A South Retention Basin Construction Diagram

These concrete structures have remained intact; i.e., no cracks exist in the basins, and no leaks have been reported from the basins during routine inspections (CP-18666, *200-PW-2 and 200-PW-4 Operable Units Borehole Summary Report*). Therefore, no direct pathway to soil exists for the stored waste. Under the definition of surface impoundment (WAC 173-303-040, "Definitions"), this unit has no associated ancillary equipment. Consequently, the TSD unit boundary, as shown on the Part A Form, was established as the exterior wall of the concrete basin structure. The scope of closure includes the basin storage cells and soils under the basins.

All waste from TSD unit operations was removed from the unit when operations ceased in 1989. The waste feed piping from the 242-A Evaporator and basin discharge piping to the 216-A-37-1 Crib are outside the TSD unit boundary and will be addressed in conjunction with the 200-IS-1 OU CERCLA remedial action and/or through closure of the 242-A Evaporator.

1.1.3 Process Information

All waste received by the 207-A South Retention Basin was from the 242-A Evaporator. Waste processed by the 242-A Evaporator was received from the double-shell tank (DST) system and was an aqueous, mixed waste solution containing dissolved cations and anions such a sodium, potassium, aluminum, hydroxides, nitrates, and nitrites. Slurry and process condensate were the two mixed waste streams generated at the 242-A Evaporator. The slurry was returned to the DST system. The process condensate was condensed vapor from the evaporation process. During this period of operations, process condensate was transferred to the 207-A South Retention Basin for interim storage before it was disposed at the 216-A-37-1 Crib.

This unit operated as a surface impoundment for interim storage of 242-A Evaporator process condensate while the condensate awaited sampling and analysis. Waste was pumped from the 242-A Evaporator through waste transfer piping to the basins. Waste was stored in the basin to obtain sample results for process control. The pumps located between the 207-A North and South Retention Basins were used to transfer the stored effluent to the 216-A-37-1 Crib for disposal to the soil column. No waste treatment or disposal occurred at the 207-A South Retention Basin TSD unit.

1.1.4 Waste Inventory and Characteristics

The 207-A South Retention Basin operated from 1977 to 1989 and managed only 242-A Evaporator process condensate effluent waste. The total quantity of process condensate waste onsite at any one time was limited to the combined design capacity of the storage cells of approximately 794,937 L (210,000 gal). The total volume of liquid effluent the TSD unit received for intermediate storage was 377,000,000 L (99,590,000 gal) of evaporator condensate (DOE/RL-98-28, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program*).

The process condensate is an aqueous, mixed waste solution containing trace amounts of dissolved cations and anions such a sodium, potassium, aluminum, hydroxides, nitrates, and nitrites with radionuclides (WHC-EP-0342, Addendum 15, *242-A Evaporator Process Condensate Stream-Specific Report*). The 242-A Evaporator process condensate was designated as mixed waste (WAC 173-303-040) because the waste was derived from a waste containing spent halogenated and non-halogenated solvents (WAC 173-303, dangerous waste codes F001, F002, F003, F004, and F005) and because of the toxicity of ammonia (WT02, state-only, toxic, dangerous waste). The TSD unit constituents associated with these dangerous waste codes include ammonia, acetone, cresol-m, cresol-o, cresol-p, and methylene chloride.

1.1.5 Security Information

The 207-A South Retention Basin is located in the200 East Area of the Hanford Site. and therefore, security information pertaining to the 200 Area applies to this TSD unit. Changes to security are expected to occur during the 200 East Area deactivation and decommissioning activities. Security measures will remain in place that limit entry to authorized personnel and preclude unknowing access by unauthorized individuals until closure of the TSD unit.

2 Groundwater Monitoring

A surface impoundment and regulated unit, under the definition of WAC 173-303-040 if still operating, requires RCRA groundwater monitoring in accordance with the requirements of WAC 173-303-400(3)(a) through (3)(c), "Interim Status Facility Standards." However, a certified waiver of groundwater monitoring requirements in accordance with Title 40 *Code of Federal Regulations* (CFR) 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," Subpart F, "Ground-Water Monitoring," was developed to demonstrate there is a low potential for migration of hazardous contaminants from this unit to groundwater (PNNL 2005, *Basis for Waiver of Groundwater Monitoring Requirements for 207-A South Retention Basin*). This waiver and demonstration are consistent with the basin having remained intact during operations, thereby preventing liquid from entering the soil, and with soil sample results indicating that vadose zone contamination does not exist above levels protective of groundwater.

Ongoing regional groundwater monitoring in this area is conducted under the CERCLA RI/feasibility study (FS) process for the 200-PO-1 Groundwater OU. This groundwater remediation is outside the scope of this closure plan. Any groundwater contamination under the 207-A TSD unit will be remediated under the 200-PO-1 Groundwater OU CERCLA remedial action as agreed upon in the *Hanford Federal Facility Agreement and Consent Order Action Plan*, Section 7.0 (Ecology et al. 1989b).

3 Closure Performance Standards

The 207-A South Retention Basin will be clean closed. This section identifies clean closure performance standards for TSD unit soil and structures.

3.1 Treatment, Storage, and Disposal Unit Closure Performance Standards

The standards for closure of this TSD unit are in accordance with the requirements of the TPA Action Plan (Ecology et al. 1989b), Section 5.3, directing that Hanford Site interim status TSD unit closures meet cleanup requirements established in accordance with WAC 173-303-610. As required by the TPA (Ecology et al. 1989a), Section 6.3.1, clean closure must demonstrate that TSD unit operations did not adversely impact soil or groundwater. The closure performance standards of WAC 173-303-610(2)(a)(i) through (iii) require the owner or operator of a TSD unit to close the facility in a manner that will accomplish the following objectives:

1. Minimize the need for further maintenance.
2. Control, minimize, or eliminate post-closure escape of dangerous waste, dangerous waste constituents, leachate, contaminated runoff, or dangerous waste decomposition products to the ground, surface water, groundwater, or the atmosphere to the extent necessary to protect human health and the environment (HHE).
3. Return the land to the appearance and use of surrounding land areas.

Clean closure will eliminate the need for future post-closure inspections, monitoring, and maintenance resulting from contamination from TSD unit constituents. Completed sampling and analysis demonstrates the absence of chemical contamination at the 207-A South Retention Basin that could escape during a post-closure period. After clean closure, appearance of the land will be consistent with future land-use determinations for adjacent portions of the 200 Areas as an industrial-exclusive portion of Hanford. Clean closed basin cells could remain until disposition in conjunction with future decommissioning activities that are consistent with the future industrial land-use scenario. This land use is consistent with the determination made for this portion of the 200 Area as described in 64 *Federal Register* (FR) 61615, "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS)."

3.2 Soil and Concrete Closure Standards

The clean closure standard for soil and concrete was established to meet the closure performance standards of WAC 173-303-610(2)(a) and the clean closure requirements of WAC 173-303-610(2)(b)(i and ii) and WAC 173-303-650(6)(a), "Surface Impoundments." For this unit, the clean closure standards for soil are health based action levels prescribed by WAC 173-303-610(2)(b)(i). These cleanup levels were calculated using WAC 173-340-740(3), "Unrestricted Land Use Soil Cleanup Standards," formulas or Hanford Site background concentrations (DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*), whichever is least restrictive.

As described in Ecology Publication 94-111, *Guidance for Clean Closure of Dangerous Waste Units and Facilities* (Section 5.2, "Decontamination Options for Clean Closure"), this closure plan used the site-specific circumstances to determine that the concrete met the performance standards due to the lack of cross-media transfer of contamination based on visual inspections and physical samples. The TSD unit concrete containment is in good condition, lacks visible cracks, is unstained, and has a well-maintained coating. Because these conditions exist, removal of the top 0.6 cm (0.25 in.) of concrete surface is not necessary for decontamination. Samples of the concrete were taken to determine if there was chemical contamination present within the concrete matrix. The results of these samples are presented in the RI report (DOE/RL-2004-25, Appendix B) and indicate that no levels of contamination were present that would pose a threat to HHE.

The underlying soil qualifies for clean closure because concentrations of TSD unit constituents have been shown by verification sampling to be below the WAC 173-340-740(3) action levels for soil. Characterization activities completed in 2004 included borehole drilling and soil and concrete sampling and analysis performed in conjunction with the 200-PW-2/-4 OU CERCLA RI/FS process (DOE/RL-2004-25, *Remedial Investigation Report for the 200-PW-2 Uranium-Rich Process Waste Group and the 200-PW-4 General Process Condensate Group Operable Units*). This sampling demonstrated the absence of chemical contamination above clean closure levels in the underlying soils. Such levels will be verified as achieved upon Ecology acceptance of the completed analytical sampling and analysis results described later in this plan. Closure, as prescribed by WAC 173-303-610(2)(b)(i), directs the use of numeric cleanup levels calculated in accordance with WAC 173-340-740(3). This regulation incorporates requirements for consideration of ecological protection (WAC 173-340-740(3)(b)(ii)) and soil vapor ambient air contamination control (WAC 173-340-740(3)(b)(iii)(C)). However, these protection requirements are not applicable to this TSD unit closure. WAC 173-340-740(3)(b)(ii) directs establishment of soil cleanup levels that do not apply to TSD unit closures based on WAC 173-340-7493(2)(a)(i), "Site-Specific Terrestrial Ecological Evaluation Procedures." Soil vapor ambient air considerations of WAC 173-340-740(3)(b)(iii)(C)(III) pertain to protection of remediation workers from exposure to volatile organic constituent vapors during soil removal activities. This provision does not apply because volatile organic constituents are below worker protection standards (i.e., undetected), and soil will not be removed for clean closure; no remediation worker exposure pathway exists.

4 Closure Strategy

The 207-A South Retention Basin concrete structures and soils will be clean closed without further physical closure actions. TSD unit characterization sampling was completed in 2004 as part of the 200-PW-2/-4 CERCLA OU RI/FS process. Results of the 200-PW-2/4 OU RI sampling and analysis indicate that no dangerous waste constituents stored in the basin during the period of TSD unit operations exists in basin soils or on concrete structures above clean closure standard(s) established in accordance with WAC 173-303-610(2)(b)(i) and (ii). Because the clean closure approach is based on the results of completed sampling and analysis and clean closure justification discussion presented in this plan, approval of the plan after the permit modification process has been completed will constitute approval of clean closure. Any further physical activities necessary to complete waste site disposition of non-TSD unit constituents (e.g., radionuclides) will occur in conjunction with 200-EA-1 OU remedial action activities. These remedial activities will be conducted under the TPA (Ecology et al. 1989a, Chapter 7.0) past-practice processes and will satisfy RCRA corrective-action requirements of WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8c, for the Treatment, Storage, and Disposal of Dangerous Waste*, Condition II.Y.

Closure activities, including sampling, to verify clean closure were conducted as part of the 200-PW-2/4 OUs RI. An analysis of the analytical data previously collected demonstrates that clean closure levels for this TSD unit had been achieved. No additional closure activities are anticipated for this TSD unit to achieve clean closure.

4.1 Previous Closure Activities

This section summarizes the previous closure activities for the 207-A South Retention Basin performed as a portion of the 200-PW-2/4 OU RI/FS process. Closure activities included TSD unit physical isolation, borehole drilling, and soil and concrete closure verification sampling and analysis.

To preclude any further influent to the unit, and in support of TSD unit closure, the basin was isolated from receipt of 242-A Evaporator process condensate effluent in 1989. Operations at the 242-A Evaporator were halted in 1989 to begin facility upgrades to allow waste to be transferred to the Liquid Effluent Retention Facility basins for storage and treatment at the 200 Areas Effluent Treatment Facility.

4.2 Treatment, Storage, and Disposal Unit Closure Sampling and Analysis

This section identifies the 207-A South Retention Basin TSD unit closure characterization activities, borehole drilling, geophysical logging, field screening, and sampling and analysis of concrete cores and borehole soils performed in 2003 and 2004. In total, 29 soil samples and 9 concrete samples were collected for analysis from the 3 concrete basins. These activities were performed as a portion of the 200-PW-2/4 OU CERCLA RI/FS process to identify the nature and extent of chemical and radiological contamination in vadose zone soil underlying the basin in support of OU remedial decision making and RCRA TSD unit closure. The RI was conducted in accordance with the SAP (DOE/RL-2000-60, Appendix B). Data collected from the basins are presented in the RI report (DOE/RL-2004-25, Appendix B and Section 7.2.2.2). Work plan sampling and analysis requirements for TSD unit characterization were made during a data quality objectives process documented in CP-14176, *Remedial Investigation Data Quality Objectives Summary Report for the 200-PW-4 Operable Unit.*

4.2.1 Concrete and Borehole Drilling

At the 207-A South Retention Basin, shallow boreholes C4113 (west cell), C4114 (middle cell), and C4115 (east cell) were drilled through the concrete floor of each basin cell to collect concrete and soil samples for laboratory analysis. Borehole locations are identified in Figure 4.

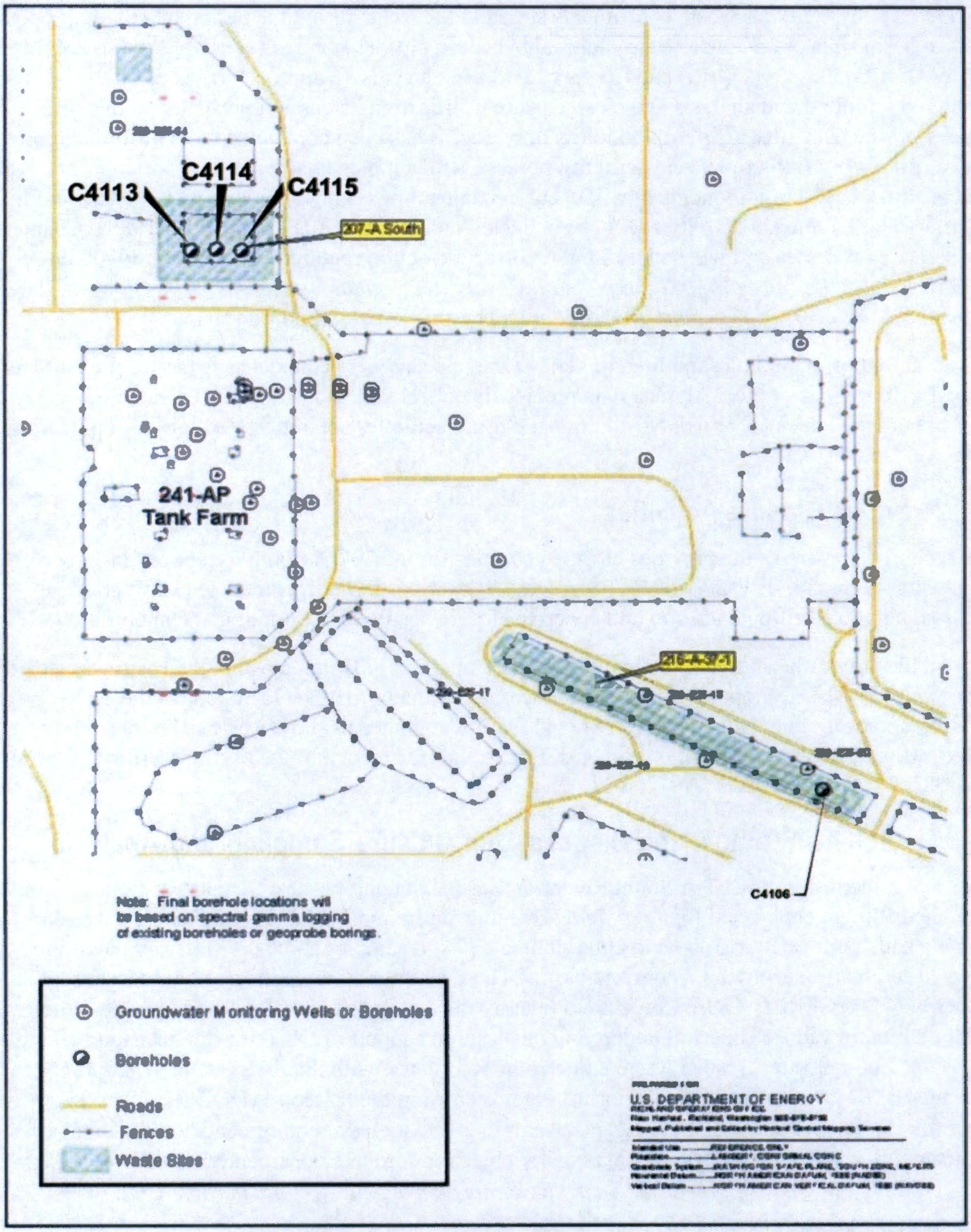

Figure 4. Borehole Locations for the 207-A South Retention Basin

Boreholes C4114 and C4115 were drilled using a combination of Guzzler™ and hand auger methods. At each sample interval, a hand auger was used to collect concrete and soil samples. The Guzzler was used to advance the hole to the next interval, with the final interval at 3.8 to 4.1 m (12.5 to 13.5 ft) below ground surface (bgs) (CP-18666). After reaching total depth, each push hole was decommissioned in accordance with WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells."

4.2.2 Soil and Concrete Sampling and Analysis

The concrete (and elastomeric lining), borehole vadose zone soils, and blown-in dirt and precipitation collected in the basin since 1989 were sampled. Samples underwent chemical and radiological analysis and determination of physical properties. Samples were collected of the concrete and of the soil under the lining to a depth of 4.2 m (14 ft) bgs for closure determination. Samples of blown-in soil and water were collected for waste designation purposes, not site characterization. In total, 44 samples were sent for analysis that included quality assurance/quality control samples, physical property samples, and waste designation samples. Sample intervals, sample numbers, and analytical results are included in the RI report (DOE/RL-2004-25, Appendix B).

Separate waste designation samples were taken of blown-in soil and water (precipitation) in the east, middle, and west cells before the material was removed to begin concrete coring. These were analyzed for a small suite of analytes: metals, gross alpha, gross beta, pH, and total organic carbon. Total organic carbon was measured at 18.9 mg/L. Analytical results are in the RIreport (DOE/RL-2004-25, Appendix B).

Nine individual concrete samples, three from each basin, were taken and submitted for analysis. Concrete samples were analyzed for parameters identified in the RI report (DOE/RL-2004-25, Table 2-6). Organic parameters were related to the composition of the elastomer lining the cell surfaces. Analytical data from soil characterization are presented in the RI report (DOE/RL-2004-25, Appendix B), and results are summarized in the following section.

In total, 29 soil samples were obtained from the 3 boreholes from 0.3 to 4.1 m (1.0 to 13.5 ft) bgs. Sample collection was guided by the sample schedule in DOE/RL-2000-60. Analytical parameters for the OU characterization sampling are summarized in the RI report (DOE/RL-2004-25, Table 2-6). Concrete and soil samples were selectively analyzed for ammonia, anions, hexavalent chromium, total cyanide, metals, nitrate/nitrite, oil and grease, pesticides and herbicides (near-surface soils), pH, polychlorinated biphenyls, volatile organics, semivolatile organics, total petroleum hydrocarbons, radionuclides, and physical properties (e.g., moisture content, particle size distribution, and bulk density). Residual concentrations of pesticides and herbicides were tested at 0.3 to 0.6 m (1 to 2 ft) bgs. Analytical data from soil characterization are presented in the RI report (DOE/RL-2004-25, Appendix B) and the results are summarized in the following section.

4.2.3 Soil Sample Results

Table 1 identifies the maximum concentration of TSD unit constituents from the RI report (DOE/RL-2004-25, Appendix B) and compares these concentrations to clean closure levels. Concentration of TSD unit constituents did not exceed clean closure levels in soils. Arsenic, which is not a TSD unit constituent, was detected at slightly above regulated levels, but these concentrations are attributable to natural background. Soil samples detected little chemical or radionuclide contamination in the vadose zone beneath the 207-A South Retention Basin, confirming that the coated concrete effectively protected the soil from contamination.

™ Guzzler is a trademark of Guzzler Manufacturing, Inc., Streator, Illinois.

Table 1. Comparison of 207-A South Retention Basin TSD Unit Constituent Soil Concentrations to Clean Closure Levels

Treatment, Storage and Disposal Unit Constituents	Maximum Soil Concentration (mg/kg)	Hanford Site Soil Background (mg/kg)[a] 90%	Human Health Protection Soil Direct Contact[b] (mg/kg)		Soil Concentration Protection of Groundwater[c] (mg/kg)	Clean Closure Requirement[d]	Meet Clean Closure Standard?
			Carcinogen	Non-Carcinogen			
Ammonia	0.248	9.23	NA[e]	NA[e]	NA[e]	Background	Yes
Acetone[f]	0.026	NA	NA	72,000	28.9	Protective of groundwater	Yes
Cresol-m[f, g]	0.12U	NA	NA	4,000	10.0	Protective of groundwater	Yes
Cresol-o[f, g]	0.014U	NA	NA	4,000	10.3	Protective of groundwater	Yes
Cresol-p[f, g]	0.12U	NA	NA	8,000	1.0	Protective of groundwater	Yes
Methylene Chloride[f]	0.005	NA	500	480	0.022	Protective of groundwater	Yes
Methyl Ethyl Ketone[f, g]	0.0021U	NA	NA	48,000	20	Protective of groundwater	Yes
Methyl Isobutyl Ketone[f, g]	0.0021U	NA	NA	6,400	2.7	Protective of groundwater	Yes
Trichloroethane[f]	0.0021U	NA	NA	16,000	1.6	Protective of groundwater	Yes

a. DOE/RL-92-24, Vol. 1, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*.

b. WAC 173-340-740(3)(b)(iii)(B), "Unrestricted Land Use Soil Cleanup Standards," "Method B Soil Cleanup Levels for Unrestricted Land Use," "Standard Method B Soil Cleanup Levels," "Human Health Protection," "Soil Direct Contact," equations found in Tables 740-1 (carcinogens) and 740-2 (noncarcinogens) for human health direct contact. Point of compliance is 4.6 m (15 ft) (WAC 173-340-740(6), "Unrestricted Land Use Soil Cleanup Standards," "Point of Compliance").

c. WAC 173-340-740(3)(b)(iii)(A) directs establishment of soil cleanup levels protective of groundwater using methods described in WAC 173-340-747, "Deriving Soil Concentrations for Ground Water Protection." Point of compliance is soils throughout the site WAC 173-340-740(6)).

d. Values represent the lowest soil concentration value of the human health direct contact, groundwater protection pathways, and Hanford Site background value.

e. No value available under WAC 173-340-740(3).

f. *Resource Conservation and Recovery Act of 1976* listed waste codes F001-F005 constituents in 242-A Evaporator waste (Part A Form constituents).

g. Constituents reported under the following synonyms: Cresol-m reported as 3-methylphenol; Cresol-o reported as 2 methylphenol; Creosol-p reported as 4 methylphenol; Methyl ethyl ketone reported as 2-butanone; Methyl isobutyl ketone reported as 4 methyl-2 pentanone (also known as hexane).

NA = not applicable.

TSD = treatment, storage and disposal.

U = not detected at the practical quantitation limit.

4.2.4 Concrete Sample Results

As indicated in the closure strategy, concrete analysis for the contaminants of concern was conducted to support the closure decision process. The RI report (DOE/RL-2004-25, Appendix B) contains the concrete analytical data that have been summarized Table 2. The organics related to the composition of the elastomer cell lining (e.g., xylenes, all benzene derivatives, cresols, naphthalene and its derivatives, isopherone, and other ketones) and tributyl phosphate are not at levels that would indicate a threat to HHE. None of the constituents were detected in the soil under the basin above clean closure levels (DOE/RL-2004-25).

Table 2. 207-A South Retention Basin TSD Unit Constituent Concrete Concentrations

Treatment, Storage, and Disposal Unit Constituents	Maximum Concrete Concentration (mg/kg)
Ammonia	0.080 U
Acetone[a]	0.120[a]
Cresol-m[b, c]	2.8[a]
Cresol-o[b, c]	1.0[a]
Cresol-p[b, c]	2.8[a]
Methylene Chloride[b]	0.0021 U
Methyl Ethyl Ketone[b, c]	0.0021 U
Methyl Isobutyl Ketone[b, c]	0.0021 U

a. The constituents listed in this column were detected in concrete samples and not detected in vadose zone soil; therefore, these concentrations are not applicable to groundwater.

b. *Resource Conservation and Recovery Act of 1976* listed waste codes F001-F005 constituents in 242-A Evaporator waste (Part A Form constituents).

c. Constituents reported under the following synonyms: cresol-m reported as 3-methylphenol; cresol-o reported as 2 methylphenol; creosol-p reported as 4 methylphenol; methyl ethyl ketone reported as 2-butanone; methyl isobutyl ketone reported as 4 methyl-2 pentanone (also known as hexane).

U = not detected at the practical quantitation limit.

5 Contingent Closure Plan

Based on the results that support clean closure, a contingent closure plan will not be required. If it is determined in the future that clean closure is not possible, a closure plan will be prepared that contains the revised closure strategy.

6 Schedule for Closure

The unit specific closure requirements for this TSD unit are complete. The only remaining activity for closing this TSD unit is certification of closure as described in Section 7. Previous closure activities for this TSD unit are described in Section 4, including borehole drilling and vadose zone soil and concrete sampling and analysis, which were completed in 2004 (DOE/RL-2004-25). No additional physical closure activities are planned.

Following approval of this plan. a certification of closure package will be submitted within 90 days following the due date for TPA Interim Milestone M-037-10.After closure, appearance of the land will be consistent with future land-use determinations for adjacent portions of the 200 Areas as an industrial-exclusive portion of the Hanford Site. This land use is consistent with the determination made for this portion of the 200 Area as described in 64 FR 61615.

Duties associated with TSD unit dangerous waste management activities include performing inspections and notifying Ecology of any potential threats to HHE. Until final closure, TSD unit inspections will continue as approved by Ecology. Following Ecology approval of clean closure, training for dangerous waste management activities and inspections at the 207-A South Retention Basin will be discontinued.

7 Certification of Closure

This TSD unit received its last volume of waste in 1989. Closure activities included borehole drilling and soil and concrete sampling and analysis performed in conjunction with the 200-PW-2/4 OU CERCLA RI/FS process completed in 2004 (DOE/RL-2004-25). This sampling demonstrated the absence of chemical contamination in the TSD unit above clean closure levels.

In accordance with WAC 173-303-610(6), DOE will submit a certification of closure to the lead regulatory agency (Ecology) and subsequent permit modification document. Both DOE and the Co-Operator identified on the current Part A Form will sign the certification of closure, and an Independent Qualified Registered Professional Engineer (IQRPE) will state that the unit has been closed in accordance with the approved closure plan. Documentation supporting the IQRPE's certification will be placed in the Administrative Record. A permit modification will be submitted to include this closed TSD unit into Part V of the Hanford Facility RCRA Permit (WA7890008967).

8 Post-Closure Plan

The closure plan for the 207-A South Retention Basin is clean closure with regard to RCRA contaminants from TSD unit operations; therefore, no post-closure plan or activities for purposes of addressing RCRA contaminants are needed for this site.

9 Amendment of Closure Plan

As required by WAC 173-303-610(3)(b), the closure plan will be amended if changes to closure activities require a modification of the approved closure plan; however, closure activities are complete. If an amendment to the approved closure plan is required, DOE will follow the process contained in RCRA Permit Condition I.C.3.

10 References

40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," Subpart F, "Ground-Water Monitoring," *Code of Federal Regulations*.

42 USC 2011, *Atomic Energy Act of 1954*, as amended, Pub. L. 83-703, 68 Stat. 919.

42 USC 6901, *Resource Conservation and Recovery Act of 1976*, et seq. Pub. L. 94-580, October 21, 1976.

42 USC 9601, *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, et seq., Pub. L. 107-377, December 31, 2002.

64 FR 61615, "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS)," *Federal Register*, Vol. 64, No. 218, pp. 61615-61625, November 12, 1999.

CP-14176, 2003, *Remedial Investigation Data Quality Objectives Summary Report for the 200-PW-4 Operable Unit*, Rev. 0, Fluor Hanford, Inc., Richland, Washington.

CP-18666, 2004, *200-PW-2 and 200-PW-4 Operable Units Borehole Summary Report*, Rev. 0, Section 1 and Section 2, Fluor Hanford, Inc., Richland, Washington.

DOE/RL-92-24, 2001, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Rev. 4, Vol. 1 and Vol. 2, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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Revision 0

216-A-36B CRIB CLOSURE PLAN (D-2-4)

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

U.S. DEPARTMENT OF ENERGY Richland Operations Office
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By Janis D. Aardal at 2:24 pm, Jun 17, 2014

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Contents

Figures

Tables

Terms

AEA	*Atomic Energy Act of 1954*
AFAN	ammonium fluoride and ammonium nitrate
ASD	ammonia scrubber distillate
bgs	below ground surface
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
DOE	U.S. Department of Energy
DWS	drinking water standard
Ecology	Washington State Department of Ecology
FS	feasibility study
HHE	human health and the environment
HWMA	Hazardous Waste Management Act
IQRPE	Independent Quality Registered Professional Engineer
MCL	maximum contaminant level
NA	not applicable
OU	operable unit
PUREX	plutonium-uranium extraction
RCRA	*Resource Conservation and Recovery Act of 1976*
RCW	*Revised Code of Washington*
RI	remedial investigation
TOC	total organic carbon
TOX	total organic halides
TPA	Tri-Party Agreement
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TSD	treatment, storage, and/or disposal
WAC	*Washington Administrative Code*

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1 Introduction

The purpose of this plan is to explain the closure process for the *Resource Conservation and Recovery Act of 1976* (RCRA) 216-A-36B Crib which is an interim status treatment, storage, and/or disposal (TSD) unit. This closure plan is being submitted in accordance with Tri-Party Agreement (TPA) (Ecology et al. 1989a, *Hanford Federal Facility Agreement and Consent Order*) Interim Milestone M-037-02, which requires submittal of revised closure plans to the Washington State Department of Ecology (Ecology) to support TSD unit closure for five TSD units by June 30, 2014: 207-A South Retention Basin, 216-A-29 Ditch, 216-A-36B Crib, 216-A-37-1 Crib, and 216-B-63 Trench. Figure 1 provides a timeline that summarizes the operations and regulatory milestones associated with this TSD unit. Operations milestones are shown below the timeline, and regulatory milestones are shown above the timeline.

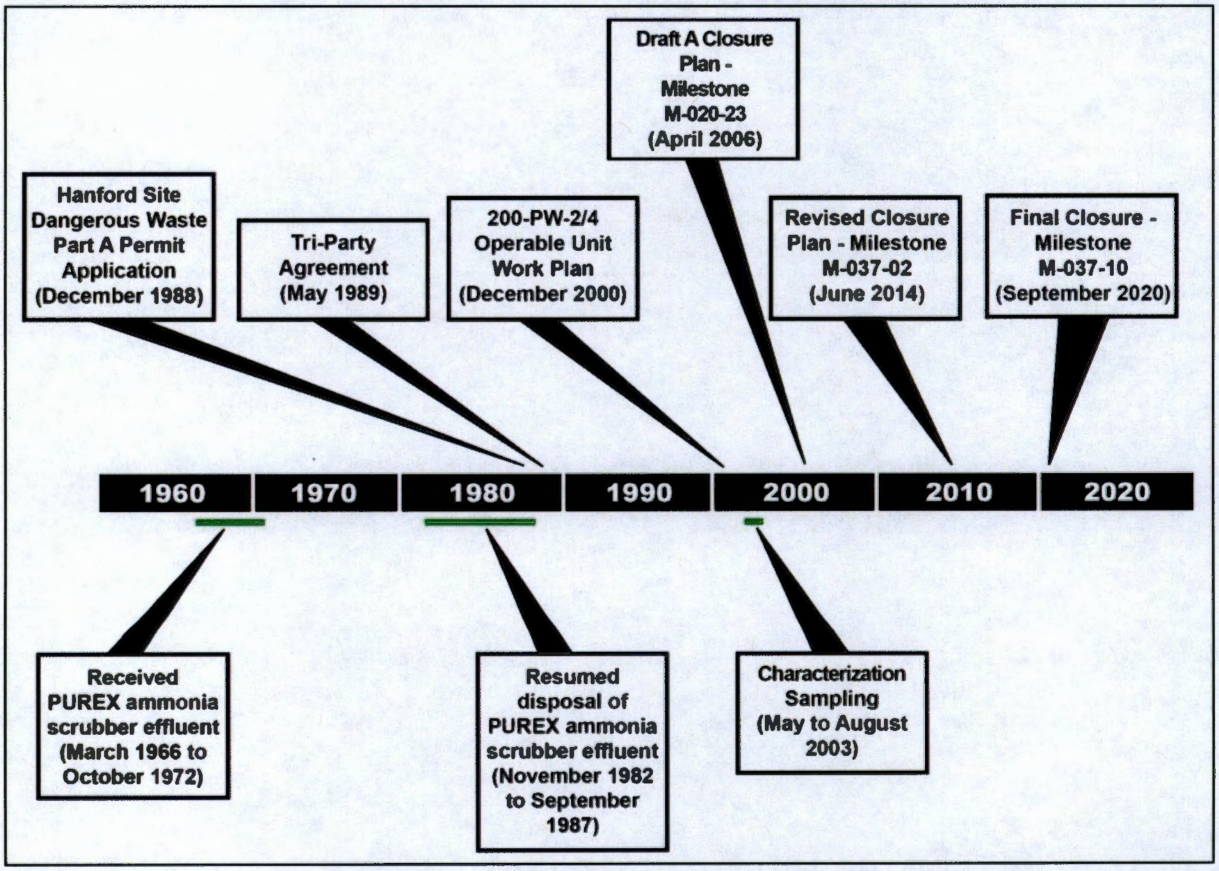

Figure 1. Timeline for the 216-A-36B Crib

Based on the analytical data previously collected, closure for the gravel-filled earthen 216-A-36B Crib and underlying soil is clean closure in accordance with *Washington Administrative Code* (WAC) 173-303 "Dangerous Waste Regulations," specifically WAC 173-303-610, "Closure and Post-Closure." All liquid waste in the 216-A-36B Crib has been processed. There is no ancillary equipment. This strategy is based on analytical data, summarized in DOE/RL-2004-25, *Remedial Investigation Report for the 200-PW-2 Uranium-Rich Process Waste Group and the 200-PW-4 General Process Condensate Group Operable Units*, showing that this TSD unit meets clean closure performance standards for TSD unit dangerous waste constituents without further physical closure activities. Because clean closure is based on the results of completed sampling and analysis described in this closure plan, no further closure activities are expected to be performed, and all verification sampling to confirm clean closure has been performed; therefore, no additional sampling and analysis is included in this closure plan. In accordance with WAC 173-303-610 requirements, the data also show that TSD unit operations and TSD unit constituents did not impact groundwater. Consequently, post-closure activities are not needed, and a post-closure monitoring plan is not included.

Contaminants other than the TSD unit constituents are present in the soil and groundwater. This past-practice contamination may pose a threat to human health and the environment (HHE) and will be addressed through the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) remedial action process for the 200-EA-1 Operable Unit (OU).

1.1 Unit Description

1.1.1 Overview

The 216-A-36B Crib is the southern 152 m (500 ft) of the original 216-A-36 Crib, which was divided into the 36A and 36B Cribs in 1966. The original 216-A-36 Crib began operating in March 1966 for the disposal of the 202-A Plutonium-Uranium Extraction (PUREX) Plant ammonia scrubber distillate (ASD) waste via a pipeline to the soil column in the crib. In 1966, after 6 months of operation, the 216-A-36 Crib was removed from service because of the rapid buildup of fission products within the first 30 m (100 ft) of the crib from the ASD waste influent. At that time, a vertical grout barrier was placed 30 m (100 ft) from the north end of the crib that isolated the north end from the south end; the barrier subdivided the crib into the 216-A-36A segment (north end) and the 216-A-36B segment (south end). At that time a smaller diameter pipeline was inserted inside the original 216-A-36A pipeline, effectively moving the discharge point 3.65 m (12 ft) south of the grout barrier and bypassing the "A" segment. The 216-A-36B Crib received ASD waste until waste receipt was terminated on September 6, 1987.

ASD was considered mixed waste, which means that the process condensate is a mixture of both hazardous/dangerous waste, as defined in RCRA and *Revised Code of Washington* (RCW) 70.105, "Hazardous Waste Management," also known as the Washington State Hazardous Waste Management Act (HWMA), and also radionuclide "source, special nuclear, and byproduct materials" as defined in the *Atomic Energy Act of 1954* (AEA) (42 USC 2011). Both RCRA and AEA state that these radioactive materials are regulated at U.S. Department of Energy (DOE) facilities exclusively by the DOE, acting pursuant to its AEA authority. Because the ASD waste was designated as dangerous waste under WAC 173-303, "Dangerous Waste Regulations," a *Dangerous Waste Permit Application* for the 216-A-36B Crib (WA7 89000 8967, Part V, Closure Unit 12) (Part A Form) was submitted to Ecology. The radionuclide materials are not hazardous/dangerous wastes and are, therefore, not subject to regulation by the State of Washington under RCRA and HWMA. All information contained herein, and related to or describing AEA-regulated materials and processes in any manner, may not be used to create conditions or other restrictions set forth in any permit, license, order, or any other enforceable instrument. Information contained herein on radionuclides is provided for process description purposes only.

1.1.2 Physical Description

The 216-A-36B Crib is located in the 200 East Area about 366 m (1,200 ft) south of the 202-A Plant Canyon Building (PUREX Plant) (Figure 2). This crib is an engineered, subsurface liquid-effluent disposal facility that received PUREX ASD waste from March 1966 until October 1972, when the crib temporarily was removed from service. The crib was placed back in service in November 1982 for the restart of the PUREX Plant and operated again until September 6, 1987, when the unit received its final volume of waste.

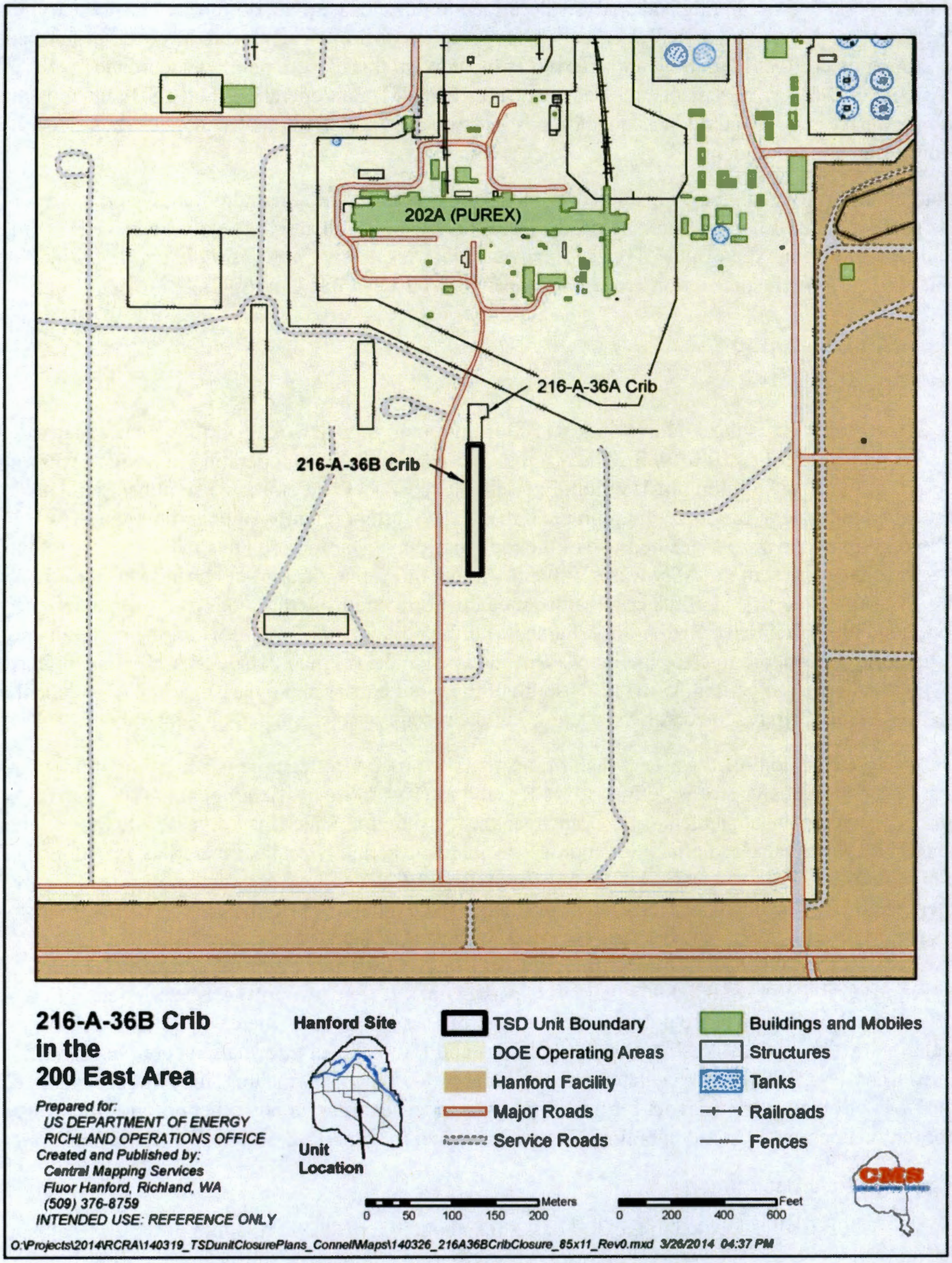

Figure 2. 216-A-36B Crib Site Plan

The gravel-filled 216-A-36B Crib is 152 m (500 ft) long and 3.4 m (11 ft) wide at the bottom. The bottom of the crib is 7.3 m (24 ft) below grade. A 15 cm (6 in.) diameter perforated stainless steel pipe was placed horizontally 7 m (23 ft) below grade to aid in percolation of the effluent into the soil column. After final receipt of waste, the crib was covered with 7 m (23 ft) of clean soil and revegetated. Figure 3 is a configuration diagram of the 216-A-36B Crib (showing both the "A" and "B" segments).

Other associated crib structures included a liquid level monitoring riser (i.e., a gage well) and a vent riser. The gage well was constructed of 20 cm (8 in.) vitreous clay pipe extending from the bottom of the crib to about 1 m (3.5 ft) above grade. The lower portion of the gage well was perforated to allow monitoring of the depth of liquid in the crib during the former operations. The vent riser was a 20 cm (8 in.) code M-8 stainless steel pipe attached to the end of the distribution line. The vent riser contained an internal tube filter and extended approximately 0.92 m (3 ft) above grade.

The Part A Form identifies the TSD unit boundary as beginning inside the security fence surrounding the crib. Under WAC 173-303-040, "Definitions," for landfill, this unit has no ancillary piping. The waste feed piping from the PUREX Plant to the 216-A-36B Crib is outside the TSD unit boundary and the scope of TSD unit closure. This feed piping is planned to be addressed in conjunction with the 200-EA-1 OU.

1.1.3 Process Information

During the entire period of 216-A-36B Crib operations (beginning in March 1966), the site received PUREX Plant ASD waste generated during N Reactor spent fuel dissolution (decladding) operations in the 202-A Plant Canyon Building. Spent fuel dissolution occurred in dissolvers in a solution of concentrated ammonium fluoride and ammonium nitrate (AFAN). This process produced highly radioactive cladding removal waste and, secondarily, large quantities of gaseous ammonia, which was scrubbed with water to prevent its release to the atmosphere. Before 1970, ammonia scrubber waste underwent less processing before it was discharged to the 216-A-36A Crib, and it contained higher levels of contaminants. After 1970, dissolver condensate and scrubber liquid called ammonia scrubber feed was collected in Catch Tank F12 and pumped to the E-F11 Concentrator for boiling to further concentrate radionuclides. This process generated ammonia scrubber waste with reduced radiological and AFAN solution chemical constituents. All of the ammonia from the E-F11 Concentrator was volatilized during boiling and was reabsorbed in an overhead condenser, forming a condensate waste stream containing liquid ammonium hydroxide, identified as ASD. As the result of two condensation steps, ASD waste primarily was water that was low in solids and contained ammonium hydroxide and small quantities of low-level radionuclides. Ammonium hydroxide was the primary constituent of concern in ASD waste, which sometimes contained much smaller quantities of ammonium fluoride.

The 216-A-36B Crib operated to dispose of liquid PUREX Plant ASD waste received via the 202-A Plant Canyon Building E-F11 Concentrator condensers. Waste was jetted to the crib from the condensers through waste transfer piping, bypassing the north end (216-A-36A Crib), and discharging through perforated, distribution piping to the soil column of the 216-A-36B Crib. No waste treatment occurred at this site.

1.1.4 Waste Inventory and Characteristics

This crib received ASD waste until discharges to the crib ceased in September 1987. The process design capacity was 440,000 L/day (160,000 gal/day). The TSD unit operated for less than 3 weeks due to a discharge of ASD waste containing an amount of ammonia hydroxide that caused the effluent to be designated as a dangerous waste.

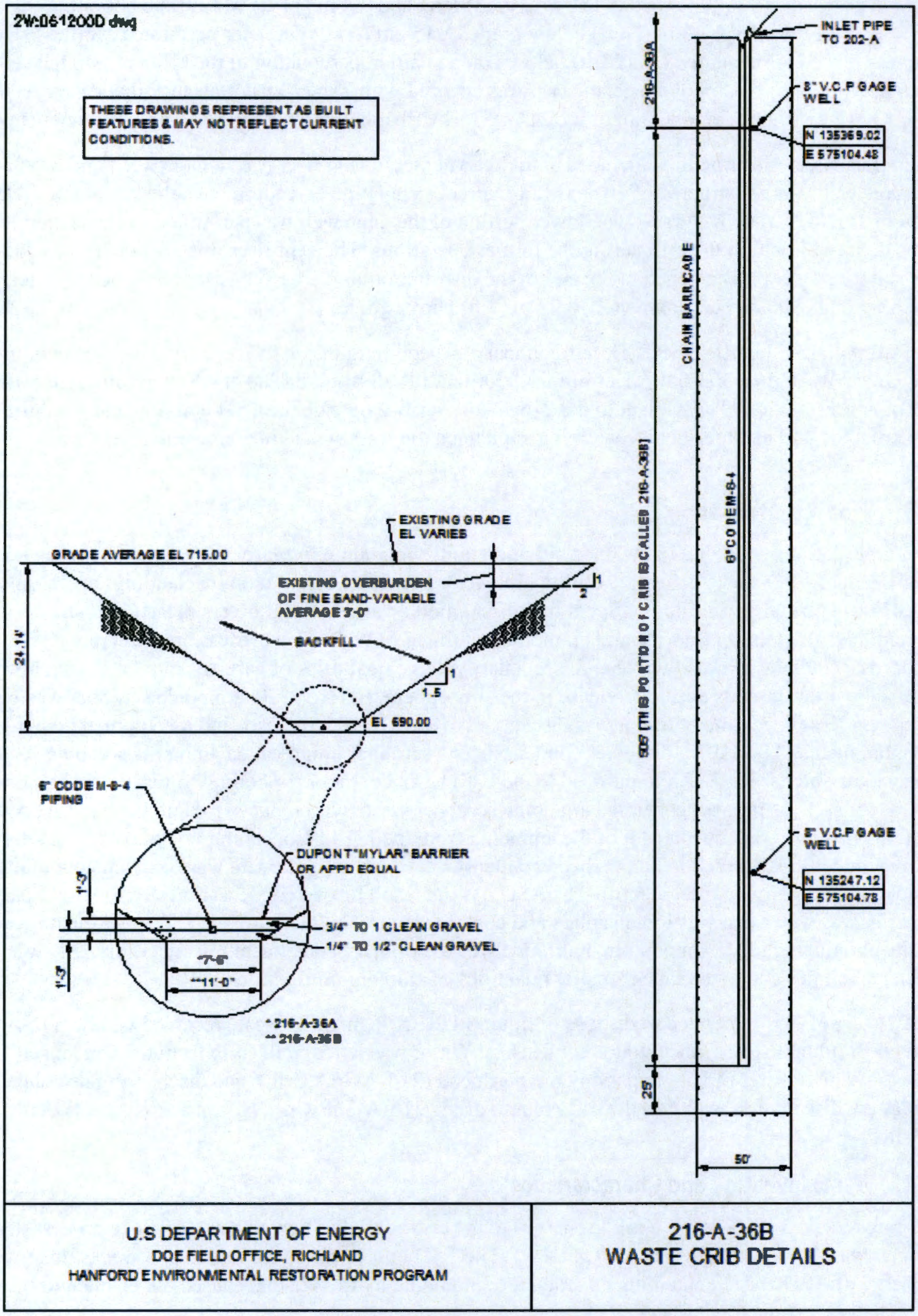

Figure 3. Construction Diagram for the 216-A-36B Crib

The ASD waste managed at this unit was a mixed waste of primarily water containing ammonium hydroxide and small quantities of low-level radionuclides. ASD waste was generated by two sequential condensation steps and contained very little solids. The ASD waste contained ammonia (WT02, state-only, toxic waste) as ammonium hydroxide. The Part A Form identifies liquid ammonium hydroxide as the only dangerous waste compound potentially managed at this unit (Table 1), and the ammonia in the ammonium hydroxide represents the sole potential TSD unit constituent in waste potentially remaining in the TSD unit soil.

1.1.5 Security Information

The 216-A-36B Crib is located in the 200 East Area of the Hanford Site and therefore, security information pertaining to the 200 Area applies to this TSD unit. Changes to security are expected to occur during the course of 200 East Area deactivation and decommissioning activities. Security measures will remain in place that limit entry to authorized personnel and that preclude unknowing access by unauthorized individuals until closure of the TSD unit.

2 Groundwater Monitoring

This section describes the 216-A-36B Crib groundwater monitoring history and provides aquifer information, groundwater well information, and well sampling and analysis information. This section updates information provided in DOE/RL-2000-60, *Uranium-Rich/General Process Condensate and Process Waste Group Operable Units RI/FS Work Plan and RCRA TSD Unit Sampling Plan Includes: 200-PW-2 and 200-PW-4 Operable Units*) and the remedial investigation (RI) report (DOE/RL-2004-25) with the latest (calendar year 2012) groundwater monitoring results. Information pertaining to non-TSD unit constituents is provided for information only.

After clean closure, no final status groundwater monitoring program will be required for this TSD unit. However, regional monitoring will continue for the PUREX cribs by the 200-PO-1 Groundwater OU for contaminants of concern related to groundwater. Groundwater is scheduled to be remediated under the CERCLA RI/feasibility study (FS) process for the 200-PO-1 Groundwater OU, and groundwater remediation is outside the scope of this closure plan.

2.1 History of RCRA Groundwater Monitoring at the 216-A-36B Crib

The 216-A-36B Crib was originally monitored under a separate groundwater monitoring plan (WHC-SD-EN-AP-170, *Interim Status Groundwater Monitoring Plan for the 216-A-10 and 216-A-36B Cribs*). In June 1997, monitoring of three PUREX cribs was combined into a single groundwater monitoring plan (PNNL-11523, *Combination RCRA Groundwater Monitoring Plan for the 216-A-10, 216-A-36B, and 216-A-37-1 PUREX Cribs*, Rev. 0), based on their proximity to one another, similar construction and waste disposal constituents, and similar hydrogeologic characteristics.

From 1997 to 2005, the PUREX cribs were monitored under a combined monitoring plan (PNNL-11523, Rev. 0) to assess groundwater contamination and evaluate contamination extending from the cribs and included an expanded monitoring well network consisting of 11 wells in the immediate vicinity of the cribs and 57 other wells. Specific conductance associated with the 216-A-36B crib was significantly higher in downgradient wells, compared to upgradient wells, indicating that the crib may have contributed to groundwater contamination. Ammonia was not detected in the groundwater. Contaminants identified above drinking water standards (DWS) included arsenic, gross alpha, iodine-129, strontium-90, and tritium.

Table 1. Comparison of 216-A-36B Crib Interim Status TSD Unit Constituent Soil Concentrations to Clean Closure Levels

Treatment, Storage, and Disposal Unit Constituents	Maximum Concentration			Hanford Site Soil Background (mg/kg)[c]	Dangerous Waste Designation (mg/kg)	Closure Levels				Clean Closure Requirement[f]	Meet Clean Closure Standard?
	All Soils		Shallow Zone Only[a]			Soil Cleanup Level for Human Health Direct Contact[b]		Ground-water Protection[d] (mg/kg)	Ecological[e]		
	Concen-tration (mg/kg)	Depth (ft bgs)	Concentration (mg/kg)			Carcinogen	Noncar-cinogen				
Ammonia[g]	58.2	53.5	0.040U	9.23	10,000[h]	NA	NA	NA	NA	NA	Yes

a. Shallow zone = <4.6 m (15 ft) bgs.

b. WAC 173-340-740(3)(b)(iii)(B), "Unrestricted Land Use Soil Cleanup Standards," "Method B Soil Cleanup Levels for Unrestricted Land Use," "Standard Method B Soil Cleanup Levels," "Human Health Protection," "Soil Direct Contact," equations found in Tables 740-1 (carcinogens) and 740-2 (noncarcinogens) for human health direct contact. Point of compliance is 4.6 m (15 ft) (WAC 173-340-740(6), "Unrestricted Land Use Soil Cleanup Standards," "Point of Compliance").

c. DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, 90% lognormal distribution.

d. WAC 173-340-740(3)(b)(iii)(A) directs establishment of soil cleanup levels protective of groundwater, using methods described in WAC 173-340-747, "Deriving Soil Concentrations for Ground Water Protection." Values are calculated using the WAC 173-340-740. "Unrestricted Land Use Soil Cleanup Standards," three-phase model for protection of drinking water (WAC 173-340-747[4], "Deriving Soil Concentrations for Ground Water Protection," "Fixed Parameter Three-Phase Partitioning Model," amended February 12, 2001). Point of compliance is soils throughout the site (WAC 173-340-740(6)).

e. Ecological considerations are not applicable to TSD unit closure.

f. Listed values represent the most restrictive level of the direct exposure and groundwater protection pathways after evaluation of this value to ensure that it is not less than natural background and for analytical considerations as indicated in WAC 173-340-700(6)(d), "Overview of Cleanup Standards," "Requirements for Setting Cleanup Levels," "Natural Background and Analytical Considerations."

g. Ammonia is not regulated under WAC 173-340, "Model Toxics Control Act—Cleanup," and no human-health direct-contact soil cleanup level exists.

h. Designation level for ammonia as a state-only toxicity criteria waste is 1 wt% (10,000 mg/kg) of a waste stream (WAC 173-303-100, "Dangerous Waste Criteria").

bgs = below ground surface.
NA = not applicable.
TSD = treatment, storage and/or disposal.

From 2005 to 2011, the PUREX cribs were monitored under a revised plan (PNNL-11523, *Interim-Status RCRA Groundwater Monitoring Plan for the 216-A-10, 216-A-36B, and 216-A-37-1 PUREX Cribs*, Rev. 1), which included a smaller monitoring network consisting of 11 wells (2 upgradient and 9 downgradient wells) in the vicinity of the cribs. The primary contaminant of interest was identified as nitrate. Arsenic was no longer monitored because it was detected below groundwater background concentrations, and radionuclides were not included in the revised RCRA specific monitoring.

In 2010, per agreement between Ecology and DOE (Davis, 2010, "Protective Filing Disposition of the 216-A-10 Crib (Treatment, Storage and Disposal [TSD]: D-2-2"), the 216-A-10 Crib was reclassified from a RCRA TSD to a CERCLA past-practice site and is no longer subject to RCRA requirements. At that time, since dangerous wastes in groundwater were not identified for the 216-A-36B Crib, the crib was returned to interim status monitoring, and a separate monitoring plan was written (DOE/RL-2010-93, *Interim Status Groundwater Monitoring Plan for the 216-A-36B PUREX Plant Crib*) and then revised in July 2011 to provide more detail pertaining to the constituent list and sampling frequency; it is the current monitoring plan for the site.

2.2 Aquifer Identification

The uppermost or unconfined aquifer near the 216-A-36B PUREX cribs occurs within the upper portion of the Ringold Formation unit (DOE/RL-2010-93). Depth to water is approximately 100 m (328 ft), and the aquifer is approximately 22 m (72 ft) thick.

Near the 216-A-36B Crib, groundwater flow is estimated to be toward the southeast. Flow directions are influenced by a northwest southeast trending paleochannel with high permeability Hanford formation sediments near the crib, the Ringold lower mud unit at the water table east of the 200 East Area, and the higher water table elevations to the west and north. These flow directions are supported mainly by the distribution of plumes emanating from near these cribs and recent efforts to improve the accuracy of water level measurements in the southeastern portion of the 200 East Area (DOE/RL-2013-22, *Hanford Site Groundwater Monitoring Report for 2012*).

Beginning in 2008, efforts were undertaken to improve the accuracy of the water level measurements and resultant estimates of groundwater gradient near the PUREX Plant and associated waste sites. Results of the data collection and analysis effort indicate that the groundwater flow direction changed near the PUREX cribs and Integrated Disposal Facility slightly during 2012. The trend surface analysis results, indicating an east flow direction, represent the average hydraulic gradient beneath this region. However, near the edge of the study area, the groundwater flow appears to be rotating toward the southeast. Therefore, near the 216-A-36B Crib, the groundwater flow direction is less certain and may be southeast. The groundwater flow rate ranges between 0.001 and 0.7 m/day (0.0003 to 0.2 ft/day) (SGW-55438, *Hanford Site Groundwater Monitoring for 2012: Supporting Information*, Table 3-1).

2.3 Well Location and Design

Per the current groundwater monitoring plan (DOE/RL-2010-93) for the 216-A-36B Crib, one upgradient well (299-E17-19) and three downgradient wells (299-E17-14, 299-E17-16, and 299-E17-18) are sampled (Figure 4). Well details are provided in Table 2. Wells that constitute the groundwater monitoring network were selected to be in compliance with 40 CFR 265.91, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," "Ground-Water Monitoring System."

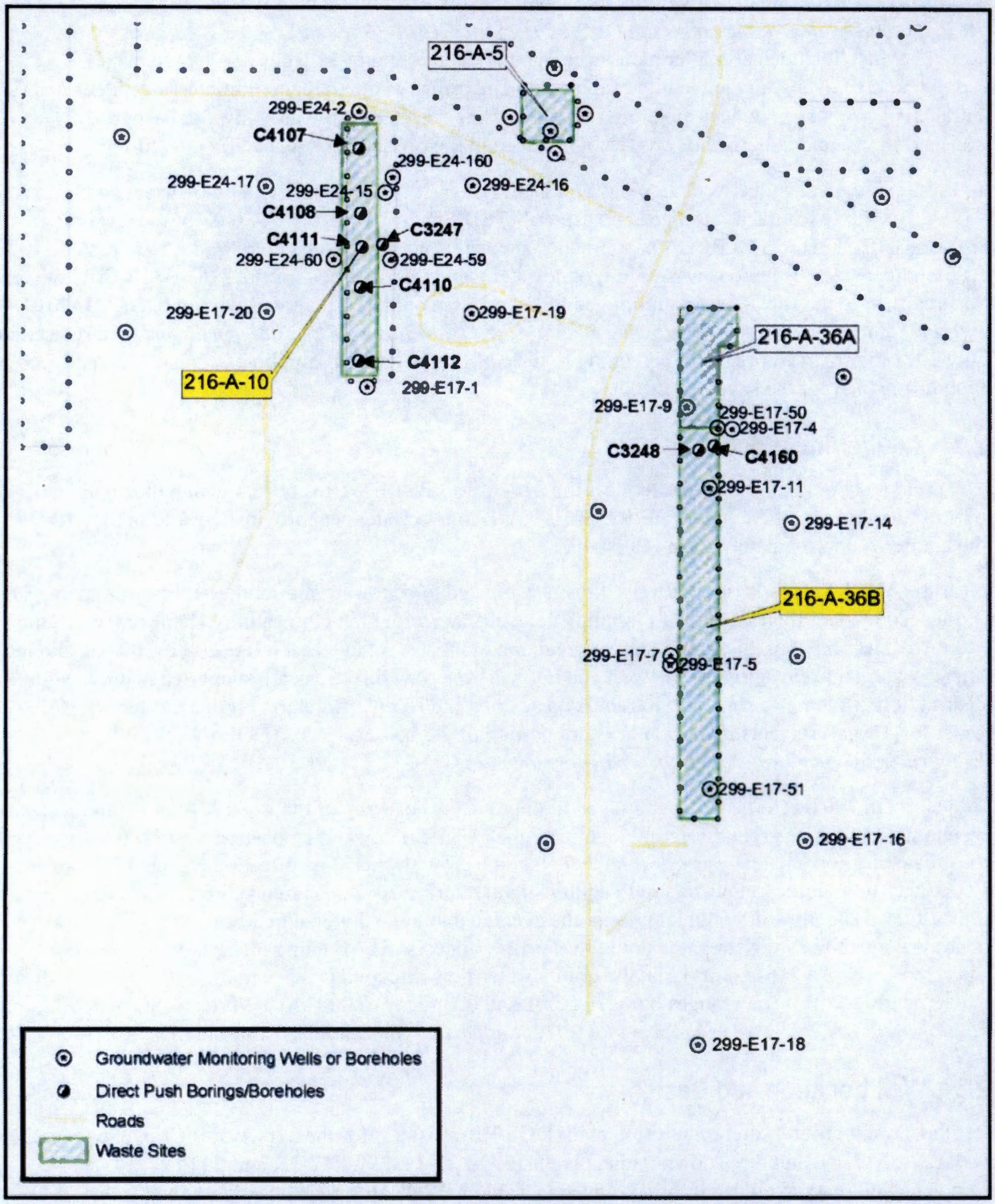

Figure 4. 216-A-36B Borehole Locations

Table 2. RCRA Monitoring Well Details

Well Name	Year Installed	Water Depth (ft bgs)	Water Level (Date)	Water Table Elevation (MSL NAVD88 ft)	Screen Top (ft bgs)	Screen Bottom (ft bgs)	Remaining Water Column (ft)	Location
299-E17-14	1988	326.2	7/9/2013	399.6	309.5	331.5	5.3	Down-gradient
299-E17-16	1988	325.1	7/9/2013	399.1	310	330	4.9	Down-gradient
299-E17-18	1988	324.8	7/24/2013	399.5	308.7	331.5	6.7	Down-gradient
299-E17-19	1988	324	7/9/2013	399	304	326.6	2.6	Up-gradient

Source: NAVD88, *North American Vertical Datum of 1988.*

bgs = below ground surface.

RCRA = *Resource Conservation and Recovery Act of 1976.*

2.4 Well Sampling and Analysis

Since 2011, the 216 A-36B Crib network groundwater wells have been monitored semiannually for RCRA indicator parameters of pH, specific conductance, total organic carbon (TOC), and total organic halides (TOX). Wells are monitored annually for water quality parameters including alkalinity, anions (nitrate, chloride, and sulfate), metals (including calcium, iron, manganese, magnesium, potassium, and sodium), and phenols. Water level measurements, temperature, and turbidity are collected semiannually.

Per CERCLA and AEA monitoring, the four 216-A-36B network wells are monitored for arsenic, chromium, manganese, vanadium, iodine-129, nitrate, strontium-90, technetium-99, tritium, gross alpha, gross beta, and uranium (TPA-CN-205, *Change Notice for Modifying Approved Documents/Workplans In Accordance with the Tri-Party Agreement Action Plan, Section 9.0, Documentation and Records: DOE/RL-2003-4, Revision 1, Sampling and Analysis Plan for the 200-PO-1 Operable Unit*).

2.5 Results of Interim Status Groundwater Assessment

The most current (fiscal year [FY] 2012) groundwater monitoring results are presented in DOE/RL-2013-22. No exceedances of the 2012 critical mean for pH, specific conductance, TOC, or TOX were detected (SGW-55438, Table 3-10), and the site will remain in interim status detection monitoring. Additional details regarding calculation of the 2012 critical mean values are provided in DOE/RL-2011-118, *Hanford Site Groundwater Monitoring for 2011*, Appendix B).

Groundwater quality constituents monitored for the site include chloride, iron, manganese, nitrate, phenols, sodium, and sulfate. An RI completed for the 200-PO-1 OU in 2012 (DOE/RL-2009-85, *Remedial Investigation Report for the 200-PO-1 Groundwater Operable Unit*) identified six contaminants of potential concern in the near field area: iodine-129, technetium-99, strontium-90, tritium, trichloroethene, and nitrate. The report recommended that the OU should advance to the next step in the CERCLA process, which is an FS, to develop alternatives to remediate the groundwater contamination. Relatively large plumes of iodine-129, tritium, and nitrate remain in the vicinity of the 216-A-36B Crib.

Monitoring results (including process knowledge and discharge records) indicate that the impact to groundwater originates from other facilities as well as from the 216-A-10, 216-A-36B, and 216-A-37-1 Cribs. The 216-A-36B Crib historically affected groundwater by producing an elevated water table. Table 3 shows the maximum concentration of ammonia detected in groundwater from the monitoring network. In accordance with WAC 173-303-610 requirements, the data also show that TSD unit operations and TSD unit constituents did not impact groundwater. The sole TSD unit constituent, ammonia (i.e., ammonium ion) in ammonium hydroxide has no federal DWS (MCL).

Table 3. Comparison of 216-A-36B Crib Groundwater Data to Clean Closure Levels

Treatment, Storage, and Disposal Unit Constituent	Maximum Concentration in Groundwater (μg/L)	Hanford Site Groundwater Background (μg/L)[a] (90% Log Normal Distribution)	Overall Groundwater Cleanup Level (μg/L)	Clean Closure Driver[b]	Meet Clean Closure Standard?
Ammonia	137	113	NA	Not regulated	Yes

a. DOE/RL-96-61, *Hanford Site Background: Part 3, Groundwater Background*.

b. Listed values represent the most restrictive level of the groundwater pathways, after evaluation of this value, to ensure that it is not less than natural background and for analytical considerations as indicated in WAC 173-340-700(6)(d), "Overview of Cleanup Standards," "Requirements for Setting Cleanup Levels," "Natural Background and Analytical Considerations."

NA = not applicable.

3 Closure Performance Standards

The 216-A-36B Crib will be clean closed. Therefore, this section identifies TSD unit clean closure performance standards for TSD unit soil and associated structures.

3.1 Treatment, Storage, and Disposal Unit Closure Performance Standards

The standards for closure of this TSD unit are in accordance with the requirements of the TPA Action Plan (Ecology et al. 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*, Section 5.3) directing that closure of Hanford Site interim status TSD units meet cleanup requirements established in accordance with WAC 173-303-610. As required by TPA (Ecology et al. 1989a, Section 6.3.1) clean closure for disposal units also must demonstrate that TSD unit operations did not adversely impact soil or groundwater. The closure performance standards of WAC 173-303-610(2)(a), "Closure Performance," require the owner or operator of a TSD facility to close the facility in a manner that accomplishes the following objectives:

- Minimize the need for further maintenance.
- Control, minimize, or eliminate, to extent necessary, to protect HHE, post-closure escape of dangerous waste, dangerous constituents, leachate, contaminated runoff, or dangerous waste decomposition products to the ground, surface water, groundwater, or the atmosphere.
- Return the land to the appearance and use of surrounding land areas to the degree possible given the nature of the previous dangerous waste activity.

Clean closure will eliminate the need for future inspections, monitoring, and maintenance resulting from contamination from TSD unit constituents. Completed sampling and analysis demonstrates at the 216-A-36B Crib that the levels of dangerous wastes remaining do not exceed the WAC 173-303-610 clean closure standards.

After clean closure, the appearance of the land will be consistent with future land-use determinations for adjacent portions of the 200 Areas as an industrial-exclusive portion of the Hanford Site. This land use is consistent with the formal determination made for this portion of the 200 Area as described in 64 FR 61615, "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS)."

3.2 Clean Closure Standards for Soil

The clean closure standards for soil are action levels established to meet the closure performance standards of WAC 173-303-610(2)(a) and the clean closure requirements of WAC 173-303-610(2)(b)(i) and WAC 173-303-665(6), "Landfills," "Closure and Post-Closure Care." The soil qualifies for clean closure because no TSD unit constituents have been shown by RI sampling to exceed soil cleanup levels prescribed by WAC 173-303-610(2)(b)(i). In accordance with WAC 173-303-610(2)(b)(i), clean closure levels for TSD unit constituents in soils are numeric levels calculated using the formulas of WAC 173-340-740(3), "Unrestricted Land Use Soil Cleanup Standards," or Hanford Site background concentrations (DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*), whichever is least restrictive. However, at this unit, the sole dangerous waste constituent of concern, ammonia (WT02 from the ammonium hydroxide), is not regulated under WAC 173-340, "Model Toxics Control Act—Cleanup," and no regulatory cleanup level exists. Given the absence of an established regulatory cleanup level for ammonia in soil, the clean closure requirement will be the dangerous waste designation level for ammonia as a state only toxicity criteria (WT02) waste, calculated in accordance with WAC 173-303-100, "Dangerous Waste Criteria" (i.e., greater than 1 wt% of the waste stream). Because there is no regulatory level and the ammonia reported in soil (i.e., ranging from 21.9 mg/kg at 7.6 m [25 ft] below ground surface (bgs) to 58.2 mg/kg at 16.3 m [53.5 ft]) is not sufficient to designate soil (if removed) as a state only WT02 dangerous waste, this TSD unit meets WAC 173-303-610 clean closure cleanup requirements without further physical closure activities.

3.3 Clean Closure Standard for Piping and Materials

The clean closure standard for crib (influent distribution, vent piping, and gage well) is established in accordance with WAC 173-303-610(2)(ii). This standard is the dangerous waste designation level for ammonia as a state only, toxicity criteria (WT02) waste calculated in accordance with WAC 173-303-100 (i.e., greater than 1 wt% of the waste stream). Achievement of this standard for these materials will be demonstrated through process knowledge and an understanding of waste characteristics.

Buried crib piping and materials within the TSD unit boundary and the scope of closure include stainless steel influent distribution piping and stainless steel vent piping; vitrified clay gage well piping; and the thin-gage plastic sheeting overlaying the distribution piping as a moisture barrier. These materials are not reasonably expected to be contaminated with TSD unit constituents above clean closure levels, and their removal or further analytical investigation will not be necessary for clean closure based on the criteria described in the following paragraph.

The waste distribution piping is considered to be empty. The influent waste stream to the 216-A-36B Crib ceased in 1997 and no new liquid has been discharged to the pipe since that time. The piping was sloped and perforated to facilitate complete drainage, thereby precluding liquid from remaining in the piping. The gage well and vent piping were open ended and placed vertically in unit soils to provide access for effluent level measurements, and were installed in a manner that would not retain liquids. The moisture barrier was placed above the waste distribution piping that was perforated at the bottom and drained downward directly to course gravel. The pipe was 7 m (23 ft) bgs, and liquid waste was most likely on top of the barrier since it sat at the bottom of the trench. Because the effluent, primarily water, is very low in solids and ammonia is the only TSD constituent, residues are not anticipated. There is no reasonable potential for ammonia to exist in the empty piping or on piping or the plastic barrier surfaces in the form of effluent or waste residues at concentrations equivalent to the WT02 dangerous waste designation level (1 wt% [10,000 mg/kg]).

4 Closure Strategy

The 216-A-36B Crib soils and crib piping and materials will be clean closed without further physical closure actions. Because the clean closure approach is based on the results of completed sampling and analysis and the clean closure justification discussion presented in this plan, approval of the plan will constitute approval of clean closure.

Non-TSD unit constituents, including radionuclides, will be dispositioned through past-practice processes for the 200-EA-1 OU identified in the TPA (Ecology et al. 1989a, Chapter 7.0). These activities will satisfy RCRA corrective requirements under WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste* (Condition II.Y).

The 216-A-36B Crib was assigned to the process-based 200-PW-2 Uranium-Rich Process Waste Group OU for characterization and remedial decision making. Because of similarities of process and waste, this waste group was consolidated with the 200-PW-4 OU for characterization. Characterization data were collected in accordance with DOE/RL-2000-60. Characterization data in support of closure are provided in the RI report (DOE/RL-2004-25, Appendix B).

4.1 Previous Closure Activities

Closure activities have been completed to preclude any further discharges to the unit and in support of TSD unit closure. Closure activities, including TSD unit physical isolation, borehole drilling, and soil verification sampling and analysis, were conducted as part of the 200-PW-2/4 OUs RI.

4.2 Treatment, Storage, and Disposal Unit Physical Isolation

The PUREX Plant, which was the sole source of the waste discharged to this crib, has been shut down. In September 1987, ASD waste from the 202-A Plant Canyon Building E-F11 Concentrator condenser that previously had been sent to the crib was rerouted to the Double-Shell Tank system for storage until final disposition. No discharge to the crib has occurred since the final discharge of ASD waste on September 6, 1987.

4.3 Verification Sampling and Analysis

This section summarizes the completed 216-A-36B TSD unit closure characterization activities, including borehole drilling, geophysical logging, field screening, and sampling and analysis of borehole soils. These activities were performed in FY 2003 and FY 2004 as a portion of the 200-PW-2/-4 OU CERCLA RI/FS process to identify the nature and extent of chemical and radiological contamination in vadose zone soil underlying the crib, in support of OU remedial decision making and RCRA TSD unit closure. The RI was conducted in accordance with the sampling and analysis in the RI/FS Work Plan (DOE/RL-2000-60, Appendix B). Data collected from the crib are presented in the RI report (DOE/RL-2004-25, Appendix B).

4.3.1 Borehole Drilling

Boreholes C3248 and C4160 (Figure 4) were drilled for characterization of the 216-A-36B Crib. The borehole activities for this crib are described in detail in CP-18666, *200-PW-2 and 200-PW-4 Operable Units Borehole Summary Report*. Drilling commenced for Borehole C3248 on July 1, 2003 and met refusal at a depth of 8 m (26 ft) bgs, resulting in abandonment of the attempt and decommissioning of the borehole. Soil samples were taken to a depth of 7.3 m (24 ft) bgs before borehole decommissioning. Borehole C4160 was drilled from the ground surface to the water table at depths of approximately 85 m (278 ft). The drilling of Borehole C4160 began on July 2, 2003 and was completed on September 9, 2003.

Boreholes were drilled to the top of groundwater using a cable-tool drill rig. The borehole was advanced to total depth using drive barrels and split-spoon samplers. Split-spoon samplers were used as the primary sampling device for collecting chemical, radiological, and physical property samples; however, the drive barrel occasionally was used to collect moisture samples. After reaching total depth, each borehole was decommissioned by removing the temporary casings and backfilling the borehole with silica sand from the bottom to the water table, with granular bentonite up to 0.3 to 1 m (1 to 3 ft) bgs, and with a concrete surface seal, in accordance with WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells."

4.3.2 Soil Sampling and Analysis

Sample collection and analysis were guided by the sample schedule in the RI/FS work plan (DOE/RL-2000-60). These activities are described in detail in CP-18666. Analytical data collected from the RI are presented in DOE/RL-2004-25 (Appendix B) and are discussed in this section.

Thirty-two samples representing Boreholes C3248 and C4160 were sent for chemical and radiological analysis and determination of physical properties. Four of the soil samples were from Borehole C3248, and the remainder was from Borehole C4160. Two were quality control samples (equipment blanks), and the remaining 30 were soil samples obtained from the boreholes from 0.2 to 97.1 m (0.5 to 318.5 ft) bgs.

Borehole soil samples were analyzed for multiple radiological and chemical constituents, including ammonia. Physical property samples were collected at major lithologic changes and as determined by the site geologist. The RI report (DOE/RL-2004-25, Table 2-2) provides sample information (e.g., Hanford Environmental Information System database sample number, date, depth, and analyses performed) for all Borehole C3248 and C4160 soil samples.

The crib TSD unit sampling approach generally required a greater sample frequency near the base of the crib, which usually is the area of highest contamination. Samples were obtained from the borehole at 12 elevations: 3.8 m (12.5 ft), 7.3 m (24 ft), 7.6 m (25 ft), 8.4 m (27.5 ft), 9.1 m (30 ft), 12.2 m (40 ft), 16.3 m (53.5 ft), 27.3 m (89.5 ft), 60.2 m (197.5 ft), 87.5 m (287 ft), 89 m (292 ft), and 97.1 m (318.5 ft) bgs.

A spilt-spoon sampler was the primary sampling device used to collect the samples from the boreholes. One-liner from selected intervals was analyzed for physical properties.

4.3.3 Soil Sample Results

Table 1 identified the maximum concentration for ammonia, 216-A-36B TSD unit constituent. Analytical results are presented in the RI report (DOE/RL-2004-25, Appendix B). Ammonia was reported ranging from 21.9 mg/kg at 7.6 m (25 ft) bgs to 58.2 mg/kg at 16.3 m (53.5 ft). There is no WAC 173-340-740(3) soil cleanup standard for ammonia. Ammonia concentrations in soil in low milligrams per kilogram did not exceed the WAC 173-303-100 state-only criteria waste designation level (10,000 mg/kg).

5 Contingent Closure Plan

Based on the results to date that support clean closure, a contingent closure plan will not be required. If it is determined at some point in the future that clean closure is not possible, a modified closure plan will be prepared.

6 Schedule for Closure

The unit specific closure requirements for this TSD unit are complete. The only remaining activity for clean closure of this TSD is certification of closure, which is described in Section 7. Previous closure activities for this TSD unit, including unit isolation and closure verification sampling and analysis to support this strategy, are complete. No additional physical closure activities are planned.

Following approval of this plan. a certification of closure package will be submitted within 90 days following the due date for TPA Interim Milestone M-037-10.

After closure, appearance of the land will be consistent with future land-use determinations for adjacent portions of the 200 Areas as an industrial-exclusive portion of the Hanford Site. This land use is consistent with the formal determination made for this portion of the 200 Area as described in 64 FR 61615.

The duties associated with TSD unit dangerous waste management activities include performing inspections and notifying Ecology of any potential threats to HHE. Until final closure, TSD inspections will continue, as approved by Ecology. Following Ecology approval of clean closure, training for dangerous waste management activities and inspections at the 216-A-36B Crib will be discontinued.

7 Certification of Closure

This TSD unit received its final volume of waste on September 6, 1987. TSD unit closure activities comprising of 200-PW-2/4 OU RI borehole drilling and soil sampling and analysis were completed in 2004. This sampling demonstrated the absence of chemical contamination in 216-A-36B TSD unit in soils above clean closure levels and that the TSD unit has not impacted groundwater.

In accordance with WAC 173-303-610(6), DOE will submit to Ecology a certification of closure and subsequent permit modification documentation. Both DOE and the Co-Operator identified on the current Part A Form will sign the certification of closure, and an Independent Qualified Registered Professional Engineer (IQRPE) will state 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 IQRPE's certification will be placed in the Administrative Record.

8 Post-Closure Plan

The closure plan for the 216-A-36B Crib is clean closure with regard to RCRA contaminants from the TSD unit operations. Therefore, no post-closure plan or activities for purpose of addressing RCRA contaminants are needed for this site. After clean closure, this crib will continue to be monitored by the 200-PO-1 Groundwater OU under a RCRA groundwater assessment program for past-practice (corrective action) constituents after TSD unit closure.

9 Amendment of Closure Plan

As required by WAC 173-303-610(3)(b), the closure plan will be amended if changes to closure activities require a modification of the approved closure plan; however, closure activities are complete. If an amendment to the approved closure plan is required, DOE will follow the process contained in RCRA Permit Condition I.C.3.

10 References

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40 CFR 265.91, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," "Ground-Water Monitoring System," *Code of Federal Regulations*.

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DOE/RL-2006-11
Revision 1

216-B-63 TRENCH CLOSURE PLAN (D-2-6)

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

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216-B-63 TRENCH CLOSURE PLAN (D-2-6)

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Assistant Secretary for Environmental Management

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Contents

Figures

Tables

Terms

AEA	*Atomic Energy Act of 1954*
bgs	below ground surface
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	*Code of Federal Regulations*
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
FR	*Federal Register*
FS	feasibility study
HEIS	Hanford Environmental Information System
HHE	human health and the environment
HWMA	Hazardous Waste Management Act
IQRPE	Independent Quality Registered Professional Engineer
NA	not applicable
OU	operable unit
RCRA	*Resource Conservation and Recovery Act of 1976*
RCW	*Revised Code of Washington*
RI	remedial investigation
TOC	total organic carbon
TOX	total organic halides
TPA	Tri-Party Agreement
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TSD	treatment, storage, and/or disposal
WAC	*Washington Administrative Code*

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1 Introduction

The purpose of this plan is to explain the *Resource Conservation Recovery Act of 1976* (RCRA) (42 USC 6901) closure process for the 216-B-63 Trench which is an interim status treatment, storage, and/or disposal (TSD) unit.

This closure plan is being resubmitted in accordance with the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989a), also known as the Tri-Party Agreement (TPA), Interim Milestone M-037-02, which requires submittal of revised closure plans to the Washington State Department of Ecology (Ecology) to support TSD unit closure for five TSD units: 207-A South Retention Basin, 216-A-29 Ditch, 216-A-36B Crib, 216-A-37-1 Crib, and 216-B-63 Trench, by June 30, 2014.

Based on analytical data previously collected, closure for the 216-B-63 Trench soils, structures, and groundwater is clean closure in accordance with *Washington Administrative Code* (WAC) 173-303, "Dangerous Waste Regulations," specifically WAC 173-303-610, "Closure and Post-Closure." This strategy is based on analytical data provided and summarized in the 200-CS-1 Operable Unit (OU) remedial investigation (RI) report (DOE/RL-2004-17, *Remedial Investigation Report for the 200-CS-1 Chemical Sewer Group Operable Unit*), and the feasibility study (FS) (DOE/RL-2005-63, *Feasibility Study for the 200-CS-1 Chemical Sewer Group Operable Unit*), showing that the TSD unit meets clean closure performance standards for TSD unit dangerous waste constituents without further physical closure activities. Because clean closure is based on the results of completed sampling and analysis described in this closure plan and all verification sampling to confirm clean closure has been completed, no further closure activities are expected to be performed. Therefore, no sampling and analysis plan is included in this closure plan. In accordance with WAC 173-303-610 requirements, the data also show that TSD unit operations and TSD unit constituents did not impact groundwater. Consequently, post-closure activities are not needed, and a post-closure monitoring plan is not included.

Contaminants other than the TSD unit constituents are present in the soil and groundwater. This past-practice contamination may pose a threat to human health and the environment (HHE) and will be addressed through the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) remedial action process for the 200-EA-1 OU.

1.1 Unit Description

1.1.1 Overview

The 216-B-63 Trench, an interim status surface impoundment, was a percolation trench that received emergency cooling water and chemical sewer waste from the 221-B Plant Canyon Building Complex (B Plant). It was also designed to receive diverted cooling water from the 207-B Retention Basin to prevent the cooling water from reaching the 216-B-3 Pond. However, no cooling water was actually diverted to the trench (DOE/RL-92-05, *B Plant Source Aggregate Area Management Study Report*). The trench received mixed waste between March 1970 and February 1992. Figure 1 provides a timeline that summarizes the operations and regulatory milestones associated with the 216-B-63 Trench. Operations milestones are shown below the timeline, and regulatory milestones are shown above the timeline.

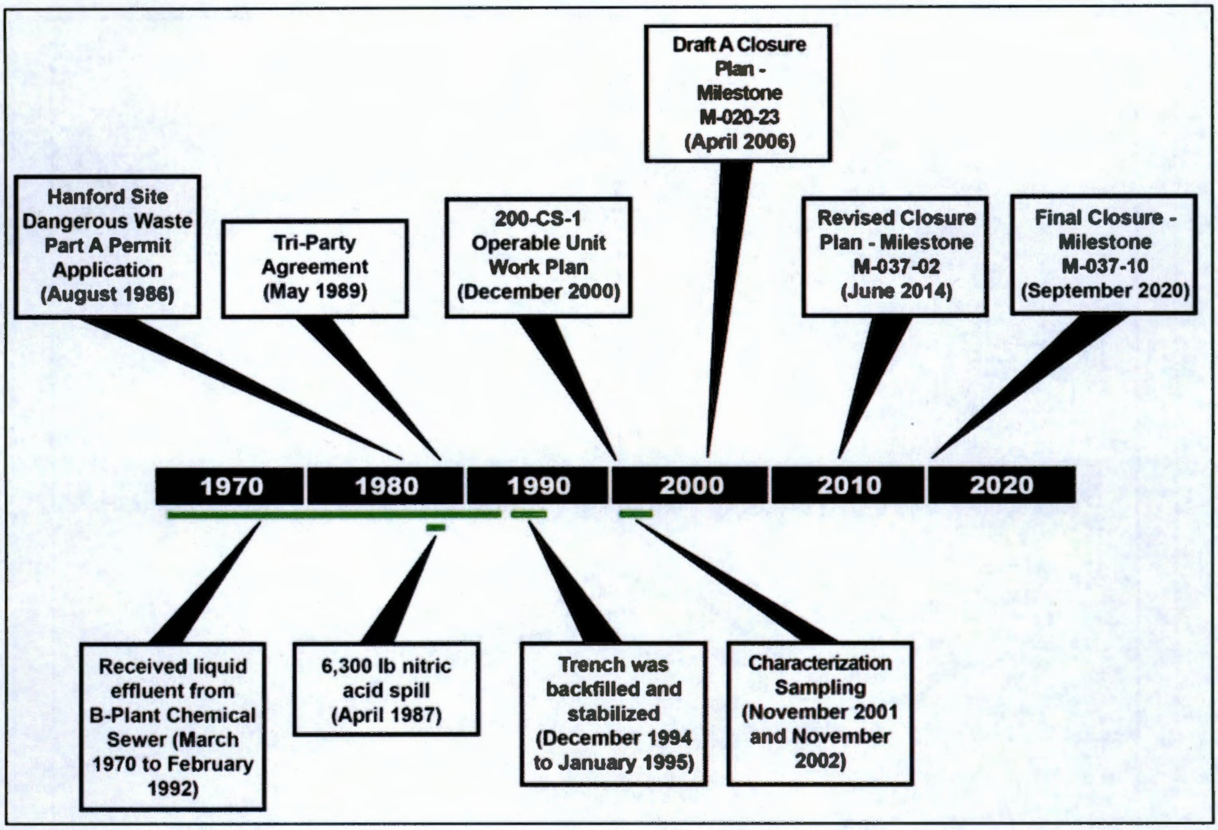

Figure 1. Timeline for the 216-B-63 Trench

Chemical sewer waste was the primary effluent disposed to the trench and was a mixture of both hazardous/dangerous waste, as defined in RCRA and *Revised Code of Washington* (RCW) 70.105, "Hazardous Waste Management," also known as the Washington State Hazardous Waste Management Act (HWMA); and radionuclide "source, special nuclear, and byproduct materials" as defined in the *Atomic Energy Act of 1954* (AEA) (42 USC 2011). Both RCRA and AEA state that these radioactive materials are regulated exclusively at U.S. Department of Energy (DOE) facilities, acting pursuant to its AEA authority. These radionuclide materials are not hazardous/dangerous wastes and, therefore, are not subject to regulation by the State of Washington under RCRA and HWMA. All information contained herein and related to, or describing AEA-regulated materials and processes in any manner, may not be used to create conditions or other restrictions set forth in any permit, license, order, or any other enforceable instrument. Information contained herein on radionuclides is provided for process description purposes only.

1.1.2 Physical Description

The 216-B-63 Trench is located in the 200 East Area of the Hanford Site (Figure 2). The 216-B-63 Trench was constructed before 1970 as a percolation trench to receive emergency cooling water and chemical sewer waste from B Plant. The trench was an open, unlined constructed earthen trench with an influent pipe and no discharge pipe.

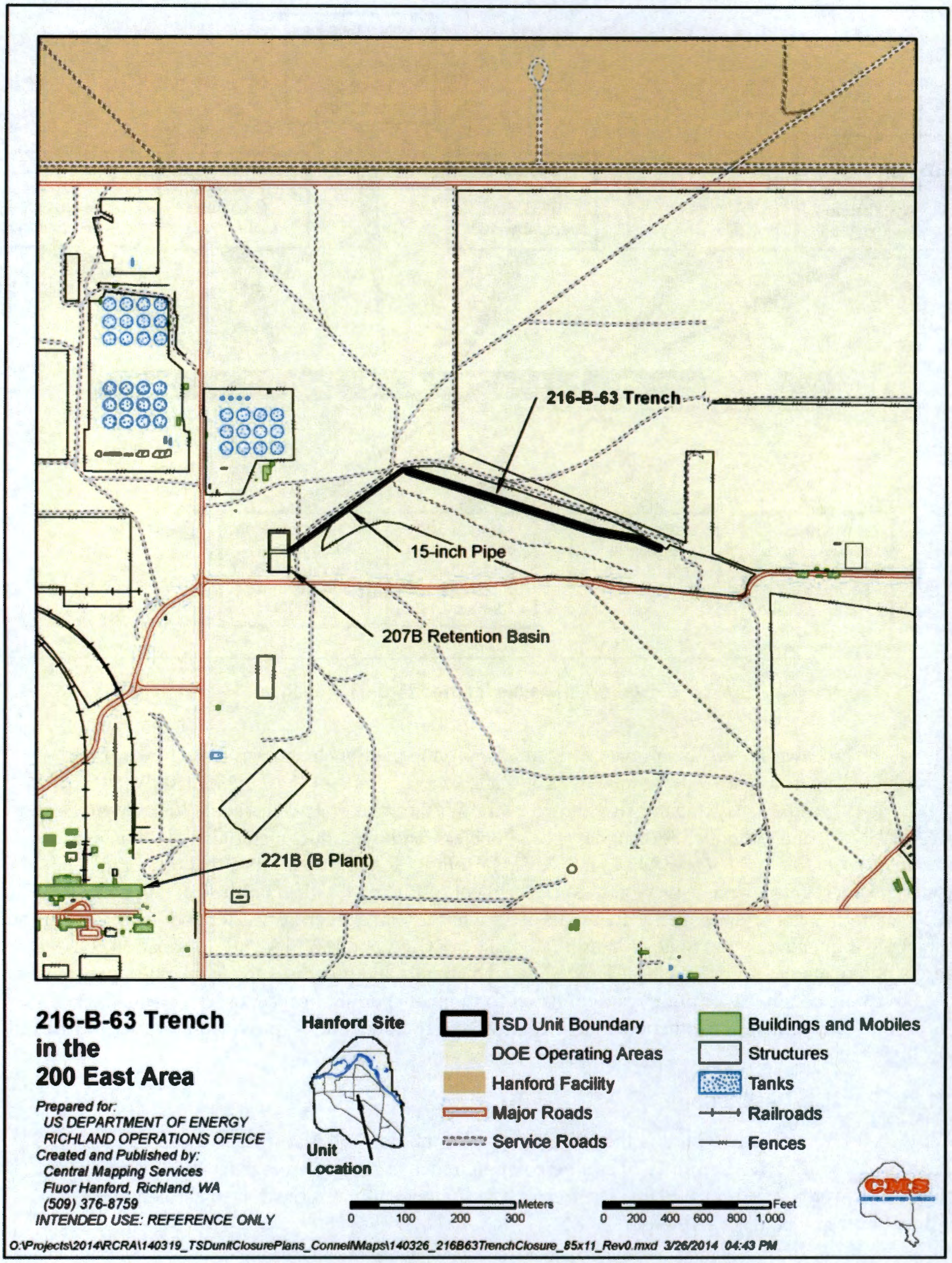

Figure 2. 216-B-63 Trench Site Plan

The trench was approximately 427 m (1,400 ft) long and 1.2 m (4 ft) wide and averaged 3 m (10 ft) in depth. The side slope was 1.5:1. The first 3.1 m (10 ft) of the trench contained a 5.1 cm (2 in.) rockfill. A 38 cm (15 in.) vitrified clay pipe came from the 207-B Retention Basin and entered into a 40.6 cm (16 in.) diameter carbon steel inlet pipe approximately 1.5 m (5 ft) long that branched off into the 216-B-63 Trench approximately 1 m (3 ft) below grade and an approximately 4 m (13 ft) long valved off dead leg. The 216-B-63 Trench began waste management operations in March 1970 by receiving the B Plant cooling water and chemical sewer effluent. The trench received waste between March 1970 and February 1992. It was designed to receive diverted emergency cooling water to prevent diverted water from reaching the 216-B-3 Pond. In February 1992, the B Plant chemical sewer effluent was combined with the B Plant cooling water effluent and discharged into the 216-B-3 Pond. At this point, discharges to the 216-B-63 Trench were terminated (see Figure 1).

1.1.3 Process Information

The 216-B-63 Trench is a percolation trench that received the B Plant cooling water and chemical sewer effluent. It operated as a settling pond, no waste treatment occurred at the 216-B-63 Trench. The major sources of waste contributions to the 216-B-63 Trench were the 2902-B high tank (potable sanitary water), cooling water from B Plant and Waste Encapsulation and Storage Facility air compressor after-coolers, a portion of the B Plant steam condensate, and the demineralizer effluent. Minor contributions came from chemical makeup overflow systems, air conditioning units, and space heaters. These minor contributions were determined to be controlled to levels below dangerous waste designation limits.

1.1.4 Waste Inventory and Characteristics

The dangerous wastes received at the 216-B-63 Trench are sodium hydroxide, sulfuric acid, and nitric acid solutions. These chemicals are regulated under WAC 173-303, "Dangerous Waste Regulations," as a dangerous waste because of its characteristic of corrosivity (D002), with pH as the TSD unit closure parameter. The 216-B-63 Trench received corrosive dangerous waste from the regeneration of demineralizer columns in B Plant (271-B Building). The demineralizer column effluents were routine corrosive discharges (D002) of sulfuric acid and sodium hydroxide solutions.

The approximate average flow rate of wastewater discharged to the 216-B-63 Trench varied from 378,000 to 1,408,000 L/day (100,000 to 400,000 gal/day). From 1970 to 1985, approximately 68,100,000 kg/yr (473,000 L/day [125,000 gal/day]) of corrosive wastewaters were managed in the 216-B-63 Trench.

The corrosive discharges occurred from 1970 until October 1985. After 1985, the cation column effluent was treated with sodium carbonate, and the anion column effluent was treated with monosodium phosphate to maintain a combined pH of between 4 and 10. Dangerous waste flows from the demineralizer columns to the trench ceased in October 1985, and all liquid flows to the trench ceased in 1992. A 2,858 kg (6,300 lb) nitric acid spill to the trench occurred in April 1987 (WHC-EP-0342, Addendum 6, *B Plant Chemical Sewer Stream-Specific Report*).

Chemical discharges to the 216-B-63 Trench after the effective date of regulation (nonradioactive hazardous waste: November 19, 1980) that designate as a dangerous waste constitute the waste codes appearing on the *Dangerous Waste Permit Application* for the 216-B-63 Trench (WA7 89000 8967, Part V, Closure Unit 21) (Part A Form). The waste codes on the Part A Form are based on documented discharges to the TSD unit.

Based on the dangerous waste received at the 216-B-63 Trench, the TSD unit constituent of concern for RCRA closure is pH. This parameter constitutes the scope of the TSD unit RCRA closure activities (Table 1). The pHs of the trench soils are reported as 8.0 to 9.5 and are well within the noncorrosive range from WAC 173-303-090(6), "Dangerous Waste Characteristics."

Table 1. Comparison of 216-B-63 Trench RI Data to Unrestricted Use Cleanup Standards[a]

TSD Unit Constituent Related to Part A Waste Code D002	Maximum Value Shallow-Zone Soil (pH Units)[b]	Maximum Value Deep Zone Soil (pH Units)[b]	Hanford Site Soil Background[c]	Soil Concentration Protective of Groundwater	Human Health Protection Soil Direct Contact		Screening Levels for Ecological Protection	Clean Closure Driver (pH Units)	Meet Clean Closure Standard?
			90% Log Normal percentile		Carcinogen	Non-carcinogen			
pH	9.5	9.5	N/A	N/A	N/A	N/A	N/A	Non corrosive (>2.0 and <12.5)	Yes

a. DOE/RL-2005-63, *Feasibility Study for the 200-CS-1 Chemical Sewer Group Operable Unit*, Appendices A and B. Shallow zone is 0 to 15 ft.

b. DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Vol. I.

c. Represents the most restrictive level after ensuring the most restrictive level is not less than natural background and for analytical considerations, as indicated in WAC 173-303-100(5)(b)(iii)(v), "Dangerous Waste Criteria."

N/A = not applicable.

RI = remedial investigation.

TSD = treatment, storage, and disposal (unit).

WAC = *Washington Administrative Code.*

There are no other closure parameters because disassociated anion/cations of acid and bases do not result in a dangerous waste designation. They are not subject to the numerical closure performance standard comparison in WAC 173-303-610(2)(b)(i) because none of them constitute a "dangerous waste, dangerous waste constituent, or residue."

1.1.5 Security Information

The 216-B-63 Trench is located in the 200 East Area of the Hanford Site and therefore, security information pertaining to the 200 Area applies to this TSD unit. Changes to security are expected to occur during the course of 200 East Area deactivation and decommissioning activities. Security measures will remain in place that limit entry to authorized personnel and that preclude unknowing access by unauthorized individuals until closure of the TSD unit.

2 Groundwater Monitoring

The 216-B-63 Trench groundwater closure approach is clean closure in accordance with the *Hanford Federal Facility Agreement and Consent Order Action Plan* (Ecology et al. 1989b, Section 6.3.l) where any TSD unit is eligible for clean closure at the Hanford Site. The clean closure approach is based on data gathered from the monitoring network (DOE/RL-2008-60, *Interim Status Groundwater Monitoring Plan for the 216-B-63 Trench*), groundwater data contained in the Hanford Environmental Information System (HEIS), and text provided in DOE/RL-2013-22, *Hanford Site Groundwater Monitoring Report for 2012*. Regional groundwater monitoring will be continued, as appropriate, in the 200-BP-5 Groundwater OU for past-practice discharge. Following clean closure certification of the TSD unit in accordance with Section 7, the TSD unit groundwater monitoring program will be discontinued.

2.1 History of RCRA Groundwater Monitoring at the 216-B-63 Trench

The 216-B-63 Trench is an interim status, non-operating TSD unit in the 200-EA-1 OU. The 216-B-63 Trench is regulated as a surface impoundment and has been designated as a TSD unit because it received mixed waste regulated by Title 40, *Code of Federal Regulations* (CFR), Part 261, "Identification and Listing of Hazardous Waste," after August 17, 1987.

Groundwater monitoring under the 216-B-63 Trench was initiated in 1989 through PNL-6862, *40 CFR 265 Interim Status Indicator-Evaluation Ground-Water Monitoring Plan for the 216-B-63 Trench*. From 1989 to 1992, 12 wells were installed to complete the initial monitoring network (DOE/RL-2008-60). The monitoring wells were arranged for a westward flow direction. Background results were statistically derived by 1993, and detection monitoring was implemented. The implementing monitoring plan was released in 1995 (WHC-SD-EN-AP-165, *Interim-Status Groundwater Monitoring Plan for the 216-B-63 Trench*). The network remained unchanged until 2012 when DOE/RL-2008-60 was implemented. The monitoring plan (WHC-SD-EN-AP-165) was replaced in 2002 by PNNL-14112, *Groundwater Monitoring Plan for the 216-B-63 Trench on the Hanford Site*; however, there were no changes in the monitoring network or the parameters for water quality or contaminant indicator parameters. Statistical analyses of the RCRA interim status indicator parameters (pH, specific conductance, total organic carbon [TOC], and total organic halides [TOX]), as specified in 40 CFR 265.92(b)(3), "Sampling and Analysis," showed no exceedances during the monitoring period through 2012.

In July/August 2011, a groundwater flow direction change was realized creating the need to modify the monitoring network (Figure 3). The flow direction was determined to be south-southwest.

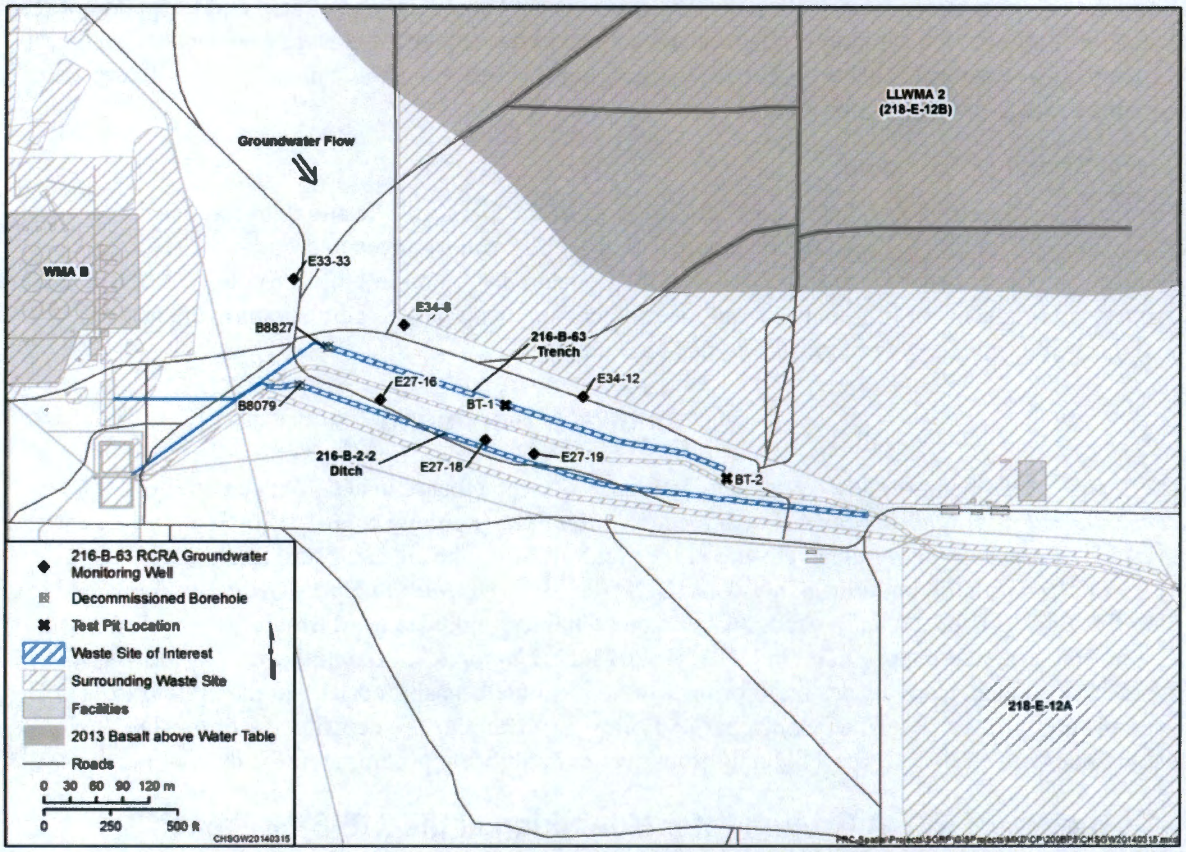

Figure 3. Location of Groundwater Monitoring Wells and Groundwater Flow Direction

Three existing upgradient and three existing downgradient wells were used to complete the monitoring network (DOE/RL-2008-60). Statistical analyses using past results for the indicator parameters were derived for detection monitoring. Since implementation of DOE/RL-2008-60, there has been no exceedance of the derived comparison values for the indicator parameters.

2.2 Aquifer Identification

The geology and hydrology of the 200 East Area, including the 216-B-63 Trench, has been described in detail in several reports over the past 20 years.

The uppermost aquifer beneath the 216-B-63 Trench is unconfined and occurs within the lower gravel-dominated Hanford formation. The water table elevation beneath the 216-B-63 Trench is approximately 122 m (400 ft) above mean sea level. The base of the unconfined aquifer is defined as the top of the Elephant Mountain Member of the Saddle Mountain Basalt and ranges between 115.4 and 118.6 m (378.5 to 389 ft) above mean sea level. The unconfined aquifer thickness ranges from 3.4 to 6.6 m (11 to 21.5 ft).

2.3 Well Location and Design

The current groundwater monitoring design consists of six groundwater monitoring wells that create an upgradient/downgradient pairing based on the south-southeast flow direction. Results for the downgradient wells (299-E27-16, 299-E27-18, and 299-E27-19) are compared to the statistically derived indicator parameter values for a statistically significant increase from the upgradient wells (299-E33-33, 299-E34-8, and 299-E34-12). The 2012 statistically significant increase values (critical means) and downgradient well results are provided in Table 2.

Table 2. 216-B-63 Trench Indicator Parameter Results

Constituent (Unit)	2012 Concentration Range	2012 Critical Mean	2012 Exceedance?	Wells Exceeded
pH	7.89 to 8.27	7.61 - 8.51	No	None
Specific Conductance (µS/cm)	418 to 547	1151	No	None
Total Organic Carbon (µg/L)	101 to 302	996	No	None
Total Organic Halides (µg/L)	<5 to 8.95	NC (limit of quantitation = 22.5 2nd quarter; 21.8 4th quarter)	No	None

NC = not calculated because proportion nondetects are greater than 50%.

Construction details and lithologic information for the 216-B-63 Trench network wells are provided in as-built diagrams in PNNL-14112 and WHC-SD-ER-TI-007, *Summaries of Well Construction Data and Field Observations for Existing 200 East Resource Protection Wells*. Table 3-2 of DOE/RL-2008-60 summarizes well construction information, including the 2012 depth of water in each well. All of the groundwater monitoring wells were constructed to meet resource protection well standards (WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells").

2.4 Results of Interim Status Groundwater Detection Monitoring

The RCRA indicator parameters are specific conductance, pH, TOC, and TOX. Groundwater quality parameters are chloride, iron (filtered), manganese (filtered), phenols, sodium (filtered), and sulfate. The 216-B-63 Trench began implementing the interim status indicator parameter evaluation (detection level) program in 1993, while preparation of the monitoring network started in 1988. To date, there have been no RCRA indicator parameter exceedances since starting the program.

Previous groundwater monitoring has indicated that dangerous waste/dangerous waste constituents from the 216-B-63 Trench have not entered groundwater. Statistical analyses of the RCRA interim status indicator parameters (pH, specific conductance, TOC, and TOX), as specified in 40 CFR 265.92(b)(3), have shown no exceedances during the monitoring period. Revised comparison values of these analyses, as well as discussion on regional contaminant plumes, are published annually in the Hanford Site annual groundwater report.

3 Closure Performance Standards

The 216-B-3 Trench will be clean closed; therefore, this section identifies clean closure performance standards for TSD structures and soils.

3.1 Treatment, Storage, and Disposal Unit Closure Performance Standards

The standards for closure of this TSD unit are in accordance with the requirements of the TPA Action Plan (Ecology et al. 1989b, Section 5.3) directing that Hanford Site interim status TSD unit closures meet cleanup requirements established in accordance with WAC 173-303-610. As required by TPA (Ecology et al. 1989a, Section 6.3.1), clean closure for disposal units also must demonstrate that TSD unit operations did not adversely impact soil or groundwater. The closure performance standards of WAC 173-303-610(2)(a)(i-iii) require the owner or operator of a TSD facility to close the facility in a manner that accomplishes the following objectives:

1. Minimize the need for further maintenance.
2. Control, minimize, or eliminate to the extent necessary to protect HHE, post-closure escape of dangerous waste, dangerous constituents, leachate, contaminated runoff, or dangerous waste decomposition products to the ground, surface water, groundwater, or the atmosphere.
3. Return the land to the appearance and use of surrounding land areas to the degree possible given the nature of the previous dangerous waste activity.

Clean closure will eliminate the need for future post-closure inspections, monitoring, and maintenance resulting from contamination from TSD unit constituents. Completed sampling and analysis demonstrates at the 216-B-63 Trench that the levels of dangerous wastes remaining do not exceed the WAC 173-303-610 clean closure standards. After clean closure, appearance of the land will be consistent with future land-use determinations for adjacent portions of the 200 Areas as an industrial-exclusive portion of the Hanford Site. This land use is consistent with the formal determination made for this portion of the 200 Area as described in 64 *Federal Register* (FR) 61615, "Record of Decision: Hanford Comprehensive Land Use Plan Environmental Impact Statement (HCP-EIS)."

3.2 Soil Closure Standards

The clean closure requirements are established in WAC 173-303-610(2)(b) and the surface impoundment standards in WAC 173-303-650(6)(a), "Surface Impoundments," to remove or decontaminate unit soils contaminated above clean closure standards. These soil clean closure cleanup levels are the numeric levels identified in WAC 173-340-740(3), "Unrestricted Land Use Soil Cleanup Standards," that are either levels calculated using the most restrictive WAC 173-340-740(3) formulas for unrestricted use or background levels (DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*) when the most restrictive WAC 173-340-740(3) formulas are more stringent than Hanford Site background concentrations.

Based on the dangerous waste received at the 216-B-63 Trench, the TSD unit constituent of concern for RCRA closure is pH. The pH for the trench soil is 9.5 and is well within the noncorrosive range from WAC 173-303-090(6).

WAC 173-340-740(3) contains the following potential clean closure standards: Environmental protection related to ecological receptors, soil concentrations protective of groundwater, soil direct-contact carcinogens, soil direct-contact non-carcinogens, soil direct-contact petroleum vapors, and soil vapors. Environmental protection related to ecological receptors' values is not a clean closure standard for TSD unit closure based on WAC 173-340-7493(2)(a)(i), "Site-Specific Terrestrial Ecological Evaluation Procedures." The soil concentrations protective of groundwater, soil direct-contact carcinogens, and soil-direct contact noncarcinogens are applicable and identified in Table 1.

3.3 Structure Closure Standard

The clean closure standard for the 216-B-63 Trench structures is established in accordance with WAC 173-303-610(2)(b)(ii) on a case-by-case basis. Structures identified as part of the TSD unit include the 38 cm (15 in.) pipe extending to the 207-B Retention Basin. The 40.6 cm (15 in.) pipe and associated weir box were not identified in the Part A Form; however, they will be included as part of the structures subject to the closure plan. Achievement of a clean closure standard for the pipe will be demonstrated through use of process knowledge (Section 1.1.3), knowledge of waste characteristics (Section 1.1.4), and the following discussion.

The piping and weir were not sampled as part of the RI activities. However, the piping and weir meet clean closure requirements without further investigation because they are not reasonably expected to be contaminated with TSD unit constituents above clean closure levels (corrosive residues). The pipe is considered to be empty, and the weir box is filled with concrete. No liquid has been discharged since 1992, and the piping was sloped allowing no residual liquid to remain. Dangerous waste residues would not reasonably exist on internal piping surfaces contacted by waste, given that the effluent was primarily water (Section 4.1) and was very low in solids. Given this, no reasonable potential exists for TSD unit constituents to exist in piping or the weir box as residues at levels that could reasonably exceed the WAC 173-340-740(3) clean closure requirements.

4 Closure Strategy

This section identifies the 216-B-63 Trench TSD unit closure strategy. The standards for closure of Hanford Site interim status TSD units are contained in WAC 173-303-610, based on the TPA Action Plan (Ecology et al. 1989b, Section 5.3), and the possibility of clean closure for all TSD units at Hanford is described in the TPA Action Plan (Ecology et al. 1989b, Section 6.3.1).

The proposed closure strategy for the 216-B-63 Trench soils, structures, and groundwater is clean closure. This strategy is based on analytical data summarized in DOE/RL-2004-17 and groundwater data contained in the HEIS database.

Closure activities, including sampling, to verify clean closure were conducted as part of the 200-CS-1 OU RI. An analysis of the analytical data previously collected demonstrated that clean closure levels for this TSD unit have been achieved. No additional closure activities are anticipated for this TSD unit to achieve clean closure.

4.1 Previous Closure Activities

Clean closure activities for the 216-B-63 Trench were performed as a portion of 200-CS-1 OU remediation process. The trench was isolated and allowed to dry out. Activities included borehole and test pit drilling, sampling and analysis, and backfill and surface stabilization. The only action remaining is administrative (e.g., certification).

4.2 Treatment, Storage, and Disposal Unit Physical Isolation

To preclude any further discharges to the unit, and in support of TSD unit closure, the 216-B-63 Trench was physically isolated from receipt of the B Plant chemical sewer effluent in 1992. The weir box at the head end of the trench was filled with concrete, and the valve stems at the 207-B Retention Basin were cut off. A prestabilization civil survey was performed, the trench was then covered with clean soil and marked with concrete posts, and a post-stabilization civil survey was performed.

4.3 Verification Sampling and Analysis

The following sections describe sampling and analyses activities that have been completed for the 216-B-63 Trench.

4.3.1 Soil Sampling and Analysis

As part of the 200-CS-1 OU RI, data were collected to characterize the nature and vertical extent of contamination and the physical conditions in the vadose zone underlying the 216-B-63 Trench. Drilling, test pit excavation, surface and borehole geophysical surveys, and soil sampling and analysis were conducted during the field activities. Two test pits, one borehole, and 46 soil samples were collected from the 216-B-63 Trench and analyzed. Of the soil samples, 15 were from the shallow zone, 0 to 4.6 m (0 to 15 ft) below ground surface (bgs) depth interval, and 31 were from the deep zone, 4.6 m (15 ft) to the depth of groundwater (approximately 32.7 m [106.3 ft] bgs). The borehole and test pit locations are shown in Figure 3.

Borehole B8827 was drilled and sampled, and Test Pits BT-1 and BT-2A were excavated and sampled in the 216-B-63 Trench, located east of the B Tank Farm in the 200 East Area. The two samples scheduled to be taken from Test Pit BT-1 at depths of 6.1 and 7.6 m (20 and 25 ft) were not obtained because the test pit caved in excessively. Excavation equipment regulated for use in radiological environments was unavailable, so sampling at Test Pit BT-2 was terminated on November 2, 2001, after sampling at the 2.3 m to 2.6 m (7.5 to 8.5 ft) depth. At that point, the soil was returned to the sampling pit in the reverse order from which it was excavated. On November 11, 2002, Test Pit BT-2A was excavated and sampled to 7.6 m (25 ft). This test pit was designated BT-2A to distinguish it from the Test Pit BT-2 operations.

The test pit locations were prepared by removing 0.3 to 0.6 m (1 to 2 ft) of topsoil from the site. The test pits were excavated to a maximum depth of 7 m (25 ft) bgs, using a track hoe. Samples were obtained directly from the track hoe bucket at intervals of approximately 0.7 m (2.5 ft). Before they were placed in a sample jar, the soil samples were screened in the field to assist in selecting sample points, support worker health and safety, and provide shipping information. Samples were analyzed for chemical and physical properties. The test pits were backfilled in the reverse order from which they were excavated, using the track hoe.

Borehole B8827 was drilled and sampled during fiscal year 2003. The borehole was drilled through the 216-B-63 Trench from the ground surface to a depth of 31.4 m (103 ft) using a high-resolution spectral gamma ray logging system and a neutron logging system to define stratigraphy more accurately, assess the nature and vertical extent of contamination, and determine the physical properties of soil under the TSD unit.

Soils from the boreholes and test pits were screened in the field both for indications of contamination and to assist in determining the discrete sample locations or depths before the samples were collected. Soil samples were collected for analysis and determination of physical properties. The sampling approach generally required a greater sample frequency near the bottom of the TSD unit, which is the area of highest suspected contamination. Sample collection was attempted at depths of 4.6 and 7.6 m (15 and 25 ft) bgs to define contamination profiles. Sample frequency generally was reduced to 6.1 to 15.2 m (20 to 50 ft) intervals below a depth of 7.6 m (25 ft) in the boreholes.

Soil samples were analyzed for the constituents of concern from DOE/RL-2004-17, which included pH. Samples were analyzed selectively for field bulk density and moisture content. Ditch bottom samples from each of the test pits were analyzed for an expanded list of compounds to satisfy waste designation requirements. Soil descriptions were recorded to define stratigraphic relationships.

4.3.2 Soil Sample Results

Analytical results obtained from the RI were intended for RCRA closure decisions and are defensible for use in this closure plan. Table 1 identified the maximum pH value in shallow soils and deep zone soils as reported in DOE/RL-2004-017, Tables 4-1 and 4-3, respectively. The maximum values are compared to the clean closure levels described in Section 3.2 and did not exceed clean closure standards.

5 Contingent Closure Plan

Based on the results to date that support clean closure, a contingent closure plan will not be required. If it is determined at some point in the future that clean closure is not possible, a modified closure plan will be prepared.

6 Schedule for Closure

The unit specific closure requirements for this TSD unit are complete. The only remaining activity for clean closure of this TSD is certification of closure as described in Section 7.

Previous closure activities for this TSD unit, including unit isolation and closure verification sampling and analysis to support this strategy, are complete. No OU related activities are required for closure.

Following approval of this plan. a certification of closure package will be submitted within 90 days following the due date for TPA Interim Milestone M-037-10.

After closure, appearance of the land will be consistent with future land-use determinations for adjacent portions of the 200 Areas as an industrial-exclusive portion of the Hanford Site. This land use is consistent with the formal determination made for this portion of the 200 Area as described in 64 FR 61615.

The duties associated with TSD unit dangerous waste management activities include performing inspections and notifying Ecology of any potential threats to HHE. Until final closure, TSD unit interim status inspections will continue. Following Ecology approval of clean closure, training for dangerous waste management activities and inspections at the 216-B-63 Trench will be discontinued.

7 Certification of Closure

Dangerous waste discharges to the 216-B-63 TSD unit ceased in 1985, and liquid discharges to the trench ceased in 1992. Closure activities that included borehole drilling, soil and groundwater sampling and analysis performed in conjunction with the 200-CS-1 OU CERCLA RI/FS process, were completed in 2004 (DOE/RL-2004-17). This sampling demonstrated the absence of chemical contamination in TSD unit soils and structures, and the sampling results support the decision that the TSD unit has not impacted groundwater.

In accordance with WAC 173-303-610(6), DOE will submit to the lead regulatory agency (Ecology) a certification of closure and subsequent permit modification documentation. Both DOE and the Co-Operator, identified on the current Part A Form, will sign the certification of closure, and an Independent Quality Registered Professional Engineer (IQRPE) will state that the unit has been closed in accordance with the approved closure plan. Documentation supporting the IQRPE's certification will be placed in the Administrative Record.

8 Post-Closure Plan

The closure strategy for the 216-B-63 Trench is clean closure with regard to TSD unit constituents for structures, soils, and groundwater; therefore, no post-closure plan is required.

9 Amendment of Closure Plan

As required by WAC 173-303-610(3)(b), the closure plan will be amended if changes to closure activities require a modification of the approved closure plan; however, no changes are expected because closure activities relating to the soils, structures, and groundwater are complete.

10 References

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DOE/RL-2008-53
Revision 1

216-A-29 DITCH CLOSURE PLAN (D-2-3)

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

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Contents

Figures

Tables

Terms

AEA	*Atomic Energy Act of 1954*
bgs	below ground surface
DOE	U.S. Department of Energy
DQO	data quality objective
DWS	drinking water standard
Ecology	Washington State Department of Ecology
FY	fiscal year
HEIS	Hanford Environmental Information System
HWMA	Hazardous Waste Management Act (RCW 70.105)
IQRPE	Independent Registered Professional Engineer
MCL	maximum contaminant level
N/A	not applicable
ND	not detected
OU	operable unit
PQL	practical quantitation limit
PUREX	Plutonium-Uranium Extraction (Plant)
RCRA	*Resource Conservation and Recovery Act of 1976*
RCW	*Revised Code of Washington*
RI	remedial investigation
TOC	total organic carbon
TOX	total organic halides
TPA	Tri-Party Agreement
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TSD	treatment, storage, and/or disposal
WAC	*Washington Administrative Code*
WTP	Waste Treatment and Immobilization Plant

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1 Introduction

The purpose of this plan is to describe the closure process for the 216-A-29 Ditch interim status treatment, storage, and/or disposal (TSD) unit. This closure plan is being resubmitted in accordance with the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989a), also known as the Tri-Party Agreement (TPA) interim Milestone M-037-02. This milestone requires submittal of revised closure plans to the Washington State Department of Ecology (Ecology) to support TSD unit closure for five units: 207-A South Retention Basin, 216-A-29 Ditch, 216-A-36B Crib, 216-A-37-1 Crib, and 216-B-63 Trench, by June 30, 2014.

The 216-A-29 Ditch TSD unit will be incorporated into a future revision of WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste.* When the TSD unit is incorporated, the provisions of Permit Condition II.Y.2.c will apply. Permit Condition II.Y.2.c establishes the corrective action status of the waste site following certification of closure. When the permit modification to incorporate the TSD unit becomes effective, the provisions of Hanford Facility RCRA Permit Condition II.Y.2.c (WA7890008967) will apply.

This closure plan is written to address only the dangerous waste constituents of concern relating to *Resource Conservation and Recovery Act of 1976* (RCRA) (42 USC 6901) TSD unit operations (TSD unit constituents). Therefore, any other constituents of concern described in DOE/RL-2004-17, *Remedial Investigation Report for the 200-CS-1 Chemical Sewer Group Operable Unit*, related to past-practice activities at this waste site, will be addressed under past-practice authority in accordance with Permit Condition II.Y.2.c.ii. TSD units that were in the 200-CS-1 Operable Unit (OU), including the 216-A-29 Ditch, have been combined into the 200-EA-1 OU. Future coordination of 216-A-29 Ditch closure activities will be with the 200-EA-1 OU remedial action process. Any physical activities necessary to complete remediation of non-TSD unit constituents is outside the scope of this closure plan and will be performed in conjunction with TPA (Ecology et al. 1989a) past-practice activities for the 200-EA-1 source OU and the 200-PO-1 Groundwater OU.

The proposed closure strategy for the 216-A-29 Ditch soils is clean closure after remediation of the soils; the groundwater strategy is clean closure following certification of closure. The soil closure strategy is based on analytical data provided in DOE/RL-2005-63, *Feasibility Study for the 200-CS-1 Chemical Sewer Group Operable Unit* (Appendices A and B) and verification sampling activities, which will be completed following 200-EA-1 OU soil remediation activities. Groundwater data from the Hanford Environmental Information System (HEIS) database show that the TSD unit has not impacted groundwater. Analytical data from vadose zone characterization activities (DOE/RL-2005-63, Appendices A and B) show that the TSD unit would not impact groundwater in the future. Verification sampling of the soils will be performed to verify that contaminant removal is complete and confirm that the waste site remedy selection was implemented to achieve clean closure.

1.1 Unit Description

1.1.1 Overview

The 216-A-29 Ditch, an interim status surface impoundment, was used for disposal of various waste streams from the 202-A Plutonium-Uranium Extraction (PUREX) Plant. The ditch operated from 1955 until 1991. Because the PUREX Plant chemical sewer effluent was designated as dangerous waste under *Washington Administrative Code* (WAC) 173-303, "Dangerous Waste Regulations," a *Dangerous Waste*

Permit Application for the 216-A-29 Ditch (WA7890008967, Part V, Closure Unit 11) (Part A Form) was submitted to Ecology in 1986 with the latest revision on October 1, 2008. Figure 1 contains a timeline that summarizes the operations and regulatory milestones associated with the 216-A-29 Ditch.

The chemical sewer discharge from the PUREX Plant to the 216-A-29 Ditch is considered a mixed waste. This means the chemical sewer effluent is a mixture of both hazardous/dangerous waste, as defined in RCRA and *Revised Code of Washington* (RCW) 70.105 "Hazardous Waste Management," also known as the Washington State Hazardous Waste Management Act (HWMA), and also radionuclide "source, special nuclear, and byproduct materials" as defined in the *Atomic Energy Act of 1954* (AEA) (42 USC 2011). Both RCRA and AEA state that these radioactive materials are regulated at U.S. Department of Energy (DOE) facilities, exclusively by the DOE, acting pursuant to its AEA authority. These radionuclide materials are not hazardous/dangerous wastes and therefore, are not subject to regulation by the State of Washington under RCRA and HWMA. All information contained herein and related to, or describing, AEA-regulated materials and processes in any manner may not be used to create conditions or other restrictions set forth in any permit, license, order, or any other enforceable instrument. Information contained herein on radionuclides is provided for process description purposes only.

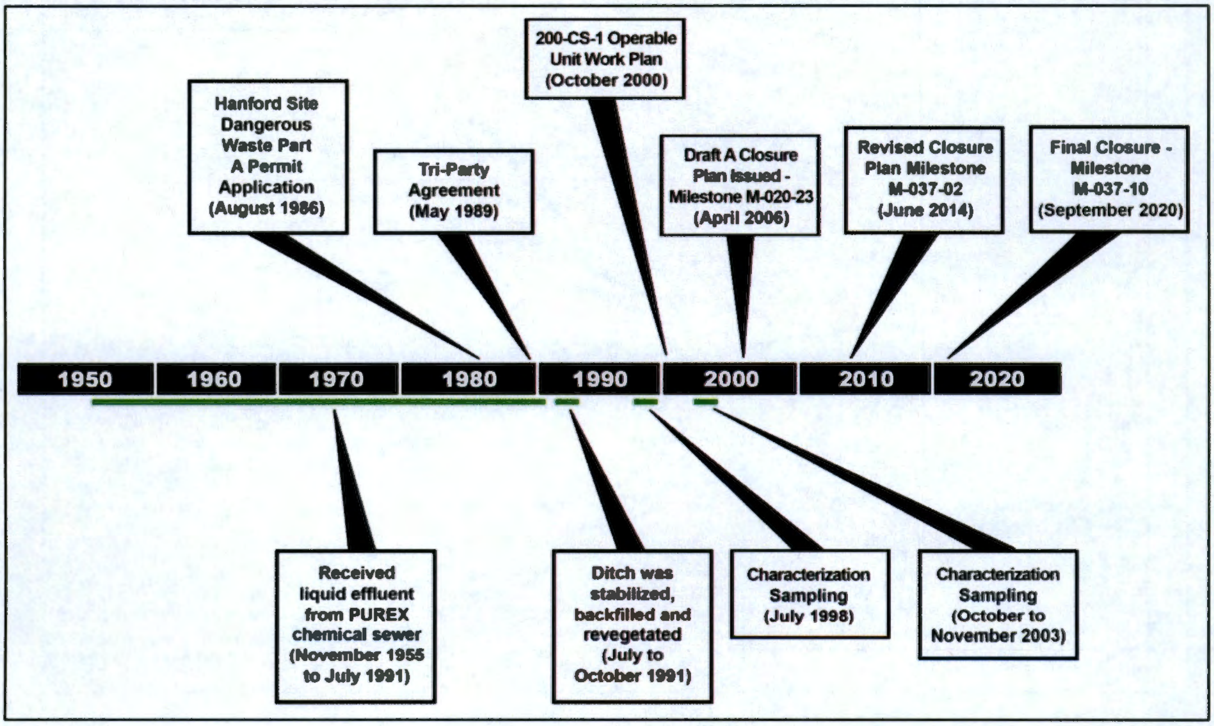

Figure 1. Timeline for the 216-A-29 Ditch

1.1.2 Physical Description

The 216-A-29 Ditch is located in the eastern portion of the 200 East Area of the Hanford Site (Figure 2). The 216-A-29 Ditch received discharge from the PUREX Plant chemical sewer. The ditch was uncovered and unlined and followed the natural topography. The ditch originated from the southeast side of the A Tank Farm (east of the AP Tank Farm) outside the 200 East Area perimeter fence. The ditch was estimated to be 1,220 m (4,000 ft) long and 1.8 m (6 ft) wide and varied from 0.6 to 4.6 m (2 to 15 ft) deep. The head end of the ditch was modified in 1983 to allow construction of the AP Tank Farm. The end of the ditch connects to the 216-B-3-3 Ditch and finally to the 216-B-3 Pond.

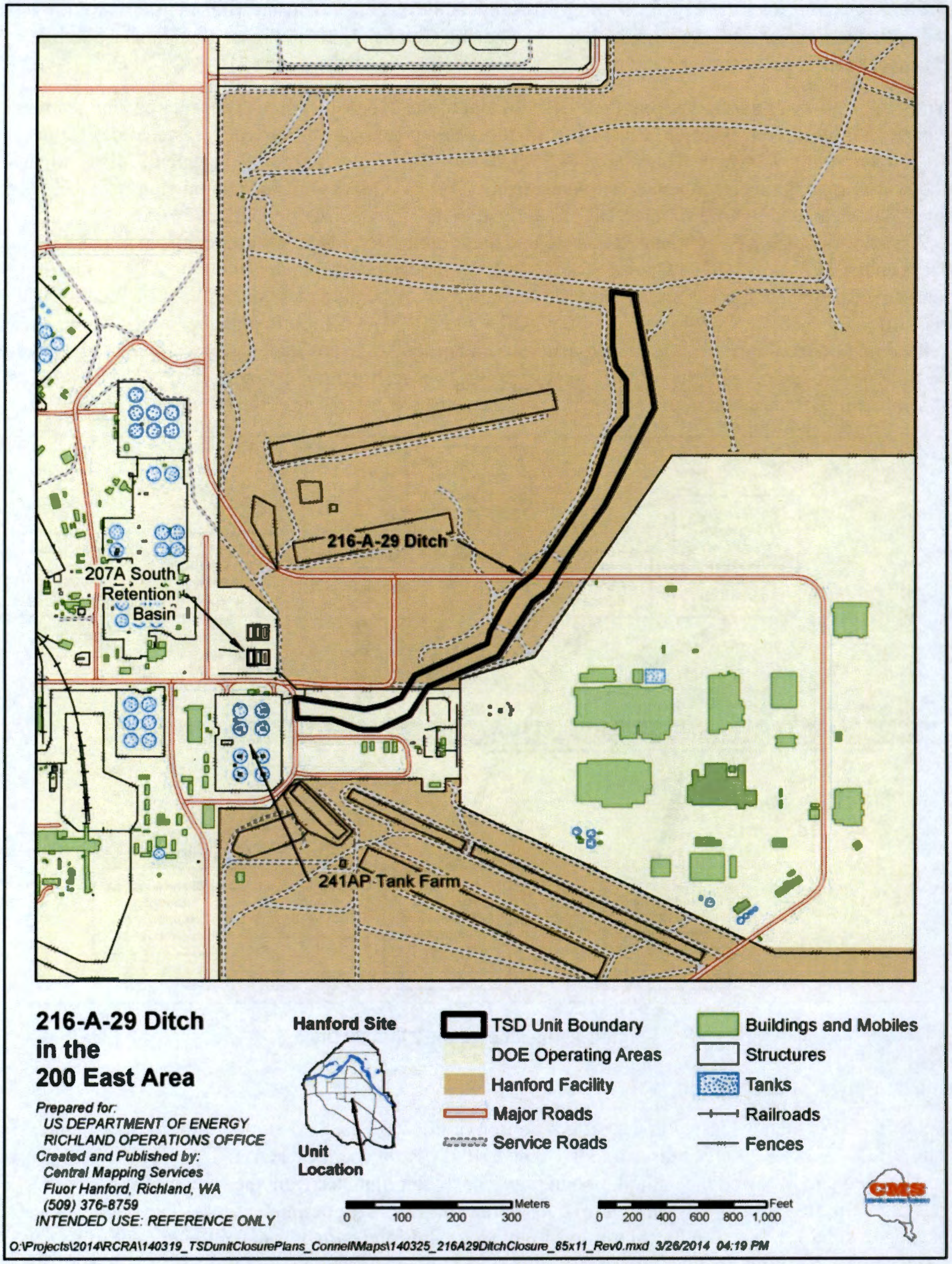

Figure 2. 216-A-29 Ditch Location and Site Plan

The PUREX Plant chemical sewer operated between November 1955 and July 1991. At the beginning of its operation, the 216-A-29 Ditch received discharge from the PUREX Plant cooling water and discharge from the chemical sewer. In early 1980, because of effluent monitoring requirements, the chemical sewer lines feeding the 216-A-29 Ditch required upgrades to allow for monitoring and diversion capabilities. A diversion box was upgraded and connected to the 216-A-42 Retention Basin. The basin received contaminated diversions from the PUREX Plant chemical sewer line, cooling water line, and steam condensate discharge. During 1990, plans were developed and approved to discontinue discharges to and discontinue use of the 216-A-29 Ditch, and all discharges were discontinued in 1991. Stabilization of the 216-A-29 Ditch was performed from July to October 1991.

During construction of the Waste Treatment and Immobilization Plant (WTP), activities to place needed infrastructure were undertaken in the area around the 216-A-29 Ditch, near the grout disposal site, the 4th Street Extension, and access road (GPF Way), which crossed the ditch to the north of the grout disposal site. Aboveground bermed raw and sanitary water pipelines, and liquid effluent pipelines for service to WTP, also cross over the 216-A-29 Ditch in various places. Liquid effluent pipelines that cross the ditch are routed along the south side of the GPF Way and the 4th Street Extension, while the water lines cross the ditch on the north side of GPF Way. Utilities lines also are present at the 216-A-29 Ditch.

1.1.3 Process Information

The 216-A-29 Ditch received nonregulated process and cooling water from the PUREX Plant and discharges of corrosive (acid and caustic) dangerous waste backwashes from regeneration of demineralizer columns in the PUREX Plant. Treatment of this waste occurred by the successive addition of acidic and caustic waste, which served to neutralize the waste in the ditch. Any acidic and caustic waste that did reach the soil was subsequently neutralized by the calcareous nature of the soil. The ditch also received off-spec make-ups of essential chemicals used in the process and spills from the PUREX Plant. The waste streams from PUREX that contributed to the 216-A-29 Ditch are summarized in WHC-EP-0342, Addendum 2, *PUREX Plant Chemical Sewer Stream-Specific Report.*

1.1.4 Waste Inventory and Characteristics

During operations, approximately 22,700,000 L/day (6,000,000 gal/day) of liquid wastewater reached the 216-A-29 Ditch. The ditch was equipped with a meter for measuring flow rate. Flow rates varied from approximately 378 to 5,290 L/min (100 to 1,400 gal/min), depending on the operating conditions of the PUREX Plant. The average flow was approximately 3,760 L/min (970 gal/min).

Chemical discharges to the 216-A-29 Ditch, after the effective date of regulation (nonradioactive hazardous waste: November 19, 1980) that designate as a dangerous waste, constitute the waste codes appearing on the Part A Form. The waste codes on the form are based on known documented discharges to the TSD unit. These discharges are identified in WHC-EP-0342, Addendum 2; DOE/RL-89-28, *216-B-3 Expansion Ponds Closure Plan* (Attachment 23 to Revision 6 of the Permit [WA7890008967]); and DOE/RL-2004-17 (Table 13-2).

The dangerous waste received at the 216-A-29 Ditch included nitric acid, sulfuric acid, sodium hydroxide, potassium hydroxide, hydrazine, hydroxylamine nitrate, cadmium nitrate, ammonium fluoride, and ammonium nitrate. Some of these chemicals are regulated under WAC 173-303, as dangerous wastes because they displayed the characteristic of corrosivity (D002) (closure parameter is pH). Cadmium nitrate is regulated because of the cadmium (D006) (closure parameter is cadmium). Hydrazine is regulated because it is in the listed waste code (U133) (closure parameter is hydrazine). Other constituents are regulated because the state-only WT02 waste code was mentioned as a basis. There are no additional closure parameters from waste codes D002 and WT02 because disassociated anions/cations of acids, bases, and salts do not result in a dangerous waste designation. They are not subject to the numerical closure performance standard comparison in WAC 173-303-610(2)(b)(i), "Closure and Post-Closure," because none of them constitute a "dangerous waste, dangerous waste constituent, or residue."

Based on the dangerous waste received at the 216-A-29 Ditch, the TSD unit constituents of concern for RCRA closure are pH, cadmium, and hydrazine. These constituents constitute the scope of the TSD unit RCRA closure activities (Table 1). The pH range for the ditch soils is from 9.3 to 9.5 and is within the noncorrosive range from WAC 173-303-090(6), "Dangerous Waste Characteristics."

1.1.5 Security

Security information for the Hanford Site is discussed in Permit Condition II.M and Attachment 33 to the Hanford Site Permit (WA789000896). Because the 216-A-29 Ditch is located near the 200 East Area, security information pertaining to the 200 Areas applies to this TSD unit.

Changes to security are expected to occur during the course of 200 East Area deactivation and decommissioning activities. Security measures will remain in place that limit entry to authorized personnel and preclude unknowing access by unauthorized individuals. Following clean closure certification of this TSD unit, security provisions no longer will apply.

2 Groundwater Monitoring

The 216-A-29 Ditch groundwater closure approach is clean closure, in accordance with the TPA Action Plan (Ecology et al. 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*, Section 6.3.1) where any TSD unit is eligible for clean closure at the Hanford Site. The clean closure approach is based on the data gathered to date from the monitoring network (DOE/RL-2008-58, *Interim Status Groundwater Monitoring Plan for the 216-A-29 Ditch*) data contained in the HEIS database, vadose zone characterization data, and data from DOE/RL-2013-22, *Hanford Site Groundwater Monitoring Report for 2012*. After clean closure, no RCRA final status groundwater monitoring program will be required for this TSD unit. Groundwater remediation, if required, will be accomplished through the 200-PO-1 Groundwater OU remedial action. Regional monitoring will continue for the 200-PO-1 Groundwater OU for all contaminants of concern to groundwater.

Table 2 shows a comparison of the TSD unit constituent levels in groundwater to clean closure levels. The clean closure levels for groundwater are the maximum contaminant levels (when available), or the most restrictive level of the WAC 173-340-740(3)(b)(iii)(B)(I), "Noncarcinogens," and (II), "Carcinogens," value for groundwater (unless this value is lower than analytical considerations as indicated in WAC 173-340-700(6)(d), "Natural Background and Analytical Considerations"). For pH, the clean closure level is non-corrosive (pH range >2.0 and <12.5). Following closure certification of the 216-A-29 Ditch (Section 7), the TSD unit groundwater monitoring program for the 216-A-29 Ditch will be discontinued.

The current interim status groundwater monitoring plan (as required by WAC 173-303-400, "Interim Status Facility Standards," and 40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," Subpart F, "Ground-Water Monitoring") is contained in a separate document (DOE/RL-2008-58). This document contains further details regarding the geology, hydrology, and current groundwater monitoring programs for the TSD unit. Excerpts from DOE/RL-2013-22 provide more recent monitoring network and groundwater conditions.

Table 1. Comparison of 216-A-29 Ditch Data to Clean Closure Levels[a]

TSD Unit Constituent Related to Part A Waste Code D002	Maximum Soil Concentration (Shallow Zone)	Maximum Soil Concentration (Deep Zone)[b]	90th Percentile Lognormal Hanford Site Background[c]	Soil Concentration Protective of Groundwater[d]	Human Health Protection Soil Direct Contact[e]		Screening Levels for Ecological Protection[f]	Clean Closure Driver[g]	Meet Clean Closure Standard?[a]
					Carcinogen	Non-Carcinogen			
pH (pH Units)	9.3	9.5	N/A	N/A	N/A	N/A	N/A	Non corrosive (>2.0 and <12.5)	Yes
Cadmium (mg/kg)	28	0.32	1.0	4.7[h]	N/A	80	14	Soil Concentration Protective of Groundwater	No
Hydrazine (mg/kg)	ND	ND	ND	PQL[i]	0.333	N/A	N/A	PQL	Yes[j]

a. Clean closure evaluations for TSD units are required to use unrestricted use levels in WAC 173-340-740(3), "Method B Soil Cleanup Levels for Unrestricted Land Use," based on WAC 173-303-610(2)(b)(i), "Closure Performance Standard."
b. DOE/RL-2005-63, *Feasibility Study for the 200-CS-1 Chemical Sewer Group Operable Unit* (Appendices A and B). Shallow zone is surface to 4.6 m (15 ft).
c. DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Vol. I.
d. WAC 173-340-740(3)(b)(iii)(A), "Ground Water Protection." Point of compliance is soils throughout the site (WAC 173-340-740(6), "Point of Compliance").
e. WAC 173-340-740(3)(b)(iii)(B)(I), "Noncarcinogens," and (II), "Carcinogens." Equations are found in (I) and (II) for human health direct contact. Point of compliance is surface to 4.6 m (15 ft) (WAC 173-340-740(6)).
f. WAC 173-340-740(3)(b)(ii), "Environmental Protection"; however, only wildlife for industrial values from Table 749-3 are used (WAC 173-340-7493(2)(a)(i), "Site-Specific Terrestrial Ecological Evaluation Procedures," "The Chemicals of Ecological Concern"). Point of compliance is surface to 4.6 m (15 ft) (WAC 173-340-7490(4)(b), "Terrestrial Ecological Evaluation Procedures," "Standard Point of Compliance").
g. Represents the most restrictive level after ensuring the most restrictive level is not less than natural background and for analytical considerations, as indicated in WAC 173-340-700(6)(d), "Natural Background and Analytical Considerations."
h. 4.7 mg/kg is proposed as the clean closure standard based on site specific calculations, which changed infiltration, groundwater flow rate, and the thickness of the mixing zone parameters in equations 747-A, 747-3, 747-4, and 747-5. Otherwise, 0.69 mg/kg would be the cleanup standard, which is below background. The cleanup standards will be modified as appropriate as part of the 200-EA-1 OU RI/FS soil concentration calculations that are protective of groundwater.
i. The PQL for hydrazine exceeds the soil concentration protective of the groundwater standard of 0.0000625. Therefore, the PQL is used for clean closure determinations.
j. Hydrazine was not identified as a constituent of concern during the 200-CS-1 operable unit data quality objectives process. Contained-in determinations for listed waste code U133 for hydrazine in soils have been approved by the Washington State Department of Ecology. Clean closure is based on the data quality objectives process and the contained-in determination.

Part A = 216-A-29 Ditch, WA7890008967, Part V, Closure Unit 11.
N/A = not applicable.
ND = not detected.
PQL = practical quantitation limit.
TSD = treatment, storage, and/or disposal.

Table 2. Comparison of 216-A-29 Ditch Groundwater Data to Clean Closure Levels

TSD Unit Constituent Related to Part A Waste Codes D002, D006, U133	Maximum Concentration in Groundwater from HEIS[a]	Groundwater Clean Closure Cleanup Level[b]	Clean Closure Driver[b]	Meet Clean Closure Standard?
pH (pH Units)	7.79 - 8.77	Non corrosive	WAC 173-303-090(6)	Yes
Cadmium (µg/L)	ND (.058-4)	5	MCL	Yes
Hydrazine	N/A	PQL[c]	PQL	Yes

Source: WAC 173-303-090(6), "Characteristic of Corrosivity."

a. HEIS queries date range back through 2002.

b. Except for pH, listed values represent in the following order of priority: (1) the MCL (when available), (2) the most restrictive level of the Method B carcinogen or non-carcinogen value for groundwater unless this value is lower than analytical considerations as indicated in WAC 173-340-700(6)(d), "Natural Background and Analytical Considerations."

c. The cleanup level of 0.0146 µg/L (Method B carcinogen) is below the PQL. Clean closure is based on the PQL.

Part A = 216-A-29 Ditch, WA7890008967, Part V, Closure Unit 11.
HEIS = Hanford Environmental Information System.
MCL = maximum contaminant level.
N/A = not applicable.
ND = not detected.
PQL = practical quantitation limit.
TSD = treatment, storage, and/or disposal.

Groundwater beneath the 216-A-29 Ditch is monitored for evidence (detection) of hazardous waste migration as required by interim status RCRA regulations (40 CFR 265.93(b), "Interim Status for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," "Preparation, Evaluation, and Response," as referenced by WAC 173-303-400). The nine wells in the groundwater monitoring network are sampled semiannually for contamination indicator parameters and annually for groundwater quality parameters and site-specific constituents. The well network is adequate for the current groundwater flow directions. Groundwater samples were collected and analyzed at all nine wells monitoring the 216-A-29 Ditch in 2012, except for two sample events missed for downgradient well 299-E25-26 as a result of pump issues and work restrictions due to overhead powerlines.

Confined aquifer units near the 216-A-29 Ditch affect groundwater flow within the unconfined aquifer. Near the north end of the ditch and immediately west and north of the 216-A-29 Ditch and the adjacent 216-B-3 Pond, flow in the unconfined aquifer is south to southwest (DOE/RL-2008-59, *Interim Status Groundwater Monitoring Plan for the 216-B-3 Pond*, Figure ES-2). Further east of the 216-A-29 Ditch, groundwater flow is more generally to the southeast. The magnitude of the water table gradient at the 216-A-29 Ditch is assumed to be similar to that at the PUREX Cribs and the Integrated Disposal Facility at 2.4×10^{-5} meter per meter (see DOE/RL-2013-22). The average flow velocities are estimated to range from 0.001 to 0.004 meter per day (SGW-55438, *Hanford Site Groundwater Monitoring for 2012: Supporting Information*, Table 3-1). Additional gradient network evaluation of the 216-A-29 Ditch area is ongoing to define groundwater flow directions and velocity more accurately.

2.1 History of RCRA Groundwater Monitoring

RCRA groundwater monitoring of the 216-A-29 Ditch began in November 1988 with an interim status indicator parameter evaluation (detection level) program (DOE/RL-92-03, *Annual Report for RCRA Groundwater Monitoring Projects at Hanford Site Facilities for 1991*). The interim status groundwater monitoring wells were sampled quarterly for one year to establish background levels. Background sampling was completed in August 1989. The program was elevated to an assessment level program in

1990 because of elevated specific conductance beyond the critical mean in one downgradient well. Results of the groundwater quality assessment, which concluded in 1995, are reported in WHC-SD-EN-EV-032, *Results of Groundwater Quality Assessment Program at the 216-A-29 Ditch RCRA Facility*. The program then reverted to indicator evaluation monitoring in October 1996.

2.2 Aquifer Identification

In November 1988, RCRA groundwater monitoring of the 216-A-29 Ditch began with an interim status indicator parameter evaluation (detection level) program (DOE/RL-92-03). The wells were sampled quarterly for one year to establish background levels. Background sampling was completed in August 1989. The program was elevated to an assessment level program in 1990 because of elevated specific conductance beyond the critical mean in one downgradient well. The results of the groundwater quality assessment, which concluded in 1995, are reported in WHC-SD-EN-EV-032. The program then reverted to indicator evaluation monitoring in October 1996. Interim status groundwater monitoring was formalized in 1999 per PNNL-13047, *Groundwater Monitoring Plan for the 216-A-29 Ditch*, and included 10 network wells. The monitoring network was modified in 2010 to remove one well (699-43-43 was determined to no longer provide representative groundwater samples in 2001), resulting in a revised monitoring network of nine wells.

2.3 Well Location and Design

At the end of the assessment monitoring program, the monitoring well network reverted to a smaller group of 10 wells, and then to 9 wells (DOE/RL-2008-58). In 2010, the upgradient and downgradient well designation was modified due to a changing flow direction from southwest to southeasterly (DOE/RL-2011-01, *Hanford Site Groundwater Monitoring Report for 2010*). Currently, there are two upgradient wells (299-E26-12 and 299-E26-13) and seven downgradient wells (299-E25-26, E25-28, E25-32P, E25-34, E25-35, E25-48, and 699-43-45 (Figure 3). The wells are sampled semiannually to annually for RCRA indicator parameters and water quality parameters with dedicated sampling pumps. Figure 3 shows the location of the wells in the 216-A-29 Ditch monitoring network.

Construction of the wells followed the RCRA standard well-construction specifications. The standards in WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," were used to set the basic design requirements. The revised interim status groundwater monitoring network for the 216-A-29 Ditch includes nine wells constructed from 1985 through 1992. Eight of the wells are constructed with screens at the water table, and the remaining well (299-E25-32P) is screened above the top of the basalt and at the bottom of the aquifer. A summary of wells is shown in Table 3.

2.4 Results of Interim Status Groundwater Monitoring

The RCRA indicator parameters are specific conductance, pH, total organic carbon (TOC), and total organic halides (TOX). Water quality and site-specific parameters include anions (chloride, fluoride, sulfate, nitrate, and nitrite), alkalinity, filtered and unfiltered metals (calcium, iron, magnesium, manganese, potassium, and sodium), oxidation-reduction potential, temperature, and turbidity. From 1990, when the 216-A-29 Ditch was placed into an assessment level groundwater monitoring program, to 1995, comprehensive sampling and analysis were performed to determine the cause of the specific conductance exceedance. The assessment report (WHC-SD-EN-EV-032) concluded that elevated specific conductance was caused by high concentrations of sulfate, sodium, and calcium in the groundwater beneath the 216-A-29 Ditch. None of these contaminants could be conclusively linked to discharges to the 216-A-29 Ditch and are not considered dangerous wastes. The TSD unit reverted to an indicator parameter evaluation program after the assessment was completed.

Figure 3. 216-A-29 Ditch Monitoring Well Locations

Table 3. Well Information for the 216-A-29 Ditch RCRA Monitoring Network

Well Name	Year Installed	Water Depth (ft bgs)	Water Level Date	Water Table Elevation (MSL NAVD88 ft)	Screen Top (ft bgs)	Screen Bottom (ft bgs)	Remaining Water Column (ft)	Location
299-E25-26*	1985	272.6	3/13/13	399.5	270	290	17.4	Downgradient
299-E25-28	1985	266.5	4/2/13	399.6	320	340	20	Downgradient
299-E25-32P	1988	272.9	4/16/13	399.7	259.4	279.4	6.5	Downgradient
299-E25-34	1988	267	7/25/13	399.4	251.6	271.6	4.6	Downgradient
299-E25-35	1988	278.4	7/25/13	399.5	260.5	281	2.6	Downgradient
299-E25-48	1992	286.1	6/4/13	399.5	274.3	294.6	8.5	Downgradient
299-E26-12	1991	234.6	4/16/13	399.6	217.6	238.6	4	Upgradient
299-E26-13	1991	208.9	7/25/13	399.6	191.7	212.3	3.4	Upgradient
699-43-45	1989	201.3	7/1/13	399.6	183	203.3	2	Downgradient

Source: NAVD88 = *North American Vertical Datum of 1988.*

Note: All wells are constructed to standards of WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," resource protection wells.

* Well 299-E25-26 is a perforated well.

No exceedances of the 2012 critical mean for pH, TOC, and TOX were detected during 2012. The critical mean for specific conductance was exceeded in wells 299-E25-35 and 299-E25-48 during both 2012 sampling events. The critical mean for specific conductance in well 299-E25-35 has been exceeded since the early 1990s, and has been exceeded in well 299-E25-48 since 2000, due to elevated calcium, sodium, and sulfate. The increasing specific conductance coincides with similar increases in calcium, sodium, and sulfate in these wells. With respect to groundwater quality constituents monitored for the site (chloride, iron, manganese, nitrate, phenols, sodium, and sulfate), iron continues to exceed the secondary drinking water standard (DWS) intermittently in well 299-E25-32P. However, the most recent exceedance in well 299-E25-32P, prior to 2012, was in 1995. Similarly, manganese continues to exceed the secondary DWS intermittently in well 299-E25-19, with the last exceedance in 1995.

3 Closure Performance Standards

This section identifies general clean closure performance standards and specific closure standards for the soils.

3.1 Treatment, Storage, and Disposal Unit Closure Performance Standards

The standards for closure of this TSD unit are in accordance with the requirements of the TPA Action Plan (Ecology et al. 1989b, Section 5.3) directing that Hanford Site interim status TSD unit closures meet cleanup requirements established in accordance with WAC 173-303-610. As required by the TPA (Ecology et al. 1989a, Section 6.3.1), clean closure for disposal units also must demonstrate that TSD unit operations did not adversely impact soil or groundwater. The closure performance standards of

WAC 173-303-610(2)(a)(i- iii), "Closure Performance Standard," require the owner or operator of a TSD unit to close the unit in a manner that ensures the following objectives:

- Minimize the need for further maintenance.
- Control, minimize, or eliminate, to the extent necessary, to protect human health and the environment, post-closure escape of dangerous waste, dangerous waste constituents, leachate, contaminated runoff, or dangerous waste decomposition products to the ground, surface water, groundwater, or the atmosphere.
- Return the land to the appearance and use of surrounding land areas to the degree possible given the nature of the previous dangerous waste activity.

Potential contaminant exposures and health impacts to humans are largely dependent on land use. Land use for the 200 Areas, selected by the DOE through 64 FR 61615, "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS)," is industrial-exclusive. Industrial cleanup standards are identified in WAC 173-340-745(5), "Method C Industrial Soil Cleanup Levels." Before WAC 173-340-745(5) standards are applied, however, the owner/operator can choose to pursue a clean closure evaluation based on the traditional application of residential standards under WAC 173-340-740(3), "Method B Soil Cleanup Levels for Unrestricted Land Use," as described in WAC 173-303-610(2)(b)(i). If necessary, and if Ecology agrees, the standards in WAC 173-340-745(5) can be imposed through the alternative closure requirements of WAC 173-303-610(1)(e).

After clean closure, the appearance of land will be consistent with future land-use determinations for adjacent portions of the 200 Areas as an industrial-exclusive portion of the Hanford Site that is consistent with the formal determination made for this portion of the 200 Area as described in 64 FR 61615.

3.2 Soil Closure Standards

The clean closure requirements are established in WAC 173-303-610(2)(b) and the surface impoundment standards in WAC 173-303-650(6)(a), "Surface Impoundments," "Closure and Post-Closure Care," to remove or decontaminate unit soils contaminated above clean closure standards. These soil clean closure cleanup levels are the numeric levels identified in WAC 173-340-740(3) that are either: (1) levels calculated using the most restrictive WAC 173-340-740(3) formulas for unrestricted use, or (2) background levels (DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*) when the most restrictive WAC 173-340-740(3) formulas are more stringent than Hanford Site background concentrations.

WAC 173-340-740(3) contains the following potential clean closure standards: environmental protection related to ecological receptors, soil concentrations protective of groundwater, soil direct-contact carcinogens, soil direct-contact noncarcinogens, soil direct-contact petroleum vapors, and soil vapors. Environmental protection related to ecological receptors, soil concentration protective of groundwater, soil direct-contact carcinogens, and soil direct-contact noncarcinogens is applicable and identified in Table 1. The soil direct-contact petroleum vapors and soil vapors standards do not apply because there are no petroleum compounds or volatile organic compounds related to TSD unit closure, respectively.

Historical listed waste (U133) hydrazine discharges will not prevent clean closure of the 216-A-29 Ditch. Hydrazine was ruled out as a potential contaminant of concern during the data quality objectives (DQO) process for the 200-CS-1 OU. The DQO report (BHI-01276, *200-CS-1 Chemical Sewer Operable Unit DQO Summary Report*) cites: "Hydrazine is a listed waste that was potentially discharged with the cooling waters; however, because hydrazine is extremely reactive and volatile, it no longer is present in any media associated with the 200-CS-1 OU." The practical quantitation limit (PQL) for hydrazine exceeds the soil concentration protective of the groundwater standard (0.0146 µg/L); therefore, the PQL is used for clean closure determinations. Also, 216-A-29 Ditch hydrazine was subject to a contained-in determination by Ecology (00-GWVZ-050, 2000, "200 Area Hydrazine Contained-In Determination Request"; 02-RCA-0261, "216-A-29 Ditch Hydrazine Contained-In Determination (CID) Request"). This contained-in determination addressed the 216-A-29 Ditch soils. Clean closure can be pursued for hydrazine at the 216-A-29 Ditch, and the U133 waste code no longer applies to 216-A-29 Ditch soils. Clean closure for hydrazine is based on the DQO process and the contained-in determinations.

4 Closure Activities

This section summarizes closure activities for the 216-A-29 Ditch performed as part of the 200-CS-1 OU remedial investigation (RI) process.

4.1 Previous Closure Activities

Physical closure activities included TSD unit physical isolation, borehole and test pit drilling, sampling and analysis, removal of 216-A-29 Ditch soils, and verification sampling following soil removal. Administrative closure activities also are discussed (e.g., certification).

The unit soils are planned to be clean closed based on the results of DOE/RL-2004-17 and remediation of the 216-A-29 Ditch soils. Soil will be removed and generated as waste. The soil generated as waste will require subsequent designation according to WAC 173-303-070(3), "Designation of Dangerous Waste," and (5), "Additional Designation Required," and management as part of closure. Because soils are not expected to be designated as dangerous waste, treatment of the soils is not expected before they are disposed at the Environmental Restoration Disposal Facility.

4.2 Treatment, Storage, and Disposal Unit Physical Isolation

To preclude any further discharges to the unit and in support of TSD unit closure, the 216-A-29 Ditch was physically isolated from receipt of the PUREX Plant chemical sewer effluent by blanking the effluent lines. Stabilization of the 216-A-29 Ditch was performed from July to October 1991. The trench no longer can accept dangerous waste.

4.3 Treatment, Storage, and Disposal Unit Sampling and Analysis

Additional sampling of the soils will be performed to verify that contaminant removal is complete and confirm that waste site remedy selection was implemented to achieve clean closure.

4.3.1 Soil Sampling and Analysis

As part of the 200-CS-1 OU RI, data were collected to characterize the nature and vertical extent of contamination and the physical conditions in the vadose zone underlying the 216-A-29 Ditch. Drilling, test pit excavation, surface and borehole geophysical surveys, and soil sampling and analysis were conducted during the field activities. Borehole and test pit locations are shown in DOE/RL-99-44, *200-CS-1 Operable Unit RI/FS Work Plan and RCRA TSD Unit Sampling Plan.*

Borehole B8826 was drilled and sampled in the 216-A-29 Ditch east of the AP Tank Farm in the 200 East Area. Test Pits AD-1 through AD-3 were excavated and sampled at the 216-A-29 Ditch in fiscal year (FY) 2002, and details are summarized in DOE/RL-2004-17. Data collected from Test Pit AD-3 were additional to the data required by DOE/RL-99-44 and were used to support the decision making process for locating a proposed waste transfer line to WTP.

Borehole B8826 was drilled and sampled during FY 2003. The borehole was drilled through the 216-A-29 Ditch from the ground surface to a depth of 83.2 m (273 ft). The borehole was logged using a high-resolution spectral gamma-ray logging system and a neutron-moisture logging system. The borehole was drilled to define stratigraphy more accurately, assess the nature and vertical extent of contamination, and determine the physical properties of soil beneath the TSD unit.

The test pit locations were prepared by removing 0.3 to 0.6 m (1 to 2 ft) of topsoil from the site. The test pits were excavated to a maximum depth of 7 m (25 ft) below ground surface (bgs) using a track-hoe. Samples were obtained directly from the track-hoe bucket at intervals of approximately 0.7 m (2.5 ft). Before being placed in a sample jar, soil samples were screened in the field to assist in selecting sample points, support worker health and safety, and provide shipping information. Samples were analyzed for chemicals, including pH, cadmium, and hydrazine, and physical properties. The test pits were backfilled, in the reverse order from which they were excavated, using the track-hoe.

Soils from the boreholes and test pits were screened in the field both for indications of contamination and assistance in determining the discrete sample locations or depths before the samples were collected. Soil samples were collected for analysis and determination of physical properties. The sampling approach generally required a greater sample frequency near the bottom of the TSD unit, which is the area of highest suspected contamination. Sample collection was attempted at depths of 4.6 and 7.6 m (15 and 25 ft) bgs to define contamination profiles. Sample frequency generally was reduced to 6.1 to 15.2 m (20 to 50 ft) intervals below a depth of 7.6 m (25 ft) in the boreholes.

Soil samples were analyzed for the constituents of concerns from DOE/RL-2004-17. Samples were analyzed selectively for field bulk density and moisture content. Ditch bottom samples from each of the test pits were analyzed for an expanded list of compounds to satisfy waste designation requirements. Soil descriptions were recorded to define stratigraphic relationships more accurately in the OU. Results obtained from previous characterization activities also were evaluated as part of this RI.

4.3.2 Soil Sample Results

Analytical results obtained from the RI were intended for RCRA closure decisions and are defensible for use in this closure plan. Table 1 identifies the maximum concentration of TSD unit constituents in shallow soils and deep zone soils from DOE/RL-2004-17 (Tables 4-1 and 4-3). These maximum values are compared to the clean closure levels.

After comparing the TSD unit constituent concentrations found in DOE/RL-2004-17 (Tables 4-1 and 4-3) to the WAC 173-340-740(3) unrestricted use values, the TSD unit was not eligible for clean closure without remediation. The TSD unit constituent concentrations were then compared to the WAC 173-340-745(5) values with the same result.

Table 1 shows that two of the three TSD unit constituents (pH and hydrazine) meet the clean closure standard; in the case of hydrazine, other provisions are used to demonstrate clean closure. Cadmium is the TSD unit constituent that does not meet the clean closure standard. To meet WAC 173-340-740(3) unrestricted use cleanup levels, 216-A-29 Ditch contaminated soils will require removal near the head and the end of the ditch. As the 200-EA-1 OU is removing the 216-A-29 Ditch contaminated soils, the TSD unit clean closure approach for the soils also will be to remove the 216-A-29 Ditch contaminated soils and conduct verification sampling. The sampling and analysis plan for verifying containment of contaminant removal will be in the 200-EA-1 OU remedial design/remedial action work plan.

5 Contingent Closure Plan

Based on results that support clean closure after soil remediation, a contingent closure plan will not be required. If it is determined in the future that clean closure is not possible, a modified closure plan will be prepared.

6 Schedule for Closure

The remaining closure activities for this TSD unit include (1) removal of the 216-A-29 Ditch soils as needed to meet closure standards, (2) completion of a DQO process for verification sampling, and (3) verification sampling of the soils. These activities will be conducted in conjunction with the 200-EA-1 OU *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) remedial action/RCRA corrective action activities and are expected to achieve clean closure for the TSD unit soils.

The unit specific closure requirement identified in item (1) above, will be completed per TPA Interim Milestone M-037-10. Items (2) and (3) will be completed within 180 days following completion of the unit specific closure requirement. The certification of closure package will be submitted within 90 days following completion of the closure activities described above.

After closure, appearance of the land will be consistent with future land-use determinations for adjacent portions of the 200 Areas as an industrial-exclusive portion of the Hanford Site. Land use is consistent with the formal determination made for this portion of the 200 Area as described in 64 FR 61615.

Following submittal of this closure plan to Ecology, the 90-day review period begins in accordance with the TPA Action Plan (Ecology et al. 1989b).

7 Certification of Closure

Upon removal of the 216-A-29 Ditch soils, additional verification sampling must be performed to determine if the closure activities meet the clean closure standard. When verification sampling results have been evaluated and confirmed, closure activities under this closure plan will have been completed.

In accordance with WAC 173-303-610(6), DOE will submit to Ecology a certification of closure and subsequent permit modification document. Both DOE and the Co-Operator identified on the current Part A Form will sign the certification of closure, and an Independent Registered Professional Engineer (IQRPE) will state 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 IQRPE's certification will be placed in the Administrative Record.

8 Post-Closure Plan

The closure strategy for the 216-A-29 Ditch is clean closure with regard to TSD unit constituents for soils and groundwater once soil removal has been accomplished. Therefore, no post-closure plan is required. If verification sampling following removal of the 216-A-29 Ditch soils does not demonstrate clean closure, a post-closure plan will be prepared and submitted to Ecology within 180 days following certification of closure, or as agreed to by Ecology, based on 200-EA-1 OU schedules.

9 Amendment of Closure Plan

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

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